Leibniz Universität Hannover

Bundesanstalt für Geowissenschaften und Rohstoffe

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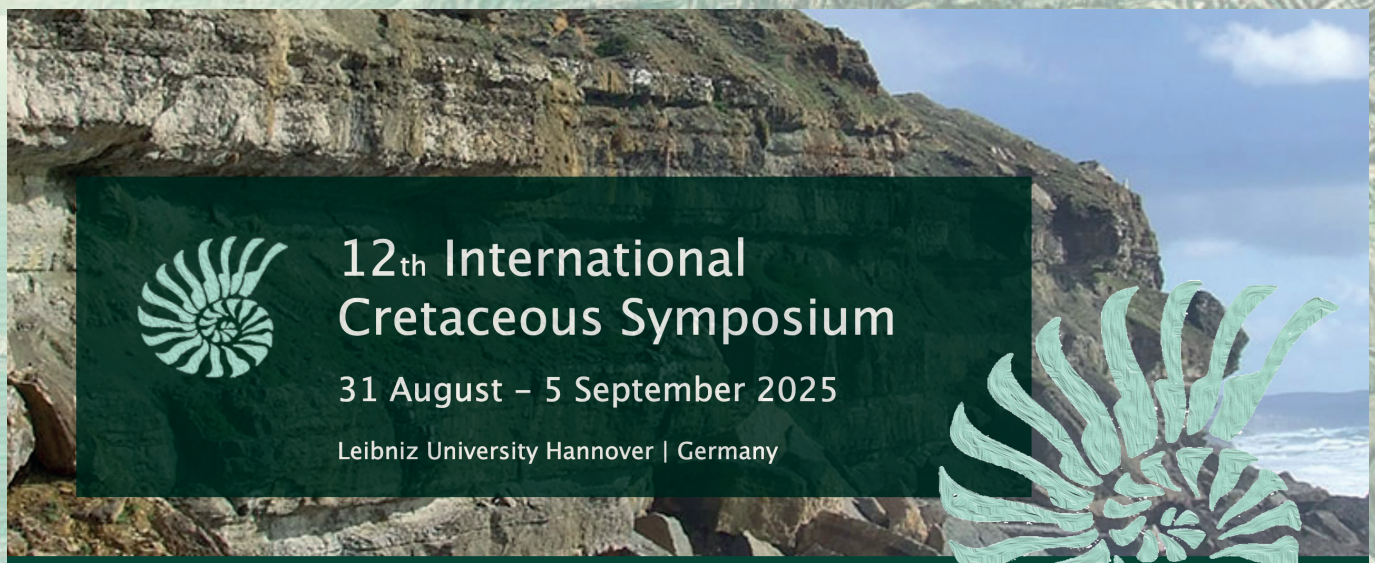

12th International Cretaceous Symposium

31 August – 5 September 2025

Leibniz University Hannover | Germany

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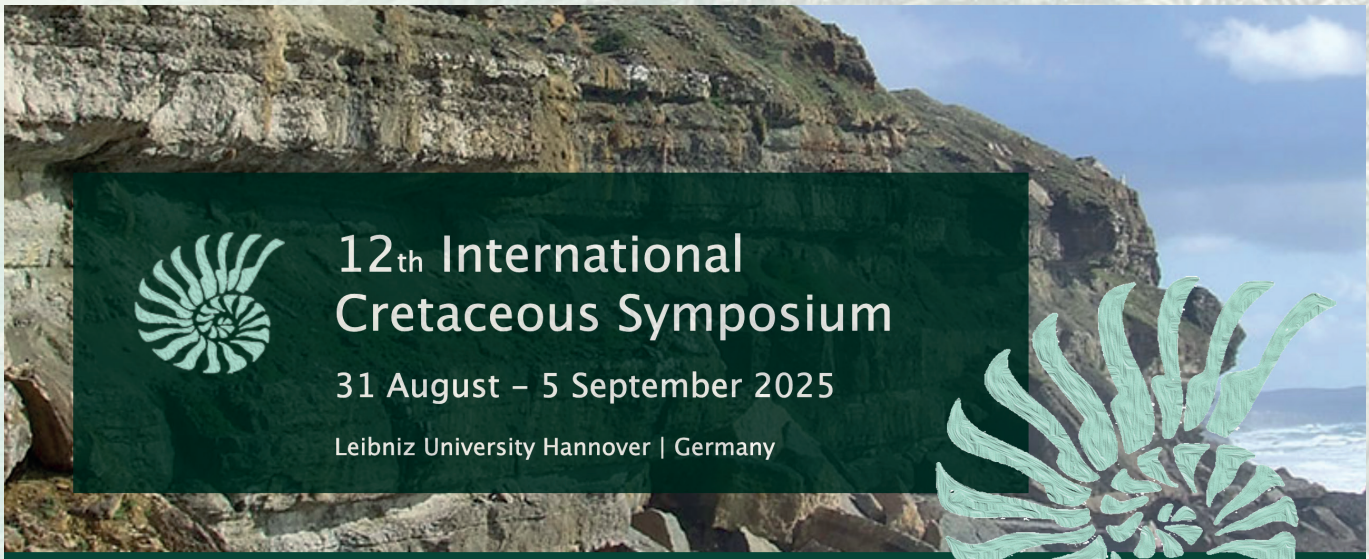

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PLENARIES

Plenary

The response of calcareous nannoplankton to paleoenvironmental changes: case studies from the Cretaceous

Bottini, Cinzia

Università degli Studi di Milano, Italy

Calcareous nannoplankton are among the most effective tools for paleoenvironmental reconstructions, thanks to their wide geographic distribution and high sensitivity to environmental changes. Parameters such as coccolith size, relative abundance, and assemblage diversity provide key insights into past ocean conditions, including surface-water temperature and fertility, and ocean chemistry.

Beyond local paleoecological reconstructions, calcareous nannoplankton have been widely used to investigate ocean-atmosphere dynamics at both regional and global scales, and across a range of temporal resolutions, from short-term events to long-term trends. The Cretaceous period, marked by major climatic and oceanographic changes, offers numerous examples of large-scale environmental perturbations, many of which are associated with intense Large Igneous Province activity. In particular, Oceanic Anoxic Events (OAEs), often linked to episodes of massive volcanism, represent key case studies for understanding plankton community responses during times of environmental stress.

This presentation will provide an overview of the paleoecological responses of calcareous nannoplankton to environmental perturbations during the Cretaceous, considering both specific OAEs and long-term background intervals (non-OAE periods). The aim is to assess how calcareous nannoplankton responded to environmental stress, whether and under what conditions they were resilient, and which thresholds may have triggered disruptions in ecological equilibrium. Potential recurring patterns among similar events, the timing and pathways of recovery following peak perturbation phases, and the factors that influenced calcification in the past will be explored keeping an eye on what is observed in modern plankton systems, offering insights into the links between past crises and ongoing environmental change.

Plenary

Defining and refining the Cretaceous time scale: integrated stratigraphy, stages, substages, GSSPs and SABSs for the last 77 Myr of the Mesozoic Era

Jarvis, Ian

Kingston University London, United Kingdom

The primary objectives of the International Subcommission on Cretaceous Stratigraphy are to establish a standard global stratigraphic subdivision and nomenclature for the Cretaceous, and to produce a stratigraphic table displaying agreed subdivision to stage and substage level, with boundaries that are defined by a Global boundary Stratotype Section and Point (GSSP). The Cretaceous Period is the longest of the Phanerozoic with12 stages. In 2000, none of the stage boundaries of the Cretaceous System was defined using a GSSP, a concept initiated in 1977. Increasingly rapid progress has been made since the ratification of the Maastrichtian Stage in 2001, now under revision, with 5 GSSPs ratified over the last 6 years. These stratotypes will be reviewed to illustrate the requirements for formal recognition of stage and substage boundaries, with only the former requiring ratification by the ICS. Out of 12, only two stages, the Berriasian and Aptian, remain to be defined. No substages have yet been formalised. A range of criteria are being used as primary markers to define stage boundaries including macrofossils (ammonites, inoceramids), microfossils (planktonic foraminifera), a magnetic reversal, and a carbon isotope event. Additional secondary markers are essential to enable the wider placement of stage boundaries. Nonetheless, no single section will ever include the complete range of potential markers to define a stage boundary. Standard Auxiliary Boundary Stratotype (SABS) sections, approved by the IUGS in 2023, provide a basis to extend the correlative potential of a GSSP between continents, biogeographic provinces, climate zones, depositional facies and preservation states.

Plenary

To heat, or not to heat, that is the question: Cretaceous environmental crises and their links to climate change

Percival, Lawrence (1); Claeys, Philippe (2); Goderis, Steven (2); Graham, Olivia (3); Ownsworth, Emma (4); Naafs, David (3); Robinson, Stuart (5); Selby, David (6); van der Lubbe, Jeroen (1)

1: Department of Earth Sciences, Vrije Universiteit Amsterdam, The Netherlands; 2: Archaeology, Environmental Changes and Geo-Chemistry (AMGC), Vrije Universiteit Brussel, Belgium; 3: Organic Geochemistry Unit, School of Chemistry, University of Bristol, UK; 4: Department of Earth and Environmental Sciences, University of Manchester, UK; 5: Department of Earth Sciences, University of Oxford, UK; 6: Department of Earth Sciences, Durham University, UK

The Cretaceous Period was marked by numerous episodes of transient environmental perturbation, several of which profoundly impacted global ecosystems. These events included one of the 'Big Five' Phanerozoic mass extinctions at the end of the Cretaceous, multiple intervals of globally widespread marine oxygen depletion (Oceanic Anoxic Events, or OAEs), and a range of other episodes of profound Earth surface change. A common factor that appears to have linked all of those times is that the environmental change was related to geologically rapid change(s) in climate. However, the nature and/or rate of climate change varied between events, and they remain debated in many cases.

This presentation gives an overview of new and published work pertaining to some of the outstanding questions and issues regarding how changes in global climate related to environmental (and/or ecosystem) degradation during the Cretaceous. A key focus is placed on events that occurred during the early–middle part of the period, and the extent and nature of their link with major volcanic activity. For example, how did carbon emissions vs basalt weathering impact global climate during the early Valanginian? Were the major Cretaceous OAEs driven by volcanic CO_2 emissions and warming, or volcanic nutrients intensifying primary productivity? And either way, what was the primary source? Establishing the nuances in how Earth's climate changed during these intervals of environmental change is key to resolving the similarities and differences of those events, and understanding the interactions between different phenomena across the Earth system during the Cretaceous Period.

Plenary

Radioisotopic dating and the Cretaceous time scale

Singer, Brad S.

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Radioisotopic dating using single crystal U-Pb zircon and $^{40}Ar/^{39}Ar$ sanidine methods since publication of Geologic Time Scale 2020 (GTS2020) continues to improve the Cretaceous time scale and more firmly establish the ages and uncertainties associated with several stage boundaries and key phenomena. Examples here aim to highlight some of these recent contributions. Bayesian age-depth modeling of 19 U-Pb dates of tuffs in the Yezo Group, Hokkaido, Japan where Leupoldina cabri fossils occur above nearly synchronous carbon and osmium isotope excursions indicate that OAE1a began at 119.55 +0.072/−0.079 Ma and had a duration of 1116 +87/−93 kyr. These findings imply that Ontong Java volcanism is a probable driver of OAE1a. Collective U-Pb and $^{40}Ar/^{39}Ar$ dating of tuffs in Quingshan Group, Jiaolai Basin, China constrain the onset of magnetic chron M0r, and thus the Barremian-Aptian boundary, to 120.287 ± 0.088 Ma (±2s full external uncertainty) which is >1 myr younger, and nearly an order of magnitude more precise than in GTS2020. U-Pb and $^{40}Ar/^{39}Ar$ dates from 11 tuffs in 5 sections of the Yezo Group, Hokkaido, Japan have yielded an age for the Albian-Cenomanian boundary of 100.74 ± 0.10 Ma. This age, which exceeds that in GTS2020 by 240 kyr, relies on correlating distinctive positive $\delta^{13}C$ excursions of OAE1d from the GSSP near Mt. Risou, France to those identified within Yezo Group strata where a first appearance of Thalmanninella globotruncanoides has been documented. A slight osmium isotope excursion in these mudstones suggests a role for Kerguelan LIP volcanism in driving OAE1d.

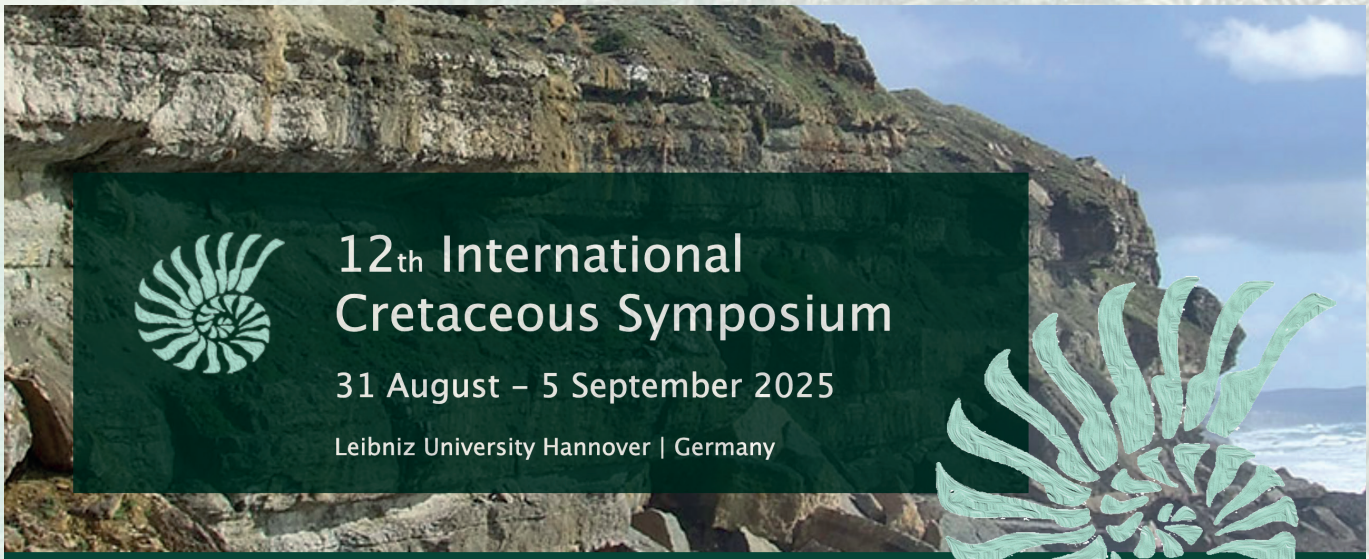
Plenary

The impact of chemical weathering on the Late Cretaceous climatic cooling

Voigt, Silke (1); Huber, Sandra J. (1,2,3); Vanessa, Schlidt (1,3); Schickedanz, Mathis (1); Seitz, H.-Michael (1,3); Raddatz, Jacek (1,3,4); Kniest, Jorit (1,3,4); Fischer, Alexa (5); Friedrich, Oliver (5); Gale, Andrew S. (6); Pogge von Strandmann, Philip (7)

1: Goethe University Frankfurt, Germany; 2: Landesmuseum Darmstadt, Germany; 3: FIERCE, Goethe University Frankfurt, Germany; 4: GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany; 5: Heidelberg University, Germany; 6: University of Portsmouth; 7: Gutenberg University Mainz, Germany

After the mid-Cretaceous hothouse, the Earth cooled severely by more than 10°C in the late Cretaceous largely under ice-free conditions. Causes of the cooling are still poorly constrained, mainly considered as result of reduced lithospheric outgassing after the climax of LIP-related volcanism or effects of ophiolite weathering. Possible interactions with changes in chemical weathering intensity based on changes in paleo-landscape and the terrestrial biosphere, instead, received little attention so far. Here, we present a new chalk-derived Li-isotope record for the Late Cretaceous and discuss its baseline and multi-million year-scale variability in terms of plate tectonic reorganization and paleo-landscape change. Rising and high δ^7Li values in the Turonian-Santonian and the Maastrichtian contrast with lower δ^7Li values in the Campanian. The pattern of the δ^7Li record matches with results of paleo-landscape modelling showing an overall decrease in erosion rates together with variable fluxes of dissolved weathering solutes in the tropics and warm temperate zones based on budgets of sediment erosion and deposition. Rising δ^7Li values in the Turonian-Coniacian and latest Campanian-Maastrichtian correspond to prominent cooling phases in concert with sea-level falls and the reorganization of fluvial catchments indicating rather incomplete weathering reactions by increased formation of clay minerals. We suggest that plate tectonic reorganization supported the conversion of terrestrial habitats and ecosystems through the spread and evolution of angiosperms. The higher productivity of flowering plants in terms of water usage together with the increased activity of ectomycorrhizal fungi intensified chemical weathering and contributed to the ongoing reduction of atmospheric CO_2.



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TALKS

1: Cretaceous Stratigraphy

1a: Jurassic-Cretaceous boundary interval

Talk

1a - Jurassic-Cretaceous boundary interval

Depositional models and their implications for sequence stratigraphy in the Bückeberg Group, Lower Saxony Basin, Germany

Fietz, Susanne

Federal Institute for Geosciences and Natural Resources (BGR), Germany

The Berriasian Bückeberg Group accumulated in the Lower Saxony Basin and comprises fluvial, lacustrine and marine deposits of a late regression to early transgression. The geothermal reservoir potential of the nearshore and terrestrial sandstone deposits have recently drawn economic interest. A comprehensive facies-based paleodepositional interpretation of potential reservoir rocks and implications for sequence stratigraphic surfaces are presented based on core analysis. Facies are identified based on sedimentological and ichnological expression, e.g., sediment texture, sedimentary structures, lithological accessories, bioturbation index (BI) and trace fossil assemblage. Facies are grouped into facies associations. Potential sequence stratigraphic surfaces are proposed based on vertical juxtaposition of facies associations. Six facies associations are identified: (1) basin deposits below fair-weather wave base, (2) lagoon deposits, and (3) floodplain accumulations are predominantly mudstone dominated. Mudstone to sandstone dominated deposits are found in (4) crevasse-splays and (5) marine wave- and storm-dominated deltaic deposits. Sandstone-dominated intervals are associated with crevasse splay channels, proximal crevasse splays and deltafront deposits. Basal contacts of the Bückeberg Group are preserved in two cores and support the interpretation of deposition on a sequence boundary, possibly with conformable transgressive surface. Juxtaposition of basin mudstone on deltaic deposit in two cores across the Lower Saxony Basin imply a transgressive surface. Several other flooding surfaces identified in core are interpreted as autogenic. The study refines the depositional model of the Bückeberg Group and permits a review of previously proposed sequence stratigraphic surfaces. Concise interpretations of paleodepositional environments and their responses to base level assist prediction of potential geothermal reservoirs.

Talk

1a - Jurassic-Cretaceous boundary interval

Calpionella alpina Ecoevent – may it be better defined?

Grabowski, Jacek (1); Kowal-Kasprzyk, Justyna (2)

1: Polish Geological Institute - National Research Institute, Poland; 2: AGH Uniwersity, Cracow, Poland

Base of the Calpionella alpina Subzone, or Calpionella alpina Ecoevent is being applied for years as a provisional marker of the Jurassic/Cretaceous boundary. The event is characterized by a decline of large species of Calpionella (= C. grandalpina Nagy), the disappearance of C. elliptalpina Nagy, the last occurrence of Crassicollaria brevis Remane and Cr. massutiniana (Colom), and increase in abundance of small (or medium-sized) spherical forms of Calpionella alpina Lorenz. The problem is that multiple conditions mentioned above are not always met together within a single studied section, and decision must be made which one is crucial. Some calpionellid specialists put more weight to the bloom of small spherical C. alpina, while for other the LO events are decisive. Visual identification of C. alpina bloom is difficult using standard range-charts, since C. alpina is usually presented as a single taxon, therefore the base of C. alpina Subzone falls somewhere in the middle of its total range. Furthermore, the taxonomy of Calpionella is inconsistent: some of the numerous species distinguished by Nagy are used (C. grandalpina, C. elliptalpina), as well as informal subdivisions into small, spherical, medium, etc. forms. The range-charts are rarely accompanied by quantitative or semi-quantitative graphs, which would be helpful to reveal an internal structure and dynamics of the C. alpina Ecoevent. Additionally, a division of underlying Crassicollaria Zone is not standardized, and it seems that Cr. colomi Subzone sometimes overlaps with abundance increase of small spherical C. alpina, leading to confusing stratigraphical interpretations and biased long-distance correlations.

Talk

1a - Jurassic-Cretaceous boundary interval

Berriasian Paleosols in the Lower Yellow Cat Member of the Cedar Mountain Formation in Eastern Utah: Evidence of Euroamerican Jurassic-Cretaceous (J-K) Dinosaur Extinction During an Exceptionally Wet Period in the Southwestern United States

Kirkland, James (1); Simpson, Edward L. (2); Wizevich, Michael C. (3); DeBlieux, Donald D. (1)

1: Utah Geological Survey - Salt Lake City, UT, United States of America; 2: Kutztown University - Kutztown, PA, United States of America; 3: Central Connecticut State University, - New Britain, CT, United States of America

A Berriasian age (145–142 Ma) for the base of the lower Yellow Cat Mbr. (YC) of the Cedar Mountain Fm. (CM) in Utah is indicated by microfossils, chemostratigraphy, and U-Pb dating of paleosols, with the onset of deposition near the beginning of Cretaceous. Euroamerican Morrison “style” dinosaur faunas dominated by diverse sauropods (mostly diplodocids), stegosaurs, small to medium ornithopods, large theropods (ceratosaurs, megalosaurids, and allosaurids), and uncommon coelurosaurs persisted during last 10 myr of the Jurassic. By contrast, the first 25 myr of the Early Cretaceous had Wealden “style” dinosaur faunas dominated by a low diversity of turiasaur and titanosauriform sauropods, polacanthid ankylosaurs, large ornithopods, large megalosauroid spinosaurids (exclusive to Europe), allosauroid carcharodontosaurid theropods, and an increased abundance of larger coelurosaurs reflecting a profound J-K dinosaur faunal turnover. The paleosol sequence at the base of the YC, laterally equivalent to the fluvial Buckhorn Conglomerate of the CM, consists of basal ferruginous paleosols (gleysols) overlain by silicified peat (histosols), which are then overlain by calcareous paleosols (vertisols and aridosols). A kaolinite bed (oxisol) has been identified at the J-K unconformity locally. Based on these paleosols, Utah’s earliest Cretaceous is characterized by an interval of unusually wet paleoclimates bracketed by drier paleoclimates during the Late Jurassic and remainder of the Early Cretaceous. Potential drivers close to the J-K boundary for this climatic excursion and faunal turnover include a mega-shield volcano(s) at Shatsky Rise in the western Pacific, and less significantly South Africa’s Morokweng impact. Was the Cretaceous bookmarked by asteroid impacts?

Talk

1a - Jurassic-Cretaceous boundary interval

Chasing the cycle – astronomical forcing during the Jurassic/Cretaceous transition: A case study of the pelagic successions of the Torre de' Busi (Southern Alps, Italy) and Lókút (Transdanubian Range, Hungary) sections

Lodowski, Damian Gerard (1); Grabowski, Jacek (1); Erba, Elisabetta (2); Szives, Ottilia (3)

1: Polish Geological Institute-National Research Institute, Poland; 2: Università degli Studi di Milano; 3: Geological Survey of Hungary, Supervisory Authority for Regulatory Affairs

This research presents the results of cyclostratigraphic investigations performed in the Tithonian–lower Berriasian carbonates of the Torre de' Busi and Lókút sections. A precise bio- and magnetostratigraphic control provided a temporal framework for this research; it allowed also to take an account on increasing sedimentation rates calculated for the Tithonian of both successions. Although studied sections are characterized by decreasing lithogenic influx, MS (Torre de' Busi, Lókút) and ARM (Lókút) series indicate relatively well expressed 100-kyr short eccentricity cycles. Their number within given magnetozones correlates between the studied sections and corresponds with their durations estimated from the geomagnetic polarity time scale (GPTS). Long eccentricity cycles are poorly expressed and only within the lower/upper Tithonian transition interval a reliable 405-kyr cycles can be interpreted; consequently, most of long eccentricity cycles were interpolated through successive counting of 100-kyr cycles. The reliability of provided interpretation is additionally strengthened by correlation with the Jebel Meloussi (Tunisia), which manifests a similar record of the latest Tithonian–earliest Berriasian orbital forcing. Ultimately, the results of this study point to diachronic character of the base of the Alpina calpionellid Subzone, which may be shifted for at least 300-kyr, either due to inconsistent definition or a diachronic nature of the 'Alpina event' itself. Diachronism can be inferred also in case of some calcareous nannofossil zones and subzones, such as NJT17 and NC0.

Talk

1a - Jurassic-Cretaceous boundary interval

Integrated chronostratigraphy of the VOICE (VOlgian Isotopic Carbon Excursion) in the Neuquén Basin

Martinez, Mathieu (1); Pierre, Pellenard (2); Beatriz, Aguirre-Urreta (3,4); Maurice, Mélina (2); Londero, Aurélia (2); Schnyder, Johann (5); Vennari, Verónica (4,6); Lescano, Marina (3,4)

1: Univ Rennes, CNRS, Géosciences Rennes, Rennes, France; 2: Biogéosciences, Université Bourgogne Europe, Dijon, France; 3: Instituto de Estudios Andinos (IDEAN), Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Buenos Aires, Argentina; 4: Consejo Nacional de Investigaciones científicas y Técnicas (CONICET); 5: Institut des Sciences de la Terre de Paris (ISTeP), Sorbonne Université, CNRS, Paris, France; 6: Universidad Tecnológica Nacional, Facultad Regional San Rafael, Instituto de Evolución, Ecología Histórica y Ambiente (IDEVEA), San Rafael, Argentina

The VOICE is a negative carbon isotopic excursion initially identified in organic carbon at high latitudes (Hammer et al., 2012) and recently documented in the Neuquén Basin, western Argentina (Pellenard et al., 2022; Weger et al., 2023). The global correlations of the carbon isotope curves show discrepancies in the trends, making its record unreadable at global scale. We propose an integrated radio-astrochronology of the VOICE anchored on calcareous nannofossil and Andean ammonite biostratigraphy on the Las Alcantarillas and Las Loicas sections. Five new CA-ID-TIMS U-Pb ages are introduced together with 532 datapoints of $\delta^{13}C_{org}$. Palynofacies analyses demonstrate the organic matter is mainly marine with no apparent source changes. The $\delta^{13}C_{org}$ values decrease from -25 ‰ PDB to -30 ‰ PDB from the P. zitteli to the C. alternans/S. koeneni Andean ammonite zones before returning to -27 ‰ PDB in the latest Tithonian. The U-Pb ages indicate that the VOICE started around 146.18 Ma. They also show a pacing of the $\delta^{13}C_{org}$ by the 405-ka eccentricity cycle. Anchoring these cycles to the U-Pb ages, we determine that the VOICE ended 142.44 Ma and lasted for ~4Ma. This new integrated chronostratigraphic framework provides with a reference for further global correlations of the carbon isotopic curves.

References:

Hammer, Ø., et al., 2012. Norwegian Journal of Geology 92, 103–112.

Pellenard, P., et al., 2022. 11th International Congress on the Jurassic System, 29 August – 2 September 2022, Budapest, Hungary, p. 88. https://jurassic2022.hu/download/JURA2022_AbstractBook_web.pdf

Weger, R.J., et al., 2023. GSA Bulletin 135, 2107–2120. https://doi.org/10.1130/B36405.1.

Talk

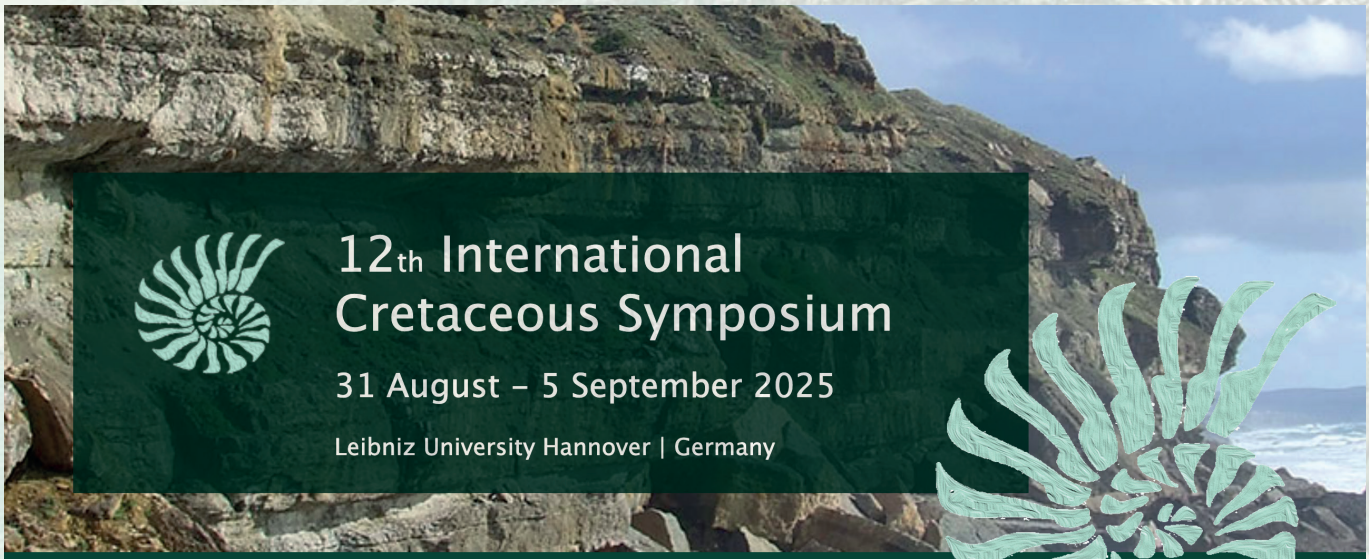
1a - Jurassic-Cretaceous boundary interval

Rock-Magnetic Properties of the Bosso Valley Section, Italy – Supplements for the Proposed Stratotype Selection of the J/K Boundary

Pruner, Petr (1); Elbra, Tiiu (1); Kdýr, Šimon (1,2); Šifnerová, Kristýna (1); Kouklíková, Lada (1)

1: Institute of Geology of the Czech Academy of Sciences, Czech Republic; 2: Charles University, Faculty of Science, Institute of Geochemistry, Mineralogy and Mineral Resources, Czech Republic

Magnetostratigraphy, calibrated to chemo- and biostratigraphy, offers a reliable tool for creating high-resolution stratigraphic frameworks and can therefore be employed in selecting the Jurassic/Cretaceous (J/K) boundary stratotype. The Bosso Valley section, co-proposed with Torre de Busi for the J/K stratotype, was studied alongside others by Houša et al. (2004), which included magnetostratigraphy. Houša et al. identified five normal and five reverse polarity zones, including the subzones M20n.1r (Kysuca) and M19n.1r (Brodno). Their data were, however, accompanied by rock-magnetic analyses of only two samples. Rock-magnetic analyses can provide essential information on the origin of the carriers of the remanent magnetization, deciphering the correct applicability of the paleomagnetic record for magnetostratigraphy. Ten selected samples (one from each individual polarity zone) from the original Houša et al. sample collection will be used for additional rock-magnetic analyses. These analyses will include stepwise acquisition and demagnetization of isothermal remanent magnetization and a three-axial Lowrie (1990) test, which will allow further verification of the previous polarity zone interpretation and thus support the stratotype proposal. Furthermore, the position of Kysuca and Brodno subzones is very well defined by the large number of samples. Our re-evaluation of the paleomagnetic data and subsequent correlations revealed the mean directions of the Brodno subzone (Declination = 100.5°; Inclination = −41.5°) and the Kysuca subzone (Declination = 116.6°; Inclination = −30.1°). These are in good agreement with Houša et al.'s Early Berriasian (Declination = 100.1°; Inclination = −39.0°) and Late Tithonian (Declination = 107.0°; Inclination = −32.3°) reverse polarity mean directions, respectively.



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TALKS

1: Cretaceous Stratigraphy

1b: Non-marine Cretaceous stratigraphy and terrestrial ecosystem

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

Geomorphological control on the palaeosol evolution in an Upper Cretaceous distributive fluvial system (Bauru Basin, Brazil).

Batezelli, Alessandro (1); Ladeira, Francisco Sérgio Bernardes (1); Delgado, Leidy Alexandra Blanco (1); Silva, Márcio Luiz Da (2); Rebelo, Taynah Burato (1)

1: State University of Campinas - UNICAMP, Brazil; 2: Federal Institute of Education, Science and Technology of South of Minas Gerais – IFSULDEMINAS, Brazil

The Marília Formation records the distributive fluvial system (DFS) stage of the Bauru Basin (Southeastern Brazil) during the Maastrichtian, dominated by braided river deposits. Based on the relationship between facies and paleosols, this work proposes an environmental evolution and estimates the rates of sedimentation and pedogenesis in the Late Cretaceous of Southeast Brazil. By studying bi-dimensional sections, we identified facies associations that comprise four main architectural elements: channels (CH), laminated sand sheets (LS), sand bars (SB), and overbank deposits (OF). The sedimentary dynamics were characterised by the formation and abandonment of channel complexes related to aggradation, the generation of carbonate palaeosols, clay illuviation, and vegetation growth within the channels. Fifteen palaeosol profiles occur intercalated in the deposits. They are characterised by horizons Bt, Btk, Bss, C, and Ck, which allows a possible general comparison with the present soil orders: Alfisols, Aridisols, Entisols, and Vertisols. The macro- and micromorphological characteristics, combined with the mineralogy of these horizons, indicate arid and semiarid climatic conditions, with the minimum time of profile formation varying from 3740 to 5000 years. The genetic relationship between architectural elements, palaeosols, and the piling pattern suggests that the Marília Formation resulted from a succession of high-frequency depositional events of 103 to 104 years. This approach may allow an understanding of the avulsion and pedogenesis processes in the distal distributive fluvial systems.
Thanks to FAPESP for supporting the Project 2020/07997-4, "Exploring the diversity of South American Cretaceous dinosaurs and associated fauna." Thanks to CNPq for the grants (310734/2020-7 and 303977/2021-3).

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

Biochronostratigraphic remarks on limnic ostracoda assemblage from Maracangalha Formation, Lower Cretaceous, Recôncavo Basin, NE-Brazil

Do Carmo, Dermeval (1); Scarpa, Lucas (1); Conceição, Ana Luisa (1); Costa, Giovanni (2); Negrão, André (2); Dantas, Rafaela (2); Jovane, Luigi (3); Santos, Franklin (3); Horbe, Adriana (1); Antonietto, Lucas (1,6); Carvalho, Marcelo (4); Assine, Mario Luis (5)

1: Institute of Geosciences, University of Brasília, Brazil; 2: Institute of Geosciences, University of São Paulo, Brazil; 3: Institute of Oceanography, University of São Paulo, Brazil; 4: National Museum, Rio de Janeiro, Brazil; 5: University of São Paulo State, Rio Claro, Brazil; 6: Museum of Paleontology Placido Cidade Nuvens, Brazil

The present work is dealing with biochronostratigraphic record of species of ostracodes recovered from Maracangalha Formation, Itaparica, Bahia State. After a detailed field work in two outcrops at Itaparica island, respectively named Gameleira and Manguinhos beaches, nine species of Ostracoda were recovered: Paracypridea brasiliensis, Cypridea ventronodata, Cypridea vulgaris, Theriosynoecum isoplektum, Reconcavona? incerta; Petrobrasia signum; Clinocypris? weilleri; Salvadoriella redunca posterior e Cypridea sp. Considering species occurring at Gameleira beach, the first listed species named the Zone Paracypridea brasiliensis, coded as O04, a last occurrence interval zone, is the uppermost of the three biostratigraphic unities of Rio da Serra Local Stage. From the base upward of this stage, the other two biostratigraphic unities are: Zone Theriosynoecum varietuberatum, coded as O02, and Zone Cypridea (Morininoides) candeiensis, coded as O03. Each of zones O02 and O03 are divided into two subzones and, the uppermost O04 into five subzones based on last occurrence interval. So, the Rio da Serra Local Stage is composed of three zones and nine subzones attributed to Berriasian to Valanginian interval. Based on these nine subzones, it is possible to divide into lower, subzones O02.1, O02.2 and O03.1, mid, subzones O03.2, O04.1 and O04.2, and upper, subzones O04.3, O04.4 and O04.5, Rio da Serra Stage. Considering this and the listed occurrences of ostracodes species, it is possible attribute both outcrops to mid Rio da Serra Stage, inferred to be Valanginian. As perspective for the future on biostratigraphy, it is conducted integrated studies with paleomagnetism approaches and correlation with occurrences on western Africa.

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

Evolution of pre-salt lake-systems during Barremian-Aptian: A multiproxy study of high-frequency paleoenvironmental variations

Sousa, Ariany de Jesus; Costa, Rozileide de Oliveira Lima; Ng, Cristiano; Ferreira, Elisabete Pedrão; Lima, Francisco Henrique de Oliveira; Carvalho, Fábio de Araújo; Araújo, Carlos César; Silva, Carlos Manuel de Assis; Leite, Caroline de Oliveira Nardi; Figueiredo, Milene Freitas; Carmo, Isabela de Oliveira

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Characterizing paleoenvironments provides input for geological modeling of the Lower Cretaceous from the Santos Basin, thereby reducing the risks and uncertainties with exploration and production processes. Reconstructing and visualising the spatial distribution of paleoenvironments during the Buracica-Alagoas ages contributes to the understanding of the sedimentary and stratigraphic evolution of the basin. In this scenario, the ecological preferences of non-marine ostracods were used to reconstruct the Lower Cretaceous Pre-Salt paleoenvironments of the basin. This reconstruction was based on interpretations of ostracod abundance and diversity values. Three paleoenvironmental lacustrine conditions were recognized: (i) Deep Zone (anoxic conditions); (ii) Open Water Zone (Intermediate Lake); (iii) Littoral Zone (poor preservation in high energy areas). The ostracod rates made it possible to observe conditions in the Deep and Open Water Zones during the Buracica and early Jiquiá ages. In the upper portion of the Jiquiá, there was a high frequency of alternation between lake conditions. During the Alagoas age, the Littoral Zone predominated. In addition to the previous study, analysis of ratios, grades of minor elements and trace elements, as well as the calculation of rare earth element anomalies, was. The enrichment of certain minor elements and traces may reflect variations in the depositional environment's oxidation state and solubility. In the intermediate to upper Alagoas, thick intervals with positive Eu anomalies indicated the influence of mafic magmatism or reworking of mafic rocks to the basin.

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

Palynological evidence for the Late Cretaceous lake transgression event in the Songliao Basin, NE China

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The lake transgression event (LTE) associated with a lake anoxic event (LAE) has been reported previously from the Cretaceous Nenjiang Formation in the Songliao Basin, NE China. Detailed studies based on sedimentology, dinoflagellates, ostracods, and biomarkers have provided important evidence for this LTE in Member 1 of the Nenjiang Formation (K2n1). However, the related floristic record has not received enough attention. In this paper, palynological data of borehole Ji Tao Di-1 (JTD-1) from the western slope of the Songliao Basin were analyzed to investigate vegetation and climate changes associated with this Cretaceous LTE. Three palynological sub-assemblages reflect significant paleovegetation and paleoclimate changes through this LTE and reveal ecosystem fluctuations related to the global Cretaceous oceanic anoxic event (OAE3). A significant increase in the relative abundance of Schizaeoisporites and Cyathidites spores may represent the LTE in the Nenjiang Formation. Principal Components Analysis (PCA) and Sporomorph EcoGroup (SEG) model indicate that climate changed from cool and humid subtropical before the LTE, to relatively warm temperate during the LTE and temperate after the LTE in this area. The relatively warmer and drier climate during the later period of the LTE may be influenced by the contemporaneous OAE3. After the LTE, the highland mixed forests were dominant, and a large number of angiosperms (i.e., members of the Proteaceae) occupied the ecological niches of the middle canopy, indicating that the flourishing of angiosperms in the late Santonian may be closely related to environmental disturbances resulted from the LTE and OAE.

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

Upper Cretaceous (Maastrichtian) endemic ostracods, charophytes and dinosaurs from the Lameta Formation at Jabalpur, Madhya Pradesh, India: palaeoenvironment, palaeobiogeographic and biostratigraphical implications

Khosla, Ashu

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Ostracod assemblages comprising over 30 species and a charophyte gyrogonite assemblage—including Platychara cf. sahnii, Nemegtichara grambastii, and Microchara sp.—have been identified from the Lameta Formation at Bara Simla Hill and Chui Hill near Jabalpur. These fossil-rich beds, underlying the Deccan basalts, are interpreted as pedogenically modified alluvial plain deposits laid down in semi-arid conditions. They are notable for abundant dinosaur bones and nesting sites containing three eggshell oospecies (Megaloolithus cylindricus, M. jabalpurensis, and Fusioolithus baghensis), indicating a Late Cretaceous (Maastrichtian) age. The ostracods are mostly endemic, while Microchara and Nemegtichara are also restricted to the Indian subcontinent. Biogeographically, the assemblage aligns with other infratrappean and intertrappean deposits across India. The co-occurrence of dinosaur remains, ostracods, and charophytes suggests lacustrine to palustrine conditions, with alkaline, shallow freshwater environments. Charophytes confirm the non-marine nature of the sediments and support age estimates, with Platychara and Nemegtichara known from Upper Cretaceous to Lower Palaeocene strata elsewhere. A Maastrichtian age is further corroborated by the presence of freshwater fish (Rhombodus, Apateodus, Stephanodus), endemic ostracods (Candona, Cyclocypris, Cypridea (Pseudocypridina), Cypridopsis, Cyprois, Limnocythere, Mongolocypris, Paracandona, Paracypretta, Stenocypris, Zonocypris and Wolburgiopsis sp.), and Aquilapollenites in the pollen record. Stratigraphically, the Lameta beds at Chui Hill show reversed magnetic polarity (Chron C29R), overlain by normally magnetized basalts, then a thick reversed lava pile, matching the Cretaceous–Paleogene boundary sequence. The Lameta Formation’s faunal and floral evidence, along with geochronology and magnetostratigraphy of the Deccan basalts (65.6 ± 0.3 Ma), firmly places these deposits in the latest Maastrichtian.

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

High-resolution non-marine ostracod richness in the Late Cretaceous of China

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The Late Cretaceous was a crucial period in Earth's history, characterized by a greenhouse climate, several major geological events and, in particular, the Angiosperm Terrestrial Revolution. This revolution notably reshaped terrestrial diversity and ecosystems, with the spread of angiosperms altering plant communities and aquatic ecosystems by modifying habitats and food sources. Non-marine ostracods, being sensitive to environmental shifts, provide valuable insights into these changes. However, the lack of high-resolution richness curves for non-marine ostracods has limited our understanding of the patterns and processes of evolution of terrestrial life during this period.

In this study, 76 Cretaceous non-marine sections and drill cores containing ostracod fossils from China were compiled and subjected to rigorous data-quality control. Fourteen age-control stratigraphic points/levels, such as zircon U-Pb dating, magnetic stratigraphy, and astronomical tuning were used to place precise chronological constraints on the resulting richness estimates. The Constrained Optimization (CONOP) method was used to construct a high-resolution non-marine ostracod richness curve with an estimated temporal resolution of approximately 0.079 million years. This curve shows an overall increasing trend throughout the Late Cretaceous, with several prominent richness declines in the late Coniacian, the Santonian-Campanian boundary, and the late Campanian.

These richness fluctuations are closely correlated with contemporaneous environmental changes, particularly in precipitation and climate. The expansion of aquatic angiosperms during the Angiosperm Terrestrial Revolution provided habitats for ostracods and indirectly enhanced their food sources, including epiphytic microorganisms, algae and organic sediments. Our results also provide a framework for global comparisons of richness trends over the study interval.

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

Turtle remains from Koh Moul (Koh Kong Province, SW Cambodia) and their stratigraphical implications

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The Mesozoic non-marine formations traditionally known as the so called ‘Grès Supérieurs’ cover vast areas in SW Cambodia. Although macroflora and palynomorphs were reported from the Kampot-Bokor area in the 1970s, other fossils are scanty. A fibula of a titanisauriform dinosaur, reminiscent of Euhelopodidae has recently been described from Koh Paur Island, Koh Kong Province, suggesting an Early Cretaceous age for the fossil-bearing deposits. Subsequent field surveys led to discovery of new fossil sites, with remains of plants, invertebrates and vertebrates.

Turtle shell fragments have been collected from Koh Moul Island in Koh Kong Province, along with abundant fossil wood. The outer surface of the shell is covered with ornamentation, consisting of vermiculated ridges and bulges. The carapace length is estimated at about 80 cm. The morphology of the wide diamond-shaped entoplastron is reminiscent of large basal trionychoid turtles known from the Khorat Goup in NE Thailand, such as Basilochelys macrobios from the Phu Kradung Formation.

Large basal trionychoid turtles are known from the top pf the Phu Kradung Formation and the Sao Khua Formation, as well as equivalent strata in eastern Thailand. They were also reported from Kut Island, Thailand, some 50 km NW of Koh Moul. The discovery of large basal trionychoids in SW Cambodia suggests that the fossil bearing deposits of Koh Moul are Early Cretaceous in age.

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

The modes and patterns of limb size evolution close to the origin of birds

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The assembly of the volant bird body plan from the ancestral bulky dinosaurian condition is an enduring topic of evolutionary biology, including multiple instances of convergence and homology-related traits that contribute to the refinement of the flight capability. As the basic system, the body plan stands out from all these changes in demonstrating pronounced decrease in body size and proportionately elongation of the forelimb. Given the scaling relationships of limb and body size, changes of the former are likely clouded by changes of the entire body size. But changes of individual limb element, which provide the direct materials for natural selection, are essential to comprehend branch and lineage specific evolutionary patterns across the transition from terrestrial to volant theropods. Here we analyze the patterns of morphological disparity and evolutionary rate of appendicular limbs along avialan stem lineages using phylogenetic comparative approaches. Contrary to the traditional wisdom that the evolutionary innovation like flight would promote and accelerate evolvability, our results show a shift to low disparity and decelerated rate near the origin of birds that is largely ascribed to the evolutionarily constrained forelimb. Taken together, the recovered patterns of disparity and rate of appendicular limb evolution demonstrate how the early avialan bauplan has been shaped deeply by natural selection driven by powered flight.

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

Ostracod fauna from the Lower Cretaceous Lisangou Formation of the Guyang Basin and its applications on: Biostratigraphy and palaeoecology

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This study investigates a non-marine ostracod fauna recovered from the Lisangou Formation of the Guyang Basin, encompassing twelve species belonging to ten genera: Cypridea unicostata, Cypridea sp., Candona spp., Mongolianella sp., Djungarica sp., Rhinocypris cf. jurassica, Ziziphocypris costata, Lycopterocypris cf. infantilis, Damonella cf. circulata, Timiriasevia sp., Darwinula? custella. Among these, the species C. unicostata is widely distributed in Hauterivian to Albian strata; Z. costata is found in Aptian to ?Danian non-marine strata, L. infantilis and D. circulata are widely distributed in Hauterivian to Albian non-marine strata. Consequently, based on the ostracod biostratigraphic correlation, the Lisangou Formation is mainly Aptian but may extend down to Hauterivian.

In this study, the ontogeny features of the Cretaceous fossil species Darwinula? custella of Darwinuloidea were identified for the first time. This also marks the first record of juvenile fossils of Cretaceous darwinuloideans. The family Darwinulidae has garnered significant interest over the past decade due to its potential status as one of only three "ancient asexual" groups in the animal kingdom. It has been suggested that the group has been reproducing asexually for over 200 million years due to the lack of male fossils in Mesozoic sediments. However, this assertion has been challenged by the discovery of rare males in one existing darwinulid species. Our new fossil material of Darwinuloidea, which shows its ontogeny, may provide fossil evidence for investigating whether the family Darwinulidae is indeed a truly "ancient asexual" group.

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Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

The Songhuajiang Biota, a window to understanding Late Cretaceous terrestrial ecosystem

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The Songliao Basin is one of the largest non-marine oil and gas bearing basins that developed during the Cretaceous period, recording an almost complete Cretaceous stratigraphy. Fossils are very abundant in the Songliao Basin, and three biotas, including the Jehol Biota sensu lato, the Songhuajiang Biota and the Mingshui Biota are recognized in the Songliao Basin. Of which the Songhuajiang Biota is the most typical and unique, serving as a window to understanding the Late Cretaceous terrestrial ecosystem. The Quantou to Nenjiang Formations yielded extremely abundant fossils,including: ostracoda, conchostraca, bivalvia, gastropoda, insecta, testudines, grocodylomorpha, dinosauria, palynofossils, dinoflagellates, charophyta, which are rich in quantity, diverse in types, and well-preserved in these strata, especially in the lower Qingshankou Formation and Nenjiang Formation. These fossil assemblages are named the Songhuajiang Biota. Here, we define and introduce the Songhuajiang Biota in terms of its definition, biological composition, and ecological significance. The Songhuajiang Biota, is defined by three typical elements: The ostracod Cypridea, the fish Sungarichthys, and the clam shrimp Eoestheria. The Songhuajiang Biota is the typical and unique terrestrial biota of the mid-late Cretaceous. As a typical and unique terrestrial biota of the mid-late Cretaceous, the Songhuajiang Biota is a key to decoding the Cretaceous terrestrial ecosystem.

Talk

1b - Non-marine Cretaceous stratigraphy and terrestrial ecosystem

The diachronous development of the rift basins in the Early Cretaceous of northeastern China and its implications

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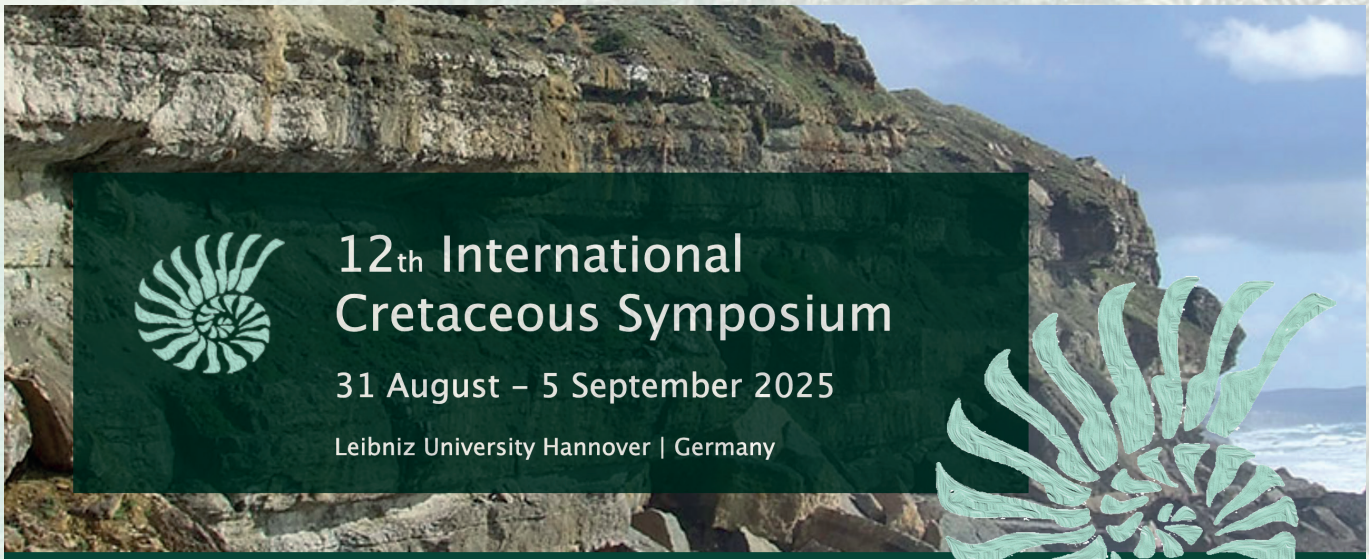
The Early Cretaceous Jehol Biota that is best known for producing exceptionally complete fossils such as birds, dinosaurs, pterosaurs, mammals, insects, and flowering plants, is preserved in lacustrine deposits interbedded with volcanic ashes. The fossil-bearing beds are from bottom up referred to the Huajiying, Yixian and Jiufotang formations respectively, in rift basins in northern Hebei, western Liaoning provinces in northeastern China. Geochronologic studies have not only constrained the ages of the fossil-bearing beds but also revealed a diachronous distribution pattern of the rift basins, i.e., they progressively migrated eastward. The diachronous development of the rift basins led to the lateral variations of stratigraphic sequences and depositional environments, which in turn influenced the spatiotemporal evolution of the Jehol Biota, i.e., the first stage of the Jehol Biota is restricted to northern Hebei Province and represented by the appearance of basal member of numerous vertebrate lineages, and the second and third stages of the Jehol Biota began in western Liaoning Province and then expanded to a wider area and are represented by a greater vertebrate species diversity. The diachronous development of the rift basins in the Early Cretaceous of northeastern China is controlled by the eastward retreat of the subducting paleo-Pacific plate along the northern margin of the North China Craton and accompanied by other local tectonic and volcanic activities.



12th International Cretaceous Symposium

31 August – 5 September 2025

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TALKS

1: Cretaceous Stratigraphy

1c: Integrated stratigraphy and refining the Cretaceous timescale

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

From the Andes to the Tethys: A multidisciplinary approach to Valanginian correlations

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The Valanginian stage of the Early Cretaceous (~137.05–131.29 Ma) witnesses important geological, climatic, and biological events and is a key interval for global stratigraphic correlation. As precise radio-isotopic ages were scarce until recently, the chronology of events remained poorly understood, and comparing the Andean and Tethyan domains has been challenging due to differing depositional environments and tectonic settings.

Data on ammonoid biostratigraphy, calcareous nannofossil bioevents, astrochronology, and chemostratigraphy have significantly improved their temporal alignment. A pivotal event aiding correlation is the Valanginian carbon isotope excursion (Weissert CIE), a globally recognized positive $\delta^{13}C$ shift, interpreted as linked to increased volcanic activity and carbon cycle perturbation. This excursion is recorded in both Andean and Tethyan sedimentary sequences, serving as a reliable chemostratigraphic marker.

The Vergol-Morénas (Vocontian Basin, France) and the Cerro La Parva (Neuquén Basin, Argentina) sections were studied recently. They are geographically remote, were deposited in different environments, and encompass the lower-upper Valanginian boundary. In both cases, the δ13 Corg correlates with the 405-ka eccentricity cycle, and both sections can be correlated based on these cycles with a precision in time of ca. 100 ka. This study adds the Cañada de Leiva section (Neuquén Basin), which spans the entire Valanginian with a precise ammonoid and nannofossil biostratigraphy.

By integrating fossil evidence provided by ammonites and calcareous nannofossils with astrochronological and chemostratigraphic data, it has been possible to strengthen the correlation between the Andes and Tethys during the Valanginian, clarifying global paleoenvironmental changes and refining the Early Cretaceous timescale.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

New insights into absolute age and stratigraphic analyses of the Greenhorn marine cycle in Central, KS

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High-resolution analysis of outcrops, cores, and logs from central Kansas provide new insights into the evolution of the Greenhorn marine cycle in Central, KS. This sequence, comprising the upper Dakota Fm., Graneros Shale, and Greenhorn Limestone, records the transition from non-marine to marine clastic, and carbonate depositional systems that resulted from eastward transgression of the WIS shoreline. This study refines previously outlined stratigraphic frameworks by combining modern chronostratigraphic techniques including U-Pb radiometric age dating and carbon stable isotope analyses with sequence-stratigraphic characterization.

Multiple orders of framework surfaces and major carbon isotope excursions are identified and correlated using absolute age control and relative markers. The lower package comprises a thick succession of coastal plain paleosols and fluvial deposits. An abrupt erosional transition is overlain by a conformable succession of tidally influenced sandstones and argillaceous mudstones that record the transgression of the WIS. The sandstones are overlain by 10m of argillaceous mudstone that comprises at least six parasequences and records successive drowning of the margin. The highstand succession records a transition from detrital (Graneros Shale) to carbonate-dominated marine sedimentation (Greenhorn Limestone). A high confidence regionally correlative ash bed previously hypothesized to be the 95.53 ± 0.36 Ma “X-Bentonite” in the upper Graneros Shale is used to date the maximum flooding surface. Our new ICP-MS and CA-TIMS analyses have produced significantly younger ages, shifting previously interpreted biostratigraphic and stable carbon isotope chemostratigraphic correlations along the eastern margin of the WIS.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

The Aptian GSSP at Cau (Spain)

Castro, Jose Manuel (1); de Gea, Gines A. (1); Ruiz-Ortiz, Pedro A. (1); Erba, Elisabetta (2); Weissert, Helmut (3)

1: University of Jaén, Spain; 2: University of Milan, Italy; 3: ETH Zentrum, Switzerland

The Aptian Working Group (AWG) of the International Commission on Stratigraphy (ICS), led by Elisabetta Erba and Helmut Weissert, has been working on the definition of the base of the Aptian stage over the last three decades. After considering the base of magnetic chron M0r, following research on ammonite biostratigraphy triggered further discussion and the need for another primary marker. Consequently, in 2024 the AWG decided to shift the base of the Aptian upwards into C34n and for the first time in Mesozoic stratigraphy, a chemostratigraphic event was selected as primary marker. A prominent “negative spike” in the Corg- and Ccarb- isotope records was first identified by Menegatti et al. (1998) in Northern Italy (Cismon section) and later recognized in various land and marine sites across different paleolatitudes and settings (Erba et al., 2015; Leandro et al., 2022).

This distinctive C isotope negative spike was, therefore, selected by the AWG as the new marker for defining the base of the Aptian. Two potential sites were chosen for the final vote as candidate Global Boundary Stratotype Section (GSSP): Cismon (Italy) and Cau (Spain). The majority of AWG members favored the expanded hemipelagic shelf section at Cau for the Aptian GSSP.

This communication presents a review of available data for the Barremian/Aptian boundary interval at the proposed Cau locality in Spain, characterized both in an outcrop section and in a continuous core (Castro et al., 2021).

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

Revised calcareous nannofossil biozonation of the Cretaceous at low and middle latitudes

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We have conducted a comprehensive study of calcareous nannofossils in numerous Cretaceous successions located at low and middle latitudes, including both land and oceanic sections. Through a rigorous review of existing literature and the incorporation of new findings, we have significantly revised previous zonal schemes. The proposed biozonation include the intercalibration of nannofossil events with planktonic foraminiferal biozones, magnetostratigraphy and chemostratigraphy. This enhancement includes a critical assessment of the reproducibility and reliability of individual nannofossil events, as well as a reevaluation of their ages in light of recent advancements in defining Cretaceous stage boundaries. Moreover, the new nannofossil biozonation is specifically applied to the characterization of oceanic anoxic events.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

Relative Paleointensity Variability During the Aptian–Albian: Insights from the Sergipe-Alagoas and Umbria-Marche Basins

Gewehr de Mello, Raquel (1); Francisco Savian, Jairo (1); Fauth, Gerson (2); Florindo, Fabio (3); Di Chiara, Anita (3); Satolli, Sara (4); Roisenberg, Henrique (5); Leandro, Carolina (1); Frigo, Everton (6); Pontel, Caroline (1); Baecker-Fauth, Simone (2); Krahl, Guilherme (2); Kochhann, Karlos (2); Lopes, Fernando (2); Bruno, Mauro (2); Guerra, Rodrigo (7); Santos, Alessandra (2); Spagnuolo, Lilla (3); Trindade Lopes, Camila (1); Coccioni, Rodolfo (8); Frontalini, Fabrizio (9); Jovane, Luigi (10); Trindade, Ricardo (11)

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This study investigates relative paleointensity (RPI) variations during the Aptian–Albian using high-resolution sedimentary records from the Sergipe-Alagoas Basin (SER-03, Brazil) and the Umbria-Marche Basin (PLG, Italy). Advanced paleomagnetic and rock magnetic techniques were applied, including NRM normalization using ARM, IRM, and magnetic susceptibility, as well as the pseudo-Thellier method. In PLG, ARM 20 mT proved to be a reliable proxy, with magnetite as the primary remanence carrier. Variations in mineralogy and coercivity were observed, notably with hematite and goethite in upper layers. In SER-03, ARM 15 mT was identified as the most sensitive proxy, with PSD-dominated magnetite/titanomagnetite mineralogy. RPI curves from both sites show good agreement with global data, revealing secular variations even within the Cretaceous Normal Superchron (CNS). A marked decline in RPI is observed prior to the M0r reversal, followed by low intensity during the ISEA event (~117 Ma) and subsequent recovery. These results refine the magnetostratigraphic framework for the Aptian–Albian and contribute new data from underrepresented Southern Hemisphere sites, supporting interpretations of core dynamo behavior and improving global geomagnetic models.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

Carbon and oxygen stable-isotopes and holostratigraphy of Seaford Head (southern England): integrating biostratigraphy and the Turonian – Campanian time scale

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We present high-resolution (10–25 cm interval) carbonate carbon- and oxygen-isotope records ($\delta^{13}C_{carb}$, δ^{18}Ocarb) for the 162 m thick Chalk section exposed in the cliffs at Seaford Head, southern England. This reference section for the Upper Cretaceous of NW Europe has been proposed as a global reference for the Coniacian–Santonian and Santonian–Campanian stage boundaries and is designated an auxiliary GSSP boundary stratotype for the Campanian Stage. Carbon isotope stratigraphy, comprising 30 named carbon-isotope events (CIEs), supported by lithostratigraphy, macrofossil, microcrinoid, microfossil and calcareous nannofossil biostratigraphy, allows for precise correlation to other key European sections. CIEs provide the means of placing the Coniacian (top Navigation CIE) and Campanian (top Late Santonian Event) stage boundaries, while the lowest occurrence of Cladoceramus undulatoplicatus defines the base Santonian. Our holostratigraphic approach allows for intercalibration of biozonation schemes and chemostratigraphy. Spectral analysis of carbon and oxygen isotope profiles at Seaford Head demonstrates a clear expression of 405 kyr orbital cycles, offering the basis for orbital tuning of the isotope time series. Correlation of the Seaford Head orbital time scale to geochronological ages of bentonites from the US Western Interior Basin permits anchoring of the isotope records to various astronomical solutions. We favour a tuning approach to the La04 sinusoidal eccentricity solution along with a tie of 405 kyr minima to existing Laskar/Zeebe solutions for age calibration of biostratigraphic datum levels. Our results provide a basis for improved correlation and age calibration of Coniacian to Campanian successions at a regional to global scale.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

Bridging the gap between the Boreal and Tethyan Realms: Sr-Isotope correlation of the Barremian–Albian interval

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The Lower Cretaceous (Barremian - Albian) interval is marked by complex stratigraphic correlations between the Boreal Realm and the Tethys, often hindered by biostratigraphic inconsistencies and regional variation. We present stable and radiogenic isotope data ($\delta^{13}C_{carb}$, $\delta^{18}O$, $^{87}Sr/^{86}Sr$) for the Lower Cretaceous (Barremian – Albian) based on new findings from northern Germany, contributing to a refined chemostratigraphic framework.

1) Geochemical analyses of eight well-preserved macrofossils (corals, oysters, gastropods, ammonites, belemnites), from a single level dated to the earliest Albian reveal notable variability. The $\delta^{13}C_{carb}$ values vary by up to 5‰, indicating organism-specific food sources and subsequent biofractionation. Due to diagenetic effects the $^{87}Sr/^{86}Sr$ signals also differ significantly among taxa by 0.000225, with belemnites providing the most reliable data. They are in closest agreement with existing Early Cretaceous Sr-isotope reference curves, and are thus considered the most stratigraphically reliable ones.

2) The belemnite-based Sr-isotope data enable correlation between the Boreal Realm and the Tethys independent of biostratigraphy. This chemostratigraphic approach addresses long-standing discrepancies within the Lower Cretaceous biostratigraphic framework. Several offsets in the current biostratigraphic scheme, are re-evalutated. The mid-Barremian warming event is mirrored by the highest Sr-isotope values recorded int the entire Early Cretaceous, which we link to intensified continental weathering and increased run-off. These environmental conditions likely contributed to the deposition of black shales in restricted Boreal basins.

Our data offer an independent temporal framework to support regional and interregional stratigraphic alignment, providing new insights on Early Cretaceous paleoceanography and climate dynamics.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

Dinoflagellate cyst events from around the Campanian–Maastrichtian transition: State of knowledge and potential candidates for boundary markers

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Certain doubts regarding the definition of the Global Boundary Stratotype Section and Point (GSSP) for the base of the Maastrichtian Stage (Tercis-les-Bains in southwest France) have led the Subcommission on Cretaceous Stratigraphy to establish a new Maastrichtian Working Group. The main tasks undertaken by the group include verifying the validity of the highest (HOs) and lowest (LOs) occurrences of micro- and macrofossil taxa that were used to define the Campanian–Maastrichtian transition and, if necessary, proposing new boundary indicators, including a primary boundary marker. Three of the twelve currently valid boundary criteria are dinoflagellate cyst (dinocyst) events, but only one of them (the HOs of Raetiaedinium evittigratia and R. truncigerum) has shown real biostratigraphic value. Other formal dinocyst boundary markers either disappear high above the GSSP level (Samlandia carnarvonensis, S. mayi) or has a limited geographical distribution (Corradinisphaeridium horridum). Potential candidates for new dinocyst boundary markers include the HOs of Callaiosphaeridium asymmetricum, Coronifera oceanica, Odontochitina costata, Xenascus ceratioides, and the LOs of Cladopyxidium saeptum, C. verrucosum, Florentinia mayi, Glaphyrocysta expansa, and G. pala. Although Callaiosphaeridium asymmetricum and Florentinia mayi have not yet been found in Tercis (the latter occurs in the geographically nearby Zumaia in northern Spain), all the above-mentioned bioevents have been shown to be geographically widespread, indicating their potential biostratigraphic importance. Understanding the actual relevance of the mentioned dinocyst events requires refined and highly-resolved studies at the GSSP site, including comparison with other Campanian–Maastrichtian dinocyst records precisely tied to the chronostratigraphic framework.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

Albian integrated stratigraphy and radioisotopic ages of the Yezo Group, northern Japan

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The Albian was a major turning point for palaeoenvironmental change in the Cretaceous, with the opening of the Equatorial Atlantic Gateway leading to a reorganisation of surface and deep circulation, frequent occurrence of Oceanic Anoxic Events and significant increases in surface and deep water temperatures. Therefore, a radioisotopic-based age model for the Albian period is important, but has yet to be realized, because silicic tuffs are rarely interbedded in the representative Albian strata in Europe. The Yezo Group, Hokkaido, Japan, comprises forearc basin sequences accumulated on the active continental margin of the Eurasian continent in the northwestern Pacific Ocean. The strata yield abundant age-diagnostic macro and microfossils, and intercalate numerous silicic tuffs. We have compiled microfossil-, macrofossil- and carbon isotope stratigraphy for the Albian section of the Yezo Group, and obtained U-Pb zircon ages of tuffs from several stratigraphic levels. On the basis of integrated stratigraphic correlation with the sequence of the Vocontian Basin, we identified the levels of the Leenhardt of OAE1b, OAE1c, OAE1d and A/CB in the Yezo Group. U-Pb zircon ages of silicic tuffs intercalated in these levels, are 110.00 ± 0.60 (Leenhardt), 103.71 ± 0.82 Ma (OAE1c), 101.67 ± 0.81 Ma (OAE1d) and 100.74 ± 0.10 Ma (A/CB). The former three ages were obtained by LA-ICP-MS, the latter by ID-TIMS, so there is room for improvement. Further dating of the Yezo Group silicic tuffs is expected to make a significant contribution to improving the accuracy and precision of the global Albian age model.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

Integrated stratigraphy of the Turonian-Coniacian Opole Succession, a pivotal link in the Central European Cretaceous

Todes, Jordan P. (1); Walaszczyk, Irenuesz (2); Dubicka, Zofia (2); Chroustová, Markéta (2,3); Radzikowska, Magda (4); Sageman, Bradley B. (5)

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The Opole Basin (southwestern Poland) preserves an expanded, fossiliferous Turonian to Coniacian succession, exposed through numerous cement quarries in the immediate vicinity of Opole. It serves as an important composite reference section for this interval in Europe, in part due to a rich record of many representative macrofossil and microfossil groups. Furthermore, it is situated near the nexus of the Bohemian Cretaceous Basin and the Central European Basin, providing unique opportunities for inter-correlation.

Here, we present a revised, high-resolution, integrated stratigraphic scheme of the accessible succession. A new inoceramid biozonation places the succession between the Inoceramus apicalis Zone (lower middle Turonian) and the Cremnoceramus deformis–C. crassus Zone (upper Lower Coniacian). Although the middle Coniacian is not presently exposed, it is observed further to the west in the subsurface. Ammonites are particularly well-represented in the Turonian, including enormous representatives of the genera Lewsiceras and Pachydesmoceras. The succession yields a rich and representative record of both planktonic (Dicarinella, Helvetoglobotruncana, Marginotruncana, and Falsotruncana) and benthic (Gavelinella, Globorotalites, Eponides, Lingulogavelinella, and Protostensioeina) foraminiferal lineages, providing a rare opportunity for the direct correlation of both groups in central Europe. Other invertebrate groups are well-represented, including ostracods (including the stratigraphically important genera Neocythere, Imhotepia, Bythoceratina, and Cytherelloidea), dinoflagellates, echinoids, and sponges. An independent chronostratigraphic framework is provided by a new carbon isotope chemostratigraphic record. This detailed integrated framework may help to better delineate the biotic and correlative significance of this keystone succession.

Talk

1c - Integrated stratigraphy and refining the Cretaceous timescale

The Campanian-Maastrichtian boundary interval at the Peritethyan Oslen-Krivodol reference section (Bulgaria): bioevents, isotope data and palaeoceanography

Wagreich, Michael (1); Pavlishina, Polina (2); Dochev, Docho (2); Koukal, Veronika (3)

1: University of Vienna, Austria; 2: Sofia University, Bulgaria; 3: Natural History Museum Vienna, Austria

The Oslen-Krivodol section is situated in the western Fore-Balkan Mountains, in a Peritethyan palaeogeographic position. The lower part of the studied 7m section is composed of green to greenish glauconitic limestones (Darmantsi Formation), overlain by thin- to medium bedded limestones, clayey and nodular limestones (Kunino Formation). A complete nannofossil zonal succession could be established, from the uppermost Campanian to the lowermost Maastrichtian, with subzones UC15cTP, UC15deTP, UC16aTP and UC16bTP. The nannofossil bioevent for the base of the Maastrichtian, the LO of Uniplanarius trifidus, is at 3.25m in the section. Strontium isotope stratigraphy indicates the C-M-boundary around 0.707736±5. Additional nannofossil bioevents include the FO and LO of Microrhabdulinus ambiguus below those two inferred CMB levels, and the decrease of warm-water nannofossil indicators like Watznaueria spp. indicating cooling along the Campanian Maastrichtian Boundary carbon isotope event. Two dinocyst zones have been recognized in the section: the upper Campanian Areoligera coronata and the lower Maastrichtian Cerodinium diebelii Zone. Their boundary is marked by the last occurrence of typical Campanian taxa (Odontochitina, C. robusta, C.horridum, A. fenestra) and the appearance of Maastrichtian forms (C. diebelii, M. carpentierae, Glaphyrocysta). inoceramid bivalves were collected from one level in the upper part of the Kunino Formation, represented mainly by the genus Cataceramus, but Endocostea is also present: Endocostea typica Whitfield, 1880; Cataceramus pallisieri (Douglas, 1942); Cataceramus subcircularis (Meek, 1876) and Cataceramus barabini (Morton, 1834). Based on the presence of E. typica we can indicate the upper part of eponymous inoceramid zone at the base of the Maastrichtian.

Talk

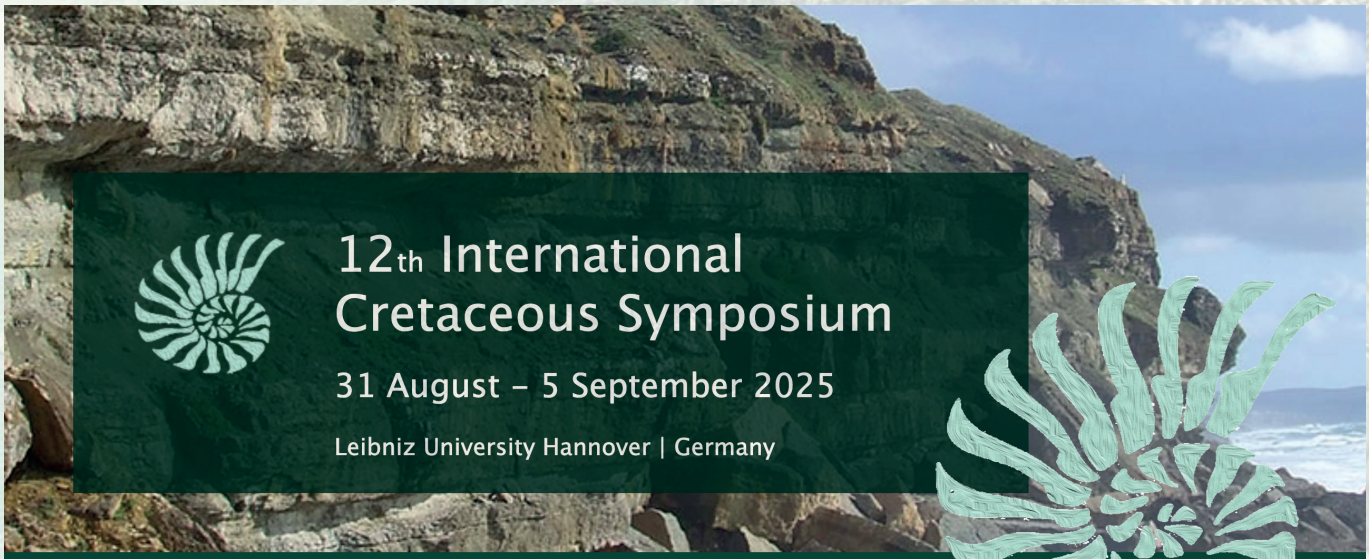
1c - Integrated stratigraphy and refining the Cretaceous timescale

The Santonian-Campanian Boundary in the Pacific Basin: correcting Gale et al, 2023

Ward, Peter

University of Washington, United States of America

The recent definition of the Santonian/Campanian boundary based on magnetostratigraphy (the C34N-C33R magnetic reversal boundary) by Gale et al, 2023, marks an important advance in attempting to correctly correlate the Santonian and Campanian Stages and their substages far from the European stratotypes. Unfortunately, the Gale et al, 2023 contribution made a fundamental error in the placement of this boundary in the Northeast Pacific (British Columbia, California, and Baja California), the Northwest Pacific (Japan and Sakhalin), and Antarctica. Data will be presented demonstrating that the C34N/C33R reversal most closely aligns with the base of the Canadoceras yokoyamai Zone in North America, Japan, and Sakhalin, and with the base of the newly defined, Anapachydiscus naumanni Zone (lowest Campanian) in Antarctica, allowing direct correlation to Japan and Sakhalin. Based on this error, the diachroneity between the stage boundary stratotype in Italy, and each of these regions, is estimated at one to three million years. In this talk, the state of magnetostratigraphy for the Santonian through Maastrichtian will be summarized with reference to both new magnetostratigraphic results and how chron boundaries in this vast "Pacific Basin" correlate to ammonite and inoceramid biostratigraphy in North America, Japan, Sakhalin and Antarctica. Proposals for new, stage boundary, auxiliary stratotype sections will be presented, as well a new proposal for a three substage Campanian and two substage Maastrichtian defined by ammonite biostratigraphy integrated with magnetostratigraphy. The timing of the first occurrences of globally cosmopolitan, Campanian Stage Baculites species will also be presented in support of a three substage Campanian.



TALKS

2: Cretaceous Climates

2a: Drivers of Cretaceous climate change: Evidence from new proxies and numerical modeling

Talk

2a - Drivers of Cretaceous climate change: Evidence from new proxies and numerical modeling

The evolution of seawater temperature and oxygen isotopes in the Cretaceous Western Interior Seaway using carbonate clumped isotope paleothermometry

Brown, Adriana Justine (1); Petersen, Sierra Victoria (1); Jones, Matthew (2)

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The Western Interior Seaway (WIS) was a vast epicontinental sea that inundated North America in a series of transgressive-regressive marine cycles from the Early to Late Cretaceous. The WIS has been studied as a classic shallow Cretaceous seaway with a complex stratigraphic record of the interplay between tectonics, climate, sea level, basin evolution, and faunal evolution. However, fundamental questions remain unresolved regarding the WIS, including how seawater temperatures and oxygen isotope compositions ($\delta^{18}Ow$) varied latitudinally and through time. A robust record of latitudinal temperature gradients (LTGs) could help explain paleoceanography and faunal evolution in the WIS. Previous WIS paleotemperature reconstructions have yielded improbably warm temperatures from poorly constrained $\delta^{18}Ow$ values or focused on specific time intervals or regions. Here, we report carbonate clumped isotopes ($\mathbf{\Delta}47$) measurements from 94 Cretaceous oysters obtained from the Smithsonian's Cobban collection and the University of Michigan Museum of Paleontology to obtain LTGs from the Aptian to Maastrichtian Stages. This study approximately triples the $\mathbf{\Delta}47$-derived WIS temperatures and $\delta^{18}Ow$ values published to date. Our measurements yield average seawater temperatures ranging from 23-31 °C and indicate LTGs were minimal from the Aptian to Campanian and increased in the Maastrichtian. Values of Cretaceous $\delta^{18}Ow$, traditionally assumed to be -1.0‰ Standard Mean Ocean Water (SMOW), varied between -1.0‰ and +0.4‰ SMOW through time. We interpret changes in mean temperatures and LTG as responses to global climate drivers and regional influences, offering insights on basin evolution resulting from sea level fluctuations, tectonics, and paleoceanographic circulation patterns in the WIS.

Talk

2a - Drivers of Cretaceous climate change: Evidence from new proxies and numerical modeling

Paleotemperature reconstruction in the Late Cretaceous through clumped isotopes in rudist bivalves

Křížová, Barbora (1); de Winter, Niels J. (2); Ziegler, Martin (3); Riva, Alberto (4); Claeys, Philippe (5); Goderis, Steven (5); Arbulla, Deborah (6); Frijia, Gianluca (4)

1: Università di Ferrara, Italy; 2: Faculty of Science, Vrije Universiteit Amsterdam, The Netherlands; 3: Earth Science Department, Utrecht University, The Netherlands; 4: Department of Physics and Earth Sciences, University of Ferrara, Italy; 5: Archaeology, Environmental Changes and Geo-Chemistry Group, Vrije Universiteit Brussel, Belgium; 6: Museum of Natural History in Trieste, Italy

The clumped isotope (Δ47) composition of the fossil calcite and aragonite provides direct information about past seawater temperatures. Its greatest benefits include the independence of the Δ47 thermometry from the oxygen isotope composition of the seawater. A limitation of this proxy is its susceptibility to diagenesis and solid-state reordering caused by the elevated temperatures during sediment burial, altering the original Δ47 signal. Laboratory heating experiments show different Δ47 resetting kinetics for various carbonate components, which are necessary to evaluate in order to choose optimal carbonate archives for paleoclimate reconstructions.

We present clumped and stable isotope data from Cenomanian-Campanian rudists, extinct bivalves widely used for Late Jurassic-Cretaceous paleoclimate studies. The fossils come from regions with different burial temperature histories, the Friuli-Venezia Giulia region (FVG; Italy) and Istria (Croatia). Although the rudist $\delta^{18}O$ values from both regions are not significantly different, the Δ47 temperatures in FVG reach as much as 71-101 °C, suggesting Δ47 signal resetting, while Δ47 temperatures in Istria specimens are much lower. We evaluate the clumped isotope resetting of rudist fossils using two models, which, however, do not conclusively reveal what reordering kinetics pattern rudists follow. This merits caution when using rudist calcite as an archive for past temperatures. The well-preserved Δ47 composition of Istrian rudists indicates temperatures of 34-41 °C, aligning with the higher end of Late Cretaceous paleotemperature reconstructions. Combining Δ47 and $\delta^{18}O$ results yields $\delta^{18}O_{seawater}$ values of -0.1 to 1.4 ‰, differing from the value of -1 ‰ assumed for ice-free Late Cretaceous oceans.

Talk

2a - Drivers of Cretaceous climate change: Evidence from new proxies and numerical modeling

Consequences of Late Cretaceous uplift of Africa on continental weathering systems and global climate

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1: CEREGE, Aix-en-Provence, France; 2: GET, Toulouse, France; 3: Biogéosciences Dijon, France

A large part of the African continent has experienced a significant uplift throughout the Late Cretaceous. This event coincides with a decline of CO_2 level, and a global climate cooling. Evidences of this uplift include quantification of sediment volumes in oceanic basins, thermochronological dating, and inland geomorphological observations. In addition, new geochemical data from sediment cores, including clay mineralogy and combined Hf and Nd isotopic composition for which data acquisition is still ongoing, indicates a contrasted and asynchronous response of continental weathering systems to this uplift.

Here we used the modelling framework GEOCLIM to simulate the response of continental weathering and global geochemical cycles to the Cretaceous African uplift. We developed an uplift scenario based on marine sedimentary data around the African continent, and reconstruction of paleo elevation and lithology. This scenario is used as input by GEOCLIM, that computes weathering fluxes (including silicates, petrogenic organic carbon and phosphorus), and the evolution of global carbon cycle (both organic and inorganic part). This framework allows us to quantify pCO_2 drawdown and the associated global cooling that may have resulted from this tectonic event.

Talk

2a - Drivers of Cretaceous climate change: Evidence from new proxies and numerical modeling

Temperatures of the Cretaceous Ocean

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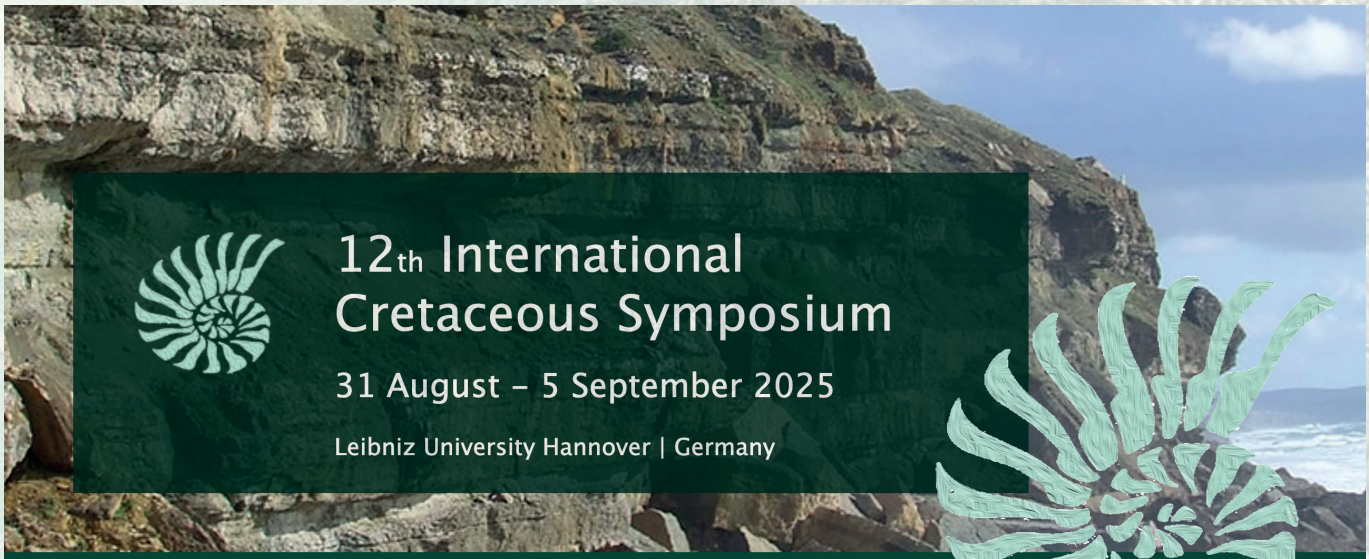
In this study the stable and clumped isotopes of belemnites are presented from the Albian and Campanian - Maastrichtian interval derived from the chalks of Norfolk, UK. These chalk sediments were deposited on the North Atlantic shelf, part of an extensive relatively shallow epicontinental sea that covered most of northern Europe and beyond. Cathodoluminescence and elemental geochemistry of the belemnites reveals that most of the rostra were well preserved. If interpreted in terms of temperature (using an assumption regarding the $\delta^{18}O$ of seawater), our oxygen isotope record reveals relatively warm temperatures for the Albian, warm temperatures during the Campanian with maximum mean temperatures of ~24 °C, followed by cooling to ~21 °C during Maastrichtian. Clumped isotope palaeothermometry is a method that provides a temperature constraint that is independent of the isotopic composition of the water in which the carbonate formed. Our clumped data also show relatively warm temperatures for the Albian and Campanian - Maastrichtian cooling (from 26 to 20 °C). These clumped isotope data compare favourably with published TEX86 temperatures. Significantly, our data are similar or higher than modelled temperatures, modelled with relatively high CO_2 concentrations.



TALKS

2: Cretaceous Climates

2b: Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

Talk

2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

The “Hill 991” Section (Monte Cucco, Italy): A High-Resolution Reference Record for the Aptian–Albian Interval in the Umbria–Marche Basin

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The “Hill 991” section, located within Monte Cucco Regional Park (Umbria Region, Italy), presents a continuous and well-preserved 48-meter-thick stratigraphic succession spanning the upper Aptian to lower Albian (~117–105 Ma) interval of the Umbria–Marche Basin (western Tethyan Ocean). This succession, part of the “Marne a Fucoidi” Formation, includes multiple black-shale horizons interpreted as the sedimentary expression of Oceanic Anoxic Event 1b (OAE1b). The section was systematically logged, sampled at high resolution, and correlated with established reference sections (e.g., Poggio le Guaine). $CaCO_3$ content, magnetic susceptibility, and biostratigraphic data were integrated to identify major biotic turnovers and refine correlations within the Aptian–Albian interval. The results confirm the stratigraphic continuity of the section and allow recognition of all OAE1b sub-events. We also provide evidence of significant microfossil (i.e., foraminifera, radiolaria) changes along the record that are ascribed to variations in paleo-productivity, -dissolution and -oxygenation. These findings underscore the potential of the “Hill 991” section as a complementary Umbria-Marche’s reference site to “Poggio le Guaine” core for reconstructing palaeobiological, paleoclimatic, and paleoenvironmental dynamics during this critical interval of Earth history.

Talk

2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

Re-organization of ocean circulation patterns and sea-level change revealed by foraminifera across Oceanic Anoxic Event 2 at Eastbourne (SE England)

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This study documents quantitative changes of planktonic and benthic foraminiferal assemblages in the Eastbourne section (Anglo-Paris Basin), one of the most expanded, complete, and well-studied records of Oceanic Anoxic Event 2 (OAE 2).

Before the onset of OAE 2, planktonic foraminiferal assemblages are indicative of a well-stratified upper water column. Benthic foraminifera suggest an outer neritic-upper bathyal environment with an oxygenated seafloor.

The onset of OAE 2 is marked by a sea-level fall supported by the maximum abundance of shallow water benthics (Ataxophragmium depressum, Arenobulimina, Plectina cenomana) and by the disappearance of bathyal taxa. Planktonic assemblages are dominated by rotaliporids and whiteinellids and suggest increased Tethyan influence in the source of surface waters.

Tethyan planktonic foraminifera are sharply replaced by assemblages dominated by Praeglobotruncana, Dicarinella and Muricohedbergella during the Plenus Cold Event (PCE). The coeval occurrence of Eggerellina, Textularia, Gaudryina and Quinqueloculina antiqua indicates the onset of a transgressive phase and improved oxygenation at the seafloor. All data converge on the incursion of Boreal surface waters in the Anglo-Paris Basin associated with a disruption of thermal stratification and re-oxygenation of the seafloor coeval with the extinction of rotaliporids.

The dominance of unkeeled planktonic foraminifera and the acme of the benthic genera Marssonella, Gavelinella, and Lingulogavelinella suggest the establishment of poorly stratified mesotrophic surface waters, increased influx of organic matter to the seafloor and a further relative sea-level rise in the final phase and after the end of OAE 2.

Talk

2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

Coccolithophore production and calcification in the western Tethys Ocean during the Albian-Cenomanian

Fant, Mara; Erba, Elisabetta

Università degli Studi di Milano, Italy

Coccolithophore photosynthesis and biocalcification influence the organic and inorganic carbon cycle and atmospheric CO_2 absorption into the oceans. We investigated the Upper Albian-Lower Cenomanian interval of the Piobbico Core-Monte Petrano composite section (Umbria-Marche Basin, Italy) to understand if changes in nannofossil assemblages and calcite paleofluxes can be linked to variations in the ocean alkalinity. Total nannofossil calcite paleofluxes were gathered for the Marne a Fucoidi (marlstones and marly limestones) and Scaglia Bianca (limestones) from the absolute abundances of the most common taxa and volume/mass of individual taxon, obtained by counting all nannofossil specimens in 1 mm^2 of ultrathin sections and by normalizing to 1 year. Precise sedimentation rate estimates are available based on high-resolution integrated biostratigraphy, chemostratigraphy and cyclostratigraphy.

Out of 36, only 10 genera constitute 95% of nannofossil assemblages. The amount of calcite produced by individual nannofossil taxa is highly variable and strictly dependent on the ultrastructure and dimensions. Lithostratigraphically, the beginning of the limy sedimentation of the Scaglia Bianca does not align with changes in nannofossil paleofluxes since the increase occurs in the transitional interval with lowered terrigenous input (in late Albian times). Paleoenvironmental changes in temperature, fertility, chemistry influenced calcareous nannoflora with species-specific responses. Overall, high terrigenous input (Marne a Fucoidi) limited coccolithophore calcification, while fluctuations in nannofossil calcite paleofluxes (Scaglia Bianca) might derive from changes in marine carbonate chemistry (ocean alkalinity) possibly affecting calcification patterns at species-specific level.

Talk

2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

Early Aptian Marine Incursions and Stratigraphic Evolution of the Lower Cretaceous Barbalha Formation, Araripe Basin, Northeastern Brazil

Fauth, Gerson (1,2); Strohschoen Jr, Oscar (1); Kern, Henrique P. (1); Villegas-Martín, Jorge (1); Santa Catharina, Amanda (1); Batista dos Santos Filho, Marcos Antonio (1); Leandro, Lilian Maia (1); Luft-Souza, Fernanda (1); Tungo, Edna de Jesus Francisco (1); Bruno, Mauro Daniel R. (1); Bom, Marlone H. H. (1); Baecker-Fauth, Simone (1); Santos, Alessandra (1); Nauter Alves, Andressa (3); Mota, Marcelo Augusto de Lira (4); Lima, Francisco Henrique de Oliveira (5); Assine, Mario Luís (6)

1: Technological Institute of Paleoceanography and Climate Changes (itt Oceaneon), Unisinos University (UNISINOS), Cristo Rei, São Leopoldo, Brazil; 2: Graduate Program in Geology, Unisinos University, Cristo Rei, São Leopoldo, Brazil; 3: Earth and Environmental Science Department, University of Rochester; 4: Institute of Geosciences, University of São Paulo, São Paulo, Brazil; 5: Petrobras, Research Center (CENPES), Cidade Universitária, Ilha do Fundão, Rio de Janeiro, Brazil; 6: Department of Geology, São Paulo State University-UNESP, Rio Claro, SP, Brazil

In the interior Cretaceous basins of northeastern South America, a significant question concerns the timing of the earliest marine incursions and their effects on sedimentary stratigraphy. This study investigates the Barbalha Formation in Brazil's Araripe Basin through analysis of two drill cores (1PS-06-CE and 1PS-10-CE) using a multi-proxy approach that includes stratigraphy, microbiofacies, ichnofossils, and microfossils. Three short-lived marine incursions, named Araripe Marine Incursions (AMI) 1–3, were identified. AMI-1 and AMI-2 occur within the Batateira Beds' shales (lower Barbalha Formation) and are characterized by benthonic foraminifera, calcareous nannofossils, dinocysts, and a mass mortality of non-marine ostracods. AMI-3, found in the upper Barbalha Formation, is distinguished by ichnofossils and planktonic foraminifera, including the genus Leupoldina, which indicates an early to late Aptian age and allows correlation with global foraminiferal biozonation.In addition, sedimentological and ichnological data from six boreholes, supplemented by four additional cores, reveal two depositional sequences: the first includes fluvial meandering deposits overlain by lacustrine-lagoonal deposits (equivalent to Batateira Beds), while the second comprises alluvial plain and tidally influenced delta deposits overlain by bayhead delta deposits. The presence of microfossils and marine to brackish ichnofossils confirms marine incursions of varying intensity throughout these sequences. Preservation patterns suggest the eastern to southeast region of the basin experienced the strongest marine influence. These results provide important insights into the timing and nature of early marine flooding in northeastern Brazil's inland basins, linked to the breakup of the Gondwana supercontinent and the initial opening of the South Atlantic Ocean. [Acknowledgements: Mar Interior Project]

Talk

2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

The Marine Lower Cretaceous of England: Geological Conservation Review

Hart, Malcolm (1); Munt, Martin (2); Price, Gregory (1)

1: University of Plymouth, United Kingdom; 2: Dinosaur Isle, Sandown, Isle of Wight, United Kingdom

The Geological Conservation Review Series began in 1977 and, in a series of volumes, documents the key geological sites of the United Kingdom. Many of the selected sites were, or have subsequently become, Sites of Special Scientific Interest. Initially published in hard copy, the remaining volumes are being published on-line in the Proceedings of the Geologists' Association. The marine, Lower Cretaceous sites extend from Speeton in the North-East of England to the Aptian and Albian sediments of the Isle of Wight and the Dorset Coast. Many of the stratigraphical units are famous parts of the UK Cretaceous succession, including the Speeton Clay Formation, the Spilsby Sandstone Formation, the Hunstanton Formation, the Gault Clay Formation and the Atherfield Clay Formation. The biostratigraphy of most of the marine Lower Cretaceous was initially based on ammonites (and belemnites), although many parts of the succession have now been described in terms of their microfossil assemblages (foraminifera, ostracods, calcareous nannofossils and dinoflagellate cysts).

Work on the present volume was begun in 1990's by the late Simon Kelly and taken over by the present team following his sad death in 2023. Many of the sites listed in his initial survey have now been lost or are in a 'poor' condition and part of the current work is an assessment of what remains available. The GCR Series has several remaining gaps, and this volume is an important omission, coming just after the 200th anniversary of the founding of the Cretaceous System in 1822.

Talk

2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

Organic walled dinoflagellate cyst assemblages from parts of the Byers Group, Livingston Island, Antarctica – biostratigraphical, palaeoenvironmental and palaeoclimatic assessment

Pavlishina, Polina Vsevolodova (1); Dochev, Docho Iskrov (1); Metodiev, Lubomir Stefanov (2)

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An integrated palynological study at Byers Group, Livingston Island (Antarctica) has provided valuable information on dinoflagellate cysts and miospores for biostratigraphic interpretation and palaeoenvironmental reconstruction. On the Byers Peninsula, the Byers Group is exposed as a thick succession of Upper Jurassic–Lower Cretaceous sedimentary and volcanic rocks composed mainly of marine mudstones, sandstones, siltstones, and conglomerates. The Byers Group includes different formations and members, as the President Beaches Formation and the overlying Chester Cone Formation occupy a large area of the western part of the Peninsula. It has been found that the President Beaches Formation and the Sealer Hill Member of the Chester Cone Formation contain comparatively rich assemblages of dinoflagellate cysts, gymnosperms and pteridophyte spores. Dinocysts Batioladinium reticulatum Range Zone (uppermost Berriasian) and Senoniasphaera tabulata Interval Zone (mid Valanginian) have been indicated in the President Beaches Formation, while the Lithodinia stovery Zone (lower Hauterivian) has been found in the Sealer Hill Member of the Chester Cone Formation.

A neritic middle shelf depositional environment can be inferred from the overall composition of dinocyst assemblages and palynofacies data. The input of terrestrial material has been high in the basin, with consistently high continental to marine ratio. Anoxic intervals are evidenced within the President Beaches Fm demonstrated by significant parts of grey greenish amorphous organic matter. Land vegetation likely consisted of pteridophyte-spore producing plants and coniferous forests with equal amounts of Araucariacites and Podocarpidites, suggesting a temperate warm, humid palaeoclimate.

The study is contribution to Project 70-25-10/ Bulgarian Polar Program.

Talk

2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

New hypothesis on the origin and early evolution of the Hippuritidae (Bivalvia)

ITO, Ayaka; SANO, Shin-ichi

University of Toyama, Japan

A new hippuritid rudist bivalve is recovered from the Cretaceous allochthonous limestone body intercalated in the Eocene Caramoan Formation in the Caramoan Peninsula, southeastern Luzon Island, the Philippines. Its age is supposed to be Cenomanian, according to the stratigraphic range of co-occurring bivalves, Sr isotopic stratigraphy of a rudist shell and U-Pb dating of the tuff bed intercalated in limestone. The shapes and positions of ligamentary infolding, two pillars and myo-cardinal arrangement in its right valve have the characteristics similar to those of Vaccinites rousseli, one of the primitive hippuritid species (upper Turonian). Its left valve is stacking into the right valve, and possibly has a very thin outer shell layer, and thus the pores and canals system, diagnostic features of the hippuritids, are not probably present. These characteristics of the left valve are similar to those of the hippuritid genus Torreites (Santonian-Maastrichtian). The mode of development of the multiple-fold system in new hippuritid: the increase of the number of infoldings and their order of development during the ontogeny, is distinct from that of advanced multiple-fold hippuritid genera of the Campanian–Maastrichtian age. Furthermore, a cladistic analysis of the Hippuritidae including the new hippuritid, identifies its evolutionary basal position and the process of achieving diagnostic features in this family. Thus, the discovery of a new hippuritid in the Central Pacific, which represents one of the earliest records of this family and uniquely combines the variable morphological features, requests the complete revision of the early evolutionary history of the family Hippuritidae.

Talk

2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

Integrated biostratigraphy (foraminifera and ostracod) of a middle Cretaceous carbonate sequence from North-Eastern Algeria, North African Tethyan margin.

Chibout, Nahla (1); Trabelsi, Khaled (2,3,4); Wolfgring, Erik (5); Mebrouk, Fateh (6); Wagreich, Michael (2)

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Foraminifera and ostracod biostratigraphic data have been integrated to improve the age-constraints of the middle Cretaceous carbonate successions at 2 sections (El Hammimat and Kef Gouriret) from the Oum El Bouaghi area, north-eastern Algeria. 33 ostracod and 17 planktic foraminifera species have been identified and applied to establish the biostratigraphic framework of the studied sections. Three ostracod assemblages corresponding to two partial range zones have been recognized, the Rehacythereis bartensteini biozone, middle Aptian in age, which is subdivided into two subzones, the Protocythere bedoulensis (upper Gargasian) and the Cytherella circumrigosa (lowermost Clansayesian), as well as the Rehacythereis zoumoffeni biozone, late Aptian – early Albian in age. Two foraminifera assemblages attributing to two partial range zones have been identified, the Globigerinelloides algerianus and the Hedbergella infracretacea of the upper Gargasian and lowermost Clansayesian respectively.

These ostracod and foramininfera biozones are well correlated with there equivalents previously described from Tethyan margins (Oertli, 1958; Bischoff, 1963; Babinot et al., 2007; Coccioni and Petrizzo et al., 2012; Premoli Silva, 2015; Trabelsi et al., 2021), providing therefore new constraints on the chronostratigraphy of the middle Cretaceous carbonate successions of north-eastern Algeria, established here for first time at the studied sections. Regional correlation reflect tectono-sedimentary control on the spatio-temporal distribution of lithofacies within the studied area.

Talk

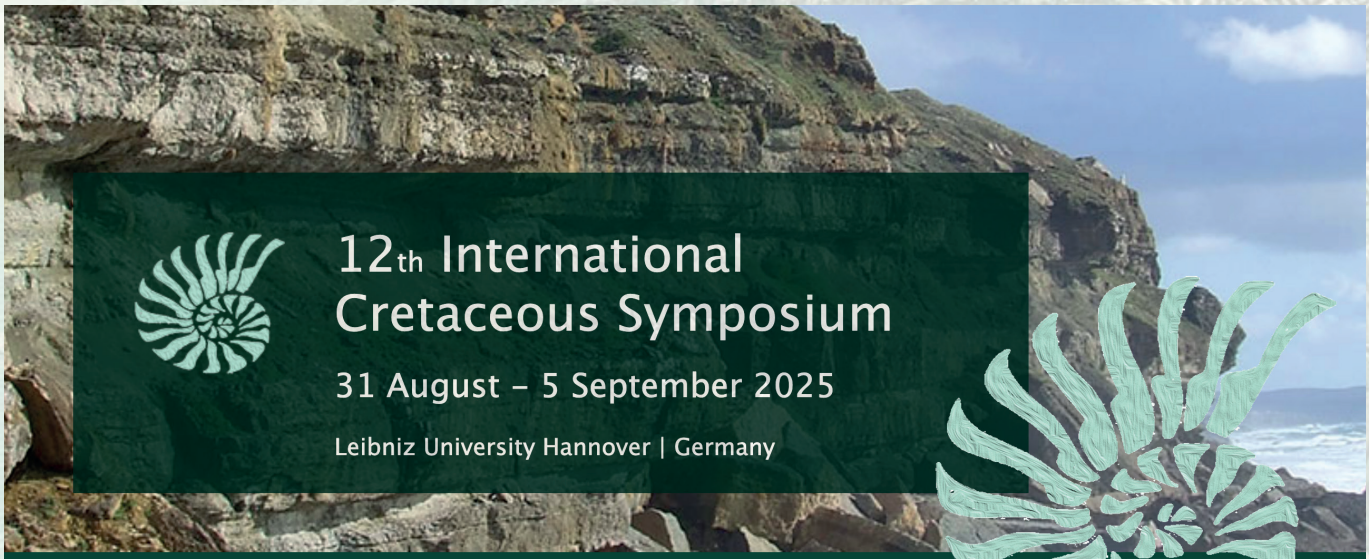
2b - Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils...

Palaeoecological response to Earth System changes across the Cenomanian – Turonian interval in the UK Chalk Sea

Witts, James (1); Bohun, Harriet (1); Gale, Andrew (2); Twitchett, Richard (1)

1: Natural History Museum, London, United Kingdom; 2: School of the Environment and Life Sciences, University of Portsmouth, Portsmouth, United Kingom

The Cenomanian-Turonian boundary interval (Late Cretaceous ~93.9 million years ago) coincides with a dramatic period of environmental change. This includes the global carbon cycle perturbation of Oceanic Anoxic Event 2 (OAE-2), rapid changes in seawater oxygenation and temperature (e.g., the 'Plenus Cold Event' and early Turonian thermal maximum), as well as sea level and productivity fluctuations. Despite a wealth of proxy and geological data, the effects of these events on the diversity and functional ecology of marine ecosystems remain uncertain. The UK Chalk Group of the Anglo-Paris Basin provides a complete and abundantly fossiliferous record across this interval which is currently the focus of the ChaSE (Chalk Sea Ecosystems) project. Using extensive macrofossil collections from the expanded Cenomanian-Turonian succession exposed at Eastbourne (East Sussex, UK) held at the Natural History Museum as well as new quantitative field data, we document several intervals across the broader C-T boundary interval where the marine macrofauna in this part of the Chalk Sea underwent significant changes in both taxonomic and functional diversity. We demonstrate how these data are related to the environmental changes outlined above, and how they provide important evidence for the complex regional response, and resilience, of marine ecosystems to Earth System perturbations in the 'greenhouse' world of the Late Cretaceous.



12th International Cretaceous Symposium

31 August – 5 September 2025

Leibniz University Hannover | Germany

TALKS

2: Cretaceous Climates

2c: Land-Ocean linkage in the circum-Pacific and Asia during the Cretaceous

Talk

2c - Land-Ocean linkage in the circum-Pacific and Asia during the Cretaceous

Chorono- and sequence stratigraphy, and depositional history of the Upper Cretaceous Kuji Group, Northeast Japan: shallow-marine to fluvial sedimentation of the eastern margin of Paleoasian continent

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1: Faculty of Dinosaur Paleontology, Fukui Prefectural University, Japan; 2: Basin Films Inc., Japan; 3: Waseda Research Institute for Science and Engineering, Japan; 4: School of International Liberal Studies, Waseda University, Japan

The Upper Cretaceous Kuji Group (300–400 m thick) distributed along the Pacific coast of north Tohoku region, Northeast Japan are examined through sedimentary facies and sequence stratigraphic analyses, and U-Pb age dating of detrital zircon from intercalated tuff layers. Identified twenty-six sedimentary facies and seven sedimentary facies associations show that the group is composed of terrestrial to shallow-marine sandstone-dominated siliciclastic deposits. The Tamagawa (1), Kunitan (2), and Sawayama (3) formations in ascending order are represented by talus, flood plain, gravelly river, sandy meandering river, and inner bay-estuary (1), shoreface to inner shelf (2), and meandering river (3) depositional systems, respectively. Their stratigraphical and geographical distributions indicate five depositional sequences with ten forth-order sequences, reflecting five third-order relative sea-level changes with some local tectonic influence along the north-south trending western margin of the Yezo forearc basin. The U-Pb age data including those of a previous research range 92.6 to 79.1 Ma, showing the middle Turonian to middle Campanian age. Our results provide valuable information on paleo- and sedimentary environments for reconstructing Late Cretaceous biota including terrestrial and marine vertebrates such as dinosaur and shark, etc., benthic molluscs, and sporophyte, gymnosperm, and angiosperm fossils.

Talk

2c - Land-Ocean linkage in the circum-Pacific and Asia during the Cretaceous

Centennial–millennial-scale climate variability during the OAE1a interval: Insights from a lacustrine varve record in Mongolia

Hasegawa, Hitoshi (1); Heimhofer, Ulrich (2); Hasegawa, Takashi (3); Ichinnorov, Niiden (4); Kawabe, Mihoko (1); Sakuma, Aki (5); Kozaka, Yukiko (3); Yamada, Keitaro (6); Mimura, Kazuhide (7); Itaki, Takuya (7)

1: Kochi University, Japan; 2: Leibniz University Hannover, Germany; 3: Kanazawa University, Japan,; 4: Paleontological Institute, Mongolia; 5: University of Tokyo, Japan; 6: Yamagata University, Japan; 7: AIST, Japan

Understanding the climate variability and stability during past 'hothouse' periods is essential for predicting future climate under ongoing global warming. However, information on millennial-scale (and shorter) climate variability during such periods is extremely limited due to the lack of appropriate high-resolution, deep-time archives. We have been conducting research to elucidate decadal- to orbital-scale continental climate variability from a Lower Aptian lacustrine varve record located in southeastern Mongolia (Hasegawa et al., 2022). The material used in this study is the CSH02 research core, which we consider now to cover the OAE1a interval based on new analyses.

We performed ultra-high-resolution elemental composition analysis (6-yr resolution) using an XRF core scanner (Itrax), mineral composition analysis of 1282 samples, carbonate $\delta^{18}O$ and $\delta^{13}C$ analysis of 822 samples, and organic matter $\delta^{13}C$ measurements combined with palynofacies analysis of ~200 samples. The results indicate a decrease in the K/Al ratio, an increase in kaolinite, a shift in carbonate $\delta^{18}O$ and $\delta^{13}C$ towards more negative values, and a gradual increase in pollen and plant fragments near the stratigraphic level presumed to mark the onset of OAE1a, suggesting increased humidity and enhanced chemical weathering.

Furthermore, the Ca/Ti ratio (evaporation/precipitation proxy) shows that, during a 20 kyr-lasting interval prior to the estimated onset of OAE1a, centennial-scale variations were predominant, whereas during the 20 kyr following the onset of OAE1a, pronounced millennial-scale (~1,000–2,000 years) variations are observed. Our findings suggest that the state dependence of the millennial-scale climate instability also existed at the transitional phase toward the "hothouse" climate state.

Talk

2c - Land-Ocean linkage in the circum-Pacific and Asia during the Cretaceous

Cretaceous seawater osmium isotopic record

Matsumoto, Hironao

University of Tsukuba, Japan

Past seawater osmium isotopic record ($^{187}Os/^{188}Os$) is a useful chemostratigraphic tool. The Os isotopic composition of seawater reflects the balance between radiogenic Os from continental sources and less radiogenic Os from the mantle and extraterrestrial materials. Because the residence time of Os in seawater (~10^4 years) is longer than the typical ocean circulation timescale (~103 years), its isotopic composition is relatively homogeneous throughout the ocean. Osmium isotope ratios in seawater have varied over geological time, and these signatures are preserved in sediments. Therefore, the past-seawater Os isotopic variations recorded in the sedimentary rocks are useful for the stratigraphic correlations.

Although Cenozoic seawater Os isotopic records have been compiled over the past 30 years, Cretaceous Os isotopic data have been limited to the major oceanic anoxic events (e.g., OAE1a and OAE2) and the Cretaceous–Paleogene boundary, which is insufficient to establish a complete Os isotope stratigraphy during the Cretaceous. However, in recent years, an increasing number of Os isotopic datasets have been assembled, enabling the development of reference curves for the entire Cretaceous. In this presentation, I integrate previously published Os isotopic data with newly obtained data to provide an updated Os isotopic stratigraphy for the Cretaceous. Furthermore, I explain key Os isotopic variations and their possible causes.

Talk

2c - Land-Ocean linkage in the circum-Pacific and Asia during the Cretaceous

The Weissert Event records from terrigenous sequences exposed in the Pacific coast of NE Japan

Tomaru, Taiga (1); Takashima, Reishi (2); Orihashi, Yuji (3); Yamanaka, Toshiro (4); Ando, Hisao (5,7); Asahara, Yoshihiro (6); Kuroyanagi, Azumi (2); Nishi, Hiroshi (7)

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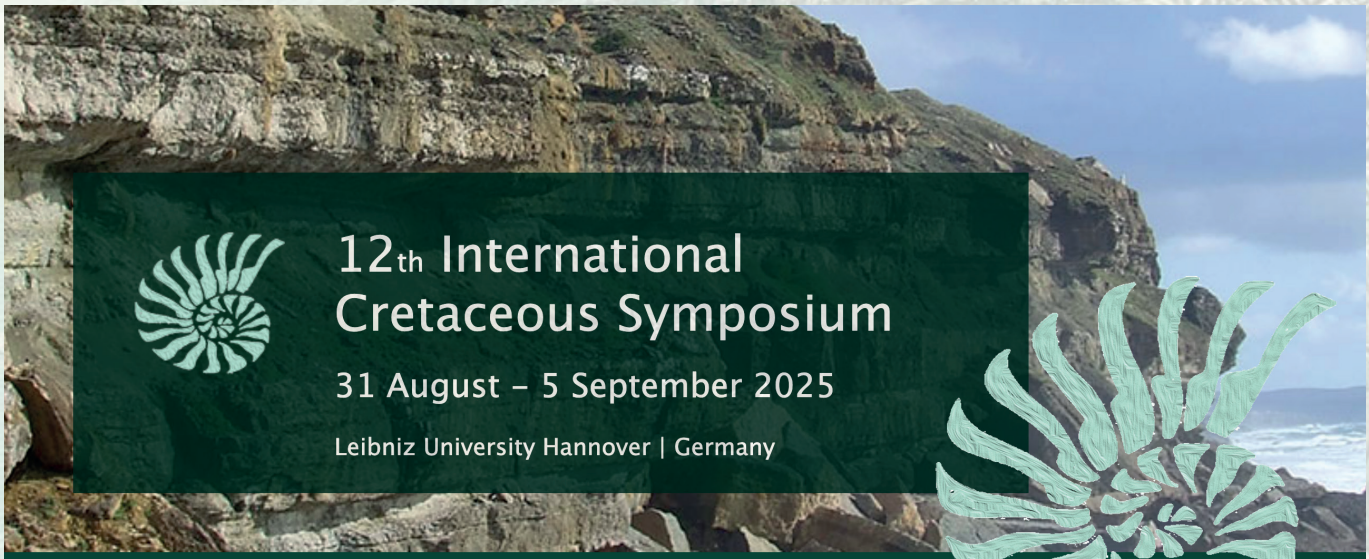
The Valanginian is characterized by a period during the Cretaceous when the earliest carbon cycle perturbation event (the Weissert Event) as well as the earliest on-land LIP emplacement took place. In recent years, the GSSPs for the Valanginian and Hauterivian stages have been ratified, and stratigraphic and palaeoenvironmental studies of the Valanginian are becoming more active. On the other hand, there is little paleoceanographic information on the Valanginian Panthalassa, the largest ocean at the time. In Northeast Japan, Berriasian-Hauterivian marine sequences, accumulated in the northwest of the Panthalassa on the northeastern margin of Eurasia, are exposed sporadically. These sequences have not been chronologically well constrained in detail due to a scarcity of age-diagnostic fossils. We have attempted detailed international stratigraphic correlation based on zircon U-Pb ages of tuff as well as carbon isotopic stratigraphy for the Berriasian-Hauterivian sequences (Karakuwa, Oshima and Somanakamura groups) exposed in Northeast Japan. As a result, the Berriasian/Valanginian boundary and the Weissert Event were successfully identified. In addition, an approximate stratigraphic level for the Valanginian/Hauterivian boundary was recognized, although it was not conclusive. On the basis of TOC and DOP analyses for the studied sequences, the Weissert Event was dominated by an oxic environment in NW Panthalassa, while transient dysoxia occurred sporadically.



TALKS

2: Cretaceous Climates

2d: Cretaceous Eustasy:

State of the Art – contributions in honour of Peter R. Vail (1930 – 2024)

Talk

2d - Cretaceous Eustasy: State of the Art – contributions in honour of Peter R. Vail (1930 – 2024) en)

Sea-Level Fluctuations during the Cenomanian–Coniacian on the NW Arabian Plate Margin: Insights from a Sequence Stratigraphic Case Study from West-Central Jordan

Chirakal, Tojo (1); Messaoud, Jihede Haj (1); Alibrahim, Ali (1); Grélaud, Carine (2); Kalifi, Amir (1); Ibrahim, Khalil (3); Powell, John (4); van Buchem, Frans (1)

1: King Abdullah University of Science & Technology, Saudi Arabia; 2: Bordeaux INP, ENSEGID, Bordeaux, France; 3: Department of Earth and Environmental Sciences, The Hashemite University, Zarqa, Jordan; 4: British Geological Survey (BGS), United Kingdom

The Late Cretaceous Cenomanian-Turonian stratigraphic record on the margins of the Arabian Plate is characterized by high eustatic sea levels, punctuated by short-term fluctuations, as well as tectonically forced sea level changes. Despite favorable exposure, carbonate deposits of this age on the NW plate margin are relatively understudied compared to the NE margin (Oman). This study presents a high-resolution, multi-proxy sequence stratigraphic investigation of the latest Albian-Coniacian Ajlun Group in west-central Jordan. A >260 km proximal-distal transect along the western border of Jordan was studied, integrating detailed sedimentological observations, new carbon isotope stratigraphy and biostratigraphic data, covering the Cenomanian-Coniacian for this region.

Preliminary results reveal six regionally traceable sequence boundaries in Jordan (SBs), which can be correlated across the Arabian Plate to Oman. Particular emphasis is placed on SB 2 at the Early-Middle Cenomanian boundary, correlatable to the Top Natih E SB (Oman), showing m-scale erosive features in tidal channel deposits and complex rudist-bearing clinoforms/sandwaves. Additionally, the Middle Turonian SB 4, regionally equivalent to the K150SB and the Top Natih A (Oman), indicates a sea-level fall of 10–20 m based on stratigraphic data from southern Jordan, with carbon isotope records likely placing SB 4 just above the Round-Down carbon isotope event. A short duration of this event, followed by a quickly re-established carbonate factory and moderate incision depths, suggests a primarily eustatic control of this SB in Jordan, contrasting with a principally tectonic control in Oman. The results provide a refined high-resolution stratigraphic record for the NW Arabian Plate.

Talk

2d - Cretaceous Eustasy: State of the Art – contributions in honour of Peter R. Vail (1930 – 2024) en)

Deciphering eustatic signals using high-resolution biostratigraphy and chemostratigraphy: examples from the Albian and Cenomanian Stages

Gale, Andrew Scott

University of Portsmouth, United Kingdom

The use of high-resolution biostratigraphy and chemostratigraphy to precisely correlate between successions in geographically widespread regions provides a valuable tool for the identification of eustatic events. In the Cretaceous, this is made possible by detailed variance in the global $\delta^{13}C$ srecord, in conjunction with rapid evolution of inoceramid bivalves and ammonites. This approach is utilised here to identify eustatic events in the Albian and Cenomanian stages.

Middle-Upper Albian boundary

The succession of ammonite migrations and rapid evolution of the bivalve Actinoceramus permits precise correlation between central Texas (USA), the Vocontian Basin (SE France) and the Anglo-Paris Basin (southern England, northern France). Evolution of A. concentricus parabolicus immediately predates rapid, global sea-level fall which caused extensive erosion on shelves; later onlap from a major transgression was approximately coincident with evolution of A. sulcatus sulcatus, widely marked by development of intraformational conglomerates.

Albian-Cenomanian boundary

Hardgrounds occur between the basal Cenomanian marker (T. globotruncanoides) and immediately beneath the lowest occurrences of Cenomanian ammonites of the M. mantelli/G. wacoense zones, present in Texas, North Africa and NW Europe. A hiatus, representing up to 7 myr, and including the uppermost Albian and lowermost Cenomanian, is widely developed.

Lower-Middle Cenomanian boundary

High-resolution correlation is provided by ammonites and carbon isotope positive excursion MCE1. In NW Europe and Texas, ammonites and carbon isotope records correlate, and place a sequence boundary beneath the Cunningtoniceras inerme Zone. This represents a major sea-level fall, with subsequent transgression low in the Turrilites costatus Subzone.

Talk

2d - Cretaceous Eustasy: State of the Art – contributions in honour of Peter R. Vail (1930 – 2024) en)

Sea-level changes through OAE2 in a high-resolution, carbon- isotope temporal framework, Western Canada Cretaceous foredeep

Plint, Guy (1); Grocke, Darren (2); Selby, David (2); Walaszczyk, Ireneusz (3); Kamo, Sandra (4); Jarvis, Ian (5); Trabucho-Alexandre, Joao (6); Flynn, Jessica (7); Longstaffe, Frederick (1); Du Vivier, Alice (2); Ulicny, David (8)

1: University of Western Ontario, Canada; 2: Durham University, UK; 3: University of Warsaw, Poland; 4: University of Toronto, Canada; 5: Kingston University, UK; 6: Utrecht University, Netherlands; 7: University of Guelph, Canada; 8: Institute of Geophysics, Prague, Czech Republic

An allostratigraphic framework for the Cenomanian–Turonian boundary (CTB) succession in the Western Canada Foreland Basin is based on > 3000 well logs, supplemented by core and outcrop. A low-gradient, ramp-style depositional system existed across the foredeep, with nearshore sand grading into offshore mud. A mudstone-dominated section in the proximal foredeep preserves a 185-m-thick 2 ‰ $\delta^{13}C_{org}$ positive carbon-isotope excursion, typical of OAE2, but ×10 thicker than most ‘expanded’ sections. Throughout OAE2, inner shelf heterolithic mudstones form stacked parasequences, 5–15 m thick, organized into larger-scale upward-shallowing packages. The carbon-isotope curve allows detailed correlation to the CTB reference section at Eastbourne (UK), to the SH#1 core (Utah), and to other CTB sites. The globally-recognized sub-plenus unconformity (SB Ce5) is replaced in the high-accommodation foredeep by six high-frequency, basinally-isolated lowstand sandbodies, offset up to 150 km from highstand shorelines. Associated erosion surfaces merge eastward towards the forebulge. This lowstand is followed by the S. gracile transgression, inferred to record 15 to > 40 m of eustatic change. Additional lowstands, determined from facies mapping, precede the latest Cenomanian N. juddi transgression, and the basal Turonian M. puebloensis transgression. Sea-level change of 20–30 m is suggested by facies offsets. Despite a background subsidence rate of 0.3–0.5 m/kyr, repeated forced regressions, and hence relative sea-level falls, imply sea-level drawdown occurred at an even greater rate. The rates and amplitudes of sea-level change inferred from facies cyclicity in the proximal foredeep exceed reasonable limits on thermo- and aquifer-eustasy, hinting at a glacio-eustatic component.

Talk

2d - Cretaceous Eustasy: State of the Art – contributions in honour of Peter R. Vail (1930 – 2024) en)

Towards a calibrated and plausible short-term eustatic curve for the mid-Cretaceous

Simmons, Mike (1,5); van Buchem, Frans (2); Davies, Andrew (1); Bidgood, Mike (3); Ray, David (4)

1: Halliburton, United Kingdom; 2: KAUST, Saudi Arabia; 3: GSS International, United Kingdom; 4: University of Birmingham, United Kingdom; 5: Natural History Museum, United Kingdom

A plausible, pragmatic eustatic curve provides a valuable tool for not only understanding Earth systems processes through time, but also for generating subsurface characterisation of lithological variation and heterogeneity. We present a simplified workflow that allows for the construction of a pragmatic short-term ("3rd order") mid-Cretaceous eustatic curve, for which the results can be tested by process-modelling to determine plausibility.

Sedimentary architecture, vertical facies trends and changes in palaeobathymetry indicators can be interpreted using a consistent sequence stratigraphic approach, which reduces uncertainty in understanding sea-level trends. The examination of multiple suitable stratigraphic sections in a global dataset can be used to identify a commonality in the timing of major transgressive and regressive events, although some residual uncertainty will remain. A prerequisite to this is detailed work on biostratigraphic calibration between different fossil groups and other chronological techniques (e.g., $\delta^{13}C$ excursions).

Having established timings of synchronous eustatic rise and fall, eustatic magnitude limits can be estimated from stratigraphic observations, geochemical proxies, or from a compilation of published magnitudes. These can then be integrated with an independently calculated long-term eustasy trend and the resultant curve analysed for plausibility. Here forward stratigraphic modelling can be powerful for assessing the impact of uncertainties in timing and magnitude on the generation of a plausible eustatic curve. We show that many published Cretaceous eustatic curves fail to adequately create plausible sedimentary models in that the pace of eustatic change depicted is unable to generate the partitioning of different systems tracts observed in the rock record.

Talk

2d - Cretaceous Eustasy: State of the Art – contributions in honour of Peter R. Vail (1930 – 2024) en)

Carbon-isotope stratigraphy and sea level changes in the Turonian of the Western Interior Seaway, North America

Uličný, David (1); Sageman, Bradley B. (2); Plint, A. Guy (3); Jones, Matthew M. (2); Gröcke, Darren R. (4); Trabucho-Alexandre, João P. (5); Leckie, R. Mark (6); Jarvis, Ian (7); Eaton, Jeffrey G. (8); Walaszczyk, Ireneusz (9)

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New carbon stable-isotope datasets from shallow-marine successions of Turonian age are evaluated in sedimentological and biostratigraphic context, from tectonically separate depocenters in the Western Interior Seaway (WIS) of North America, with the aim to: (i) establish the chronology and assess the regional versus potentially global nature of long-term (c. 1 Myr) cyclic changes in palaeo-sea level; and (ii) suggest which astronomical cycles and climatic mechanisms may have been involved in driving sea-level fluctuations in this greenhouse regime. While each of the sections studied shows specific features related to local subsidence and clastic supply history, comparison of palaeobathymetric indices reveals several conspicuous stratigraphic features that can be correlated over c. 1,700 km along the western margin of the WIS. A broad correlation is found in three principal, long-term intervals of shallow-water conditions, characterized by dominantly regressive stratal patterns, separated by major transgressive events. Most of those are considered time-equivalent in all sections, within the resolution of isotope-based and biostratigraphic correlation. Long-term cyclicity demonstrated in the WIS Turonian and correlative time-equivalent records in Central Europe suggests a relationship between major sea-level fluctuations and long-term amplitude modulation of obliquity cycles. However, shorter-term sea-level cycles paced by the long-eccentricity (405-kyr) cycle have been documented as well.

Talk

2d - Cretaceous Eustasy: State of the Art – contributions in honour of Peter R. Vail (1930 – 2024) en)

Cenomanian fluvial to marine valley backfilling controlled by palaeotopography and eustatic sea-level changes (Saxonian Cretaceous Basin, Germany)

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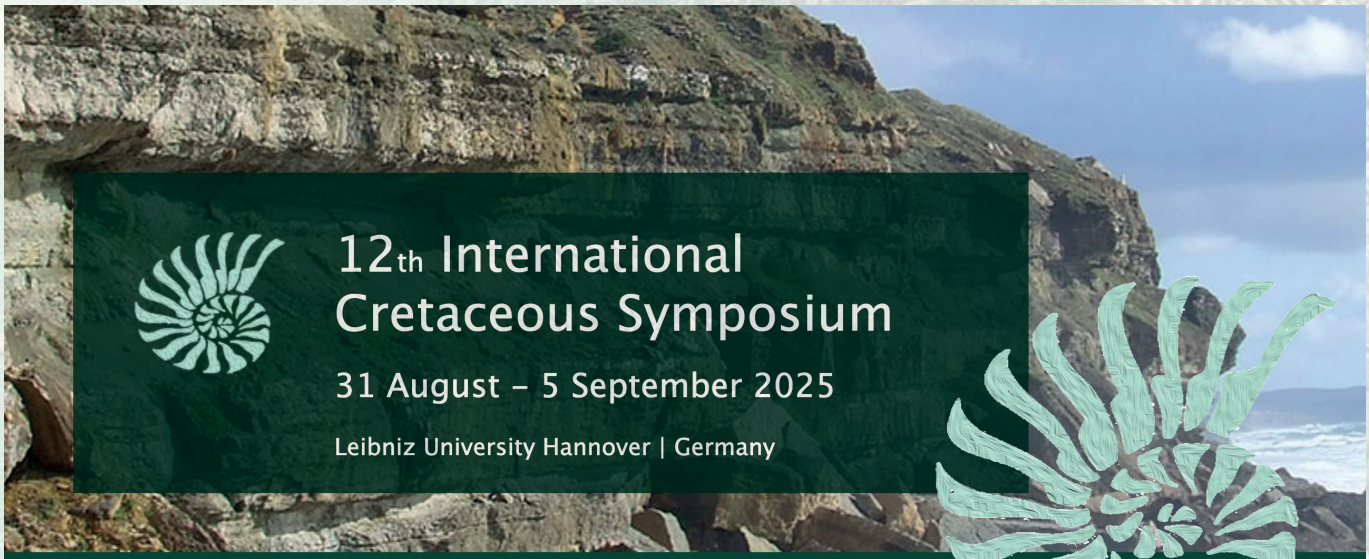
Detailed stratigraphic-sedimentological analyses of numerous lower Cenomanian–lowermost Turonian core sections from the Upper Cretaceous Elbtal Group of the Saxonian Cretaceous Basin (SCB, Germany) provide detailed insight into the stratigraphic architecture and facies development of the fluvial to marine strata infilling the N–S-directed Pirna palaeovalley. This palaeovalley is part of a northwards-discharging palaeo-drainage system cut into the basement of the Mid-European Island that limits the SCB in the southwest. Deposition was constrained by the palaeotopography and closely tracked early Cenomanian–earliest Turonian sea-level changes, reflecting a continuous up-dip shift of facies belts. Stratal architectures indicate shallow western and steep eastern palaeovalley flanks. Northern and middle segments of the palaeovalley were filled with lower Cenomanian fluvial siliciclastics (Niederschöna Formation), while southern parts were still bypassed. First marine influences (tracked by ichnofossils) were manifested in the northern palaeovalley in the Wurmsandstein Member of the upper Niederschöna Formation during the late early Cenomanian. The retrogradational facies development continued during the middle and Late Cenomanian when widespread shallow-marine sandstones of the Oberhäslich Formation draped most of the pre-existing palaeo-topography. The marine onlap was continued by the rapid plenus Transgression and the deposition of the fine-grained siliciclastic offshore deposits of the uppermost Cenomanian Pennrich Formation, culminating in a maximum-flooding interval (Lohmgrund Horizon) at the base of the lower Turonian Brießnitz Formation. The Cenomanian succession of the study area represents a textbook example of a retrogradational palaeovalley backfilling in the course of a major transgression and highlights the validity of Walther’s law of facies.



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TALKS

2: Cretaceous Climates

2e: Terrestrial environments and climates in the Cretaceous

Talk

2e - Terrestrial environments and climates in the Cretaceous

Palaeosols of the Barra Velha Formation and their Relationship with Environmental Evolution of the Santos Basin, Brazil

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The carbonate reservoirs of the Brazilian Pre-salt are made up of lacustrine deposits formed in an evaporative and alkaline lake with high concentrations of silica and magnesium. The typical inland lake facies comprises spherulites, shrubs, and magnesian clays. At the marginal regions of the lake, reworked facies, such as grainstones and packstones, indicate an energetic and fluctuating coastline. Based on the analysis of drill cores and thin sections (Santos Basin), diagnostic features of paleosols were identified and described (horizons, structures, bioturbation, colours, dissolution, cementation, neoformation, and illuviation of clay minerals), allowing us to classify them as well-drained paleosols (WDP) and poorly drained (PDP). From an environmental perspective, well-drained paleosols (WDP) are rich in dolomite, overlying areas with karst porosity, indicating a drop in lake level and prolonged periods of subaerial exposure. In turn, poorly drained paleosols (PDP) are rich in organic matter, greenish-grey colours and minerals formed under reducing conditions. Such characteristics indicate palustrine regions (backshore) under the influence of saline waters rich in Mg, where the dolomitization of carbonates occurred due to high evaporation rates. A model of Aptian landscape evolution in the Santos Basin is proposed here, incorporating both tectonic and climatic aspects. The first and fourth authors thank the Brazilian National Council for Scientific and Technological Development (CNPq) for the productivity grants (process 310734/2020–7 and 311491/2019–7, respectively.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Proxy-based reconstructions of climate extremes at high- and low-latitudes during the Cretaceous greenhouse

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The Cretaceous was a prolonged greenhouse period characterized by relatively cool early (Berriasian to Aptian) and late (Campanian to Maastrichtian) phases separated by the “Cretaceous super greenhouse” (Albian to Santonian). Extensive research has focused on the evolution of Cretaceous paleoclimate conditions; however, questions remain regarding the nature of extreme climate conditions during the Cretaceous (e.g., glacial and hyperthermal conditions). To address these questions, we employ updated, proxy-based global maps of mean annual temperature (MAT), warmest mean monthly temperature, and mean annual precipitation from nine Cretaceous time slices in order to 1) better constrain the occurrence of glacial conditions; 2) estimate maximum and minimum ice volumes and areas; and 3) describe the occurrence of excess mean annual and summer temperatures. Our preliminary analyses of proxy-based winter temperatures and three precipitation seasonality scenarios suggest that even during the coldest periods of the Cretaceous, high-latitude snowpack build-up was less than 1 meter water equivalent and no snow survived the melt season at elevations <2000 meters above sea level (masl). However, our results leave open the possibility that alpine glaciers could have accumulated at high latitudes on isolated peaks at minimum elevations ranging from 2000 masl during the Hauterivian-Barremian to 3500 masl during the Turonian. Additionally, our results suggest excess temperatures were commonplace during the summer months in the tropics during the middle Cretaceous supergreenhouse, and that MAT >35 °C may even have occurred in restricted areas. The strategies that plants employed to survive these high temperature conditions is a ripe field for future research.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Geochemical Analysis of Mid versus Low Latitude Palaeo-ecosystems of Continental Vertebrates from the North American Albian-Cenomanian Western Interior Basin

Forster, Clayton William (1); Suarez, Celina Angelica (1)

1: University of Arkansas, USA

Initiation of the transition from Early to Late Cretaceous and Cretaceous Thermal Maximum, coincided with major, global hydrologic cycle changes. Within western North America, an increased storm strength and dominance of eddy diffusion fractionation over advection-based fractionation within atmospheric processes controlled the dispersal of oxygen isotopes ($\delta^{18}O$) over the continent. The resulting pattern from this dispersal process can be observed within the $\delta^{18}O$ isotopic landscape (isoscape) of meteoric water over the North American continent during the Albian to Cenomanian Ages. As observed in the $\delta^{18}O$ isoscape, latitudinal effects have a dominant control over the dispersal pattern and subsequently of a shallow $\delta^{18}O$ gradient from equator to the poles. The favored direction of water movement was from the south near the equator northward, dispersing oxygen-^{18} along the way. Locally, we examine the effects of the climatic conditions and effects on the oxygen isotopic composition of vertebrates within low versus high latitude sites. We examined the Albian-Cenomanian vertebrate assemblages within the higher latitude upper Cloverly Formation of Wyoming and Montana and two assemblages within the low-latitude upper Antlers Formation and Woodbine Formation in Texas and Oklahoma. Within these sites and assemblages, water $\delta^{18}O$ isotopic values are calculated from the mineralic isotopic composition combined with the reconstructed latitudinal location and timing of deposition by utilizing the 'palaeoverse' package in R in conjunction with GPlates. Values predicted by the $\delta^{18}O$ isoscape as well as predicted by a derived 3rd order isotopic gradient are compared to the assemblage and site averages.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Terrestrial ecosystem response against environmental change across the Cenomanian/Turonian boundary recorded by biomarkers in sediments from the Great Valley Sequence, California, USA

Ikeda, Masashi A. (1); Sawada, Ken (1); Ando, Takuto (2); Takashima, Reishi (3); Nishi, Hiroshi (4)

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The Oceanic Anoxic Events (OAEs) caused by volcanic activity during the Cretaceous period, which was a super-greenhouse period, had a major impact on marine ecosystems. On the other hand, there has been limited research on the impact on terrestrial ecosystems (e.g. Heimhofer et al., 2018). In the present study, we analyzed biomarkers in the sediments deposited across the Cenomanian/Turonian boundary (CTB) from California, USA to reconstruct terrestrial ecosystem changes during environmental disturbance event.

We analyzed sedimentary rocks across the CTB in the Budden Canyon Formation, Great Valley Sequence (GVS), were collected from the North Fork Cottonwood Creek sections in northern California, USA. The OAE2 interval (1st build-up, Trough, 2nd build-up, Plateau, and Recovery phases) was determined by $\delta^{13}C$ and osmium isotope stratigraphy (Vivier et al., 2015). For the biomarker analysis, the extractions of crashed sediments were fractionated using silica-gel column and analyzed by GC-MS.

The aromatic terpenoid-based angiosperm/gymnosperm index (ar-AGI) values fluctuated wildly in the early stages (1st build-up to 2nd build-up), and then stabilized in the middle stage (Plateau). The Higher Plant Parameter (HPP), which indicates the contribution of conifers, increased rapidly at the last stage (Recovery phase) and remained high after OAE2. These results suggest that the abrupt climate changes caused by OAE2 had a significant impact on the terrestrial ecosystem of the western North American continental margin at that time, and that it shifted to a different environment before and after the OAE2.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Late Jurassic to Early Cretaceous Climate Changes in the Asian Interior: Environmental Magnetism and Chromaticity Records of sediment from northern Qaidam Basin, East Asia

Li, ChunYan (1,2); Dai, Shuang (1); Zhang, Zhaobin (1); Cao, Pengju (1); Ji, Tianqi (1,2); Wang, Xiaohui (1); Fang, Xinnan (1)

1: School of Earth Sciences, Lanzhou University, China; 2: College of Earth and Environmental Sciences, Lanzhou University, China

The Late Jurassic to Early Cretaceous period is a crucial stage of dramatic climatic and environmental transition in the late Mesozoic. However, our understanding for the climate pattern and its dynamics are still unclear. This contribution presents a data set of magnetostratigraphy age of 151.3 Ma -129.96 Ma for the strata (1061 meters thick) on the Hongliugou Section in the northern Qaidam Basin (East Asia), and the high-resolution environmental magnetism (χlf, χARM, χfd/HIRM, χ-T, Loop), chromaticity (L*, a*, Redness%, Hm/(Hm+Gt)) and TOC of the fluvial-lacustrine sediments along the Section. The depositional environments on the section from bottom to top are interpreted as shore-shallow lake facies, delta facies and meandering river facies, exhibiting an overall coarsening sequence upward. The variation of proxies depends on the lithology and environmental facies. This indicates their variation can be linked to the climate change. Hence the climate condition recorded by the proxies can be divided into four stages: warm and humid (151.3 Ma -147.5 Ma), hot and arid (147.5 Ma ~ 145 Ma), warm and arid (145 Ma ~ 136.4 Ma), and warm semi-arid (136.4 Ma ~ 129.96 Ma). The trends of the first to third stage are in accordance with variation of global temperature curves, and the transition from second to third stage may be linked to the Jurassic-Cretaceous boundary events. Those reveal that the climate changes in this region were influenced by global change. While the fourth phase, unlike the earlier stages, might have been affected by the paleogeomorphology in the interior Asia.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Inner-continental paleotemperature estimates based on brGDGT analyses from lignites (Aptian-Albian, Mongolia)

Stoepke, Fritz-Lukas (1); Littke, Ralf (2); Bauersachs, Thorsten (2); Wheeler, Alex (1,3); Krencker, François-Nicolas (1); Steinig, Sebastian (4); Flögel, Sascha (5); Hasegawa, Hitoshi (6); Ichinorov, Niiden (7); Heimhofer, Ulrich (1)

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The late Early Cretaceous (121.4 to 100.5 Ma) was characterized by a gradual warming trend superimposed on an already warm greenhouse climate. Whereas the evolution of ocean temperatures during this time interval is relatively well constrained, information on the climatic response of continental interiors is limited. Here we report new paleotemperature estimates based on brGDGT distributions, bacterial membrane lipids used as temperature proxy, from two different sites located within the Choir-Nyalga Basin of central Mongolia including the Shivee Ovoo (SVO) and Tevshiin Govi (TSG) opencast lignite mines. Both sites include lignite-rich continental successions assigned to the Khukhteeg Formation, well known for its exceptionally well-preserved fossil flora. The lignites from both sites exhibit low thermal maturity, as indicated by huminite reflectance, pointing to minimal post-depositional alteration. To reconstruct peat-forming conditions, we combined coal petrology and palynology, with geochemical analyses (TOC, TS, δ^{13}Corg) and brGDGT-based paleothermometry. The brGDGT analysis yielded mean annual air temperatures estimates for both sites of approximately 12 ± 3°C at SVO and 10 ± 3°C at TSG. These results represent some of the oldest brGDGT-based paleotemperatures to date and support previous estimates for relatively cool paleotemperatures in Asia during the late Early Cretaceous. The data will be compared with climate model outputs to better constrain boundary conditions for intracontinental climates during greenhouse phases.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Aptian-Albian Stable Isotope Paleotemperature Estimates From North American Continental Records

Suarez, Marina Bianca (1); Allen, Matthew (2); Weldon, Annette (1); Forster, Clayton (3); Suarez, Celina Angelica (3)

1: University of Kansas, United States of America; 2: University of Michigan, United States of America; 3: University of Arkansas, United States of America

North America contains abundant Cretaceous continental strata that hosts potential archives of paleoclimate records. While detailed work has been done in Late Cretaceous strata which not only contains archives for stable isotope proxies, but also leaf physiognomic data, less study has occurred in the Early Cretaceous which lack angiosperm-dominated floras. Here we present new paleotemperature estimates from multiple stable isotope proxies including $\delta^{18}O$ of pedogenic carbonates, clumped isotope paleothermometry, and paired stable isotopes of aquatic and semi-aquatic taxa. The southern-most data originate from the Hensel Formation of South Texas. Clumped isotope paleothermometry of pedogenic carbonates result in temperature estimates between 35°C and 42°C. Clumped isotope paleo-thermometry of lake and palustrine carbonates from the Cedar Mountain Formation range from 15°C and 31°C for lake carbonates and 20°C to 44°C for palustrine carbonates. Farther north in Wyoming, we utilize the oxygen isotope value of semi aquatic taxa such as crocodilians and turtles to provide a proxy for water and utilize the oxygen isotope value of fish scales and teeth to estimate temperature at 26°C though with significant error. Preliminary clumped isotope paleothermometry provides a temperature of 25°C. The farthest north locality, the Kootenai Formation contains lacustrine, palustrine, and pedogenic carbonates. Utilizing a previous empirically-derived latitudinal gradient of meteoric water, carbonate $\delta^{18}O$ values were used to estimate a temperature range for the Kootenai Formation between 13°C and 28°C. These values provide a temperature gradient for the Aptian-Albian over the mid latitudes of North America of ~-1°C/degree of latitude.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Wood anatomical evidence on the climate of the upper Campanian Jose Creek Member, McRae Formation

Upchurch, Garland

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Palaeobotany has long provided estimates of terrestrial climate in deep time. Most quantitative estimates come from leaf physiognomy, with wood anatomy providing more qualitative data. An exceptional wood flora from the Upper Campanian Jose Creek Member, McRae Formation (76 to >72 ma), Western Interior of North America, provides both qualitative and quantitative evidence for megathermal (tropical) temperatures and minimal seasonality at ~40 degrees paleolatitude. The wood flora comprises abundant conifers, >38 species of dicots, and 5–8 types of palms. Over 90% of the dicot species and specimens representing three major groups of conifers, show the absence of growth rings, indicating low seasonality and above-freezing Cold Month Mean Temperature (CMMT). This is corroborated by diverse palms. For dicots, patterns of vessel diameter and density are most like those of modern tropical woods from moist to wet climates. Transfer functions based on a subset of 10 anatomical traits for dicots estimate Mean Annual Temperature (MAT) of 21–28°C, CMMT of 16–24°C, abundant precipitation, and no dry season. MAT estimates fall within the range of other palaeobotanical and geochemical proxies, while moisture estimates are compatible with Jose Creek paleosols. The Jose Creek climate is most comparable to that of moist to wet, submontane to lowland tropical forest using the Holdridge system of climate classification, comparable to Af, or perhaps warm Cfa climate, in the Koeppen system.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Volcanic Drivers of East Asian Precipitation Changes During the K-Pg Mass Extinction

Yin, Yitian (1); Gu, Xue (1,2); Zhang, Laiming (1,2); Wang, Chengshan (1,2)

1: China University of Geosciences (Beijing); 2: State Key Laboratory of Geomicrobiology and Environmental Changes, China

The Deccan Traps (DT) Large Igneous Province (LIP) erupted during the Cretaceous-Paleogene (K-Pg) boundary interval (67–65 Ma), fundamentally transforming the global terrestrial environment. However, mechanisms coupling volcanic gas emissions to hydroclimatic shifts remain poorly constrained. Here, we present the first continuous high-resolution terrestrial precipitation record from East Asia (Songliao Basin), reconstructed using paleosol organic carbon isotopes ($\delta^{13}C_{SOM}$) spanning the critical DT eruptive sequence. Our results reveal three hydrologic regimes: (1) an early humid phase (66.5–66.3 Ma) coinciding with CO_2-driven equatorial Pacific warming; (2) an abrupt arid shift (66.3–66.1 Ma) aligned with sulfur-rich eruptions and enhanced basalt weathering; and (3) a post-boundary return to humid conditions (65.9-65.7 Ma) linked to CO_2-induced amplification of land-sea thermal contrasts. Pre-boundary aridity—potentially driven by combined volcanic forcing (e.g., sulfur aerosols, weathering feedbacks)—may have exacerbated ecological pressures, while post-boundary warm-humid conditions provided a foothold for forest ecosystem recovery in mid-latitude regions, as evidenced from North America. This study establishes a terrestrial hydrological framework and advances our understanding of LIP-climate linkages during the biotic upheavals.

Talk

2e - Terrestrial environments and climates in the Cretaceous

Identifying the correlation between a terrestrial geological occurrence and Oceanic Anoxic Event 2

Zhang, Xiangyu

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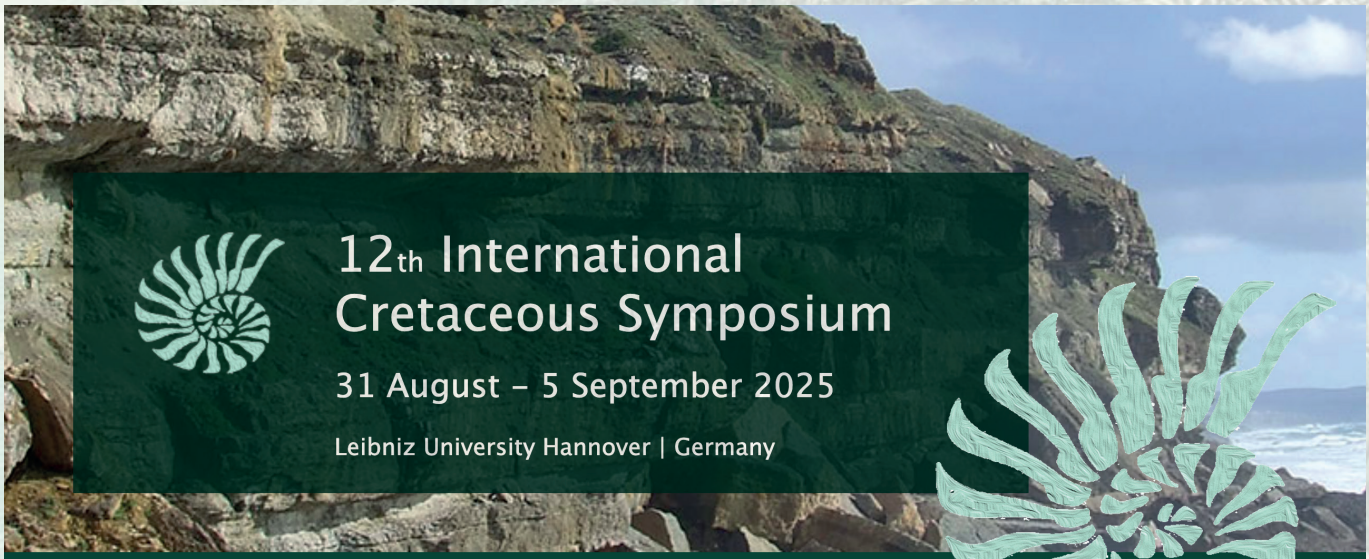
The Tianjialou Formation of the Dasheng Group, situated within the Yishu Fault Zone in East China, exhibits the development of dolomite and gypsum, which serve as records of a notable warming event. The existing K-Ar isotope ages of the andesite in the Tianjialou Formation is 95 Ma, which constrain the depositional time of the Tianjialou Formation to the Cenomanian Stage during the Late Cretaceous, hinting that the warming event documented by the dolomite and gypsum may be associated with Oceanic Anoxic Event 2 (OAE2). Carbonate carbon-oxygen isotope and organic carbon isotope analyses were further conducted, revealing that, in contrast to carbonate carbon isotopes, organic carbon isotopes can be correlated with the carbon isotope curves related to OAE2, whereas the deviation in carbonate carbon isotopes is influenced by the degree of closure of inland salt lakes. Our research reveals that terrestrial geological events can be correlated with OAE2 through the perspective of concurrent significant warmth. The global warming associated with OAE2 exerts a more prominent impact on terrestrial systems, due to the lesser thermal buffering capacity of land in comparison to the ocean. Of course, organic carbon isotope comparison is essential.



TALKS

3: Cretaceous Events

3a: Cretaceous Environmental Benchmarks: Volcanism, Oceanic Anoxia and climate change

Talk

3a - Cretaceous Environmental Benchmarks: Volcanism, Oceanic Anoxia and climate change

Beyond the KPg Impact: Volcanism as the Slow Burn Behind Sudden Extinction

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The causes of mass extinctions throughout Earth's history have long been debated, particularly regarding the relative roles of large asteroid impacts and large igneous province (LIP) volcanism. For the end-Cretaceous mass extinction, the two main candidates are the Chicxulub impact and the Deccan Traps volcanic eruptions. While the impact hypothesis is widely accepted, the precise timing and environmental impact of the Deccan eruptions have been less clear. U-Pb zircon dating now indicates that ~80% of the Deccan basalts erupted during magnetic chron C29r, starting ~250,000 years before the Cretaceous-Paleogene (KPg) boundary and continuing into the early Paleocene, suggesting a causal link. Mercury (Hg) has often been used as a volcanic proxy in marine sediments, but its reliability is limited due to post-depositional alteration and inconsistent Hg/TOC ratios. Tellurium (Te), when normalized to conservative elements like thorium (Th), may offer a more robust volcanic tracer. This study presents a high-resolution geochemical analysis of Hg and Te across several marine sections from diverse depositional settings in Europe, North Africa, the Middle East, and India. Results show a dramatic increase (over two orders of magnitude) in both Hg and Te concentrations during the final 100 kyr of the Maastrichtian, extending into the early Danian (P1a). These peaks align with major Deccan eruption pulses and support the view that volcanism played a critical role in preconditioning global ecosystems through CO_2 and SO_2 emissions, ocean acidification, and warming—thereby exacerbating the ecological collapse triggered at the KPg boundary.

Talk

3a - Cretaceous Environmental Benchmarks: Volcanism, Oceanic Anoxia and climate change

Complexes of Upper Cretaceous planktonic foraminifera on the background of volcanic activity in Georgia

Mikadze, Khatuna (1,2); Lapachishvili, Nino (1); Chkhaidze, Zviadi (1)

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The territory of Georgia, as well as the entire Caucasus region, during the Cretaceous period, was an area of intense volcanic activity parallel to sedimentation processes. During the Late Cretaceous, the southern slope of the Greater Caucasus was the northern edge of Tethys, and volcanic activity with varying intensity covered almost all geological units in Georgia and occurred under conditions of alternating stretching and compression of the Earth's crust. During the Mesozoic history of the Western Georgia, three pulses of volcanic activity are registered, appearing in the Bajocian, Tithonian–Kimmeridgian, and Late Cretaceous stages, respectively. The formation of a thick volcanic–sedimentary sequence known as the „Mtavari" formation is related to the Turonian–Santonian stage. This formation is composed by the covers and pyroclastic masses of alkaline basalts, trachyandesite, trachytes, and phonolites alternating with the units of limestones and marls. It should also be noted that the Middle Turonian-Coniacian deposits are represented by pink and red limestones and marbles (the red color is due to the presence of hematite pigment, which indicates oxidizing conditions during early diagenesis in a relatively deep-sea marine environment). An improved method of washing carbonate limestones has yielded well-preserved foraminifera shells. Based on planktonic foraminifera, the following complexes were identified: Marginotruncana schneegansi/pseudolinneiana, Marginotruncana coronata, Marginotruncana sigali - M. renzi, Concavatotruncana concavata, Contusotruncana fornicata, Globotruncana arca, Globotruncana ventricosa. Based on planktonic foraminifera, the following complexes were identified: Marginotruncana schneegans-pseudo linneana, Marginotruncana coronata, Marginotruncana sigali- Marginotruncana renzi, Concavatotruncana concavata, Contusotruncana fornicata, Globotruncana arca, Globotruncana ventricosa.

Talk

3a - Cretaceous Environmental Benchmarks: Volcanism, Oceanic Anoxia and climate change

Multi-Proxy Chemostratigraphy of the Cenomanian-Turonian Boundary (OAE2) in the Southeast Anatolian Basin (İnişdere, Türkiye): Anoxia, and Platform Drowning

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1: Turkish Petroleum Corporation, Turkey; 2: Tekfen Engineering, Turkey; 3: Fırat University, Turkey

The Southeast Anatolian Basin, a key petroleum reservoir region in Türkiye, hosts critical Upper Cenomanian–Lower Turonian carbonate sequences in the İnişdere area. This study integrates biostratigraphic and geochemical analyses of neritic-hemipelagic Cenomanian-Turonian boundary interval (CTBI) strata to refine chronostratigraphic correlations. A notable $\delta^{13}C$ excursion in the İnişdere section coincides with rising Mn/Ca and declining Ce/Ca ratios, reflecting enhanced organic carbon burial during the Oceanic Anoxic Event 2 (OAE2), linked to mass extinctions. $\delta^{18}O$) reveal paleoceanographic shifts in water column dynamics and sediment-water interface conditions, suggesting suboxic-to-anoxic transitions. Cross-plots of $\delta^{13}C$, $\delta^{18}O$, and rare earth element (REE) indicate minimal diagenetic alteration. Stratigraphic analyses—encompassing major/trace elements, REE, TOC (0.85–2.92 wt%), stable isotopes ($\delta^{13}C$, $\delta^{18}O$), and $^{87}Sr/^{86}Sr$ ratios—highlight lower Turonian organic-rich limestones formed under outer ramp anoxia. Elevated redox-sensitive elements (U, Th, V, Co, As, Cr) in black limestones underscore anoxic conditions favoring organic preservation. These geochemical trends align OAE2 with platform drowning during the CTBI. The chemostratigraphic record correlates with regional Neotethys paleoenvironmental shifts, emphasizing the basin's role in global carbon cycle perturbations. This multi-proxy approach clarifies the interplay between anoxia and platform drowning during OAE2.

Talk

3a - Cretaceous Environmental Benchmarks: Volcanism, Oceanic Anoxia and climate change

The Drowning of the El Doctor platform as a response to the Oceanic Anoxic Event 2

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The El Doctor Carbonate Platform was an isolated bank that developed in central Mexico during the Albian–Cenomanian. This study documents environmental changes associated with the drowning of this carbonate system, based on petrographic, mineralogical, and geochemical analyses from a stratigraphic section recording the transition from thick-bedded, shallow-water limestone to thin-bedded marly limestone and mudstone. The section was age constrained by foraminiferal biostratigraphy to the late Cenomanian-early Turonian. Pre-drowning facies consist of bioturbated mudstone and wackestone with mollusk fragments and miliolids, commonly exhibiting fenestral fabrics, indicative of deposition in a lagoonal-peritidal environment. Drowning facies are dominated by microbialites and intraclastic packstone with echinoderm fragments, reflecting deposition under environmentally stressed marine conditions. Post-drowning facies comprise laminated wackestone and packstone, relatively rich in organic matter and containing calcispheres, radiolarians, and planktonic foraminifera. They were accumulated in a pelagic deep-water basinal setting. The drowning of the platform was driven by an increased influx of terrigenous material, triggered by both the switch towards more warm and humid climate conditions and the effects of the Laramide orogeny in central Mexico. Additionally, a change to more eutrophic surface waters and oxygen-depleted bottom conditions contributed to the platform demise. These processes occurred during the Oceanic Anoxic Event 2 (OAE 2), as evidenced by a pronounced positive carbon isotope excursion throughout the section.

Talk

3a - Cretaceous Environmental Benchmarks: Volcanism, Oceanic Anoxia and climate change

Possible record of the end-Cretaceous tsunami passage in the epicontinental Europe – case study from the Nasiłów (Poland)

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The Greensand at Nasiłów (Poland) is a unique glauconite-quartz-sand unit topped by a phosphatic layer. It represents the most unusual sedimentological unit across the Cretaceous–Paleogene (K–Pg) boundary in the region. This c. 40 cm-thick bed, enclosed between Maastrichtian and Danian carbonates, contains reworked micro- and macrofossils, including belemnite rostra, other molluscs' shells and spongy phosphatic fragments. New foraminiferal and dinoflagellate cyst biostratigraphic data, in addition to paleomagnetic data, show that the boundary interval at Nasiłów is nearly complete.

Sedimentologically, Greensand displays an erosive base, chaotic grading, and exotic quartz pebbles up to 3 cm in size. Other sedimentological and taphonomic features, such as the orientation of belemnite rostra and other shells, in addition to specific preservation of certain fossils, when combined, cannot be explained by ordinary sedimentary processes.

All these characteristics indicate a high-energy environment and that the Greensand might represent a tsunami deposit triggered by the Chicxulub impact at the K-Pg boundary. This extraordinary tsunami likely crossed the Atlantic Ocean, reworked the uppermost Maastrichtian sediments in the epicontinental European sea and deposited them as clastic remixed deposits represented by Greensand in Nasiłów.

This study demonstrates that impact-generated tsunamis might have played an important role in shaping K–Pg sections around the Atlantic and likely beyond. The widespread hiatal character of many K–Pg sites, including deep-ocean records, may thus be attributed to this mega-tsunami. Consequently, tsunami-related processes should be considered in future sedimentological interpretations of the K–Pg boundary worldwide, from shallow marine to abyssal environments.

Talk

3a - Cretaceous Environmental Benchmarks: Volcanism, Oceanic Anoxia and climate change

Origin and thermal maturity of the organic matter in the Cenomanian–Turonian Eagle Ford Formation in northeastern Mexico

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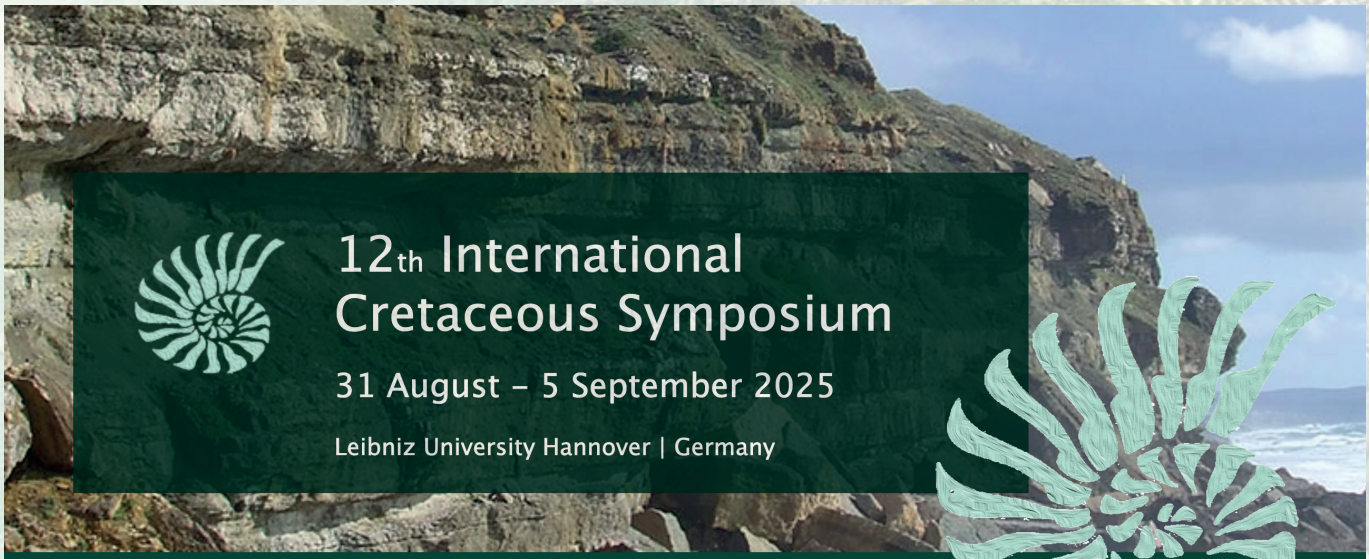
Deposited during the Late Cretaceous in the southern part of the Western Interior Seaway and the northeastern portion of the Mexican Interior Basin, the Eagle Ford Formation is one of the most prolific hydrocarbon source rocks in the world due to its high organic matter content. Recently, the IRME-1 core from a drill site in the Sabinas basin recovered a complete succession of this unit. This study aims to analyze the organic matter in this core to evaluate its origin and thermal maturity. The analytical techniques employed, which are typically applied independently, were combined in a multiproxy approach that included petrographic (palynofacies analysis, spore coloration index-SCI, vitrinite equivalent reflectance-%RoEq) and geochemical (Rock-Eval pyrolysis, biomarkers) proxies. The terrigenous-to-aquatic ratio (TAR) and odd-even preference (OEP) suggest that the organic matter is predominantly of marine origin. These results are consistent with the hydrogen and oxygen indexes, and palynofacies analysis, which classify the kerogen as type II-III (predominance of Amorphous Organic Matter, accompanied by a moderate content of degraded non-biostructured phytoclasts and a very low proportion of opaque phytoclasts). As for the thermal maturity indicators, significant variability is observed. The Rock-Eval Tmax parameter (362–449°C) suggests an immature to early mature stage. However, the remaining indicators (%RoEq: 1.40-1.83; %VRm: 1.42–1.77, calculated as 0.2633×LnMDR; SCI: 8–10), consistently point to advanced thermal maturity (overmature). This variability highlights the importance of integrated studies that compare multiple techniques, which enable a more accurate characterization of the organic matter.



12th International Cretaceous Symposium

31 August – 5 September 2025

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TALKS

3: Cretaceous Events

3b: Cretaceous oceanic anoxic events

Talk

3b - Cretaceous Oceanic Anoxic Events

Early Cretaceous Oceanic Anoxic Events (OAEs) in Peri-Tethyan shallow-water carbonate systems: Evidence from the Latium-Abruzzi Carbonate Platform (Ernici Mts, Central Italy)

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While the effects of OAEs are well known for the pelagic successions of the Tethys Ocean, little is known about their impact on the Peri-Tethyan shallow-water carbonate systems. We present the preliminary results of a study related to the realisation of the Geological Map of Italy (CARG Project), focussed on the identification and description of the perturbation induced in the Lower Cretaceous shallow-water carbonate succession of the Latium-Abruzzi Carbonate Platform by the well-known Early Cretaceous OAEs. Two stratigraphic sections were studied in the Ernici Mts. (central Apennines, Italy) "calcari ciclotemici a gasteropodi" fm. (CCG - Berriasian p.p. - lower Aptian p.p.). A layer of black dolostone, about ten centimetres thick, has been observed in several outcrops of the dolomitic lithofacies (CCGa) of CCG. SEM images, along with EDS and WDS analysis indicated the presence of siderite and pyrite aggregates starting from the basal part of the blackish dolostone and gently decrease towards the upper part of the study interval. TOC and sulphates show similar trends. In situ analyses using the LA-ICP-MS facility at Roma Tre University shows a significant increase in elemental concentration of redox-sensitive elements as well as in the Fe/Al ratio in the blackish dolostones. Biostratigraphic calibration performed on the collected samples has established a Hauterivian p.p. age. A preliminary attempt for U-Pb dating of the CCGa black dolostone was carried out through LA-ICP-MS investigations providing a lower intercept age of 125.7± 1.8 Ma. These promising results suggest that the perturbations were induced by the Faraoni OAE.

Talk

3b - Cretaceous Oceanic Anoxic Events

Cretaceous Sea Surface Temperature Reconstruction in the Eastern Tethyan Realm

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The scarcity of reliable sea surface temperature (SST) records from the eastern Tethys during the Cretaceous is a critical knowledge gap in paleoclimate studies. Cretaceous shallow marine sequences in the Tibetan Himalaya offer exceptional archives for reconstructing Tethyan SSTs. However, conventional paleothermometers – particularly carbonate oxygen isotope systems – suffer substantial diagenetic overprinting associated with Himalayan orogenesis. This study presents oxygen isotope values of bioapatite to estimate the SST during the Albian-early Campanian in the Tibetan Himalaya. Nineteen limestone samples were collected from the Albian-early Campanian in Nirang section and processed to obtain fish remains. In-situ oxygen isotope measurements were conducted using secondary ion mass spectrometry (SIMS), and elemental compositions were analyzed with SEM-EDS and LA-ICP-MS. Results show that fish teeth are composed mainly of bioapatite, with some samples partially replaced by silicon-bearing minerals. Oxygen isotope values ($\delta^{18}O$) of better preserved fish teeth indicate an average SST ranging from ~21°C to ~32°C (averaging 26.3°C ± 2.4°C). The SST evolution through time reveals a cooler climate during the Albian, with a warming trend through the Cenomanian to early Coniacian, followed by a rapid cooling in the early Campanian. This trend is consistence with previously published TEX86 data compilation, confirming that southeastern Tethyan SST variations predominantly tracked global climatic forcings.

Talk

3b - Cretaceous Oceanic Anoxic Events

Quantifying the pattern of organic carbon burial through Cretaceous Oceanic Anoxic Event 2

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The Cenomanian-Turonian Oceanic Anoxic Event 2 (OAE 2, ca. 94 Ma) is characterized by a marked positive carbon isotope excursion (CIE), linked to increased organic carbon (OC) burial driven by high productivity and widespread deoxygenation. To date, however, the precise pattern of changes in the burial rate of organic matter has not been well constrained. In this work, we present a compilation of data from 42 globally distributed OAE 2 sites, as well as organic carbon isotope ($^{13}C_{org}$), total organic carbon (TOC), and trace element concentration data from a new OAE 2 interval in southern Tibet, China. In southern Tibet, the absence of redox-sensitive trace element enrichment through OAE 2 indicates prevailing oxic conditions. Organic carbon (OC) mass accumulation rate (MAR) at this site decreased from the lower part of the CIE to the upper part, in contrast to an approximate doubling of organic carbon MAR in the upper part observed globally. This result, coupled with detailed analysis of the compilation, shows that redox was a key factor controlling organic burial rates during OAE 2, with OC MAR scaling positively with increasing deoxygenation. Leveraging a biogeochemical model to simulate these data suggets that 5-20% of the seafloor became anoxic during OAE 2, and that this deoxygenation was accompanied by 100% to 200% increase in global seawater P concentration. Our findings indicate that during OAE 2, elevated nutrient levels may have resulted from enhanced recycling from sediments under reducing conditions, sustaining intensified primary production and subsequent organic carbon export and burial.

Talk

3b - Cretaceous Oceanic Anoxic Events

Iron isotope signatures of hydrothermally sourced nutrients that triggered Oceanic Anoxic Event 2

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Oceanic Anoxic Event 2 (OAE2, ~94 Ma) occurred near the Cenomanian-Turonian boundary and marks a major perturbation to global marine environment in the middle Cretaceous. Increased nutrient input into oceans are thought to have stimulated primary productivity and triggered OAE2. Both large igneous province (LIP) – related submarine volcanism and enhanced continental weathering can deliver abundant trace elements including iron in oceans. Because iron is micro-nutrient and its isotopes can fingerprint these processes across OAE2, here we present a high-resolution whole-rock Fe isotope record (δ^{56}FeT) and FeT/Al data of Gongzha section in southern Tibet, an OAE2 reference section in eastern Tethys where redox states and detrital inputs were stable, to investigate the relative roles of enhanced submarine volcanism and continental weathering in triggering OAE2. The iron isotope results show three notable negative shifts at ~94.8 Ma, ~94.5 Ma, and ~94.3 Ma corresponding well to episodes of intensified volcanism as documented by the osmium isotope data indicative of hydrothermally sourced iron inputs. In particular, the most prominent negative δ^{56}FeT shift by ~0.4‰ occurred at the onset of OAE2 around 94.5 Ma and was followed by a prolonged positive δ^{56}FeT excursion coeval with the positive δ^{13}C shift of OAE2 in the persistent presence of hydrothermally sourced iron. Similar δ^{56}FeT variation patterns occur in other OAE2 sections worldwide, implying LIP-related submarine volcanism as the driving force for initiating OAE2. Enhanced continental weathering in the middle Cretaceous may have played an increasingly important role in terminating OAE2.

Talk

3b - Cretaceous Oceanic Anoxic Events

The Anoxic Event of the Albian-Cenomanian Boundary Interval in the Tethyan Realm

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A carbon cycle disturbance occurred in the mid Cretaceous, within the upper Albian-lower Cenomanian interval, described as the Albian-Cenomanian Boundary Event (ACBE). This anoxic event is seen as a global one, being identified in both Tethyan and Boreal realms. For pointing out changes related to the ACBE, we investigated two successions of the Tethyan Realm: (i) Lepşa section, Eastern Carpathians, placed at 34°N palaeolatitude during mid Cretaceous times and (ii) Youxia section, S Tibet, situated at 21°S palaeolatitude. Both successions contain nannofossil events characterizing the Albian-Cenomanian Boundary Interval, i.e., the successive LO (last occurrence) of Crucicribrum anglicum and Hayesites albiensis, followed by the successive FO (first occurrence) of Gartnerago chiasta, Calculites anfractus, and Corollithion kennedyi, spanning the UC0 and UC1 zones. In the Youxia section, a few nannofossils confined to high palaeolatitudes were identified in the UC0a subzone. In both sections four successive peaks (A, B, C and D) of $\delta^{13}C$ isotope were observed, where A, B, and C are late Albian in age and peak C is early Cenomanian. The boundary between the Albian and Cenomanian falls, as globally identified, between peaks C and D, just above the FO of Calculites anfractus. Additionally, the lower part of Youxia section (UC0a subzone) shows increased values of $\delta^{18}O$, accompanied by increased productivity of the nannofossils, possibly linked to temperature decrease in the surface waters. These changes might reflect ocean circulation modifications in the Southern Hemisphere, resulting from the enhanced connection among different oceanic basins during the mid Cretaceous times.

Talk

3b - Cretaceous Oceanic Anoxic Events

Calcareous nannofossil paleoceanography across Oceanic Anoxic Event 3: From local to global perturbations

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The Coniacian-Santonian is the time of deposition youngest Cretaceous episode of anoxia namely the oceanic anoxic event 3 (OAE3). The OAE3 was confined to the equatorial Atlantic Ocean and adjacent basins rather than being global in scale.

We focused on nannofossil paleoceanography of the late Turonian to early Campanian time interval and applied quantitative analyses to assess the response of calcareous nannoplankton to paleoenvironmental changes across OAE3. The study was conducted on sites from the Deep Sea Drilling Project (DSDP) and Ocean Drilling Program (ODP) situated in the Atlantic Ocean and the Indian Ocean.

A detailed, revised, and high-resolution nannofossil biostratigraphy of the selected sites enabled correlations at a supra-regional scale. Quantitative analyses allowed us to characterize paleotemperature and nutrient changes before, during, and after OAE3.

We identified relatively large fluctuations in abundance (“acmes”) of the genera Micula and Marthasterites, across OAE3. The onset of OAE3 coincides with a major increase in abundance (and local dominance) of M. furcatus, suggesting the rapid establishment of new and peculiar paleoceanographic conditions at a widespread to global scale. The most altered paleoceanographic conditions occurred during the core of OAE3 as characterized by the synchronous maximum abundance (climax) of M.staurophora on a global scale. In addition to their value for paleoenvironmental reconstructions, the Micula and Marthasterites “acmes” are useful for the biostratigraphic characterization of the Turonian/Coniacian, Coniacian/Santonian, and Santonian/Campanian boundaries and might be introduced as additional events in future nannofossil zonations for the Late Cretaceous. This research was funded through MUR for ECORD-IODP Italia.

Talk

3b - Cretaceous Oceanic Anoxic Events

Carbonate and organic carbon production at the OAE2 on SE Newfoundland Ridge

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Since the Permian/Triassic boundary, significant atmospheric and oceanic carbon cycle perturbations repeatedly occurred in the Mesozoic. One well-documented perturbation is Oceanic Anoxic Event 2, which occurred at the Cenomanian/Turonian boundary. Integrated Ocean Drilling Program, Expedition 342 recovered a relatively expanded Cretaceous sequence, including the Cenomanian/Turonian boundary interval in the northwestern Atlantic, off Newfoundland. We examined planktic foraminiferal assemblages, planktic foraminiferal mass accumulation rate (PFAR), and organic carbon isotope stratigraphy across the Cenomanian/Turonian boundary sequence from Site U1407. At around 269 mCCSF. a distinctive and typical organic carbon isotope excursion is identified within an approximately 40 cm-thick black shale layer. The development of this black shale indicates that the subsurface and/or deep-water column became anoxic in this interval. On the other hand, the coarse fraction and planktic foraminiferal accumulation rates began to decrease at 270 mCCSF and returned to the pre-event level at approximately 267 mCCSF. The carbonate production rate was depressed for a 3 m-thick interval, which is significantly thicker/longer than the thickness of the black shale. If we assume that the decline in PFAR represents surface-ocean acidification, this acidification, hence an increase in pCO_2, started significantly earlier than the observed water-column anoxia.

Talk

3b - Cretaceous Oceanic Anoxic Events

Resilience and extinction of calcareous plankton and shallow-water benthic biocalcifiers across the Late Cretaceous Oceanic Anoxic Event 2

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Oceanic Anoxic Event 2 (OAE 2) across the Cenomanian/Turonian boundary (93.9 Ma) is characterized by a synchronous positive $\delta^{13}C$ excursion in both carbonates and organic matter that likely resulted from burial of large amounts of organic carbon in deep-sea and hemipelagic settings. According to several studies, causes for OAE 2 are massive submarine volcanic activity that emitted greenhouse gases and provided biolimiting metals in marine ecosystems, leading to the onset of the Cenomanian-Turonian Thermal Maximum and to the enhancement of ocean fertility. Ocean temperature, sea-surface stratification, nutrient availability, carbonate ion saturation and continental weathering were subject to significant variations during OAE 2 that resulted in fluctuations in diversity, abundance and calcification of marine species.

We analysed the record of the main biocalcifiers of pelagic-hemipelagic settings (planktonic foraminifera and calcareous nannofossils) and of low-latitude carbonate platforms (larger benthic foraminifera and rudist bivalves) by looking at well-dated sections. Using carbon isotope stratigraphy, we performed precise correlation from shallow to deep water and tied the biotic response to the record of geochemical proxies of paleoenvironmental changes. The main extinction event, severely affecting the shallow-water benthic biocalcifiers and to a minor extent the calcareous plankton, occurred within the so-called Plenus Cold Event. High surface seawater temperature and extreme fluctuations over geologically short time intervals were probably the main cause of extinction, with concurrent contributions from decreased seawater carbonate saturation and disruption of ocean stratification. Overall, calcareous plankton fared much better, showing a greater resilience than carbonate-platform biocalcifiers to paleoenvironmental perturbations across the OAE 2.

Talk

3b - Cretaceous Oceanic Anoxic Events

Mid-Cenomanian Event recorded by sedimentological, geochemical, and biotical proxies in the Eastern Carpathians

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This study provides data from a 15-meter-thick section located within the outermost thrust sheet of the Eastern Carpathians. The lower part contains deep-sea black shales, silts, and black radiolarites, whereas the upper section consists of cm-thick radiolarites-green shale couplets, and rarely, thin sandstones, clastic radiolarites and black shales. Based on calcareous nannofossil biostratigraphy, the analyzed sequence corresponds to the UC3 and UC4a zones/subzones. The succession of the nannofossil event is the LO (last occurrence) of Gartnerago theta (base of the UC3b subzone), followed by the LO of Staurolithes gausorhethium (base of the UC3c) and the LO of Corollithion kennedyi (base of UC3d). The youngest event recorded in the studied succession is the FO (first occurrence) of Cylindralithus biarcus which marks the base of the UC4 biozone. As Lithraphidites acutus and Cretarhabdus striatus are present from the base to the top of the succession, we consider that the youngest nannofossil subzone is UC4a.In the base of the sequence, two peaks of the isotope $\delta^{13}C_{org}$ were identified: i) the oldest reaches the value of -23.7‰, being accompanied by the highest values of TOC (total organic carbon) in the studied section (5.9%), and (ii) the youngest, up to -23.9‰, keeping high TOC values, i.e., up to 1.8%. These peaks, positioned in the UC3a nannofossil zone, likely represent the distinct characteristics of the Mid-Cenomanian Event (MCE), with the oldest significant positive excursion attributed to MCE Ia while the youngest to MCE Ib.

Talk

3b - Cretaceous Oceanic Anoxic Events

Palynostratigraphical characterization of the Marne a Fucoidi Formation from the Umbria-Marche Basin (Northern Apennines, Italy).

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The Early Cretaceous of the Umbria-Marche Basin is marked by three Oceanic Anoxic Events (OAEs) within the Marne a Fucoidi Formation, which is composed of multicolour marlstones and marly limestones interbedded with organic-rich black shale layers. These events are associated to the development of anoxic conditions at the sea floor. Some of these occurred on a global scale—such as the early Aptian OAE1a—while others were regional, such as the early Albian OAE1b. In the present study, the microfloristic content from the Fiume Bosso, Roccaccia, and Bottaccione sections was analysed for the first time, along with data from the Poggio le Guaine section. The palynological assemblage of OAE1b is characterized by sporomorphs as Cyathidites spp. and Afropollis spp., and dinocysts as Florentinia mantellii. The dinoflagellate cyst species Litosphaeridium conispinum was recorded in all studied sections. Its first occurrence marks the late Albian in the Tethyan domain. The occurrence of Elaterosporites klaszii and E. verrucatus—typical of the Albian to Cenomanian—was also recorded. These taxa were found in association with L. conispinum in the Fiume Bosso section, and below its first occurrence in the Bottaccione section. The distribution of dinoflagellate cysts provides valuable insights into the palaeobiogeographic dynamics of the Tethyan realm during the Early Cretaceous, highlighting patterns of ecological response to regional and global anoxic events and reinforcing their utility as biostratigraphical and palaeoenvironmental markers.

Talk

3b - Cretaceous Oceanic Anoxic Events

Polycyclic aromatic hydrocarbon evidence for increased wildfire frequency during Cretaceous OAE 2

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Intensified frequency and scale of wildfires due to global warming has been increasingly recorded in recent years. Studies of wildfire activity during deep time greenhouse climate states are crucial for evaluating their likely impacts on the global environment and ecosystems in the future. Oceanic anoxic event 2 (OAE 2), which was characterized by extremely high global temperature and a reduced equator-pole temperature gradient, could provide insights into our understanding of present-day global change processes. Here we provide data on polycyclic aromatic hydrocarbon (PAH) abundance from the Qiangdong section in the Tethyan Himalaya of southern Tibet to investigate wildfire behavior and its impact on the environment during OAE 2. Our results indicate a significant increase in the frequency of wildfires during the early part of OAE 2, followed by a rapid weakening. The change of PAH composition through OAE 2 in Qiangdong shares a similar trend to that previously found in the Western Interior Seaway, indicating potentially globally elevated wildfire frequency during the early part of OAE 2. We also document a rapid increase in chemical index of alteration values in Qiangdong. These data, coupled with other proxies for weathering intensity through OAE 2, suggest that increased weathering during OAE 2 can be attributed at least in part to the effects of vegetation loss caused by wildfire. As such, we suggest that frequent wildfires during OAE 2 promoted the flux of nutrients to the oceans, thereby stimulating productivity that, in turn, increased the area of oceanic anoxia and organic carbon burial.

Talk

3b - Cretaceous Oceanic Anoxic Events

Cretaceous Oceanic Anoxic Events in Turkey

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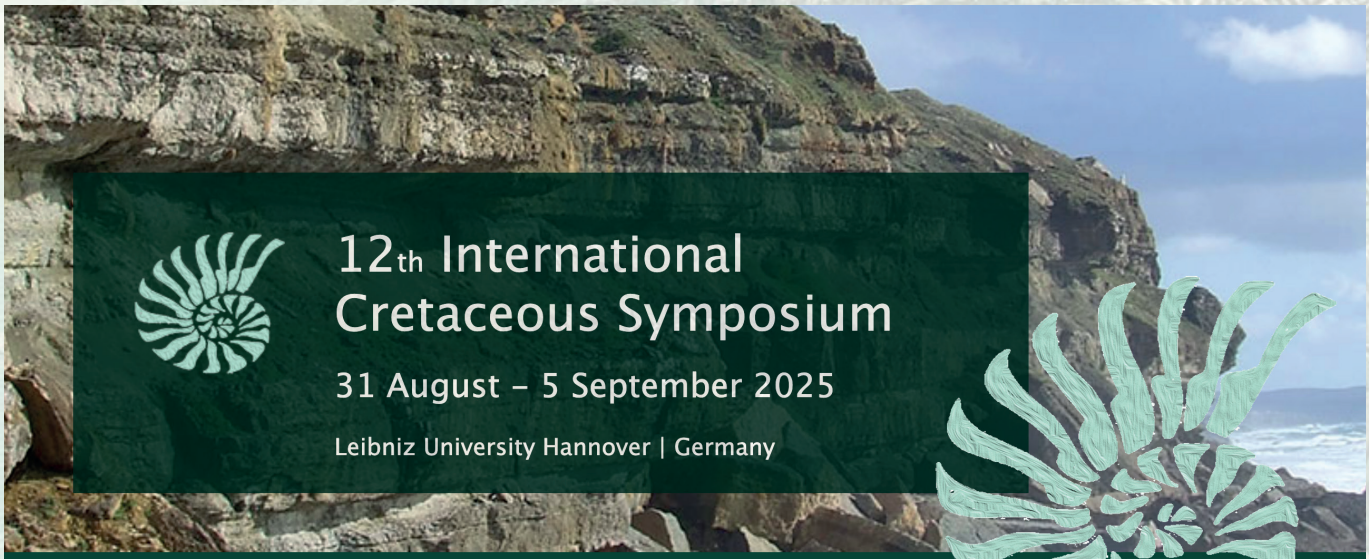
Middle East Technical University, Turkiye

Mudurnu-Göynük basin, Central Pontides (NW Turkey) and Central Taurides (S Turkey) and Arabian Platform include records of Cretaceous oceanic anoxic events in Mid-Barremian, Aptian, Albian, Cenomanian-Turonian, Campanian intervals of the Cretaceous successions as presence of black shale intervals and or their representatives respectively.

The Mid-Barremian black shales (MBE) have been recorded within pelagic succession in central Sakarya zone of Pontides after the drowning of the platform. The carbon isotope curve displays a 2 ‰ shifts. Eu, Ce, V, Cu, Zn, Fe, Ba, P, and S values display a relative enrichment. The Aptian black shales (OAE1a) are recorded in pelagic carbonates in central and north of Sakarya zone negative carbon shift of 2 ‰, and TOC around 2%. In Sakarya zone of Pontides, OAE2 is recorded in pelagic carbonates with more than 1 ‰ carbon positive shift and >2 % TOC. This interval is relatively rich in S, Mo, Ba, Cd, Ni, V, Zn, Pb, Cr, Co. Another OAE2 wasrecorded in Antalya Nappes of Taurides without carbon isotope curve but TOC >20%.

Mid-Late Campanian OAE is recorded in Pontides and Arabian Platform. It displays relative enrichment of S, Mo, Cd, Fe, Ni, V, Zn, Cr, Co, U.

The OAE1a and OAE2 levels recorded in Turkey are correlated with European examples controlled by sealevel and tectonics in large-scale and climate and oceanographic changes in small-scale. The most extensive OAE records in Turkey belong to OAE1a and OAE2, and display potential for source rocks for hydrocarbon and sedimentary strategic element exploration.



TALKS

3: Cretaceous Events

3c: Cretaceous environmental perturbations: paleoecology, paleoceanography and geochemistry

Talk

3c - Cretaceous environmental perturbations: paleoecology, paleoceanography and geochemistry

Late Aptian climate change and evidence for the Equatorial Humid Belt in Tunisia

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A comprehensive sedimentological and sequence stratigraphic study in Tunisia provides robust evidence for a significant climatic shift in the early late Aptian, expressed by a sharp facies change from a carbonate and evaporite dominated system, to shallow marine siliciclastics rich in plant material. It coincides with a high magnitude sea-level drop of about 60m, observed in Tunisia and other locations around the NeoTethys.

Based on over 20 wells and 10 outcrop sections, this study offers a well-constrained Aptian sequence stratigraphic framework along the southern Tethys margin. Two large scale sequences are defined, the first one covers the early and early late Aptian, and is dominated by marine and tidal-influenced carbonates, marls and gypsum, deposited under arid conditions. The second sequence is of late Aptian/earlies Albian age and is dominated by siliciclastic deposits. It comprises a lowstand wedge of sands and ooliths, during the transgression an incised valley system was backfilled with large-scale crossbedded tidal deposits, and in the shallow marin domain prograding deltaic sediments are remarkably enriched in plant material (leaf and wood fragments). In the most proximal settings mamal and dinosaur fossil remains were found. The climate at this time is interpreted as humid.

The wider implication of these results are that the Equatorial Humid Belt extended into Tunisia, and that this occurred during the late Aptian, instead of during the Albian. This timing corroborates recent work from Brazil, and may have its bearings on the understanding of the conditions that triggered the rise of the angiosperms.

Talk

3c - Cretaceous environmental perturbations: paleoecology, paleoceanography and geochemistry

Long-term variations in palaeoenvironmental conditions during the Late Aptian–Late Cenomanian in the western Tethys: Insights from the Umbria-Marche Basin (central Italy)

Gambacorta, Gabriele (1); Böning, Philipp (2); Bottini, Cinzia (3); Brumsack, Hans-Jürgen (2); Erba, Elisabetta (3)

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We present a high-resolution record of long-term changes in detrital input, chemical weathering, freshwater influx, and palaeoproductivity across the late Aptian to late Cenomanian (~25 Myr), based on quantitative elemental data from the Umbria-Marche Basin (central Italy, western Tethys). This interval captures a major environmental transition, from multicolored marlstone and black shale-dominated sediments of the Marne a Fucoidi Formation to the widespread chalk deposition of the Scaglia Bianca Formation.

During the late Aptian "cold snap" surface water were oligotrophic and stratified while bottom waters were oxygenated although subject to cyclic redox shifts evidenced by the deposition of reddish and greenish marlstones and marly limestones. The Aptian cooling was followed by significant warming across the Aptian-Albian boundary characterized by a dissolution phase and the onset of seafloor deoxygenation cycles that persisted throughout most of the Albian. The early–middle Albian was characterized by intensified weathering and nutrient supply supporting meso–eutrophic conditions and favoring black shale deposition under stratified surface waters. A major shift occurred in the late Albian, with the onset of stable arid conditions that reduced runoff and chemical weathering associated to oligotrophic surface waters and a stable thermocline that persisted until the onset of Oceanic Anoxic Event 2 in the latest Cenomanian.

Geochemical data confirm a shift from an unstable palaeoclimatic/palaeoceanographic mode in the Aptian-Albian to stable circulation in the late Albian-Cenomanian. The Western Tethys recorded large-scale climatic-oceanic changes, but its peculiar palaeogeographic position also allowed recording regional variations in weathering/runoff, productivity, and redox conditions at the seafloor.

Talk

3c - Cretaceous environmental perturbations: paleoecology, paleoceanography and geochemistry

Escalating environmental instability exacerbated the end-Cretaceous ecosystem collapse

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The ultimate cause of the end-Cretaceous mass extinction remains debated. While multiple environmental disturbances are recognized, their cumulative effects on environmental instability and species turnover remain unclear. Here, we reconstruct a quantitative record of global environmental variability (EV) across the Cretaceous-Paleogene transition by compiling multi-proxy paleoclimate data, including records of temperature, oxygen isotopes, carbon isotopes, atmospheric pCO_2, and chemical weathering from 31 globally distributed sites, spanning 69-63 Ma. Our analysis reveals a significant increase in EV starting at 66.9 Ma, followed by two distinct phases of escalation. The second phase, coinciding with the onset of Deccan Traps volcanism, peaks around 60 kyr before the Cretaceous-Paleogene boundary, aligning with the maximum eruption rate. By integrating these EV trends with global elasmobranchs and bivalve fossil records, we find a significant positive correlation between species extinction rates and EV. We conclude that the rapid escalation of environmental instability, primarily driven by Deccan volcanism, played a critical role in exacerbating the end-Cretaceous extinction.

Talk

3c - Cretaceous environmental perturbations: paleoecology, paleoceanography and geochemistry

Biotic and environmental perturbations during the OAE 1a in the Southern Iberian Palaeomargin (western Tethys): Insights from organic and inorganic proxies

Sequero, Cristina (1); Castro, José Manuel (2); De Gea, Ginés A. (2); Quijano, María Luisa (2); Froehner, Sandro (3); Naafs, David (4); Pancost, Richard (4); Ruiz-Ortiz, Pedro Alejandro (2)

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The early Aptian Oceanic Anoxic Event (OAE 1a) represents one of the most important hyperthermal episodes in Earth's history, associated with a massive light-carbon input from volcanogenic (Ontong-Java Plateau) and/or methanogenic sources. Its onset is marked by a disruption of the global carbon cycle, expressed as a pronounced negative carbon isotope excursion. This event is associated with global temperature increase, anoxia in ocean bottom waters, and widespread deposition of organic-rich sediments. Complex biotic and environmental perturbations are associated to this event, with their global expression being influenced by local factors.

In this study, we investigate the biotic and environmental perturbations associated with the OAE 1a in three sections from the Southern Iberian Palaeomargin (western Tethys): La Frontera, Carbonero and Cau sections, by the combination of biomarker analysis, elemental geochemistry, and total organic carbon (TOC) measurements. These sections comprise hemipelagic (Cau) and pelagic (Carbonero and La Frontera) sediments. We present high-resolution C-isotope records, used as a basis for a precise stratigraphic correlation (C-isotope segments C2/Ap2 to C7/Ap7).

Our results highlight that major biotic and environmental perturbations took place during segment C4/Ap4, marked by changes in both organic and inorganic proxies across all three sections. This coincides with widespread deposition of organic-rich sediments in all major ocean basins. Other episodes of environmental and biotic perturbations occurred at the top of segment C2/Ap2 and at the C5/Ap5-C6/Ap6 transition, though these are not recorded in all sections. The variable expression of the OAE 1a effects can be related with differences in local palaeogeographic conditions.

Talk

3c - Cretaceous environmental perturbations: paleoecology, paleoceanography and geochemistry

Paleoceanographic control on the spatiotemporal distribution and extinction of the Late Jurassic – Early Cretaceous pygopide brachiopods

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Pygopide brachiopods – Antinomia, Pygope, and Pygites – were sessile benthic organisms with different paleobiogeographic origins, and from their first occurrence in the late Oxfordian until their final demise in the late Barremian, they were an emblematic group of Tethyan fossils. Their quick diversification during the early Tithonian is linked to their successful adaptation to limited food supply in the colonized thalassobathyal environment, that turned out disadvantageous in abundant food supply. They coudn't inhabitate low oxygenated water masses, and they might be able to proceed long–distance dispersal only during their larval stage. Stepwise assemblage changes, migration patterns and extinction of Pygopides can be linked to intervals of environmental perturbations with dysoxic conditions, and controlled by the paleocurrent systems and sea level changes. The Weissert Event was a turning point: Antinomia got extinct, Pygites invaded new territorries, while Pygope was withdrawn from the Tethys and only documented from East Greenland. After a prolonged 2-5My lag, Pygope re-appeared in the Tethys as a Lazarus taxon. Our results further support the northward migration of Tethyan assemblages during the Berriasian–early Valanginian, but after the early late Valanginian, southbound dispersal from the north Boreal was not straightforward. It might be possible via the proto–North Atlantic and the Polish Trough as well, therefore a complete oceanic circulation cell could have existed between the western Tethys–Boreal–Arctic–Laurasian continental shelf regions. The middle Valangianian and middle Hauterivian transgression facilitated the backward dispersal of pygopides. Irrevocable extinction of pygopide brachiopods is linked to the latest Barremian–early Aptian global environmental perturbations.

Talk

3c - Cretaceous environmental perturbations: paleoecology, paleoceanography and geochemistry

Size response of Eprolithus floralis to Oceanic Anoxic Event 2 (Cenomanian-Turonian, Late Cretaceous)

Tungo, Edna de Jesus Francisco (1); Erba, Elisabetta (2); Fauth, Gerson (1); Bottini, Cinzia (2)

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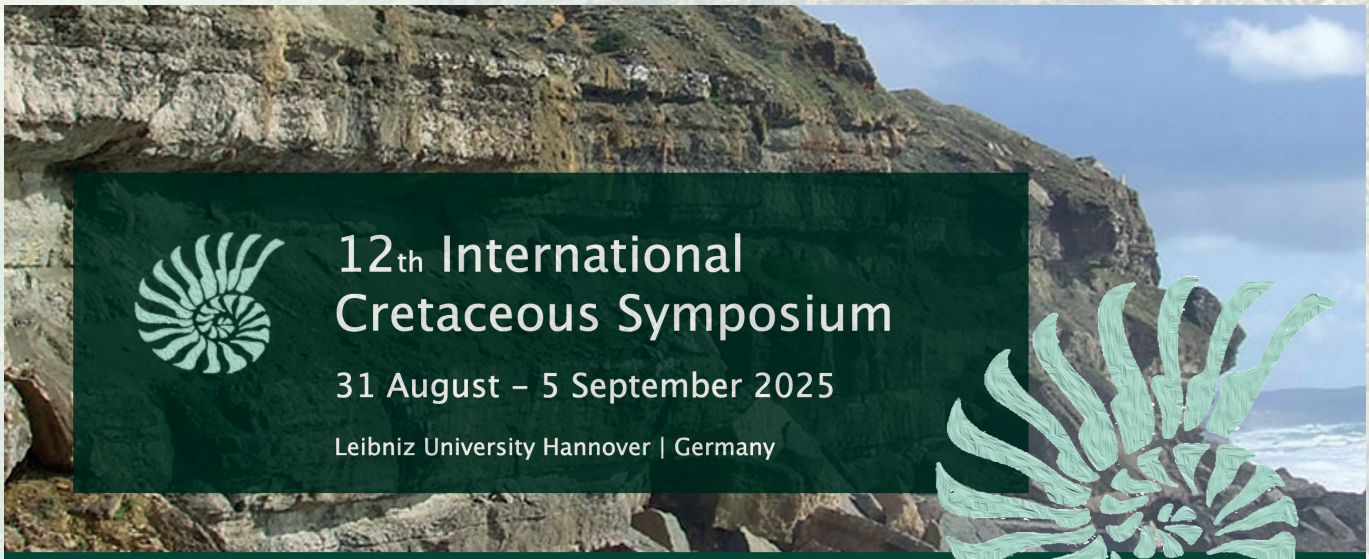
The Oceanic Anoxic Event 2 (OAE 2; ~94 Ma) was driven by volcanic activity, triggering global warming and ocean chemistry changes. Here, we focus on Eprolithus floralis size to improve our understanding of OAE 2’s impact on nannoplankton. Unlike previously studied coccolith taxa (Biscutum constans, Discorhabdus ignotus, Zeugrhabdotus erectus, Watznaueria barnesiae) linked to fertility changes, E. floralis is a heavily calcified nannolith associated with cooler waters. We measured total and inner diameters, and the diaphragm, on Eastbourne (UK), Clot Chevalier (France), and Novara di Sicilia (Italy) for morphometry.

Results show that E. floralis experienced size variations across OAE 2, with consistent patterns at all sites: total and inner diameters started to decrease just before the event, reaching minima values around peak B, followed by recovery. In contrast, diaphragm size increased during OAE 2 and decreased afterward. Two E. floralis morphotypes were identified: spiky and rounded. The rounded, on average smaller than the spiky one, dominates during OAE 2 (>80%), and strongly influencing average size. The main size trends of E. floralis partly mirror those of other coccoliths, with all species showing reduced sizes during OAE 2 and minima around peak B. Size reduction and subsequent recovery align with volcanism onset and end, with no clear link to temperature. This suggests E. floralis and other small coccoliths adopted similar strategies to cope with elevated CO_2 and/or toxic metals, and rounded morphotype may have been better adapted to these conditions.

Acknowledgements: Projects: CNPq/402804/2022-8, EU PRIN Missione-4/Componente-1 2022WEZR44, and Dipartimenti di Eccellenza-2023–27.



12th International Cretaceous Symposium

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TALKS

4: Cretaceous Sedimentation and Tectonics

Combined

4a: Shallow-marine carbonate systems

&

4c: Cretaceous geodynamics

Talk

Combined 4a - Shallow-marine Carbonate Systems & 4c - Cretaceous Geodynamics

Correlation of Spatial Variations of Sedimentary Facies to Seismic Facies of the Maastrichtian Carbonate Successions in Arabian Platform, Southeast Türkiye

Altintas, Damla (1); Yilmaz, Ismail Omer (2); Ozkan Altiner, Sevinç (2); Celep, Halil Emre (1)

1: Turkish Petroleum (TPAO), Turkey; 2: Middle East Technical University (METU), Turkey

An integrated study was developed to characterize the spatial patterns of facies distribution in Maastrichtian age Garzan Formation which is one of the most prolific reservoirs in the southeast of Turkey. The sedimentary architecture of depositional environment and the diagenetic history of this carbonate succession were built by the use of sedimentological analysis of well cuttings and cores, well logs, and three-dimensional seismic data in oilfields A, B, C, and D. A total of twenty wells were examined in detail to construct a 3D carbonate depositional model. The vertical and horizontal facies changes in shallow marine carbonate deposits of the Garzan Formation suggested that the rudist-dominated carbonate successions were built-up in distally-steepened carbonate ramp. The heterogeneity of the Garzan carbonate rocks is greatly influenced by diagenesis which overprints the sedimentary facies and impacts the reservoir properties. The main diagenetic properties defined in petrographic analysis are micritization, neomorphism, dissolution, cementation, compaction, and partial dolomitization. Seismic attribute maps allow estimating different geological properties of the subsurface and determining the stratigraphic heterogeneity. Spectral decomposition is a functional seismic interpretation method providing seismic facies map with distinctive colors. This study provides the correlation of the sedimentological facies to the seismic facies. Another aspect of this study is to reveal the possible mechanisms responsible for the formation of the channels identified on top of the Garzan Formation on the spectral decomposition map. Integration of the seismic data interpretation and sedimentological analysis suggested that these were the tidal channels influenced by bottom currents.

Talk

Combined 4a - Shallow-marine Carbonate Systems & 4c - Cretaceous Geodynamics

From Mesozoic faults to neotectonic activity in northern Central Europe – the legacy of the Late Cretaceous inversion phase

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1: Institut für Erdsystemwissenschaften, Abteilung Geologie, Leibniz Universität Hannover, Hannover, Germany; 2: GEUS - Geological Survey of Denmark and Greenland, Department of Groundwater and Quaternary Geology Mapping, Århus, Denmark; 3: Lantmäteriet, Geodata Division, Sweden; 4: Geowissenschaftliches Zentrum der Universität Göttingen, Abteilung Strukturgeologie und Geothermie, Germany

Northern Central Europe is a key area for the Late Cretaceous intraplate deformation that is characterized by a tectonic inversion phase with the transformation of former extensional features into contractional structures. This inversion was distinct along the northern and southern margin of the Central European Basin System e.g., at WNW-ESE striking structures like the Sorgenfrei-Tornquist Zone, the northern Harz boundary fault and the Osning thrust. It is remarkable that so far, the best evidence for neotectonic activity in northern Central Europe and Denmark comes from these areas. It has also been shown that historic earthquakes, which were observed over the last 1200 years cluster at Late Cretaceous reverse faults like the Osning thrust, the Halle fault, the Haldensleben fault or the Gardelegen fault. These structures have in common that they penetrate large parts of the crust, partly down to the Moho. Therefore, they represent stress-sensitive, first-order lithospheric features, where past, present, and potentially future seismic events are manifested. Repeated reactivation of these structures might have caused large-scale fatigue processes that have weakened the faults and made them prone to stress release and neotectonic movements and enhance the potential for a reactivation due to glacial isostatic adjustment (GIA) related stress field changes. This has implications for the seismic hazard assessment of northern Central Europe.

Talk

Combined 4a - Shallow-marine Carbonate Systems & 4c - Cretaceous Geodynamics

Crustal-scale flexure during Late Cretaceous inversion of the Polish Basin and its influence on depositional systems

Krzywiec, Piotr

Institute of Geological Sciences, Polish Academy of Sciences, Poland

Early concepts of inversion tectonics relied on a model of half-graben bounded by deeply rooted listric fault that is subsequently reactivated as reverse fault, and as a result half-graben infill is uplifted and eroded. However, this model explains inversion of relatively small depocenters associated with uplift of relatively small crustal blocks, and it doesn't include syn-inversion flexural subsidence of basin's flanks, important during inversion of large sedimentary basins and uplift of large crustal block. Flexure of flanks of inverted basin implies specific thickness and facies distribution of syn-inversion strata, similar to foreland basin depositional system, with regional thickening of inversion-related succession towards the inversion axis, and presence of coarse-grained deposits in vicinity of basement blocks uplifted during inversion. The Late Cretaceous evolution of the Polish Basin provides excellent example of such flexural inverted basin. Its most subsiding axial part, the Mid-Polish Trough, was in Late Cretaceous transferred into the Mid-Polish Anticlinorium – major anticlinal structure that extends for approximately 1000 km from SW Baltic Sea towards the SE Poland and W Ukraine. Due to the large size of this structure, loading along the flanks of inverted basin axial part led to a regional flexure of its footwall. As a result, Upper Cretaceous syn-inversion succession is characterized by regional thickening towards the Mid-Polish Anticlinorium. Seismic data imaged Upper Cretaceous progradational wedges, localized thickness reductions, local unconformities and contourites that developed along the edges of crustal blocks uplifted during inversion.

This study was supported by NCN grants 2017/27/B/ST10/02316 and 2018/29/B/ST10/02947.

Talk

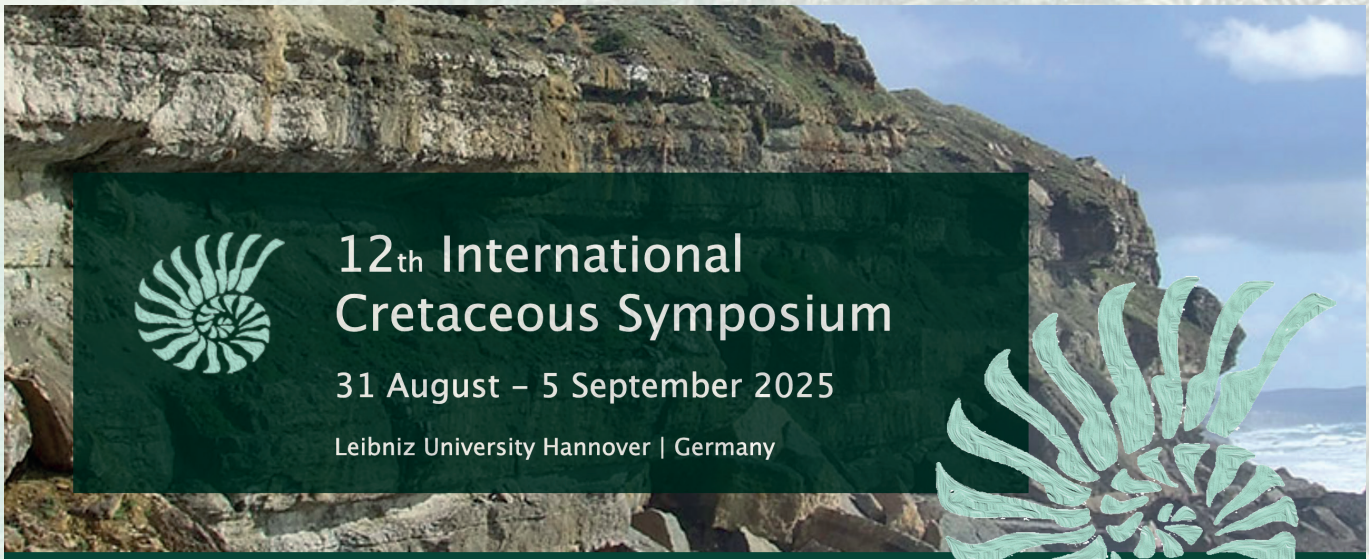
Combined 4a - Shallow-marine Carbonate Systems & 4c - Cretaceous Geodynamics

Dislocation Enhancement in Seismic Imaging: A Case Study from the Upper Cretaceous complex in the Polish Carpathian Foreland

Kwietniak, Anna (1); Urbaniec, Andrzej (2); Łaba-Biel, Anna (2); Kubik, Benedykt (2)

1: AGH Univeristy of Krakow, Poland; 2: Oil and Gas Institute - National Research Institute, Krakow, Poland

The study area lies in the central part of the Carpathian Foreland in southern Poland. The interval encompasses mixed carbonate-clastic facies of the Upper Cretaceous and the topmost part of the Lower Cretaceous –Upper Jurassic complex. The motivation for the research was to reconstruct the spatial orientation of faults concerning the major tectonic processes that took place in the area and to find the temporal and spatial relation with the sedimentation process. For this purpose, the novel interpretation tools of the colour-processing technique were applied for processing 3D seismic data. The idea behind the technique is to transfer the data into a new coordinate system that respects individual colour saturation. This result enables a new level of detail for structural interpretation, highlighting lineations within the seismic cube. Further validation of the proposed structural model was compared with the results of paleoenvironmental analysis, which is the result of the chronostratigraphic image and Wheeler diagram analysis. The techniques applied to the high resolution seismic data enabled better insight into the paleoenvironmental studies of the Late Cretaceous sedimentary basin in the research area. The resulting paleoenvironmental model is built based on seismic sequence stratigraphy, seismic attribute analysis and tectonostratigraphic analysis. The methodology allowed validation and modification of the previous tectonic model and allowed tracing of faults that continue into the Cenozoic formations. The work is founded by National Science Center Recognition of the depositional architecture of the Upper Cretaceous sedimentary basin in the central part of the Carpathian Foreland, 2021/43/D/ST10/02728.



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TALKS

4: Cretaceous Sedimentation and Tectonics

Combined

4d: Cretaceous sedimentation patterns in the southern Boreal Realm – regional versus global control

&

4e: Regional geology and integrated stratigraphy of the Upper Cretaceous of NW-Europe

Talk

Combined 4d - Cretaceous sedimentation patterns in the southern Boreal Realm [...] & 4e - Regional geology and integrated stratigraphy of the Upper Cretaceous of NW-Europe

The limestones in the Lower Cretaceous of Greenland – and their associated fossils

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1: The Geological Survey of Denmark and Greenland (GEUS), Denmark; 2: Dept. of Geosciences,Ruhr-University Bochum, Germany

The Mesozoic in Greenland is an almost exclusively siliciclastic sedimentary succession. The Cretaceous is dominated by dark-grey, silty mudstones low in organic carbon and fossils – and has thus been considered boring and of little interest.

We present three Early Cretaceous exceptions with “carbonate” deposition.

1) Vividly-coloured, fauna- and flora-rich Ryazanian–Valanginian mudstone deposits on structural highs. They were considered ‘the first representative of limestone deposition’ since the Late Permian in Greenland, when first described by the early mapping geologist in the 1930–40’ies. However, the amount of carbonate, originating from calcareous nannofossils (CN), only qualify the unit as calcareous mudstones. Calcareous nanofossils as well as various ammonites, belemnites and brachiopods are partly of Tethyan origin and reflect major palaeoceanographic changes.

2) The re-discovery of the mid-1930’ies fauna-rich Hühnerbjerg locality represent pure carbonates that largely originate from inoceramid prisms. The setting was an isolated basement horst submerged in earliest Cretaceous (Valanginian–Hauterivian) and constituted a seamount, protected from siliciclastic input and hosted a rich fauna: brachiopods, in particular, ammonites, nautiloids, belemnites, bivalves, gastropods, crinoids, echinoids, serpulids, corals and crustaceans – and barren of calcareous nannofossils. The mount top carbonates were swept of the sides of the mount and transported in debris flows down the flanks and deposited as packstones and grainstones.

3) Imbedded in dark Barremian mudstones are methane seep carbonates. The seep mounds attracted a rich and diverse fauna and provide a rare preservation window to the otherwise almost barren Barremian marine succession.

Talk

Combined 4d - Cretaceous sedimentation patterns in the southern Boreal Realm [...] & 4e - Regional geology and integrated stratigraphy of the Upper Cretaceous of NW-Europe

Deciphering the sequence stratigraphic symphony of Lower Cretaceous pelagic carbonates in the Danish Central Graben

Jelby, Mads E. (1); Ineson, Jon (2); Sheldon, Emma (2); Thibault, Nicolas (3); Blok, Carlette N. (2); Bodin, Stéphane (1); Anderskouv, Kresten (3)

1: Aarhus University, Denmark; 2: Geological Survey of Denmark and Greenland (GEUS), Denmark; 3: University of Copenhagen, Denmark

The Lower Cretaceous Tuxen and Sola formations in the Danish Central Graben (North Sea) constitute one of the oldest chalk successions recorded globally. Forming a regionally extensive succession in the Central Graben with similar, age-equivalent units widespread across the southern Boreal Realm, it comprises a heterogeneous mixed carbonate–siliciclastic stratigraphy of predominantly bioturbated pelagic chalks and hemipelagic marlstones and mudstones, which straddle the global early Aptian Oceanic Anoxic Event 1a (OAE-1a). Despite testifying to a dynamic basin-filling history influenced by relative sea-level changes of both eustatic and intra-basinal tectonic origin, the Lower Cretaceous pelagic carbonates are relatively overlooked compared to their Upper Cretaceous – Danian counterparts of the Chalk Group characterized by more homogeneous, clean white chalk. Consequently, the timing, magnitude and depositional controls on these basin events remain to be fully understood.

We present herein an updated depositional and sequence stratigraphic model of the Tuxen and Sola formations in the Danish Central Graben, based on high-resolution sedimentological analysis combined with a new integrated stratigraphic framework from biostratigraphic and well-log data. The succession records c. 20 Myr of transgressive–regressive cycles, superimposed by numerous lower-order events controlled by local, global and (potentially) orbital forcings. The study thereby serves as a benchmark for deciphering sequence stratigraphic controls at multiple scales in pelagic successions, where this distinction is typically challenging.

Talk

Combined 4d - Cretaceous sedimentation patterns in the southern Boreal Realm [...] & 4e - Regional geology and integrated stratigraphy of the Upper Cretaceous of NW-Europe

Opoka: unlocking the mineralogical composition of Upper Cretaceous carbonate-siliceous facies of the European Basin

Jurkowska, Agata (1); Świerczewska-Gładysz, Ewa (2); Kowalik Filipowicz, Szymon (3)

1: AGH University of Krakow, Poland; 2: University of Łódź, Poland; 3: AGH University of Krakow, Poland

Opoka is a carbonate-siliceous rock that forms thick Campanian-Maastrichtian successions in Poland, Ukraine, and Russia, and has also been documented in Western Europe (France, Germany, and the Nederlands). Its mineralogical composition has only recently been thoroughly examinated, and studies have revealed that the main component of the insoluble residue (remaining after calcium dissolution) is opal-CT. This silica polymorph forms a siliceous rock network composed of adjoining lepispheres. Opoka is usually characterized by a low content of terrigenous material and contains intercalated horizons of marls and cherts. The latter can be distinguished from flints by their different mineralogical composition—namely, the presence of primary opal-CT, which differs from the nano-α-quartz typical of flints. A common feature of opoka the presence of siliceous sponge fossils, often preserved only as voids resulting from spicule dissolution.

The recognition of opoka mineralogical composition and the origin of its components has helped constrain the Si cycle during pre-Eocene times. This also opens the discussion about the abiotic sources of Si in porewater, and the role of siliceous sponges in delivering Si into sediments, and subsequently contributing to chert formation. Proper mineralogical verification of rock types identified within the Late Cretaceous epicontinental European Basin also sheds new light on existing bathymetric models of chalk and opoka facies distribution.

Talk

Combined 4d - Cretaceous sedimentation patterns in the southern Boreal Realm [...] & 4e - Regional geology and integrated stratigraphy of the Upper Cretaceous of NW-Europe

A new sequence stratigraphic model for the German Wealden (upper Berriasian) of northwest Germany

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In northern Germany the Berriasian stage is represented by an overall brackish sedimentary sequence which was deposited in the landlocked, continuously subsiding Lower Saxony Basin (LSB). The brackish inland sea of the LSB extended for 400 km from west to east and ca. 100 km from south to north. It formed the southernmost extension of the North Sea Basin. The Berriasian deposits are lithologically attributed to the Purbeck and Wealden type facies, with the upper part of the Münder Formation dominated by carbonates and evaporites, and the overlying Bückeberg Group (= German Wealden) by siliciclastics.

This study improves our understanding of the parameters controlling the sedimentation patterns of the German Wealden, which accumulated up to 700 m of siliciclastics in the basin center. An integrated bio- and lithostratigraphic approach helps to reconstruct the spatial distribution and relationship between the different sandstone bodies in the Deister-Hils Embayment of the southeastern margin of the LSB. We provide new micropaleontological data from cores and outcrops, recalibrating the stratigraphic position of the sandstones. We further present an updated biostratigraphic range chart of the well established ostracod zonation. Several intercalated brackish–marine ingressions are documented from the central basin and the coarser grained siliciclastics of the margin, which allow a sequence stratigraphic interpretation. We propose a sequence stratigraphic model, which can also be applied to other parts of the LSB. This model will help to better understand the facies distribution for geothermal and hydrocarbon exploration as well as for potential CO_2 storage.

Talk

Combined 4d - Cretaceous sedimentation patterns in the southern Boreal Realm [...] & 4e - Regional geology and integrated stratigraphy of the Upper Cretaceous of NW-Europe

The Cretaceous fossil record of the Sverdrup Basin

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The sedimentary record of the Sverdrup Basin in the Canadian Arctic encompasses all stages of the Cretaceous. Owing to a brief history of research (from 1952) and a limited number of publications (<100) it is manageable to database the entire Cretaceous fossil record of the basin. We completed this task for macrofossils, and have made major progress regarding microfossils and palynomorphs. At present, the database contains more than 3700 entries of two types: 1) approximately 1900 entries pertain to specimens collected by CASP, with each specimen receiving its own entry; 2) approximately 1800 entries document literature data, with each entry corresponding to one species at one locality. All entries are georeferenced and dated to stage level, and can be displayed and interrogated in GIS. Sample coverage of Cretaceous outcrop area is governed by accessibility, both with regard to exposure and logistics, but is reasonably dense, given the often challenging fieldwork conditions. The relevance of the dataset extends beyond the Sverdrup Basin limits given that marine connections via Baffin Bay, North Greenland and the Western Interior existed at times during the Cretaceous, and many species are common to other parts of the Boreal realm. Notable macrofossil records of regional significance include the Berriasian and Valanginian ammonite and bivalve faunas of the Deer Bay Formation, sporadic Albian to Santonian ammonite occurrences, and a Sphenoceramus community from the Santonian–Coniacian boundary interval. Microfossils and palynomorphs are recorded from all stages, and were mostly employed for biostratigraphy, but also hold great palaeoecological potential.

Talk

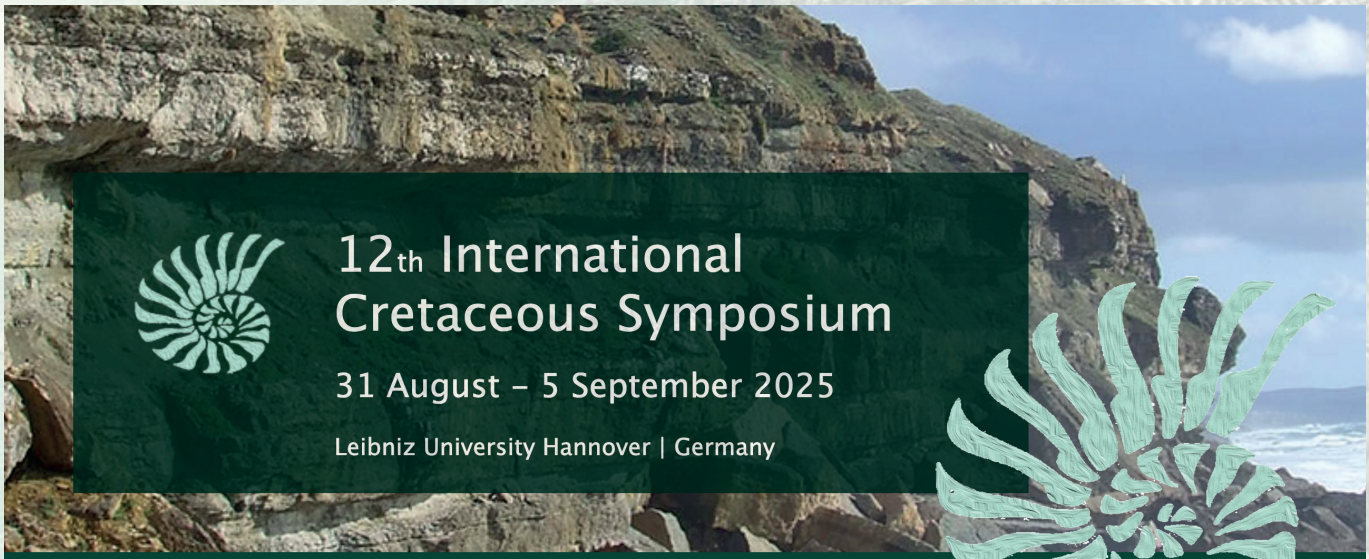
Combined 4d - Cretaceous sedimentation patterns in the southern Boreal Realm [...] & 4e - Regional geology and integrated stratigraphy of the Upper Cretaceous of NW-Europe

Tectonostratigraphic framework and regional correlation of Lower Cretaceous sandstones in the Broad Fourteens and West Netherlands basins of the Netherlands

Verreussel, Roel; Bouroullec, Renaud; Peeters, Stefan

TNO Geological Survey of the Netherlands, The Netherlands

In this paper, results of an integrated stratigraphic analysis and seismic mapping project (TNO-EBN DeVli Project) are presented. The area of interest comprises the Broad Fourteens and the West Netherlands basins that occupy a large part of the southern Dutch on- and offshore. The stratigraphic interval of interest is the predominantly non-marine Upper Jurassic Schieland Group and the marine Lower Cretaceous Rijnland Group. The Mesozoic basins were affected by the late Cimmerian rift, resulting in complex stratal relationships within rapidly changing paleo-depositional environments and a plethora of lithostratigraphic units that required a sequence stratigraphic perspective. The integrated seismic and stratigraphic approach made it possible to fit the pieces of the lithostratigraphic puzzle into a tectonostratigraphic framework. Seismic sections, time structure maps and time-thickness maps were compiled to better understand the complex evolution of these two basins. One of the most interesting findings is the presence of massive sandstone units, that were previously assigned to different stratigraphic units but are in fact time equivalent and belong to the same tectonostratigraphic mega-sequence. This basin wide event occurs at the transition from the Ryazanian to the Valanginian and reflects erosion of the rift shoulders and redeposition in the rift. In the West Netherlands Basin, this event is embodied in the Delft Sandstone Member, which is the most important targets for geothermal energy in the region. The high level of detail in both the seismic and stratigraphic analysis allowed to propose an alternative depositional model for the unit, in contrast with existing models.



TALKS

5: Cretaceous Biota

Combined

5a: Cretaceous large benthic foraminifear

5c: Unravelling the biogeographic, biostratigraphic, palaeoecologic, and taxonomic significance of inoceramid bivalves

5d: Cretaceous invertebrates

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Micropaleontological Constraints on the Age and Paleoenvrionments of the Cenomanian-Turonian Ajlun Group within a Sequence Stratigraphic Framework (Central Jordan)

Alibrahim, Ali; Chirakal, Tojo; Messaoud, Jihede; AlAfifi, Abdulkader; van Buchem, Frans

King Abdullah University for Science and Technology, Saudi Arabia

This study presents detailed micropaleontological analyses of the Cenomanian Turonian shallow water carbonate system of the Ajlun Group in a regionally defined sequence stratigraphic framework. Two outcrop sections were studied with a total thickness of 700m representing proximal (Bustani) to distal (Mujib) settings. Over 300 thin sections and disaggregated analyses were produced and integrated with existing sedimentological, nannopaleontological, and isotopic data. The Early/Middle Cenomanian boundary interval is marked by the highest abundance and diversity of benthic foraminifera including index fauna, Praetaberina bingistani and Nummufallotia apula in the Bustani section and Praelaveolina tenuis and Meandropsina vidali in the Mujib section. Benthic foraminiferal diversity declines significantly at the K130 sequence boundary surface that corresponds to a sealevel drop positioned around this substage boundary. It marks the change from a rimmed carbonate platform to a shallow ramp dominated by oyster shells and small planktic foraminifera interbedded with faverina and ostracods. Larger benthic foraminifera reappear briefly in Late Cenomanian prior to Oceanic Anoxic event 2, marked by the abundance of dwarf heterohelicids and buliminids coinciding with a positive carbon isotope excursion.

Following OAE2, the Turonian interval shows a recovery of planktic foraminiferal diversity followed by carbonate platform settings but with large gastropods and rare small benthic foraminifera. The Middle/Late Turonian boundary is represented in a thin interval dominated by Cuneolina pavonia parva? in peloidal grainstone facies. In addition to the age dating contribution, this study illustrates how micropaleontological information can document subtle environmental changes that refine the sequence stratigraphic model.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Use of Microtomography for the Creation of a 3D Atlas for Non-Marine Ostracods from the Lower Cretaceous of Brazil

Batista dos Santos Filho, Marcos Antonio (1); Vázquez García, Bernardo (1); da Silva Pereira, Julia (1); Fauth, Gerson (1); Henrique de Oliveira Lima, Francisco (2)

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The use of x-ray microcomputed tomography (micro-CT) for the creation of tridimensional models of fossils has become increasingly common in the last decades. These models allow researchers from all over the world to not only have access to high-resolution images of fossils that would be otherwise difficult to study, but to also observe them in many different angles and easily make different kinds of measurements. For microfossils, which are usually only illustrated at high resolution in a few specific views, micro-CT scanning provides an opportunity for the creation of detailed models to aid in the analysis of different species, particularly of rarer ones. Here we divulge an initiative to create a tridimensional atlas of non-marine ostracods of the lower Cretaceous of Brazil, chosen due to their great relevance for the biostratigraphy of that time period. A total of 152 species have been scanned through micro-CT at the LMPT lab of the Federal University of Santa Catarina (UFSC). Specimens from all selected species have been collected, with 104 having been borrowed from the Naturmuseum Senckenberg, 26 from the Bundesanstalt für Geowissenschaften und Rohstoffe, and 10 belonging to the collection of itt Oeaneon. An illustrated atlas with these 3D models will be made, containing also their taxonomic description, stratigraphic range, biogeography, and scanning electron microscopy images, to provide a complete picture of each specimen. We hope through this project to provide a useful tool for studies involving non-marine ostracods from this important geological period.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

How many, and where from? The rudist genus Torreites (Palmer 1933) revised

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Torreites has received only moderate attention throughout the years since its establishment by R.H. Palmer (1933), following its first description from Cuba by Henri Douvillé (1927) nearly a century ago, as Hippurites (Vaccinites) sanchezi. At first glance, Torreites is a peculiarly shaped Late Cretaceous hippuritid rudist bivalve currently subdivided into seven species and based on comparably few and incomplete (type) specimens. Intriguingly, its paleobiogeographic extent is limited to the Caribbean and Arabian provinces – without any other record in the European and North African Neotethys, Pacific, or elsewhere. Therefore, the timing of settlement in the Caribbean and Arabian provinces, respectively, has great potential in understanding circum-equatorial rudist dispersion patterns between the two distant areas.

This highlights the need of a more detailed taxonomic description and morphological understanding of the genus Torreites. This study presents a detailed taxonomic and statistical analysis of close to 300 specimens of Torreites from the Lower Campanian of Saiwan, Sultanate of Oman. The figure of species included in this study by far outnumbers the few dozen globally described specimens, allowing an unprecedented estimation on phyletic relation of the four ‘Arabian’ species. First results reveal a larger interspecific variability than previously assumed that suggests the merger of several of the Arabian species. Furthermore, updated chronostratigraphy of Torreites-bearing strata and refined surface current models narrow the mode of dispersal around the Late Cretaceous equatorial oceans.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Arachnids in Cretaceous amber

Kotthoff, Ulrich; Harms, Danilo; Loria, Stephanie; Mey, Constantin

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For multiple arachnid groups, such as pseudoscorpions (false scorpions), schizomids (dwarf whip scorpions) and ricinuelids (hooded tick spiders), there were multi-million-year gaps in the fossil record between their first occurrences during the Palaeozoic and fossil findings from the Cenozoic. Cretaceous amber deposits contributed significantly to filling these gaps, though these amber deposits only allow assessing geologically short time intervals. Amber from Myanmar (Burmese amber) is particularly important due to the high arachnid diversity encountered therein. It has allowed us to prolong the known temporal range for extinct groups such as the Uraraneidae (ancient spider-like organisms) or other direct relatives.

In this presentation, we review some recent findings of our own working group and of other researchers, such as the earliest known occurrences of certain arachnid groups and implications for the evolution of these groups, as well as ecological implications. While certain arachnid groups show significant evolutionary development during the Mesozoic, probably in context with the development of angiosperms, forms living in hidden ecosystems such as organic soil or bark seem to have remained in an evolutionary stasis. Problematic aspects of amber-related research are also discussed.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Orthoptera (grasshoppers and crickets) of the Cretaceous

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The Cretaceous was a period of high insect diversity, including numerous orthopteran lineages of which several have become extinct. Five Orthoptera taxa stand out in the fossil record due to their high species number: the Hagloidea, Elcanoidea (lagoon crickets), Locustopsoidea, Grylloidea (crickets) and Tridactyloidea (pygmy mole crickets). The Cretaceous orthopteran fauna is particularly well represented by multiple lagerstätten from around the globe. Especially the Brazilian Crato Formation and amber from Myanmar have yielded numerous discoveries. In our contribution we compare the diversity of Orthoptera found in the Crato Formation and Myanmar amber, especially with respect to the Elcanoidea, Locustopsoidea and Tridactyloidea. Of these three, Locustopsoidea were the dominant group in the Crato Formation by far, whereas they are completely absent from Myanmar amber. Contrary, here the other two groups appear to have been much more diverse. Possible causes for this phenomenon are discussed.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Reconstructing the richest ancient rocky shore ecosystem

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Well-exposed rocky shores and their associated faunas are rare in the geological record. A prominent example is Ivö Klack in southern Sweden a small Campanian island at the northern margin of the Late Cretaceous Chalk Sea. The fauna is the richest ancient rocky shore fauna known, with about 260 shell-bearing invertebrate species and about 70 vertebrate species, including 3 birds inhabiting the shoreline and the adjacent waters. The preserved fauna provides information on virtually all trophic levels in the ecosystem and offers an unparalleled opportunity for reconstruction of the ecosystem. Six trophic levels are recognized based on modes of life, feeding strategies, diets, and preferred habitats of the individual species. The ecosystem matches modern analogues in terms of richness. This is quite remarkable for a fauna, which lived about 77.5 myr ago. However, this to some extent reflects that the richness of the fauna is time averaged over about 500 kyr, but stratigraphic changes in faunal composition have not been observed. The reconstructed ecosystem thus gives a unique picture of the life on and around an ancient rocky shore.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Evolutionary development trend of ostracods of the genus Cythereis Jones, 1849 at the Cenomanian-Turonian boundary

Syniehubka, Vitalii

V.N. Karazin Kharkiv National University, Ukraine

A number of ostracods of the genus Cythereis Jones, 1849 have been described in the middle Cenomanian and early Turonian deposits of Western Ukraine. The studied deposits were formed in marine basins with different depths and types of bottom substrate. Analysis of ostracod remains made it possible to determine the upper and lower sublittoral zones in both Cenomanian and Turonian deposits. In this way, it was possible to observe the same species of ostracods of the genus Cythereis Jones, 1849 in different palaeoecological conditions.

It was possible to establish that representatives of the genus Cythereis Jones, 1849 have a wide morphological variability in the studied sediments. Against the background of changes in the depth of the sea basin during the Cenomanian-Turonian, patterns of the appearance of morphological adaptations in ostracods depending on the type of bottom substrate are observed. The observed adaptations during the late Cenomanian begin to consolidate and affect speciation from the early Turonian. At the same time, it was possible to collect a large collection of juvenile forms of ostracods of the genus Cythereis Jones, 1849. This made it possible to qualitatively describe the ontogenesis of ostracods and on this basis to construct phylogenetic lines. Analysis of the phylogenetic line made it possible to establish two periods when active dispersal and formation of new species of the genus Cythereis Jones, 1849 were observed.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Complex chemical communication and advanced sociality of 100-million-year-old ants

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1: University of Edinburgh, UK; 2: American Museum of Natural History, USA; 3: Fukuoka University, Japan; 4: Hokkaido University, Japan

Advanced social behaviour, or eusociality, has been a crucial evolutionary innovation, enabling colonies of ants, termites, social wasps, and bees to achieve ecological dominance over solitary species throughout the Cenozoic. Advanced sociality depends not only on cooperation and division of labor among nestmates, but also on sophisticated communication systems. In this study, we present independent evidence suggesting that Cretaceous ants, preserved in 100-million-year-old amber, were already highly social, based on their chemosensory adaptations. We examine the micro sensory organs of fossil specimens, using original imaging of amber microinclusions, while previous interpretations of fossil ant sociality were often based on individuals preserved nearby. Our analysis revealed an array of antennal sensilla associated with alarm pheromone detection and nestmate recognition, showing distinctive similarities to those in extant eusocial ants. These findings provide direct morphological support for the presence of complex chemical communication and sociality in stem-group Cretaceous ants.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Biostratigraphic and biogeographic insights from inoceramid bivalves and microfossils (calcareous nannofossils and foraminifers) of the basal Santa Marta Formation, James Ross Island, Antarctica

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1: Faculty of Geology, University of Warsaw, Poland; 2: Czech Geological Survey, Brno, Czech Republic; 3: Czech Geological Survey, Praha, Czech Republic

Inoceramid material from the Lachman Crags Member of the basal Santa Marta Formation (James Ross Island) was collected during the Czech Antarctic scientific expeditions in years 2009–2013. Fieldworks were conducted c. 2500 m SSW of the Czech Antarctic Station on the NW slopes of Lachman Crags, northern James Ross Island. The succession was sampled and analysed for calcareous nannofossils and foraminifers.

The inoceramids are dominated by the ‘Inoceramus’ steinmanni – ‘Inoceramus’ pacificus group, accompanied by juveniles of ?‘Inoceramus’ australis, rare ‘Inoceramus’ aff. andinus, and single Platyceramus sp. and ‘Inoceramus’ sp. A specimen assignable to the Cordiceramus mitraikyensis group constrains the assemblage to the upper Santonian–basalmost Campanian.

Calcareous nannofossils from the A90 section were poorly preserved, etched and mostly fragmented with the exception of small specimens of genera Biscutum, Prediscosphaera, and Discorhabdus. They indicate an interval from the first occurrence of Broinsonia parca expansa (UC9c zone) to the last occurrence of Eiffellithus eximius (UC15 Zone) that spans from the uppermost Turonian to the Campanian.

Microfossil taphocoenoses contain a low-diversity, low-abundance benthic foraminiferal community. Agglutinated foraminifera are represented by Haplophragmoides spp. and Spiroplectammina vagaensis, while calcareous benthics include Gavelinella sandidgei, Planularia sp., Pyrulina sp., Hemirobulina sp., and Quadrimorphina sp.

The presence of ‘Inoceramus’ neocaledonicus in the underlying Hidden Lake Formation—apparently equivalent of the late Coniacian ‘Inoceramus’ africanus of Madagascar—suggests a stratigraphic gap at the base of the Santa Marta Formation.

The inoceramid assemblage reflects the Weddellian Biogeographic Province, but with distinct connections to the East African bioprovince.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Campanian gastropods: An evolutionary view on Xenophoridae and Pterocerellidae of Northern Germany

Wieneke, Ulrich; Pietzonka, Manuel; Peter, Joachim; Heising, Manfred; Stoutjesdijk, Han

Citizen Scientist, Germany

The revised edition of "Fossilien aus dem Campan von Hannover" (Schneider & Girod, 2023) provided a comprehensive overview, but revealed numerous undescribed gastropods. Consequently, this gastropod revision project has begun.

Key challenges included unreliable old literature, drawings, stratigraphy, and incomplete knowledge of references. We also addressed type species, new sampling, and collection access (including private ones). Our collection-based research analyzed ~8,000 specimens (32,000 photos) necessitating multiple publications.

Beyond Campanian gastropods, our investigation included Maastrichtian and Santonian species to gain evolutionary insights, leading to the development of higher taxonomic hypotheses. Pterocerellidae and Xenophoridae serve as illustration of our findings:

Gene sequencing has revealed a close relationship between the Xenophoridae and Aporrhaidae, despite their markedly different morphologies (Irwin et al., 2024). Our discovery of new Acanthoxenophora species exhibiting long spines on the last whorl echoes a pattern observed in the Jurassic genus Diempterus and the Lower Cretaceous "Murex calcar". This shared characteristic suggests a novel hypothesis regarding their evolution.

The Pterocerellidae, a group of aporrhaid-like species with a widespread Cretaceous distribution, are represented by six distinct lineages in the boreal European fauna. Our analysis has led to a more consistent taxonomy of this group.

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Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Beast from the deep – what are you?

Wiese, Frank (1); Nils, Schlüter (2); Oliver, Friedrich (3); Richard D., Norris (4)

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A total of 158 terminal Maastrichtian deep-sea sediment samples (IODP Exp. 342, Site U1403, palaeo-water depth 3,600 m) yielded 850 atelostomate (spatangoid, holasteroid) and cidaroid spine fragments, plus a spine type that cannot be assigned to any echinoid group. Hollow, non-verticillate spines with a large lumen and a thin cylinder show narrowly spaced, low septae, bearing irregularly distributed thorns. Ovate, elongated pores between the ridges perforate the cylinder. Comparably voluminous, hollow lumen, thin cylinders and thorned septae occur in the Diadematacea (Diadematoida, Micropygoida). Because most Diadematoida spines are verticillate, and thorn-bearing spines of Micropygoida have a meshwork-filled lumen, Diadematacea are no likely source. Hollow spines occur also in the Echinothuriacea (Pedinoida, Aspidodiadematoida, Echinothurioida), but Pedinoida spines are more solid and weakly serrated, while shafts of the Aspidodiadematoida are verticillate with a lumen subdivided into dissepiments. Of all spines seen so far, only some aboral spines of Echinothurioida (e.g., Asthenosoma: Echinothuriidae; Phormosoma: Phormosomatiidae, Kamptosoma: Kamptosomatidae) show remote similarities with our material by the occurrence of oval pores, septae bearing irregularly distributed thorns, a thin cyclinder and a wide lumen. However, neither occur hoof-like spine terminations (Echinothuriidae) nor irregularly curved septae (Kamptosomatidae), why both groups are no likely source. Data on Phormosomatidae are discussed during the symposium. No Upper Cretaceous record of this spine type exists from the neighbouring Site U1407 (ca. 1,600 m palaeo-water depth), nor exist post-Cretaceous records in general. The “beast from the deep” could, therefore, represent an extinct deep-sea echinothurioid lineage, not surviving the K/Pg boundary impact event.

Talk

Combined 5a - Cretaceous Larger Benthic Foraminifera & 5c - Unravelling the [...] significance of inoceramid bivalves & 5d - Cretaceous Invertebrates

Tracing Paleoenvironmental Change with Benthic Foraminifera in the Cretaceous Austral Realm

Wolfgring, Erik (1); Amaglio, Giulia (2); Kaminski, Michael A. (3); Petrizzo, Maria Rose (2); Watkins, David (4)

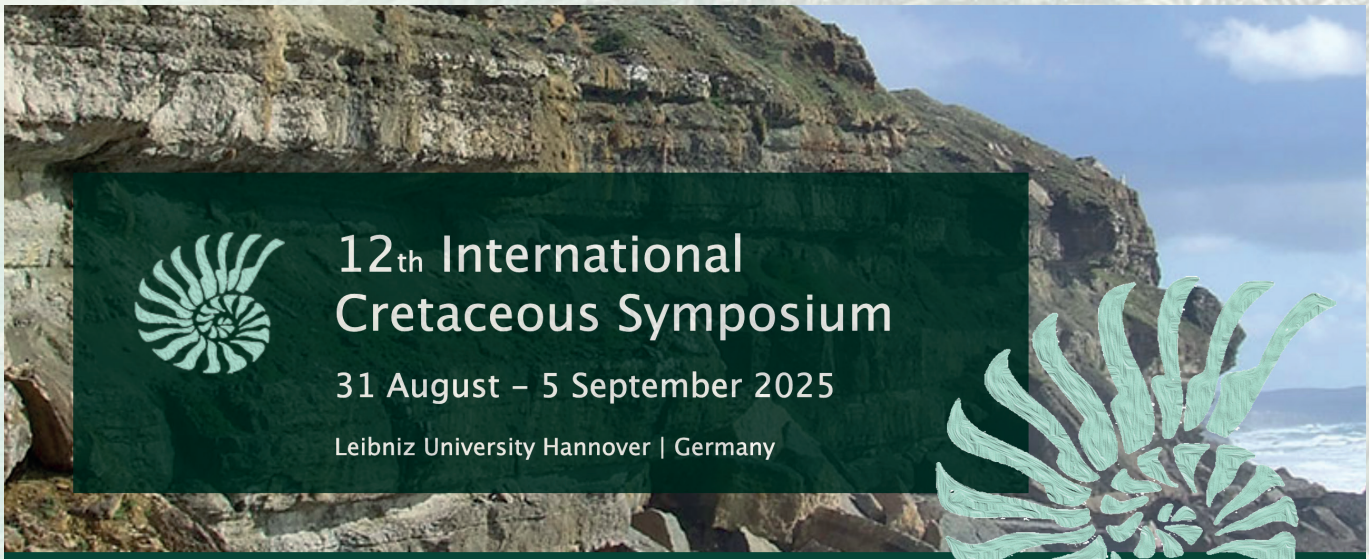
1: University of Vienna, Vienna, Austria; 2: Università degli Studi di Milano Statale, Milan, Italy; 3: King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia; 4: University of Nebraska–Lincoln, NE, USA

Benthic foraminiferal records from the Cretaceous of the Austral southern high latitudes offer valuable insights into paleoenvironmental changes and biostratigraphic correlations across the Southern Hemisphere. We integrate data from IODP Sites U1512, U1513, U1514, and U1516, with selected deep sea drilling and regional records, to examine the significance of both calcareous and agglutinated benthic foraminifera for biostratigraphy and paleoenvironments. In this study, we contextualize benthic- and planktonic foraminiferal data and calcareous nannofossils to present a robust biostratigraphic framework.

In the Albian of Site U1513, the transition from shallow to deeper marine settings is reflected in a shift from agglutinated assemblages (e.g. Trochammina, Haplophragmoides) to calcareous forms, including Gavelinella intermedia and Osangularia schloenbachi. These assemblages correspond well with those from the Kerguelen Plateau, Great Artesian Basin, and parts of South America.

The Cenomanian–Turonian interval, including the Oceanic Anoxic Event 2, is marked by reduced diversity in calcareous benthic foraminifera and the relative increase of agglutinated taxa at the Sites U1512, U1513, and U1516, indicating periods of low-oxygen bottom water conditions, correlating with records from South Africa and Walvis Ridge.

Coniacian–Santonian strata at Site U1513 show stable bathyal conditions, dominated by Gavelinella berthelini and Notoplanulina rakauroana. These faunas support correlations with the Falkland Plateau and New Zealand. Overall, benthic foraminifera provide reliable biostratigraphic correlations throughout the Cretaceous of the southern high latitudes and add to our understanding of Southern Hemisphere paleoceanography during the Cretaceous.



12th International Cretaceous Symposium

31 August – 5 September 2025

Leibniz University Hannover | Germany

TALKS

5: Cretaceous Biota

5b: Ammonites – what else?

Talk

5b - Ammonites – what else? (Wiese, Ifrim)

Valanginian ammonite biostratigraphy of northern Mexico

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New biostratigraphic and paleobiogeographic data on Valanginian ammonites from the states of Coahuila and Zacatecas have been produced as part of the Ph.D. thesis of one of the authors (JROF), with a significant portion published in 2024. This new information, combined with previously published data, is integrated and re-evaluated alongside ongoing data collection. This comprehensive dataset confirms that the Lower Valanginian ammonoid record of northern Mexico can be biostratigraphically analyzed using the Standard Mediterranean Ammonite Zonation (SMAZ). However, a few endemic species appear in the uppermost part of the Lower Valanginian. Thus, this strong Lower Valanginian Mediterranean affinity shifts abruptly at the onset of the Upper Valanginian, which is characterized by a significant increase in endemic ammonoids and the absence of SMAZ index species, thus requiring the development of a distinct Mexican biozonation. A publication currently in preparation, based on four stratigraphic sections in the Taraises area (Coahuila), will propose two new Upper Valanginian zones: the Saynoceras americanum and the Oosterella gaudryi zones. Two additional stratigraphic sections in the state of Nuevo León, Entronque San Roberto 1 and 2, have yielded an abundant ammonite assemblage from the uppermost Lower and Upper Valanginian and are under active investigation. Although the abundance of endemic ammonites has slowed down research progress, data from these two stratigraphic sections will be crucial for establishing a robust Upper Valanginian zonation for Mexico. The re-evaluation of the Upper Valanginian ammonoid record from Cuencamé, in Durango State, will also contribute to this Upper Valanginian Mexican zonation.

Talk

5b - Ammonites – what else? (Wiese, Ifrim)

Palaeobiogeographic implications in the co-fauna of the World's Largest Ammonite Parapuzosia (P.) seppenradensis (Landois, 1895)

Ifrim, Christina

Staatliche Naturwissenschaftliche Sammlungen Bayerns, Germany

The world's largest ammonite, Parapuzosia (P.) seppenradensis (Landois, 1895), has fascinated the world ever since the discovery in 1895 of a specimen measuring 1.74 metres (m) in diameter near Seppenrade in Westfalia, Germany. Its co-fauna was describedin detail The species was also found in sections in Mexico and southern England. The high-resolution integrated stratigraphy allows for precise trans-Atlantic correlation of these occurrences, and the Tepeyac section in Mexico has become Associated Stratotype Section and Point for the base of the Campanian (Gale et al. 2023). It yields giant ammonites in original deposition context (Ifrim et al., 2021) together with a rich macrofossil assemblage (Ifrim and Stinnesbeck, 2021) which is correlated to other parts of the world by ammonoid and inoceramid stratigraphy and the stable carbon isotope curve. The ammonoids in the co-fauna of P.(P.) seppenradensis in Germany and Mexico show common and endemic species. They allow for the interpretation of partially unexpected paleobiogeographic relations.

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Talk

5b - Ammonites – what else? (Wiese, Ifrim)

Not ammonites, but squids: “the Cretaceous squid ocean” revealed by digital fossil-mining

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The evolution of soft-bodied squids, which provide a significant part of the biomass in modern oceans globally, is poorly understood due to their patchy fossil record. We provide a comprehensive evolutionary history of squids through “digital fossil-mining” techniques, revealing a new Lagerstätte (Ikegami et al., in press, 2025; the origin and radiation of squids revealed by digital fossil-mining, Science). The more than 250 fossil beaks of 40 species show that squids originated and rapidly radiated by 100 million years ago. Our new data suggest that the radical shift from heavily shelled, slowly moving cephalopods to soft-bodied forms did not result from the end-Cretaceous mass extinction (66 Ma). Early squids had already formed large populations and their biomass exceeded that of ammonites and fishes. They pioneered the modern-type marine ecosystem as intelligent, fast swimmers.

Talk

5b - Ammonites – what else? (Wiese, Ifrim)

Ammonoid mass-mortality events due to submarine explosive volcanism. Uppermost Albian of Sopela (Basque-Cantabrian basin, Western Pyrenees)

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A profuse late Albian magmatism and hydrothermalism related to lithospheric hyperextension affected the thick marine sediments in the centre of the Basque-Cantabrian basin.

In the locality of Sopela, the uppermost Albian deep marine 50 m-thick succession shows basaltic pillow and tabular bodies with intervening pyroclastic deposits developed in a siliciclastic muddy depositional area. Ammonoids indicate a Mortoniceras (M.) fallax Zone to M. (M.) rostratum and perinflatum Zones upwards.

Ammonoids in the mudstones are flattened and scarce, but in the pyroclastics they occur abundantly and well preserved. Grain size varies from fine to coarse ash and lapilli. Scoria grains with bubble structures, irregular basalt and recrystallized limestone clasts with calcitic borders, among others, and a common parallel lamination suggest the deposit of hot water-logged dense high-energy flows formed after a submarine volcanic explosion.

Ammonoids show the shell replaced by calcite and chlorite. All the ontogenetic stages are preserved, being juveniles and smaller forms more abundant than large (cm-sized) adults.

Spheroidal structures 0.3 to 0.7 mm diameter with a very thin calcitic wall, are found in association with ammonitellas of similar size; although the shell is not identified inside these spheroids, some of them may correspond to eggs or very early hatchlings.

A rich community of planktic and benthic forams, ostracods, gastropods, bivalves and small crinoids occurs with the ammonoids.

The origin of the flows and the presence of this rich fossil community suggest a likely ammonoid spawning area affected by catastrophic magmatism leading to intermittent mass-mortality events in the sea-water column.

Talk

5b - Ammonites – what else? (Wiese, Ifrim)

Upper Hauterivian – lowermost Upper Barremian ammonite record of the San Isidro Formation, Santiago Huauclilla, Oaxaca State, southern Mexico

Moreno-Bedmar, Josep Anton (1); Serrano-Monroy, Diego Iván (2); Company, Miguel (3)

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New taxonomic, biostratigraphic, and paleobiogeographic data on ammonites from the San Isidro Formation in Santiago Huauclilla, southern Mexico, spanning from the Hauterivian to the Barremian stages, are presented. Sampling at five new localities yielded 730 specimens, leading to the identification of 21 taxa. Bed-by-bed sampling in four stratigraphic sections from four localities enabled the identification of eight ammonite zones: six correlate with the Standard Mediterranean Ammonite Zonation (SMAZ), and two with the Austral zonation of the Neuquén Basin (Argentina). The Upper Hauterivian exhibits a transitional pattern, with the two lower zones correlating with the Austral scheme and the two upper zones with the Mediterranean scheme. In the Barremian, the four recognized ammonite zones correspond to the SMAZ. The paleobiogeographic turnover between Austral and Mediterranean ammonite assemblages within the middle part of the Upper Hauterivian is initially gradual, with the Mediterranean index species Subsaynella sayni appearing in the lower half of the Upper Hauterivian. However, this transition ends abruptly, as Austral ammonites are entirely absent in the subsequent SMAZ zones. Three-dimensional models of key ammonites are being produced for biostratigraphic purposes as part of this ongoing study, and preliminary paleobiogeographic analyses support the integration of both zonal schemes. During the Barremian, Mexican ammonoids show a broad distribution of Holcodiscidae and Pulchelliidae. Notably, while Holcodiscidae are well represented in the studied area of Mexico, both in terms of specimen abundance and taxonomic diversity, they are extremely scarce in the Pacific domain (e.g., Colombia) and in the Austral province.

Talk

5b - Ammonites – what else? (Wiese, Ifrim)

Not ammonites, but sepioids: the oldest sepioid cephalopod from the Cretaceous discovered by zero-shot learning AI

Sugiura, Kanta (1); Ikegami, Shin (1); Takeda, Yusuke (2); Mutterlose, Jörg (3); Derin, Mehmet Oguz (4); Kubota, Aya (5); Nishida, Harufumi (6); Tainaka, Kazuki (7); Harada, Takahiro (4); Landman, Neil H (8); Iba, Yasuhiro (1)

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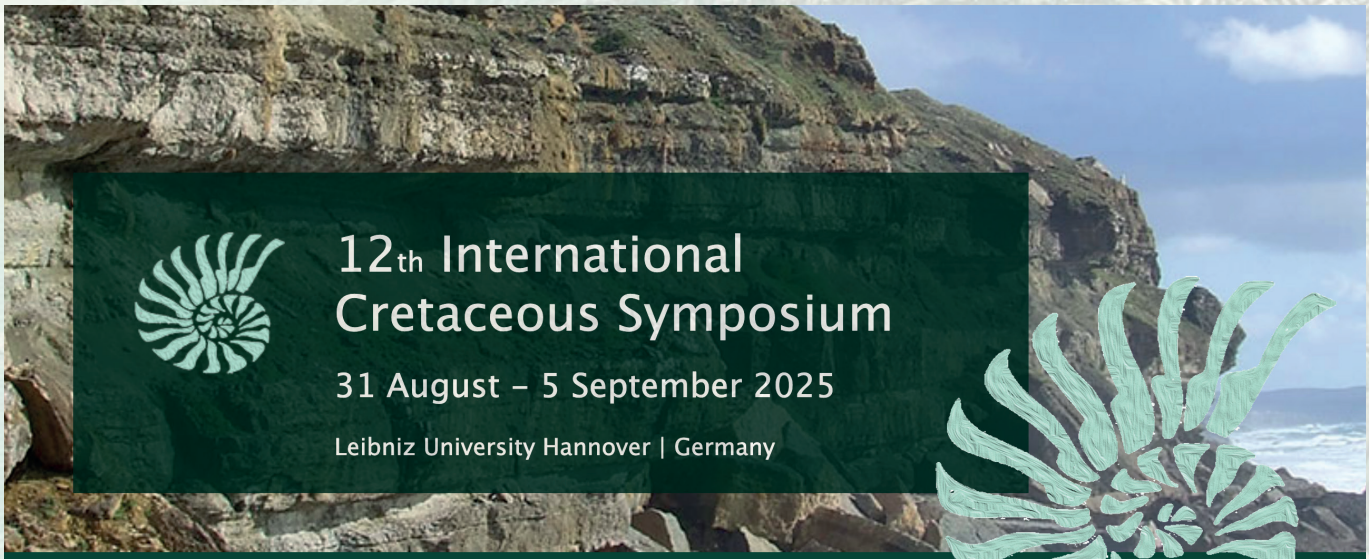
Sepioids are an evolutionarily successful group of modern ten-armed cephalopods (Decapodiformes) of high biodiversity, which provide a large amount of biomass in present-day oceans. They include the internal-shelled order Sepiida (cuttlefish) and the soft-bodied order Sepiolida (bobtail squid). The phylogenetic position and evolutionary history of these two orders are, however, so far poorly understood due to the patchy fossil record of Decapodiformes. Here we report a new genus and species from the upper Campanian to upper Maastrichtian (~74–67 Ma, Upper Cretaceous), South Dakota, which shows an intermediate morphology between Sepiida and Sepiolida. This is the first study in which an AI (artificial intelligence) model led to the discovery of a new fossil taxon. This new species demonstrates a close relationship between the two sepioid orders, which has previously been interpreted controversially. Our findings indicate that sepioids experienced an early phase of radiation in the later part of the Late Cretaceous.



12th International Cretaceous Symposium

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TALKS

5: Cretaceous Biota

Combined

5e: Cretaceous tetrapods from Europe

&

5f: Cretaceous vertebrates – open session

Talk

Combined 5e - Cretaceous tetrapods from Europe & 5f - Cretaceous vertebrates – open session

Cretaceous dinosaurs from Normandy (north-western France)

Buffetaut, Eric

CNRS, France

Normandy, in north-western France, has yielded a fairly large number of dinosaur remains since the 18th century. Most of them come from Jurassic rocks. However, several important dinosaur specimens have been collected from Cretaceous formations cropping out in the cliffs along the coast of the English Channel. The first record is an isolated caudal vertebra from the Albian of Bléville (Le Havre, Seine-Maritime), which was in the collection of the local palaeontologist Bucaille as early as 1877. It was identified as belonging to a sauropod in 1988 and later referred to Normanniasaurus genceyi Le Loeuff, Suteethorn & Buffetaut, 2013, a titanosaurian sauropod taxon based on vertebrae and pelvic elements from the same area and geological horizon. Caletodraco cottardi Buffetaut, Tong, Girard, Hoyez & Párraga, 2024 is a furileusaurian abelisaurid theropod described on the basis of a tooth, sacral and caudal vertebrae and ilia from the lower Cenomanian Chalk at Saint-Jouin-Bruneval (Seine-Maritime). To this scanty record can probably be added a bone found in the Cenomanian Chalk of Villers-sur-mer (Calvados) and referred to a bird on the basis of histological characters by Hupier in 1933 ; no detailed description was published and the whereabouts of the specimen are unknown. All these specimens come from marine deposits and the dinosaurs in question probably lived on emergent areas of the Armorican Massif, some 100 km to the west. Although scanty, this Cretaceous record from Normandy provides useful information about the dinosaur faunas which inhabited north-western Europe during the middle part of the Cretaceous.

Talk

Combined 5e - Cretaceous tetrapods from Europe & 5f - Cretaceous vertebrates – open session

New Insights into the Early Cretaceous Polar Vertebrate Faunas of Australia

Carrano, Matthew (1); Ziegler, Tim (2); Kool, Lesley (2); Fitzgerald, Erich (2); Vickers-Rich, Patricia (3); Rich, Thomas (2)

1: Smithsonian Institution, United States of America; 2: Museums Victoria, Australia; 3: Monash University, Australia

This study results from the first complete survey of vertebrate fossils (N > 4200) from the Lower Cretaceous terrestrial deposits of southeastern Australia. These materials, some of the richest samples of polar vertebrate fossils known anywhere in the Mesozoic, derive from two layers separated by ~10 my: the upper Barremian-lower Aptian upper Strzelecki Group and the lower Albian Eumeralla Formation. Both were deposited in rift-basin fluvial systems during the separation of Australia from Antarctica.

Most fossils are well-preserved, suggesting they were neither exposed to extensive surface weathering nor transported far from their initial burial sites, and thus likely retain information about their original source ecosystems. However, secondary deposition in high-energy river systems likely affected both small and large-bodied forms. The presence of rare elements from large theropod and ornithopod dinosaurs suggests that the absence of sauropods in both strata is genuine; conversely, the lack of small lepidosaurs and lissamphibians may be due to winnowing and needs to be further investigated.

Faunal profiles show high abundances of bony fishes and turtles—i.e. aquatic and semi-aquatic taxa—followed by dinosaurs (ornithopods being the most common), many of which show potentially close relationships with non-polar forms. Relictual giant temnospondyls in the upper Strzelecki gave way to much smaller crocodilians in the Eumeralla. Yet despite some important distinctions, these vertebrate communities seem to be polar ‘variants’ of non-polar ecosystems elsewhere in Gondwana.

Talk

Combined 5e - Cretaceous tetrapods from Europe & 5f - Cretaceous vertebrates – open session

Sauropods Strategically Established Nesting Colonies on Mid-channel Bar

Kim, Seongyeong (1); Lee, Yuong-Nam (2); Kim, Noe-Heon (3); Gihm, Yong Sik (4)

1: KNU G-LAMP Research Center, Kyungpook National University, Republic of South Korea; 2: School of Earth and Environmental Sciences, Seoul National University, Republic of South Korea; 3: Department of Geosciences, Princeton University, USA; 4: KNU G-LAMP Research Center, Kyungpook National University, Republic of South Korea

Dinosaur nests and their associated site fidelity are usually discovered in low-energy alluvial plains. However, the Gojeong-ri dinosaur egg site in Korea reveals an unusual nesting strategy and evidence of site fidelity, preserving numerous sauropod egg assemblages within high-energy braided river conglomerates. This includes an in-situ clutch of faveoloolithid eggs from a mid-channel bar deposit, with 127 out of 175 eggs in the study area preserved in high-energy conglomerates—suggesting periodic destruction of nesting colonies. All egg assemblages were categorized into three taphofacies based on the textural differences between the egg interiors and surrounding materials, a key taphonomic criterion: 1) in-situ clutches (Taphofacies I), 2) parautochthonous clutches (Taphofacies II), and 3) allochthonous clusters (Taphofacies III). Synthesizing insights from modern bird and turtle nesting behaviors with taphonomic analyses and interpretations, we propose that sauropods at Gojeong-ri utilized surrounding streams as natural moats to minimize predation risks and protect their nests. The sauropod's ability to balance the risks and benefits for reproductive success indicates their highly sophisticated egg-laying behavior.

Talk

Combined 5e - Cretaceous tetrapods from Europe & 5f - Cretaceous vertebrates – open session

Iridescent structural coloration in a crested Cretaceous enantiornithine bird from Jehol Biota

LI, Zhiheng; Hu, Jinsheng; Stidham, Thomas; Ye, Mao; Wang, Min; Pan, Yanhong; Zhao, Tao; Li, Jingshu; Zhou, Zhonghe; Clarke, Julia

IVPP, People's Republic of China

A combination of sectioning and microscopy techniques, along with the application of finite-difference-time-domain modeling on a fossil feather, results in the novel estimation of the range of iridescent colors from the fossilized melanosome type and organization preserved in the elongate head crest feathers of a new Cretaceous enantiornithine bird. The densely packed rod-like melanosomes are estimated to have yielded from red to deep blue iridescent coloration of the head feathers. The shape and density of these melanosomes also may have further increased the feather's structural strength. This occurrence on a likely male individual is highly suggestive of both a signaling function of the iridescent crest, and a potential behavioral role in adjusting the angle of light incidence to control the display of this iridescent structural coloration.

Talk

Combined 5e - Cretaceous tetrapods from Europe & 5f - Cretaceous vertebrates – open session

The upland theropod fauna from an Early Cretaceous fissure fill in Balve (NW Germany)

Theda, Denis (1); Nau, Darius (2); Dederichs, René (3); Hendrickx, Christophe (4); Schwermann, Achim (5)

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The Balve site is an Early Cretaceous Karstic (Barremian to Aptian) fissure fill within Devonian limestone situated in Northwestern Germany. The deposits most likely represent a cave infill in an upland environment, which was situated at least 100 m above sea level. Hence, this locality offers valuable insights into a Cretaceous hinterland ecosystem. Annual excavations at the site are being carried out by the LWL Museum of Natural History Münster since the year 2000 and have yielded remains of a diverse vertebrate fauna. This faunal assemblage includes osteichthyes, chondrichthyes, amphibians, multiple mammal taxa, crocodilians, pterosaurs and dinosaurs. Among the latter are numerous teeth and isolated bones referrable to Theropoda. Based on an analysis of the former, a previous report has already indicated the presence of Tyrannosauroidea among the fossil material. The results of our morphometric analysis of an isolated, partial quadrate suggests strong affinities with the British Eotyrannus, supporting the presence of tyrannosauroids. An as of yet indeterminate taxon of large theropod dinosaur is represented by an additional, larger and almost complete quadrate bone. Another, recent addition to the theropod fauna present at the Balve locality is ornithomimosaurs, represented so far by a manual ungual and a distal third metatarsal fragment. Ongoing analyses of the material potentially indicate the presence of further groups at the site, contributing to our growing understanding of this Early Cretaceous upland ecosystem.

Talk

Combined 5e - Cretaceous tetrapods from Europe & 5f - Cretaceous vertebrates – open session

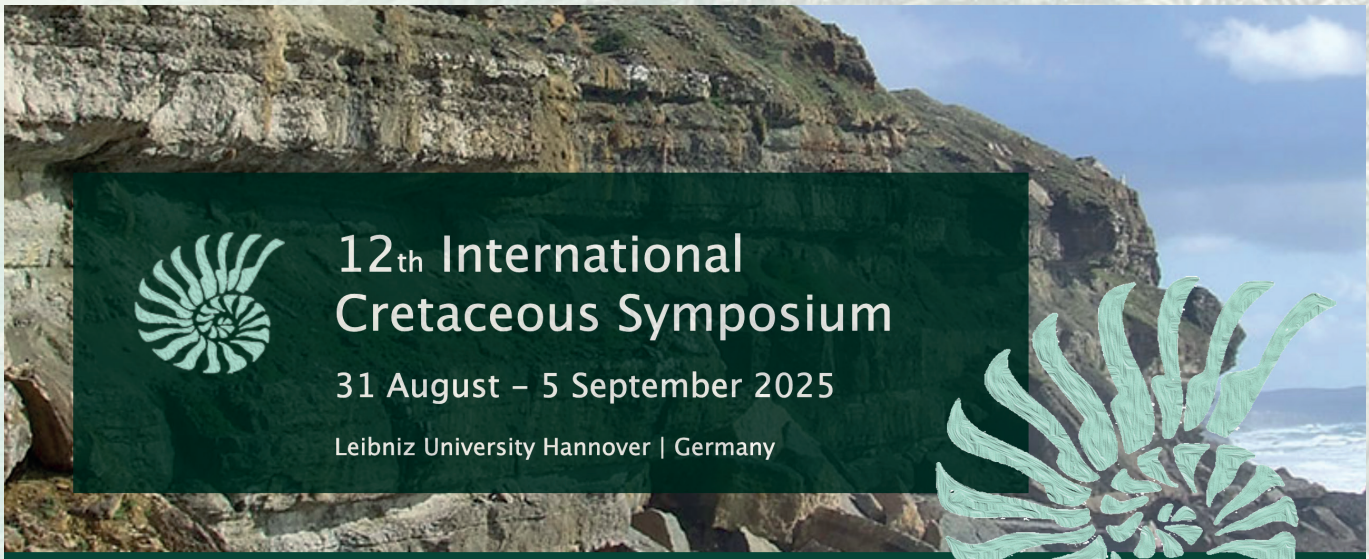
Soft tissue preservation in cretaceous teleost larvae reveals evolutionary patterns of peritoneum pigmentation

Zhang, Jing; Du, Baoxia; Li, Aijing

School of Earth Sciences & Key Laboratory of Mineral Resources in Western China (Gansu Province), Lanzhou University, China

Mesozoic teleost fossils are globally widespread. However, larval fish fossils with preserved soft tissues remain rare in the geological history, thereby constraining our understanding of the early evolution and life history traits of teleost. Here, we describe a group of incompletely ossified teleost larvae fossils from the Lower Cretaceous in northwest China, exhibiting clear soft tissue preservation in the eyes, trunk and dorsum of the abdominal cavity, with ultrastructural features consistent with melanosomes. The consistent presence of similar pigment patterns across distinct developmental stages provides a foundation for the identification of incompletely preserved larval fish fossils. Notably, the pigment pattern observed in the dorsum of the abdominal cavity is commonly found in extant teleost larvae fishes. Ancestral state reconstruction based on peritoneum pigmentation distribution patterns in 470 existing fish species reveals teleost fishes usually present a row of melanophores in the upper abdominal cavity in the early stage of their evolutionary history. This pigmentation pattern may represent a primitive trait of teleosts, providing photo-protective function against ultraviolet radiation for hematopoietic tissues during larval development. It is worth noting that most species that differentiated in the late Mesozoic were generally covered with melanophores in the abdominal cavity. This shift in pigmentation may correlate with Mesozoic environmental stressors.

This work is supported by the National Natural Science Foundation of China (42372006 and 42272029), the Fundamental Research Funds for the Central Universities (lzujbky-2022-ey18) and the Gansu Province Postgraduate Innovation Star Program (2025CXZX-090).



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TALKS

5: Cretaceous Biota

5g: Terrestrial flora evolution during Cretaceous

Talk

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

Early Cretaceous flora transition in the Jiuquan area, Northwest China

Du, Baoxia (1); Li, Aijing (1); Peng, Jing (1); Fu, Yiqiao (1); Dong, Chong (2)

1: School of Earth Sciences & Key Laboratory of Mineral Resources in Western China (Gansu Province), Lanzhou University, China; 2: Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China

The Cretaceous period was marked by a pronounced greenhouse climate, characterized by the diversification and development of key biological groups and substantial transformations in terrestrial ecosystems. Based on a comprehensive study of plant diversity and the evolution of terrestrial climatic environments during the Early Cretaceous in Jiuquan area of NW China, a diverse assemblage of well-preserved gymnosperm and early angiosperm fossils has been identified. The gymnosperm fossils encompass a diverse range of taxa, including Ephedra, Pseudofrenelopsis, Brachyphyllum, Pagiophyllum, Torreya, Athrotaxites, Araucaria, Carpolithus, Pterophyllum, Nilssoniopteris, Phasmatocycas and Podozamites. The angiosperm fossils identified include Gansufructus, Fairlingtonia, and Jixia. Integrated with comprehensive research on the paleo-climate and environment of the study area, the findings indicate that the intensification of the greenhouse climate, the aridification of the paleo-environment, fluctuations in paleoatmospheric CO_2 concentrations, and frequent wildfire events collectively played a significant role in shaping the transformation of vegetation landscapes, particularly the diversification of early angiosperms in the Jiuquan area during the Early Cretaceous. These achievements not only offer crucial evidence for the radiation evolution of plants in the northwest inland region of China during the Early Cretaceous period, but also possess substantial scientific significance for evaluating the potential impacts of greenhouse climate on biodiversity and ecosystems.

This work is supported by the National Natural Science Foundation of China (42372006 and 42272029) and the Fundamental Research Funds for the Central Universities (lzujbky-2022-ey18).

Talk

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

A New Aquatic Flora in the Late Cretaceous Ecosystem of Egypt: Evidence from Palynology and Mesofossils

El Atfy, Haytham (1); Kerp, Hans (1); Schneider, Harald (2); Kassem, Ahmed (3); Bomfleur, Benjamin (1)

1: University of Münster, Germany; 2: Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, China; 3: Gulf of Suez Petroleum Company, Egypt

We present a new assemblage of diverse and exceptionally well-preserved megaspores from Egypt, based on material from core samples from the Upper Cretaceous (Coniacian–Santonian) Matulla Formation in the Gulf of Suez. Hundreds of megaspore specimens of at least three genera significantly extend our knowledge of the flora of the Matulla Formation, which is based solely on dispersed palynomorphs. Well-preserved sporocarps with in situ micro- and megaspores of a Marsileaceae-like water fern are of particular importance. The retrieved spores closely resemble Ariadnaesporites. Together with dispersed Ariadnaesporites megaspores and associated microspores, these fossils provide further evidence for an evolutionary link and possibly ancestral position of Ariadnaesporites within Salviniales. The diverse array of megaspores and other associated mesofossils identified in this study suggests that they are under-represented in the macrofloras of Egypt and were likely essential constituents of the vegetation. The mixed character of the assemblages and the presence of damaged specimens and fragments in all of them support the interpretation of lacustrine to paralic environments of deposition for the studied sedimentary units.

Talk

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

Early Cretaceous Jehol Biota Flourished in Humid Mountain Lake Drainage

Gao, Yuan (1); Chen, Jiquan (1); Ibarra, Daniel E. (2); Sha, Lijuan (3); Wang, Chengshan (1)

1: China University of Geoscience Beijing, China, People's Republic of; 2: Brown University, USA; 3: Xi'an Jiaotong University, People's Republic of China

Water is the foundation of life, with its dynamic process profoundly impacting topographic development, habitat types and species richness; while few studies have shown convincing correlations between hydrological features and biological evolution in deep time due to the lack of quantitative proxies. This study. Here, we use triple oxygen and clumped isotope measurements of lacustrine carbonate to provide first insights into the environmental relative humidity (RH) for the Early Cretaceous Jehol Biota, known for the earliest flowering plants, feathered dinosaurs, and early birds, yet reasons for its astonishing richness are unclear. The isotopic results suggest that the Jehol Biota flourished in a humid climate with an RH value of 0.82 (±0.03, 1σ), consistent with humidity-sensitive fossil evidence (RH > 0.65). Combined with carbonate formation temperatures of 6.5 to 13.9 ℃, which indicate elevations of 2.1 to 3.1 km, and regional stratigraphy suggesting the lakes occupied areas over 85,000 km^2, the habitat of the Jehol Biota is analogous toanalogous to that of modern biodiversity hotspots such as Shangri-La in the Hengduan Mountains or Páramos in the tropical Andes. In the Early Cretaceous, the destruction of North China Craton facilitated Pacific-derived moisture influx into inland regions, which shape the diverse habitat environment and provide abundant moisture for the flourishing of the Jehol biota.

Talk

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

The first record of fossils of Pinuxylon wood and Xenoxylon wood from the Cretaceous period in Shandong Province

Hao, Ruiying (1); Jiang, Zikun (1); Xu, Kemin (2); Ning, Zhenguo (3); Tian, Ning (4); Xie, Aowei (5); Shi, Xiao (6); Wang, Yongdong (7); Xu, Guohua (8); Zhang, Fuxia (8)

1: Chinese Academy of Geological Sciences, China; 2: Shandong Institute of Geological Survey, China; 3: Department of Natural Resources of Shandong Province, China; 4: College of Palaeontlogy, Shenyang Normal University, China; 5: Senckenberg Forschungsinstitut und Naturmuseum Frankfurt, Germany; 6: College of Earth Sciences, Jilin University, China; 7: Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, China; 8: Wulian County Natural Resources and Planning Bureau, China

Compared to fossil plant organs such as leaves, petrified wood constitutes 80% of the total biomass of plant remains and serves as a crucial resource for investigating flora characteristics and vegetation evolutionary history. The Mesozoic era is considered as a significant period for the diversification and radiation evolution of fossil wood in China. Early Cretaceous fossil woods demonstrate remarkable diversity across both northern and southern flora regions. Recent studies on permineralized plants in the North China Block have enhanced our understanding of Early Cretaceous plant community evolution. However, Cretaceous fossil wood occurrences remain exceptionally scarce in Shandong Province compared to other regions. This study documents the first occurrence of Pinuxylon and Xenoxylon fossil woods from the Early Cretaceous Yangjiazhuang Formation (Laiyang Group) in Shichang area, Rizhao City, Jiaolai Basin of Shandong Province. The Jiaolai Basin of China is the southernmost edge of the distribution of the northern Jehol Biota and an important area which bears both the northern and southern palaeogeographical fauna representative species. Our study of these specimens has enriched our understanding of the floral landscape in the transitional region between the north and south flora.

Talk

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

Late Cretaceous paleowildfire event recorded in Dayangshu Basin, eastern Inner Mongolia, northern China and their paleo-environmental significance

Hui, Jianguo (1,2); Peng, Jungang (1); Dong, Chong (1); Wang, Ting (1,3); Yin, Suxin (1,2); Shi, Gongle (1)

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As a crucial disturbance factor in terrestrial ecosystems, wildfires have played a significant role in forest ecosystems since the Silurian Period. During the Cretaceous, a critical transitional phase in Earth's history, wildfire activities exerted profound impacts on evolution of ecosystems. In this study we investigate the palaeowildfire events recorded in the Second Member of the Nenjiang Formation (Campanian) in the Dayangshu Basin, eastern Inner Mongolia, northeastern China. Microstructural analysis of charcoal fossils using scanning electron microscopy (SEM) revealed well-preserved anatomical features of various plant organs, including xylem, leaves, and seeds. Inertinite reflectance ranging from 1.73% to 6.48%, with a mean value of 3.35%, suggesting that the fire temperatures could reach up to approximately 580℃. These data indicate the occurrences of crown fires during this period. Palynological sequences suggest that before the fire broke out, fern spores were more abundant, while gymnosperms and angiosperms were less abundant. A marked increase of angiosperm pollen (mainly represented by Nymphaeacidites) was observed immediately after palaeowildfire. This appears suggest that the fire enhanced surface erosion and consequent nutrient influx into aquatic systems that promoted aquatic plant proliferation. Conifer pollen started to predominate the palynoflora soon after the wildfire event. Such successional floral/palynofloral pattern suggests that wildfires could probably eliminate some ferns, while conifers ultimately dominated in this fire-prone environment due to its fire resistance.

Talk

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

New investigations on Cretaceous woods from the Jiaolai Basin, Shandong Province and their palaeoclimate relevance

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The Jiaolai Basin of China is the southernmost edge of the distribution of the northern Jehol Biota and an important area which bears both the northern and southern palaeogeographical fauna representative species. The Laiyang flora in the Jiaolai Basin is located in the transitional region between the Early Cretaceous southern and northern flora of China. Currently, research on the plants in the transitional region between the northern and southern flora are relatively weak. Our study of specimens has enriched our understanding of the floral landscape in the transitional region between the north and south flora. Cretaceous wood fossils are well preserved in China and 66 species of 29 genera have been reported up to now, which are widely distributed in China. However, in the Cretaceous Shandong Province, there are few records of wood fossils. So far, only one genus and two species have been reported.

A new material of fossil wood is described from the Early Cretaceous Zhifengzhuang Formation of Laiyang Group in Jingzhi area of Anqiu City, Jiaolai Basin, Shandong Province. The present specimen has uniseriate to triseriate pits on the radial walls of tracheids, taxodioid cross-field pitting and other characters. This discovery contributes to a better understanding of fossil wood diversity in Jiaolai Basin during the Cretaceous. Through the well preserved growth rings of the specimens, it can be inferred that the environmental paleoclimate of the Early Cretaceous in Shandong Province was generally arid, with some areas being humid.

Talk

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

Evolution of Cretaceous vegetation in Europe with particular focus on monocots and their palaeogeographical consequences

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The evolution of Cretaceous vegetation is closely associated with the evolution of angiosperms. In the Early Cretaceous, alluvial forests were formed and dominated by gymnosperms, particularly conifers. Angiosperms partly formed the forests' understorey, but grew more as shrubs, predominantly on slopes and disturbed habitats. In the Late Cretaceous, angiosperms became dominant in most of the terrestrial palaeoenvironments in Europe. They grew particularly on alluvial plains, where lauroid and platinoid angiosperms prevailed in the Cenomanian; in the Coniacian-Santonian, this environment was enriched by eudicots, particularly from the Normapolles complex.

In terms of plant strategies, angiosperms from the Early Cretaceous exchanged a ruderal (disturbed) strategy for a competitive strategy in the Late Cretaceous. Conifers grew in alluvial plains in the Portuguese Early Cretaceous, while they dominated salt marshes and wetlands in the European Late Cretaceous. During the Cretaceous, they exchanged a competitive strategy in the Early Cretaceous for a stress-tolerant strategy in the Late Cretaceous.

Among angiosperms, monocots show sharp differences in occurrence in European Cretaceous. While in the Early Cretaceous monocots are rare or entirely absent, their massive occurrence in the Late Cretaceous, particularly in the Gosau Cretaceous is of interest. It fits with the theory, that monocots originally evolved in Gondwana. Hypotheses have been developed that the Alpine orgonic system brought Gosau Cretaceous flora as passengers from the African coast, riding on the Adriatic Microplate.

Talk

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

Early Cretaceous palynofloras of the #15 coal seam (Hailar Basin, Inner Mongolia)

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Coal seams deposited in the Hailar Basin in Inner Mongolia, China act as valuable archive of past floras, climates and environments of the Early Cretaceous. A total of 19 samples were collected from the #14 and #15 coal seams, including the interburden, of the Albian-aged Yimin Formation. The aim of the study was to develop a high-resolution reconstruction of floral changes within the 9.5 m thick #15 seam using palynology.

Osmundacean fern spores (Osmundacidites) are the most abundant components of the assemblage. The fern spores Cyathidites and Deltoidospora show a upseam decrease whereas bryophyte spores (Sphagnumsporites) increase. Gleicheniacean (Gleicheniidites) and anemiacean (Cicatricosisporites) fern spores are higher in abundance in the mudstone floor and seam partings, indicating an apparent low tolerance for the harsh acidic and anoxic conditions of the mire. Pollen derived from cupressacean conifers (Perinopollenites) increase in abundance upseam whereas pinacean pollen (Pinuspollenites) decreases. Araucarian pollen is only present in the lower part of the seam. Other conifer pollen that appears consistently include Podocarpidites and Sciatopityspollenites. No angiosperm pollen was observed. Freshwater algae are present in the mudstone and sandstone partings and interburden.

The changes in flora across the seam reflect changes in water availability. The basal part of the seam is affected by periodic flooding, whereas the conditions in the middle of the seam are more stable allowing the establishment of the woody vegetation. The uppermost part of the seam is a mixed flora of ferns, bryophytes, lycophytes and conifers preceding the termination of peat deposition by flooding.

Oral

5g - Terrestrial flora evolution during Cretaceous (Zhang, Du, Heimhofer)

Floral Turnover and Its Climatic Significance in the Continental Interior of East Asia During the Early Cretaceous

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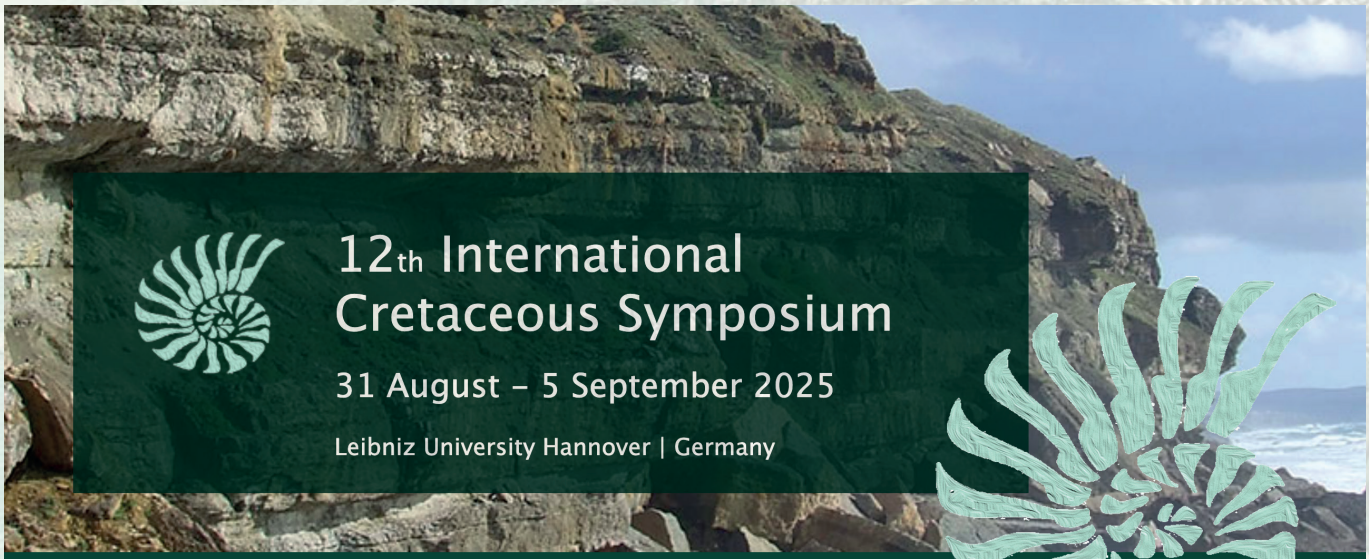
Multiple Dramatic Episodes of Environmental Changes (EECs) occurred during the gradual intensification of the Early Cretaceous greenhouse climate. During this period, the hydrological cycle intensified, leading to enhanced global weathering, increased productivity, and ultimately massive organic carbon burial. However, these conclusions are primarily based on paleoenvironmental studies of marine sedimentary records, whereas research on long-term terrestrial paleoenvironmental fluctuations remains extremely limited. In recent years, we have conducted extensive palynological studies on long-sequence Lower Cretaceous continental deposits in the inland regions of northwestern China. Our findings reveal that the Late Jurassic flora, dominated by Classopollis (~80%), rapidly transitioned into a humid-adapted flora in the earliest Early Cretaceous (Berriasian–Valanginian), characterized by bisaccate Pinaceae pollen, trilete fern spores, and Taxodiaceae pollen. By the mid-Early Cretaceous (Hauterivian–early Barremian), the vegetation shifted again, this time to a conifer-dominated flora with bisaccate pollen exceeding 80%. In the late Early Cretaceous (Aptian–Albian), the vegetation reverted to a Classopollis-dominated assemblage (~80%), representing a Cheirolepidiaceae-dominated flora, alongside the appearance of early angiosperm groups. These repeated transformations in Early Cretaceous vegetation clearly reflect revolutionary shifts in climatic conditions, evolving from the hot and arid Late Jurassic to a warm and humid climate in the earliest Early Cretaceous, then transitioning to a cooler, more humid climate in the mid-Early Cretaceous, before finally returning to a prolonged stable hot and arid regime. This long-term climatic sequence may represent a response to the progressive intensification of the Early Cretaceous greenhouse climate.



12th International Cretaceous Symposium

31 August – 5 September 2025

Leibniz University Hannover | Germany

TALKS

6: Workshop

6a: Cretaceous Earth dynamics and climate in Asia – IGCP 679

Oral

6a - Cretaceous Earth dynamics and climate in Asia – IGCP 679 (Li, Hasegawa)

Paleoclimate reconstruction of Early Cretaceous East Asia using whole-rock geochemistry and climate modeling

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Reconstructing the Cretaceous climate is important for understanding the Earth system dynamics under greenhouse conditions. However, compared to marine archives, paleoclimate records from continental basins are still limited, including those across the Asian region. This study investigates terrestrial paleoclimate across east Asia during the Early Cretaceous by analyzing whole-rock geochemistry of fine-grained mudstones from the regions including Mongolia (Gobi), China (Junggar, Heilongjiang, Liaoning, Shandong, Sichuan), northern Japan (Iwate) and northeastern Vietnam (Banhang). In addition, numerical simulations were performed using an atmosphere-ocean-vegetation coupled model, the MIROC4m-LPJ model, which simulates Aptian (120 Ma) climates under two orbital scenarios: present-day parameters (PI orbit) and parameters maximising Northern Hemisphere seasonality (Hot orbit). The reconstructed chemical weathering intensity based on the RW index tended to increase from high-latitude to low-latitude areas and exhibited higher values along coastal regions compared to lower values in inland areas. The spatial distribution of the RW index is consistent with the simulated surface temperature and precipitation patterns. Notably, the Sichuan Basin, which showed the most significant variability in weathering intensity, also showed the greatest differences in precipitation between the PI and Hot orbit simulations. The agreement between geochemical proxies and model results underscores the reliability of the RW index and demonstrates the utility of climate models in interpreting geological records. A more comprehensive spatio-temporal reconstruction of the Cretaceous Asian paleoclimate will be possible with additional data from diverse localities, highlighting the need for further chronostratigraphic and geochemical investigations.

Oral

6a - Cretaceous Earth dynamics and climate in Asia – IGCP 679 (Li, Hasegawa)

Detrital zircon U-Pb geochronology of the Cretaceous Goheung Basin, southern margin of the Korean Peninsula

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U-Pb ages of detrital zircons from the Goheung Basin were analyzed to determine depositional ages and provenance. This Cretaceous non-marine basin at the southern Korean Peninsula margin borders the Gyeongsang Basin, but its evolution remains poorly understood. We separated detrital zircons from 12 samples (six sandstones and six boulders) and analyzed U-Pb isotopic compositions of 1419 zircon grains.

Results reveal zircon ages spanning from 3650 Ma to 80 Ma (Archean to Cretaceous). Lower strata contain primarily Paleoproterozoic and Jurassic zircons with youngest Early Cretaceous ages (130-120 Ma), while upper strata show mainly Cretaceous and Jurassic ages with youngest Late Cretaceous ages (90-80 Ma). These depositional ages align with previous studies using plant fossils and detrital zircons. The zircon age spectra indicate a provenance shift from the adjacent Yeongnam Massif to the southwestern Korean Peninsula, which experienced intense Late Cretaceous volcanic activity. This shift provides insights into the tectonic and paleogeographic evolution of southern Korea during this period, potentially clarifying the relationship between the Goheung and Gyeongsang basins.

Oral

6a - Cretaceous Earth dynamics and climate in Asia – IGCP 679 (Li, Hasegawa)

Mid-Cretaceous Oceanic Anoxic Events in the eastern Tethys: Calcareous nannofossil biostratigraphy and carbon isotope constraints from southern Tibet

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The mid-Cretaceous (Albian–Turonian) interval was marked by major environmental changes on a global scale. These are documented in the sedimentary record by significant floral and faunal shifts, black shales and by perturbations of the carbon cycle. The latter are commonly recognized as positive or negative carbon isotope excursions (CIEs), commonly associated with oceanic anoxic events (OAEs). High-resolution carbon isotope records spanning this time interval have been established in the western Tethys and other regions around the world. Here we present new bio- and chemostratigraphic data of an uppermost Albian to lowermost Turonian record from the eastern Tethys (Qiangdong section, southern Tibet). A biostratigraphic study, based on calcareous nannofossils, provided relatively abundant, and moderately preserved calcareous nannofossils from the Albian – Turonian interval. The first occurrence of the calcareous nannofossil zonal marker species Corollithion kennedyi (UC1a, 100.5Ma) and Quadrum intermedium (UC5c, 94.1Ma) constrain the Albian/Cenomanian and Cenomanian/Turonian boundary in the Qiangdong section, respectively. A continuous $\delta^{13}C_{carb}$ record provides a detailed chemostratigraphic framework, with a positive CIE (~1.5‰) near the Albian/Cenomanian boundary correlating with the latest Albian OAE 1d. While the $\delta^{13}C_{carb}$ record robustly captures the OAE 1d excursion, the characteristic CIE associated with OAE 2 is less prominent, likely due to diagenetic overprinting. Our work provides a good reference for local and global comparisons.

Oral

6a - Cretaceous Earth dynamics and climate in Asia – IGCP 679 (Li, Hasegawa)

Progress of IGCP 679: Cretaceous Earth Dynamics and Climate in Asia

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The IGCP 679 project (Cretaceous Earth Dynamics and Climate in Asia) is based on the Earth system sciences to explore the processes and mechanisms of the rapid change in climate and environment under greenhouse conditions during the Cretaceous and the evolutionary responses of biodiversity on land and in the oceans of the Asian continent. The project has played an important role in promoting geoscience communication among Asian countries, including some countries outside Asia. In the last year, our project has made exciting research results on Cretaceous palaeontology, sedimentology, palaeoecology and palaeoclimate. Micro-CL scanning analysis confirms that the middle Jehol biota pterosaur Haopterus gracilis is a sister-taxon of the Lebanese istiodactyliform Mimodactylus libanensis. A new large-sized Early Cretaceous pterosaur footprint Pteraichnus junggarensis from the Junggar Basin, China was produced by the large pterosaur Dsungaripterus weii. The first pterosaur species Nipponopterus mifunensis from Japan is a sister taxon to the Mongolian unnamed azhdarchid. The Aptian-Albain tree fern Acanthopteris (Dicksoniaceae) from North China, Siberia, Russia and the Inner Zone of Japan indicates a warm and humid tropical to subtropical climate. New rainforest insects were recovered from the mid-Cretaceous Kachin amber. Terrestrial records of two hyperthermal events from a Cretaceous-Paleogene transition sequence in southeastern China suggest different forcing mechanisms. Late Early Cretaceous atmospheric CO_2 reached 2132 ppm based on stomatal and isotopic analysis of Pseudotorellia from Mongolia. The first terrestrial response to the Early Cretaceous Weissert Event indicates that the anoxia and/or high TOC deposition in inland lakes were not inherent features.

Oral

6a - Cretaceous Earth dynamics and climate in Asia – IGCP 679 (Li, Hasegawa)

The contribution of Deccan traps to the mass extinction at K-Pg boundary in east China

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The mass extinction at the Cretaceous-Paleogene (K-Pg) boundary was coincided with the Chicxulub event and occurred concurrently with Deccan traps eruptions in India. However, whether this extinction resulted from a single cause or multiple factors, and which mechanism played the dominant role, remains controversial. Previous studies identified the K-Pg boundary in the LK-1 core from the Jiaolai Basin at the depth of ~523 m. Our integrated palynological and geochemical analysis of the same core reveals about 10 m upper than the previous supposed boundary. Notably, several K-taxa (species that became extinct after the K-Pg boundary) persist in the uppermost pollen-bearing sample at 515.4 m, confirming a latest Cretaceous age and suggesting the boundary lies immediately above. High field strength elements (e.g., Zr, Hf), which remain immobile during diagenesis, effectively trace volcanic inputs as crypto-tephra in sediments. Similarly, mercury (Hg) anomalies serve as reliable proxies for Large Igneous Province eruptions. Our data reveal two distinct pulses of volcanism in the Jiaolai Basin. Following the second volcanic pulse (516.1–514.8 m), climatic cooling culminated in the complete collapse of terrestrial vegetation by 515.4 m. While iridium (Ir) concentrations showed no significant anomaly, a pronounced Ir/Al_2O_3 peak at 513.55 m likely reflects extraterrestrial input from the Chicxulub impact. Consequently, we propose the K-Pg boundary lies between 514.8 m and 513.55 m, most probably near 513.55 m. This implies terrestrial flora experienced major extinctions prior to the impact event, supporting a primary role for Deccan Traps volcanism in driving the mass extinction.

Oral

6a - Cretaceous Earth dynamics and climate in Asia – IGCP 679 (Li, Hasegawa)

Middle Cretaceous terrestrial vegetation evolution and paleoclimate change across the OAE2 event： Insights from the palynological evindence of the SK3, Songliao Basin, NE China

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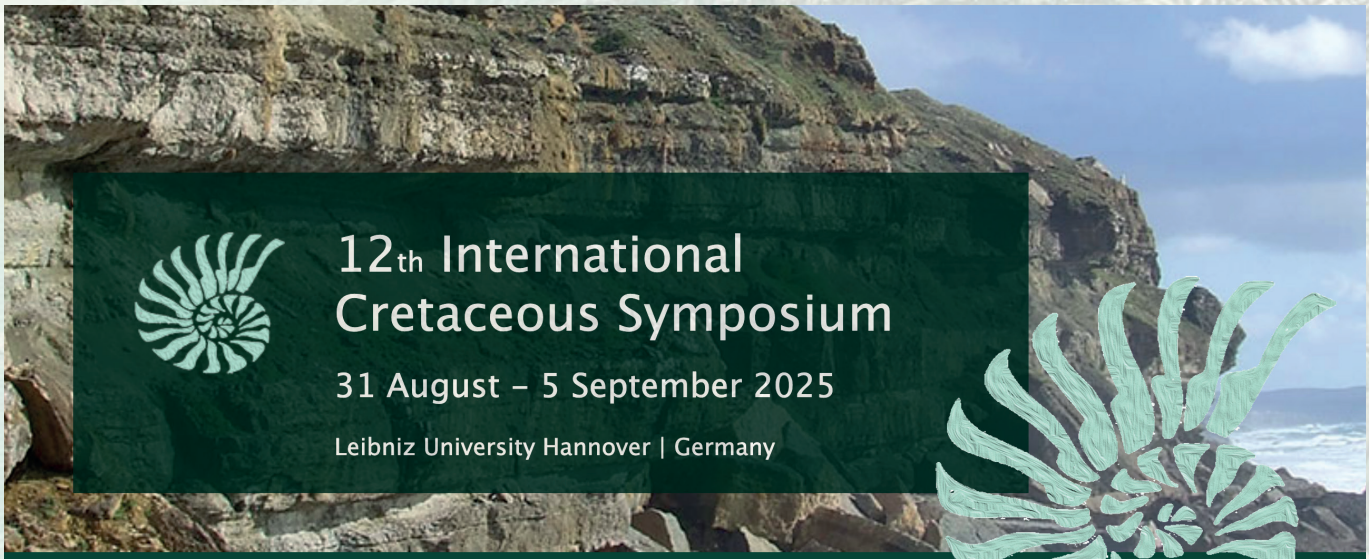
The Mid Cretaceous represents a typical greenhouse world period, characterized by the Oceanic Anoxic Event 2 (OAE2) and early origin and radiation of angiosperms. However, the middle Cretaceous climate, biota and OAE2 records are mainly obtained from marine strata, while these information from terrestrial strata is very limited. The middle Cretaceous non-marine strata of the Songliao Basin is well developed, with relatively abundant spore and pollen, which is very important for understanding the non-marine climate change, vegetation evolution of angiosperms and OAE2 during the middle Cretaceous. The International Continental Scientific Drilling Program (ICDP) borehole SK-3 of the SongliaoBasin, provided unique materials for understanding the middle Cretaceous non-marine climate change, evolution of angiosperm and OAE2. Three palynomorph assemblages, Leiotriletes-Schizaeoisporites-Osmundacidites, Inaperturopollenites-Cyathidites-Retitricolpites and Schizaeosporites-Quantonpollenites-Tricolpopollenites, are identified from the upper Denglouku Formation (K1d4), first and second member of the Quantou Formation (K2q1+2), and third member of the Quantou Formation (K2q3), respectively, ranging from Cenomanian to early Turonian. A high-precision palynomorphs analysis of the K2q3 is carried out in detail to reveal the terrestrial OAE2 records. It is suggested that a hot and arid terrestrial climate with cold snap during the OAE2 interval of east Asia. The climate was much arider during OAE2 than the lower and upper layers. What's more, OAE2 may accelerate the evolution of angiosperms.



POSTERS

Poster Sessions 1a, 1b, 1c, 2b

1a: Jurassic-Cretaceous boundary interval
1b: Non-marine Cretaceous stratigraphy and terrestrial ecosystem
1c: Integrated stratigraphy and re ining the Cretaceous timescale

2b: Paleoecology, paleobiogeography and biostratigraphy of Cretaceous marine fossils…

Poster

Poster Sessions 1a, 1b, 1c, 2b

Carbon isotope stratigraphies across the Jurassic-Cretaceous boundary from DSDP Site 534A

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This research focuses on Late Jurassic–Early Cretaceous high-resolution carbon isotope stratigraphies derived from DSDP Site 534A located in the central Atlantic Ocean. We present both $\delta^{13}C_{carbonate}$ and $\delta^{13}C_{organic}$ data (combined with published datasets) in order to evaluate whether a consistent pattern in carbon isotope variation can be established, particularly with respect to the Jurassic–Cretaceous boundary. We observe positive values in the Late Callovian followed by a decrease is $\delta^{13}C_{carbonate}$ through the Late Jurassic and across the Jurassic-Cretaceous boundary, consistent with carbon isotope stratigraphies of Tethys. Biostratigraphic and magnetostratigraphic data allow us to accurately place the low point seen in the carbon isotope curve within these schemes. The $\delta^{13}C_{carbonate}$ minimum appears within magneto zones M14-M12 and nannofossil zones NK-2B - NK3A. The Valanginian positive excursion (Weissert event) is clearly seen. The $\delta^{13}C_{organic}$ data although more scattered, also show positive values in the Late Callovian followed by a decrease in values through the Late Jurassic and across the Jurassic-Cretaceous boundary. The Valanginian (Weissert event) is also evident in our $\delta^{13}C_{organic}$ data suggesting organic carbon and dissolved inorganic carbon were coupled during this time. In contrast to some high-latitude $\delta^{13}C_{organic}$ records, a marked Tithonian (~middle Volgian) VOICE negative excursion is not observed. Our data leads us to conclude that curiously there was latitudinal decoupling between the Arctic and Atlantic/Tethyan seas.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Marine palynological records from cored intervals across the Jurassic-Cretaceous transition in the Netherlands

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Studying the Jurassic-Cretaceous transition is never easy: the interval is plagued by faunal endemism and hiatuses. In the Netherlands, the Cimmerian rift phase was in full swing during the Jurassic-Cretaceous transition, resulting in non-marine facies and unconformities. In some areas however, e.g. the offshore Terschelling and Dutch Central Graben basins, subsidence continued uninterruptedly allowing marine sediments to accumulate during the Jurassic-Cretaceous transition. In a published record1 from cored intervals ammonites were retrieved, alongside with dinoflagellate cysts and pollen and spores, allowing calibration of the dinoflagellate cysts events to ammonite zones. In the neighboring Dutch Central Graben, the sediments across the at the Jurassic-Cretaceous boundary are coarse-grained and display intra-formational reworking. Surprisingly, the palynological assemblages, even the reworked specimens, are well preserved. The reworked specimens are probably derived from lithic clasts floating in the sandy matrix. Because of the excellent preservation, it was difficult to distinguish between reworked and in situ specimens. High resolution and detailed taxonomic analyses made it possible to constrain the Jurassic-Cretaceous transition biostratigraphically. In terms of paleoenvironment, the boundary interval is also very interesting, high dominance/low diversity dinoflagellate cyst assemblages reflect restricted marine conditions. The common occurrence of genera such as Mendicodinium, Senoniasphaera and Muderongia points to low salinity environments related to freshwater input. Also interesting are the recurrent peak abundances of extremely large and thick-walled specimens of Cribroperidinium hanseni, although a cause for this phenomenon could not be established.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Biostratigraphic and Taxonomic Approaches of Non-Marine Ostracods in Brazilian Basins, Brazil

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The studied basins included the Tucano and Jatobá sedimentary basins and the comparison with chronocorrelated Brazilian basins. The biostratigraphy of these basins has been established through the identification of fossil ostracods, with species from this group serving as guide for local stratigraphic stages of Lower Cretaceous. This biostratigraphic framework based on ostracods covers the Tithonian–Aptian ages and is applied to both Brazilian onshore and offshore basins. Focusing on providing updates for the Tithonian–Barremian interval, this study involved field visits to mapped localities within these basins to collect material for analysis and species identification, aiming also to recognize potential index taxa. In total, 91 outcrop samples were collected and processed in the laboratory for the recovery the calcareous microfossils. Representatives of the non-marine genera Theriosynoecum, Cypridea, Candona, Brasacypris, Paracypridea, Salvadoriella, Reconcavona, Rhinocypris, Darwinula, Alicenula, and Tucanocypris were identified, supporting the fluvial and lacustrine paleoenvironment described for these geological interval. The main dating species recovered were Theriosynoecum pricei, present in several basins and indicative of the Tithonian; Candona? condensa (Berriasian–Valanginian); Paracypridea elegans elegans (Valanginian–Hauterivian); Cypridea (Morinina) bibullata bibullata (Hauterivian–Barremian); and Cypridea semilunaris (Barremian). The first occurrences of Candona? condensa and the genus Brasacypris were recorded in the Jatobá Basin, and the identification of morphotypes corresponding to potential new species highlights both the need to deepen our understanding of the biogeographical distribution of these taxa and the considerable diversity of the group in these intervals that remains to be fully explored.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Taxonomical, paleoecological and chronostratigraphical review of Cypridea opifera Krömmelbein, 1962 (Ostracoda, Cyprideidae), Candeias Formation, Lower Cretaceous of the Recôncavo Basin, northeastern Brazil

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The present work refines and updates the taxonomy of a species belonging to the genus Cypridea (Ostracoda: Cypridocopina: Cyprideidae), while also inferring its population age-structure and paleoenvironment in which its specimens were preserved. An ostracod-rich sample, containing several specimens of Cypridea opifera from the Candeias Formation of the Recôncavo Basin (Lower Cretaceous, Berriasian–Valanginian), was collected in the Praia de Plataforma outcrop, a well-known fossil locality from the City of Salvador, Northeast of Brazil. Other than thirty-six closed carapaces of Cypridea opifera, we also recovered a single carapace specimen of Cypridea dromedarius (this was considered, however, an autochthonous contamination, due to its isolate character). Additionally, a remark on chronobiostratigraphic approach of this occurrence, a well-marked succession of subzones seems to suggest that the biostratigraphic position would include Cypridea salvadorensis nodifer (RT-004.1) and Reconcavona? polita (RT-004.2) subzones. According to the current chronobiostratigraphic framework, it would be covering the lower Valanginian interval. The studied locality is also the type-locality for Mawsonia gigas Mawson & Woodard, 1907, a fossil fish with occurrences in the Gondwana realm.

Poster

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Barremian Palynomorphs and Associated Fish Remains from Coquinas Strata of the Sergipe/Alagoas Basin, Northeastern Brazil

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Coquinas strata are significant reservoirs in Cretaceous Brazilian marginal basins, including the pre-salt area. Outcropping in southwestern Sergipe-Alagoas Basin, northeastern Brazil, at the Atol Quarry, this coquina sequence—the Morro do Chaves Formation—is a relevant coexisting analog for subsurface coquinas reservoirs of the Campos, Santos, and Espirito Santo basins.

Subsurface and outcrop samples from the quarry section yielded varying concentrations of well-preserved spores, pollen grains, and rare dinoflagellate cysts. Most samples correspond to black shale interbeds within a predominantly coquinoidal sequence, including bivalve banks and siliciclastic sand, with hummocky cross-stratification. The palynomorph taxa represented in the assemblage comprise 15 species of spores distributed among eight genera, 20 species of pollen grains (12 genera), and one dinoflagellate cyst.

Gymnospermous pollen grains (Classopollis, Equisetosporites, Araucariacites, Eucommiidites, Gnetaceaepollenites, Inaperturopollenites, Dicheiropollis) dominated the assemblage, together with lesser amounts of trilete spores. Angiosperm pollen grains are minor components. Dinoflagellate cysts are scarce and indicate the oldest evidence of marine influence in the Brazilian Lower Cretaceous strata. The co-occurrence of Dicheiropollis etruscus, Aequitriradites spinulosus, and Transitoripollis crisopolensis define the Dicheiropollis etruscus palynozone, which is dated as Barremian (= Lower Jiquiá, Brazilian local stage). The abundance of palynomorphs, dispersed cuticles, woody tissue, and other terrestrial plant remains, allied with the rare presence of marine microplankton elements in the palynoflora, suggest a predominantly continental depositional environment with weak marine influence for the section. The macrofossils recorded, including invertebrates, tetrapods, and several fish taxa such as Semionotidae, Elopomorpha, Paraclupeidae, Gonorynchiformes, Salmoniformes, and Mawsoniidae, collectively corroborate the palynological data.

Poster

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The Cenomanian to Danian non-marine ostracoda in the Songliao Basin

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松辽盆地是白垩纪发育的亚洲最大的大陆盆地之一。松辽盆地的 ostracoda 化石非常丰富，在地层相关性、古生态和古环境重建中发挥着重要作用。对 ostracoda funa 的简要回顾是我们的。松辽盆地共鉴定出 30 属 241 种。这些 ostracoda 动物群以 Cypridea、Strumosia、Lycopterocypris、Triangulicypris、Limnocypridea、Talicypridea 等属为代表。综上所述，在松辽盆地已鉴定出 17 种介形鲸类组合。组合 1 可以追溯到白垩纪早期 （Aptian） 时期，组合 2 到 16 属于白垩纪晚期（Cenomanian - Maastrichtian）时期，组合 17 来自马斯特里奇晚期 - 早期丹尼安时期。来自松辽盆地的白垩纪国际大陆科学钻探项目岩芯 SK1 提供了一个难得的机会，可以在一个漫长的、连续记录的时间间隔内研究晚白垩纪的非海洋排斥虫。SK1 包含青山口（.Triangulicypris torsuosus-Triangulicypris torsuosus var. nota）、姚家（Cypridea exornata-Lycopterocypris retractilis）、嫩江（Cypridea gunsulinensis-Cypridea ardua）、四方台（Talicypridea amoena-Paracandona qiananensis）和明水（Ilyocypris bisulcata-Candona declivis）组。在从上坤头组到明水组的沉积序列中已鉴定出 20 个介形粒组合。最初的生物地层相关性表明，组合 1 到 19 涵盖了 Cenomanian 到 Maastrichtian 阶段，而组合区 20 可能从最新的马斯特里赫时期延伸到最早的 Danian。

Poster

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Utah's Exceptional Cretaceous Dinosaur Record

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Famed for its Upper Jurassic dinosaurs, Utah's Cretaceous dinosaur record has exploded from 7 named genera at 3 faunal levels to 36 Upper Cretaceous taxa and 55 Lower Cretaceous taxa in 21 faunal levels in the last 30 years. Local subsidence due to salt tectonics in eastern Utah resulted in the preservation of 6–8 basal Cretaceous dinosaur faunas known nowhere else in North America, subsequent to the extinction of many North American Jurassic dinosaur clades. These basal Cretaceous faunas document waning paleobiogeographic connections with Europe across the proto-North Atlantic. The more medial Aptian-Albian Cretaceous strata in central Utah, preserves unique dinosaur assemblages on an isolated North America. The basal Upper Cretaceous strata record the first immigration of Asian dinosaurs into North America and the last occurrences of a number of endemic North American dinosaur lineages. Through the Late Cretaceous, extensive, fossiliferous floodplain deposits are exposed in the high plateaus of southern Utah on the western side of the Late Cretaceous Western Interior Seaway. Research on microvertebrate sites has resulted in a diverse record of vertebrate life substage by substage through most of the Upper Cretaceous sequence. Particularly, rich dinosaur-bearing beds through the Campanian have resulted in the discovery of many new dinosaur species distinct from the coeval dinosaur-bearing beds farther north along the western coast of the seaway in Montana and Alberta. The further development of Utah's rich dinosaur assemblages will provide the basis for considerable research in the future.

Poster

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Integrated paleoenvironmental evolution and biochronostratigraphic record based on ostracoda from Quiricó Formation, São Francisco basin, Brazil: new insights from the stratotype section (São José section)

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The stratotype section of the Quiricó Formation (Minas Gerais State, Brazil) provides a unique opportunity to understand the early Aptian paleoenvironmental dynamics in the São Francisco basin. Based on the biostratigraphic framework of ostracods, this section records two units: the Alicenula longiformis Zone (Barremian) and the Harbinia spp. Zone (lower Aptian). The present study integrates ostracod assemblage data from this section with a recent publication dealing with brief marine incursions, also identified in the stratotype section. The lower beds are barren, while the middle portion hosts the highest species richness. The upper beds are dominated by Harbinia spp., indicating hypersaline lacustrine conditions, consistent with abundant evaporites, desert roses, and mud cracks. These features support a scenario of increasing aridity and basin restriction during the early Aptian. Based on this recent publication that reports palynomorphs and other marine microfossils in the Harbinia spp. Zone, it is suggested that the marine influence may have reached the basin margin during early Aptian. These occurrences highlight the importance of integrating micropaleontological and sedimentological data to evaluate basin connectivity during the early Aptian. Such links may reflect the establishment of a drainage system, facilitating faunal dispersal and episodic marine ingressions during a time of tectonic reorganization and climatic aridification. This integrated approach refines the paleoenvironmental and biostratigraphic framework of the Quiricó Formation, illustrating how limnic ostracods record might contribute to approach the basin evolution and transient marine influence during the Early Cretaceous in the Gondwanaland hinterlands.

Poster

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Paleogeographic and Paleoenvironmental Evolution of the São Francisco Basin (Brazil) during the Early Cretaceous: Insights from Limnic Ostracods assemblages

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The Quiricó Formation, São Francisco basin (Minas Gerais State, Brazil), preserves a lacustrine and fluvial-lacustrine sequence deposited during the Early Cretaceous. This study reconstructs the paleoenvironmental evolution and terrestrial ecosystem dynamics of the basin based on the stratigraphic distribution of ostracod assemblages, sedimentological data, and paleogeographic frameworks. The objective is to assess how paleoclimate, drainage evolution, and basin paleogeography influenced continental lacustrine systems during the breakup of central Gondwana. Stratigraphic sections from three key outcrops yielded 21 ostracod species attributed to multiple genera. Their vertical distribution was analyzed in relation to sedimentary facies and paleogeographic reconstructions, indicating that the basin was positioned near 20–25ºS paleolatitude, within tropical to subtropical climatic belts. Two major paleoenvironmental phases were recognized. The lower interval (Berriasian–Barremian?) was deposited in a humid fluvio-lacustrine environment, with moderate ostracod diversity and limited faunal exchange. In contrast, the upper interval (Aptian) shows increased lacustrine restriction and aridification, yet a notable rise in ostracod diversity. This pattern suggests that, despite drier climatic conditions, the establishment of a fluvial system related to the origin of the São Francisco river enhanced hydrological connectivity, facilitating faunal dispersal among isolated basins. It may also reflect brief marine influences recorded in the Aptian, contributing to environmental instability and salinity shifts. Biostratigraphic units were interpreted based on species distribution and paleoenvironmental shifts. Ostracods, as sensitive indicators of salinity, hydrology, and climate, provide critical evidence of ecosystem responses during major continental reorganization. These results contribute to a detailed approach on Early Cretaceous paleoenvironments on Gondwanaland.

Poster

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Late Cretaceous shift from wetter to drier seasonality in the fluvial-coastal depositional record of the Sub-Saharan platform (southern Morocco)

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Southern Morocco provides extensive exposures of a fluvial-coastal-shallow marine succession developed between the Albian? and the Early Turonian. The so-called Kem Kem beds represent the lower portion of this succession and are characterized by fluvio-deltaic sandstones at the base (Ifezouane/Gara Sbaa formations) passing upward into coastal mudstones and marls (Aoufous/Douira formations). A robust chronological constraint is available only for the uppermost part of the succession, the Akrabou Formation, which records the establishment of a carbonate platform during the late Cenomanian–Early Turonian. Besides the poor chronostratigraphic constrain there is a broad consensus to place in the Albian the onset of the lower-mid portion of the studied succession, known for its varied vertebrata fossil content including dinosaurs, crocodiles, turtles, and freshwater fishes. This study aims at providing stratigraphic and sedimentological lines of evidence to frame the Kem Kem palaeobiota into a novel depositional model. The fluvial-coastal strata, exposed from the Kem Kem region to the south up to the southern front of the Central High Atlas to the north, are correlated outlining a stratigraphic architecture made of unconformity-bounded sub-units. Facies associations recognized in this succession suggest a temporal variation of the depositional processes in the fluvial-coastal systems. While the lower part of the Ifezouane/Gara Sbaa formations testify a fluvial environment hinting to a moister seasonality along with a deep hydrographic network reorganization, its upper part and the Aoufous/Douira formations, show facies indicating a fluvial environment evolving into a coastal plain with evaporites and fine-grained intercalated deposits hinting to a drier seasonality.

Poster

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Late Cretaceous Limnic Ostracoda Index-Species Ilyocypris Riograndensis Mussachio & Simeoni, 1991: Paleogeographic Distribution and Crhonostratigraphic Approaches

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Ilyocypris riograndensis is a limnic microcrustacean species with a bivalved carapace, belonging to the Class Ostracoda. Originally, based on outcrop in Argentine, it was described from occurrences at the Plottier, Bajo de la Carpa, and Anacleto members (Santonian to Maastrichtian), currently elevated to formation status. Subsequent occurrences have also been recorded from the Allen Formation (Argentina), as well as the Araçatuba and Adamantina formations of the Bauru Group (Brazil, Campanian to Maastrichtian). These occurrences are related to a chronostratigraphic interval from Santonian to Maastrichtian. Recently, in São Geraldo District, São Francisco basin, it was identified occurrences of this species in outcrops previously considered as Lower Cretaceous. Based on chronostratigraphic distribution in Argentine and Bauru Group, it might be suggested that the outcrops in São Geraldo District are at least Campanian to Maastrichtian in age, and chronocorrelate with strata from the Neuquén Basin in Argentina and the Bauru Group in the Paraná Basin, Brazil. These Cretaceous outcrops in the region of São Geraldo District, Municipality of Coração de Jesus, northern Minas Gerais State, Brazil, represent a remarkable record of paleontological data that has drawn scientific interest, particularly regarding its dinossaurs and ostracod fauna. The chronostratigraphic and lithostratigraphic significance of these occurrences as contribution for a more detailed chronobiostratigraphic position of strata previously attributed to Areado Group are herein suggested as Urucuia Group. The studied outcrops consist of interbedded fine-grained sedimentary rocks (siltstone and sandstone), displaying whitish to reddish hues, which are characteristic of the region.

Poster

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Constructing a High-Resolution Richness Curve Using the CONOP Method: A Case Study of Late Cretaceous Non-Marine Ostracod in China

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Constrained Optimization (CONOP) is a widely used quantitative stratigraphic method for high-dimensional, automated stratigraphic correlation. Based on fossil co-occurrence relationships, it can integrate and extend incomplete local observations of taxa across multiple sections to form an optimal composite sequence that represents a regional or global estimation of true stratigraphic ranges of taxa, which can be used to decipher the evolutionary history of life in the deep time.

We used OneStratigraphy Database to compile and manage stratigraphic and paleontological data. Rigorous quality control was applied, including spelling corrections, taxonomic consistency, and removal of low-resolution sections. After data cleaning, 76 ostracod-containing sections/cores remained, which show good connectivity by network analysis. Chronological constraints were established using fourteen age-control points, including those from zircon U-Pb dating, magnetic stratigraphy and astronomical tuning. We arranged these points in chronological order and created a weighted virtual section to improve computational efficiency. During the CONOP calculation, we tested different optimization parameters to balance efficiency and optimization. Finally, over 100 results were generated, of which 30 with nearly the highest computational times showed consistent diversity patterns throughout. The best result was then calibrated to the Geological Time Scale 2020 and used for subsequent analysis. To test the influence of sampling bias, we used Classic Rarefaction (CR) and Shareholder Quorum Sampling (SQS) to validate the results' robustness. Ultimately, we obtained an ostracod richness curve with a unique temporal resolution of ~0.079 Myr, providing insights into the evolutionary history of terrestrial life during the Late Cretaceous and even the Cretaceous-Paleogene extinction.

Poster

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High-precision U-Pb geochronology on the upper Santonian to lower Campanian lacustrine strata in Songliao Basin and implications for the age of the end of the Cretaceous Normal Superchron

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The end of the Cretaceous Normal Superchron (ECNS), recently ratified as the Global Boundary Stratotype Section and Point for the Santonian/Campanian boundary (SCB), marks a critical transition in Earth's geomagnetic behavior, yet its precise timing remains debated. The International Continental Scientific Drilling Project SK-2 borehole in the Songliao Basin recovered an exceptionally preserved upper Santonian to lower Campanian terrestrial succession of the Nenjiang Formation. A detailed magnetostraigraphic framework have precisely positioned the ECNS within the Member 2 of the Nenjiang Formation. The presence of multiple datable bentonite layers in this interval provides a unique opportunity to apply high-precision geochronology to precisely constrain the ages of the ECNS and associated paleoenvironmental events. Here we present high-precision U-Pb zircon geochronology by chemical abrasion isotope dilution thermal-ionization mass spectrometry (CA-ID-TIMS) method from four bentonite layers in the lower Nenjiang Formation of the SK-2 borehole, integrated with Bayesian age-depth modeling, to establish a robust chronostratigraphic framework. Our Bayesian Bchron age-depth model and the combined Astro+Bchron age-depth model constrain the end of CNS at ~83 Ma. Further, the onset of the marine incursion event occurred during the deposition of the Nenjiang Formation is constrained to ~84.8 Ma, which provides robust temporal basis for further regional and global correlation to investigate their driving mechnisms.

Poster

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New types of plant fossils from the Lower Cretaceous Dongning formation in Northeast China and their paleogeographic significance

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The Dongning Basin, located in NE China along the Sino-Russian border, is adjacent to the Suifen Basin in the South Primorye region of Russia. In this study, 16 genera and 30 species of plant fossils were identified from the Lower Cretaceous Dongning Formation in the Dongning Basin. The flora is dominated by Bennettitales and Filicopsida, which exhibit high diversity, though the number of Filicopsida specimens is less abundant than those of Bennettitales. In addition to previously reported distinctive taxa such as Nathorstia pectinata, Sagenopteris suifenensis and Dictyozamites cordatus, several new taxa were discovered, including Chiaohoella dongningensis sp. nov. , Podozamites reinii, and Neozamites denticulatus. The genus Chiaohoella was previously reported from the Early Cretaceous Aptian Stage in the Jiaohe area of Jilin Province. Podozamites reinii was first documented in the Kuwajima Formation (Valanginian Stage) of Ishikawa Prefecture, Japan, and is commonly found in the Didao Formation of the Jixi area in China. The genus Neozamites ranges from the Berriasian-Valanginian stages in Japan to the Albian Stage in the South Primorye region of Russia. These fossil taxa, reported for the first time in the Dongning Formation, highlight the unique characteristics of the Dongning flora compared to contemporaneous Early Cretaceous floras in northern China, while also exhibiting features of southern flora. This discovery not only enriches the composition of the Dongning flora but also confirms that during the Early Cretaceous, the Dongning area (Northeast China), South Primorye (Russia), and Japan formed a transitional paleofloristic region influenced by shared paleoclimatic and paleogeographic conditions.

Poster

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Ecological and Evolutionary Shifts in Spinicaudata: Insights from Shell Microstructure and Paleoenviornmental Analysis

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Spinicaudata, commonly known as clam shrimp, are freshwater brachiopod crustaceans with a rich fossil record dating back to the Devonian period. Their unique bivalved carapace, which undergoes partial molting, retains ontogenetic growth records and has made them significant paleoenvironmental indicators and biostratigraphic markers. Despite their ecological and evolutionary importance, discrepancies exist between the habitats of extant and fossil Spinicaudata, particularly regarding interpretations of ancient water bodies.

This study investigates the ecological and evolutionary puzzles surrounding Spinicaudata, focusing on their decline in diversity and abundance post-Mesozoic. By analyzing shell microstructure, growth patterns, and composition, the research compares fossil Spinicaudata from the Early Cretaceous Sihetun paleolake with extant species from diverse habitats. Additionally, external factors such as temperature and predator pressure are evaluated to disentangle the drivers of their Cenozoic decline. The findings provide new insights into the potential role of shell microstructure adaptations in ecological and evolutionary shifts, offering a deeper understanding of pre-Cenozoic limnological dynamics and the broader implications for lake community transitions.

Poster

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Global Correlations of Organic Matter Carbon Isotopes at Eccentricity Timescales throughout the Valanginian Stage

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High-resolution paleoclimatic reconstructions require precise temporal correlations, a goal that remains unachieved at orbital timescales in the Mesozoic. In this study, we aim to establish orbitally-paced correlations across 3 geographically distant basins spanning the Valanginian Stage (Early Cretaceous). This interval is characterized by large-amplitude organic carbon isotope excursions concomitant with a neritic carbonate production crisis. A total of 350 samples were analyzed for organic-carbon $\delta^{13}C$ from 3 sites: DSDP Site 534 (western Atlantic Ocean), Vergol-Morénas in the Vocontian Basin (GSSP of the Valanginian Stage; SE France), and Cerro La Parva (western Argentina). The values of $\delta^{13}C_{org}$ values range from -30.1‰ to -23.8‰ in DSDP Site 534, -29.7‰ to -27.1‰ in the Vergol-Morénas section and -24.4‰ to -21.5‰ in Cerro La Parva. The trends in the $\delta^{13}C_{org}$ show common features in between the different sites and several negative peaks within the Weissert Event, identified in the Somanakamura group in Japan (Tomura et al., 2025), are also observed in the Vocontian and Neuquén basins (Moreau-Ledegen et al., 2025). The correlation of the different sites using these common features show a pacing of the $\delta^{13}C_{org}$ by the 405-ka eccentricity cycle. This highlights the potential of $\delta^{13}C_{org}$ as a reliable proxy for recording orbital forcing and demonstrates it as a robust tool for chemostratigraphic correlation at a global scale in order to align paleoclimatic signals at an unpreceded time resolution for the Early Cretaceous.

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Poster

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Ostracod biostratigraphy of the Seaford Head section: first detailed ostracod record from the English Coniacian – Campanian

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Seaford Head (southern England) offers an accessible and complete succession of exposed uppermost Turonian to lower Campanian chalk. It is an important regional reference section for the base of the Santonian and is an auxiliary GSSP for the Campanian Stage. Microfossil assemblages were studied in 99 samples spanning the 162 m thick succession. Samples yielded abundant, well-preserved and diverse microfossil assemblages dominated by benthic foraminifera. Ostracod recovery was relatively poor from the nodular chalk-rich beds of the lower–middle Coniacian but improved considerably across the Coniacian–Santonian boundary, with more consistent occurrences, and increased numbers and diversity upward through the section.

The first detailed ostracod records from the English Coniacian–Campanian are presented. Forty ostracod taxa were identified. Ostracod records are placed within a framework provided by an integrated stratigraphy that includes lithostratigraphy, macrofossil, microcrinoid, benthic foraminifera, calcareous nannofossil biostratigraphy, and a high-resolution carbon-isotope ($\delta^{13}C_{carb}$) chemostratigraphy comprising 30 named CIEs of regional to global significance. Five new ostracod interval biozones are proposed, defined by the lowest occurrences of the index species: Cytherelloidea granulosa, Neocythere (Physocythere) virginea, Limburgina senonensis, Phacorhabdotus lonsdaleianus and Pterygocythere laticristata. The ostracod taxa used for zonation are discussed, and their stratigraphic ranges are placed in the context of previous work on the English Cenomanian – basal Coniacian Chalk. The occurrences of biostratigraphically important ostracod species at Seaford Head are compared to their distributions reported in published studies of Upper Cretaceous strata from continental Europe – Spain, France, Belgium, Netherlands, Denmark, Germany, the Czech Republic and Poland.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Astronomical calibration of the latest Aptian to middle Albian in the South Atlantic Ocean: new insight from low latitudes

Fauth, Gerson (1,2); Krahl, Guilherme (1,2); Kochhann, Karlos Guilherme Diemer (1,2); Bom, Marlone Heliana Hunning (1,2); Fauth, Simone Baecker (1); Bruno, Mauro Daniel Rodrigues (1,2); Guerra, Rodrigo do Monte (1); Ceolin, Daiane (1); Santos, Alessandra

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Carbon cycle perturbations dramatically affected the ocean-climate system during the Aptian-Albian transition. This interval is notably associated with Oceanic Anoxic Events (OAEs), characterized by enhanced burial of organic carbon and widespread anoxia in marine environments. Despite its significance, the timing and duration of these events—particularly in the South Atlantic Ocean—remain highly debated. In this study, we provide a comprehensive astronomical calibration of key biostratigraphic events, including the appearances of planktic foraminifera such as Microhedbergella renilaevis and Ticinella primula, as well as calcareous nannofossils like Praediscosphaera columnata. These events are recorded in a continuous marine sedimentary succession from Core SER-03, drilled in the Sergipe-Alagoas Basin, South Atlantic, spanning from the latest Aptian to the middle Albian.

The Core SER-03 astrochronology is constructed using a high-resolution natural gamma ray (NGR) record, which is paced by the long eccentricity (405 kyr) orbital cycle, and integrated with high-resolution paleomagnetic data. This record spans the interval from approximately 114.7 to 109.5 million years ago, within magnetochron C34n. Age estimates for key biostratigraphic markers align within one long eccentricity cycle with previously published ages. Additionally, stable carbon isotope data and elemental ratios (e.g., V/Al, Cr/Al, and Ni/Al) from Core SER-03 suggest a local expression of Oceanic Anoxic Event 1b (OAE 1b), helping to fill a gap in low-latitude areas.

Poster

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Orbital Pacing and Climate Modulation of the Late Cretaceous Upwelling System in Northern Arabian Plate: Micropaleontological and Isotopic Evidence from Oil Shales in Jordan

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The Maastrichtian oil shales of Jordan, deposited along the southern Tethyan margin of the north Arabian Plate, represent one of the most organic-rich Late Cretaceous successions in the region. Formed under the influence of a sustained coastal upwelling system, these deposits provide a sensitive archive of orbitally paced climate variability. The total organic carbon (TOC) content is

consistently high throughout the studied interval, with values reaching up to 20 wt.% in the lower part of the Muwakkir Chalk Member (MCM). A pronounced cyclic pattern in TOC and lithology is observed across all studied cores, terminating with a sharp decline in TOC to below 0.5 wt.% at the transition to the overlying chalk. This study integrates high-resolution calcareous nannofossil, dinoflagellate cyst, and bulk carbonate carbon isotope stratigraphy from four cores to investigate the timing, duration, and orbital control on organic matter accumulation and paleoenvironmental change. Integrated stratigraphic data constrain the age of the oil shale-rich interval to the Early Maastrichtian (71.6–69.85 Ma), representing a depositional duration of approximately 1.85 million years and an estimated sedimentation rate of ~2.4 cm/kyr. Spectral and cyclostratigraphic analyses reveal a dominant precession signal throughout the Early Maastrichtian interval, reflecting strong insolation forcing on productivity and monsoonal upwelling intensity. A significant shift to obliquity-dominated cyclicity occurs following the Middle Maastrichtian Climatic Event (MMCE), likely related to changes in paleogeography and ocean circulation that enhanced high-latitude climate sensitivity and intermediate water ventilation. These findings highlight a strong astronomical imprint on sedimentation, organic matter preservation, and redox conditions.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Towards an integrated stratigraphy of the European Coniacian – lower Campanian Chalk: new foraminifera records constrained by lithostratigraphy, macrofossils, microcrinoids, calcareous nannofossils and $\delta^{13}C_{carb}$ from Seaford Head, England, and correlation

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The uppermost Turonian – lower Campanian Chalk succession at Seaford Head, southern England, has been proposed as a global reference section for the Coniacian–Santonian and Santonian–Campanian stage boundaries, and has recently been designated an auxiliary GSSP boundary stratotype for the Campanian Stage. The section is described and the placement of stage and substage boundaries defined. New micropalaeontological data are presented for 99 samples spanning the full exposed section. Samples yield abundant well-preserved diverse microfossil assemblages. The stratigraphic distributions of 39 stratigraphically important foraminifera species of Gavelinella, Stensioeina, Protostensioeina, Bolivina, Bolivinoides, Pyramidina, Pseudouvigerina and planktonic foraminifera (Contusotruncana, Dicarinella, Globotruncana, Marginotruncana) are presented. Foraminifera records are placed within a framework provided by an integrated stratigraphy that includes lithostratigraphy, macrofossil, microcrinoid and calcareous nannofossil biostratigraphy, and a high-resolution carbon-isotope ($\delta^{13}C_{carb}$) chemostratigraphy comprising 30 named CIEs of regional to global significance. The succession comprises benthic foraminifera zones UKB.11 Reusella kelleri IZ – UKB.16 Bolivinoides culverensis IZ. Four new species, Gavelinella praestelligera, G. praethalmanni, G. praetumida, and Protostensioeina ukrainica, and three informal species of Pyramidina are recognised. Evolutionary lineages of foraminifera genera provide the basis for a refined biostratigraphy that is successfully correlated to Salzgitter-Salder, Germany and Dubivtsi, Ukraine. Records are compared to literature data and benthic foraminifera zonations across northern Europe. However, differing taxonomic concepts of authors hamper comparison with literature data. This precludes rigorous assessment of diachronism of marker species, although regional stratigraphic differences in the distribution of the first stensioeinids and representatives of the Gavelinella clementiana group in Europe are apparent.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Chronostratigraphy of the mid-Cretaceous based on multiproxy cyclostratigraphic analysis

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The mid-Cretaceous Period experienced significant disruptions in the global carbon cycle, leading to widespread oceanic and climatic perturbations that influenced marine ecosystems and sedimentation patterns. This study focuses on the Aptian–Albian interval, aiming to refine the timing and underlying mechanisms of these perturbations through high-resolution cyclostratigraphic analysis. We analyzed sediment cores from Deep Sea Drilling Project (DSDP) Site 511, located on the Falkland Plateau in the southern South Atlantic, which offers a rare, nearly continuous stratigraphic record from southern high latitudes. Multiproxy datasets—including carbonate carbon ($\delta^{13}C$), oxygen ($\delta^{18}O$) isotopes, and gamma-ray (GR) measurements—were utilized to identify Milankovitch-band cyclicities. Time-series analysis revealed prominent ~405 kyr long-eccentricity cycles within $\delta^{13}C$, $\delta^{18}O$, and GR profiles. Astronomical tuning, employing low-pass filtering of eccentricity cycles and alignment with the La2004 g_2–g_5 target curve, facilitated the construction of a floating Astronomical Time Scale (ATS) for the Aptian–Albian interval. This approach enabled refined age estimates for the onset and duration of the observed oceanic perturbations and proposed a cyclostratigraphic framework for the Aptian–Albian boundary. Our findings enhance the chronostratigraphic resolution of mid-Cretaceous oceanic events in the South Atlantic realm and underscore the role of astronomical forcing in modulating paleoceanographic and climatic conditions. This study contributes to a more precise understanding of the pacing and global synchroneity of Cretaceous climate perturbations.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Synthetic astrochronology of the Aptian Stage

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In the last years, several astrochronological frameworks have been published on the Aptian Stage and yield scattered duration of this stage, ranging from 7.2 to 9.6 Ma (Leandro et al., 2022; Charbonnier et al., 2023). Here, I reassess the time scale of the Aptian by using several datasets published from Spain, France and Italy (Beil et al., 2020; Leandro et al., 2022; Charbonnier et al., 2023; Rodriguez-Martinez et al., 2024) to provide a consistent time scale between these basins. The 405-ka eccentricity is recorded and can be correlated thanks to biostratigraphy and chemostratigraphy between these basins. A provision duration of the Aptian Stage falls in between 8 and 9 Ma, with a preferred duration of 8.3 Ma, starting 121.15 Ma and ending 112.9 Ma. Importantly the duration of the OAE1a is assessed at 1.2 Ma. According to the timescale I propose here, he OAE1a started 119.9 Ma and ended 118.7 Ma, in a good agreement with recently published U-Pb from Japan (Li et al., 2024). Altogether, these data point toward a converging astrochronology for the Aptian Stage from multiple sites.

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Poster

Poster Sessions 1a, 1b, 1c, 2b

New calcareous nannofossil biostratigraphy for the upper Turonian – lower Campanian interval at Seaford Head (southern England), and correlation with the GSSP record

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Seaford Head is a 3 km long sea cliff section on the south coast of England, between Brighton and Eastbourne in the county of Sussex. The succession comprises upper Turonian – lower Campanian white nannofossil chalk and represents a key reference section for the Upper Cretaceous of NW Europe. This study aims to revise the calcareous nannofossil biostratigraphy of the upper Turonian – lower Campanian interval and calibrate it to a new high-resolution carbonate $\delta^{13}C$ record spanning the upper Turonian–middle Santonian. The calcareous nannofossil assemblages are investigated in terms of both semi-quantitative and quantitative abundances. This approach allows an accurate description of the abundance pattern for each observed taxon and the application of several types of biohorizons: LO (Lowest Occurrence) and HO (Highest Occurrence), LCO (Lowest Consistent Occurrence) and HCO (Highest Consistent Occurrence), Base acme and Top acme. The available calcareous nannofossil biozonations for the Late Cretaceous (CC, NC*, UC and Boreal UCizones) are applied and each biohorizon detected is evaluated both for its local reproducibility and regional to supra-regional reliability. Several zonal and subzonal markers show a high reliability: the LO of M. staurophora; the Top acme of H. trabeculatus; the HO of L. septenarius; the LO of A. parcus parcus; and the LO of A. parcus constrictus. Secondary nannofossil events have been identified and proven to be highly reliable events. The new calcareous nannofossil biostratigraphy and $\delta^{13}C$ chemostratigraphy of the Seaford Head section is correlated with the GSSPs record of Salzgitter-Salder (Germany), Olazagutia (Spain) and Bottaccione (Italy).

Poster

Poster Sessions 1a, 1b, 1c, 2b

Calcareous nannofossil bioevents in the Campanian-Maastrichtian boundary succession of the Middle Vistula River section (central Poland)

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A Campanian–Maastrichtian boundary succession is well exposed in a series of outcrops along the banks of the Vistula River, forming a composite Middle Vistula River section, located approximately 100 km south of Warsaw, Poland. This 80-m-thick succession, composed of opoka facies, spans an interval from the base of the Nostoceras hyatti ammonite Zone of the Upper Campanian to the lower part of the Pachydiscus neubergicus ammonite range in the lowermost Maastrichtian.

Calcareous nannofossils are continuously present throughout the entire succession. Despite their poor preservation, low abundance and diversity, the nannofossil assemblage appears to adequately reflect patterns recognized in other regions. Among the biostratigraphically significant nannofossils characteristic of the Campanian–Maastrichtian boundary interval in the Boreal Realm, most key taxa have been identified, including Eiffellithus eximius, Arkhangelskiella cymbiformis var. N, Zeugrhabdotus praesigmoides, Broinsonia parca constricta, Tranolithus orionatus, Reinhardtites levis, Zeugrhabdotus bicrescenticus, and Calculites obscurus. Uniplanarius trifidus, another key boundary marker whose last occurrence approximates the Campanian–Maastrichtian boundary in the Tethyan Realm, was also recorded in the studied material.

In addition, the following bioevents were recognized: the last occurrence (LO) of E. eximius, the first occurrence (FO) of A. cymbiformis var. N, the LO of Z. praesigmoides, and the LO of U. trifidus. Their succession, as identified in the Middle Vistula River section, is successfully compared – via carbon isotope curves – with equivalent successions in the Danish and North German basins.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Calcareous microfossil biostratigraphy of the Judea Group (Israel)

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The Late Albian–Turonian Judea Group is a lithologically diverse sequence of shallow-water carbonates deposited across the Israel-Sinai sub-plate.

Boreholes CT2 and CT8 in the Carmel area penetrate the Isfiye (dolomitised chalk), Tavasim Tuff, and Arqan (micritic carbonates, chalk with chert nodules) formations. Rich nannofossil assemblages indicate that the Isfiye Fm. is Late Albian and the Arqan Fm. is Late Albian–Middle Cenomanian). The Tavasim Volcanics (V2) is Late Albian (CT2) or Late Albian–Early Cenomanian (CT8).

In the Judea Mts, the Kefira, Soreq, Moza, Kefar Shaul and Bina Fms (limestones, marls, clayey marls) have been dated based on nannofossil assemblages: the Aptian–Campanian Kefira Fm., the Albian–Maastrichtian age Soreq Fm., the Early–early Middle Cenomanian age Moza Fm., the Late Cenomanian Kefar Shaul Fm., and rare nannofossils of the Bina Fm. broadly indicate its Albian–Maastrichtian age.

In the Northern Negev (boreholes Massada-1 and Kohal-1), the Hazera Fm. (Hevyon, En-Yorqeam, Zafit and Avnon members) consists of limestones, dolomitic limestones, marls and clayey marls. Rare and poorly preserved nannofossils and ostracods indicate the Early Cenomanian age in Massada-1 and Late Albian – Early Cenomanian in Kohal-1 for the Hevyon member. Nannofossils provide the Early to Late Cenomanian age for the En-Yorqeam member, which is further restricted to the Late Cenomanian by ostracods. The Zafit member is the Middle–Late Cenomanian in both boreholes. In Kohal-1, nannofossils from the Avnon member indicate its Middle–Late Cenomanian age.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Cenomanian Marine Biostratigraphy - A Critical Review of Calibration

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Biostratigraphy remains the key practical tool for correlation and age calibration. If we wish to demonstrate the synchronous nature of events in the rock record (e.g. sea-level change), it is necessary to be able to correlate rocks between regions and between depositional settings. However, despite decades of research, fundamental uncertainties exist in how bioevents and zonation schemes of different fossil groups relate to one another, and how they relate to the standard chronostratigraphic subdivisions. Here we have collated and attempted to calibrate what we consider to be important Cenomanian fossil bioevents from across a number of fossil groups. Some fossil groups are relatively well-known and calibrated. Others such as microcrinoids are relative newcomers to the biostratigraphic scene. For some groups (e.g. the larger benthic foraminifera) definition of bioevents and creation of a calibrated biozonation scheme is a work in progress.

For almost all Cenomanian fossil groups, creation of a bioevents/biozonation scheme is challenged by issues surrounding identity of the fossils (common agreement of what is meant by a taxonomic name) and by precise age calibration of the known occurrences of those fossils. Loose approaches to taxonomy and age calibration can result in over-extended “smeared” ranges. Fortunately, facies-independent techniques such as carbon and strontium isotope stratigraphy are beginning to form the basis for a Rosetta Stone to interpolate between fossil groups.

Our synthesis is ongoing, and we welcome comments from experts to improve our understanding.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Evaluating the potential of equatorial Pacific Shatsky Rise sedimentary deposits for extending high-resolution paleoceanographic reconstructions from the Maastrichtian into the Campanian (72 to 84 Ma)

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Climate reconstructions are vastly supported by unconsolidated sedimentary deposits that contain unaltered, carbonate-rich microfossils. These deposits have routinely been targeted for ocean science research and proven to be valuable archives. Specifically, these ocean drill sediments have allowed scientists to reconstruct past global temperature changes, polar ice sheet variations, and global carbon cycle dynamics over varying time scales, for the last 66 million years of Earth's history. As we go deeper in time, into the Late Cretaceous (~ 66 to 84 million years ago), these sediments are less abundant and often more challenging to recover. Here we present our latest efforts to define a global geochronological reference for the Late Cretaceous from soft sediments recovered at Shatsky Rise (Pacific Ocean). X-ray fluorescence core scanning data and bulk carbonate stable carbon and oxygen isotope records were integrated to assemble a composite record spanning the entire Campanian and Maastrichtian at unprecedented resolution. Our goal is to establish an astronomically tuned global geochronological reference for the Campanian Stage, possibly serving as a guide for addressing questions regarding the timing and phasing of global climate warming events during the Late Cretaceous.

Poster

Poster Sessions 1a, 1b, 1c, 2b

In the search of a primary marker for the base of the Maastrichtian Stage

Voigt, Silke (1); Batenburg, Sietske (2); Bornemann, André (3); Desmares, Delphine (4); Huber, Brian (5); Jurkowska, Agata (6); Martinez, Mathieu (7); Niechwedowicz, Mariusz (8); Petrizzo, Maria Rose (9); Thibault, Nicolas (10); Wagreich, Michael (11); Wa

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The GSSP for the base of the Maastrichtian Stage at Tercis-les-Bains (SW France), ratified in 2001, earned some criticism over the years, mainly because of diachroneities among macrofossils, the poor definition of lowest (LO) and highest (HO) occurrences of planktonic foraminifera and calcareous nannofossils, and the lack of magnetostratigraphy. Thereby, the main concern is the missing definition of a primary boundary marker mandatory for a GSSP. In March 2023, some members of the new Maastrichtian Working group resampled Tercis for calcareous nannofossils, planktonic and benthic foraminifera, inoceramids, palynomorphs and petrography. First results prove the preservation of foraminifera as very poor preventing the development of a reliable definition of bioevents. Results of organic-walled palynomorphs revealed relatively rich and diverse dinoflagellate cyst assemblages and the HOs of Raetiaedinium evittigratia and of R. truncigerum are useful boundary markers. The recognition of significant species among calcareous nannofossils also proves difficult. Biostratigraphic index species such as Reinhardtites levis or Monomarginatus quaternarius occur only in a few samples, Broinsonia parca constricta is consistent, but B. parca parca is very rare. Uniplanarius gothicus and U. trifidus do not occur in every sample. Their proven HO is better resolved now and lies within the uncertainty range of previous studies. A new highly resolved carbon isotope stratigraphy allows a more precise definition of the CMBE carbon isotope events, with the HO of U. trifidus to occur within CMBE-4, and its correlation to orbital chronologies of other Maastrichtian sites in the Bay of Biscay area.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Towards an orbitally-tuned Maastrichtian Stage

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The Maastrichtian marks a cool greenhouse period after the long-lasting late Cretaceous temperature decline. Our understanding of climate and carbon cycle dynamics is still limited in pre-Cenozoic times. The lack of highly resolved stratigraphy introduces severe uncertainties in the quality and interpretation of global correlation. Here we present new achievements in the development of an astrochronology for the Maastrichtian stage that integrates sedimentary cyclicity, carbon isotopes and magnetostratigraphy in combination with calcareous nannofossils from the combined record of the Basque-Cantabrian sections at Zumaia, Sopela, Bidart and the GSSP locality Tercis-les-Bains. The sedimentary successions of Zumaia, Sopela and Bidart show a distinct orbital cyclicity, less distinctly expressed at Tercis. Particularly, bedding cycles of Bidart and Sopela surprisingly match on a bed-by-bed scale, thus allowing the transfer of precession cycle numbers from Zumaia and Sopela to Bidart. Further, new high-resolution $\delta^{13}C$ data from Bidart and Tercis enable a precise correlation of both sections, roughly consistent to nannofossil events. With some accuracy, we can tie the Campanian-Maastrichtian Boundary Carbon Isotope Excursions CMBE 1-4 into the Basque-Cantabrian astrochronology showing the CMBEs to be forced by long-eccentricity. This approach yields a strong potential for a calibration of existing carbon isotope stratigraphies from the boreal chalk and the Pacific Ocean along a common orbital Maastrichtian timescale. Thereby, diachroneities in the first and last occurrences of nannofossil index taxa occur, mainly in the context of habitat stability and biogeographic provincialism between low and higher latitudes, but also because of poor preservation.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Integrated stratigraphy of the Campanian-Maastrichtain succession of the Middle Vistula River section, central Poland

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An expanded Campanian–Maastrichtian boundary succession is well accessible in the composite Middle Vistula River section, Central Poland. The studied succession, approximately 80 m thick, represented by opoka facies with a distinct three-fold lithofacies subdivision, spans an interval from the base of the Nostoceras hyatti ammonite Zone of the Upper Campanian through the lower part of the range of the ammonite Pachydiscus neubergicus in the lowermost Maastrichtian.

The Tercis-based lower boundary of the Maastrichtian cannot be precisely located; however, its approximate position is indicated by several taxa listed in the boundary definition: ammonites (FO of P. neubergicus), inoceramids (FO of Endocostea typica), and dinoflagellates (LOs of Raetiaedinium truncigerum and R. evittigratia, and LOs of Samlandia mayi and S. carnavonensis); and other taxa, not listed in current definition, with high chronostratigraphic potential: belemnites (FO of Belemnella vistulensis), benthic foraminifers (FO of Neoflabellina reticulata), planktic foraminifers (FOs of Rugoglobigerina pennyi, R. hexacamerata, and R. milamensis), and nannofossils (LO of Eiffelithus eximius, LO of Uniplanarius trifidus, FO of Arkhangelskiella cymbiformis var. N, and LO of Zeugrhabdotus praesigmoides).

All biostratigraphic markers correspond well with the isotopic signal, suggesting the base of the Maastrichtian lies close to the top of the CMBE-2 (Campanian–Maastrichtian Boundary Event) of the carbon curve, and with the magnetostratigraphic signal placing the boundary within the C32n2n Polarity Chron.

The geographic location, along with the bio-, chemo-, and magnetostratigraphic signals, makes the Middle Vistula section a valuable source of chronostratigraphic information for the ongoing work on redefining the base of the Maastrichtian Stage.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Subtilisphaera Ecozone Records from the Late Aptian of the Parnaíba Basin – their Paleoenvironmental Meaning

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Palinostratigraphic analysis of sequences from the Codó Formation in the Parnaíba Basin identified the unmistakable occurrence of the Subtilisphaera Ecozone — a phytoplanktonic assemblage dominated by dinoflagellate cysts of this genus. The recognition of this ecozone in the Parnaíba Basin reinforces the hypothesis of marine ingressions into the Araripe Basin through the São Luís and Parnaíba Basins. This record is especially prominent in the middle and upper portions of the Codó section, corresponding to the upper Aptian, and marks the onset of the basin's first marine incursion more clearly. The Subtilisphaera record becomes increasingly significant throughout the sedimentary succession, with several dinoflagellate peaks identified at 10–20% frequencies. In addition to these moderate peaks, levels of greater dinoflagellate richness were also identified, characterized by the monospecific dominance of the Subtilisphaera group, which becomes the prevailing component of the association. These levels are distinctly observed in the 9-PCR-1-MA well at a depth of 13.20 m and in the 9-PCR-3-MA well at 10.50 m, reaching peaks of 90% and 60% of Subtilisphaera, respectively. High frequencies of Subtilisphaera are sometimes accompanied by an increased presence of continental palynomorphs, supporting interpretations of shallow, coastal, and low-salinity marine environments. This bioevent likely reflects the opportunistic nature of Subtilisphaera, capable of tolerating salinity fluctuations. The ecozone was identified in the upper Aptian, aligning with numerous records from other Brazilian Cretaceous basins. The consistent presence throughout the section of the guide species Sergipea variverrucata and Equisetosporites maculosus further supports the early Aptian age attribution.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Cretaceous Marine Paleoenvironments: Ostracods, Foraminifera, and Phosphogenesis as Archives of Paleoenvironmental Dynamics in the Potiguar Basin, Northeastern Brazil

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During the Cretaceous, the carbonate platform of the Jandaíra Formation, Potiguar Basin (Northeastern Brazil), recorded an important episode of phosphogenesis associated with oceanic upwelling. This phenomenon, common in other regions of the globe during the same period, provided nutrient input to the water column, intensifying biological productivity and promoting significant changes in marine paleoenvironments. In this study, micropaleontological samples from well FD-BP-003 were analyzed based on biostratigraphic observations and paleoenvironmental inferences from ostracods and foraminifera present in the phosphatic interval. A significant proliferation of ostracods such as Cytherella, Leguminocythereis, Soudanella, and Bairdoppilata genera, as well as the marked presence of planktic (Rugoglobigerina macrocephala and Rugoglobigerina rugosa) and benthic foraminifera (Gavelinella spp. and Afrobolivina afra), indicated neritic shallow to neritic deep conditions. The results demonstrate that phosphate deposition was associated with a significant increase in the abundance and diversity of these microfossils. The biostratigraphic distribution allowed the identification of two intervals: Interval I, attributed to the Quinqueloculina spp.–Gavelinella spp. zone (Upper Campanian), and Interval II, corresponding to the Globotruncana aegyptiaca–Gansserina gansseri zone (Upper Campanian to Lower Maastrichtian). This study highlights the role of microfossils as indicators of paleoenvironmental dynamics during global changes in the Late Cretaceous.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Episodic Marine Incursions into the interior of Southwest Gondwana during the Aptian

Baecker-Fauth, Simone (1); Fauth, Gerson (1,2); Strohschoen Jr, Oscar (1); Luft-Souza, Fernanda (1); Batista dos Santos Filho, Marcos Antonio (1); Bruno, Mauro Daniel R. (1); Santos, Alessandra (1); Krahl, Guilherme (1); Lima, Francisco Henrique O. (3); M

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The Lower Cretaceous deposits of the Sanfranciscana Basin in southeast Brazil were traditionally viewed as products of a continental Gondwanan environment. However, marine microfossils have been identified in these deposits, prompting further investigation into their depositional evolution. This study analyzes samples from five sections of the Quiricó and Três Barras formations from the Sanfranciscana Basin to reconstruct the paleoenvironmental conditions during episodes of marine incursion. Microfossil assemblages include continental (non-marine ostracods and palynomorphs) and marine microfossils (benthic and planktic foraminifera, radiolarians, ascidian spicules). Lithologically, the alternation of claystone and quartz-rich biogenic chert layers suggests the presence of radiolarites. Key index microfossils, including the radiolarian Turbocapsula spp., Holocryptocapsa fallax, the planktic foraminifera Leopoldina sp., hedbergellids and the palynomorph Tucanopollis crisopolensis, permit the interval to be dated as Aptian. Based on lithological and paleontological evidence, the interval is interpreted as a continental setting that experienced episodic short-lived marine incursions. Three successive paleoenvironmental scenarios are proposed: an initial lacustrine (lake) depositional environment with exclusively non-marine biota; a subsequent phase marked by episodic marine influence, evidenced by the presence of marine microfossils; and a return to continental conditions, evidenced by aeolian (wind-blown) deposits. These marine incursions were episodic and short-lived, indicating that the interior of Gondwana was intermittently connected to marine waters during this time, influencing sedimentation and paleoenvironmental conditions. These scenarios reflect the early stages of the South Atlantic Ocean, highlighting the dynamic interplay between continental and marine influences in the basin during the Aptian. [Acknowledgements: Mar Interior Project]

Poster

Poster Sessions 1a, 1b, 1c, 2b

Insights about initial marine conditions of South Atlantic Ocean based on upper Aptian microfossils from Sergipe-Alagoas Basin, Brazil

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The Sergipe-Alagoas Basin, located in the Brazilian northeast, contains stratigraphic sections that are essential for the understanding of the opening of the South Atlantic Ocean. There are divergences in the literature regarding the age in which this process took place, the paleoceanographic conditions related to the first marine incursions, and the establishment of this ocean. In this context, here we present a biostratigraphical and paleoenvironmental study based on calcareous nannofossils, foraminifera, and ostracods, aiming to contribute for the understanding of the evolution and opening of the South Atlantic Ocean. We analyzed 32 samples from quarry São José (SJ-2-Lago), Sergipe state, Brazil, which is a 25 m section composed of carbonate rocks (mudstones/marlstones). Calcareous nannofossils were recovered, with the recurring presence of genera Nannoconus, Cervisiella, and Zeugrhabdotus. In addition, the presence of Micrantholithus hoschulzi and Radiolithus planus suggests the upper Aptian age. For foraminifera, primarily benthic taxa were recovered, with a predominance of agglutinated forms (e.g., Ammobaculites sp.) and some calcareous ones (e.g., Lenticulinas sp.). Planktonic foraminifera were recovered mainly microhedbergellids and favusellids, suggesting upper Aptian–early Albian transition. Ostracods were frequent throughout the section, with an abundance of marine, continental platform species such as Paracypris eniotmetos, Sergipella viviersae, Praebythoceratina deltalata, P. amsittenensis, P. trinodosa, and Aracajuia benderi. As such, the microfossil assemblages of the SJ-2-Lago Quarry suggests the presence of marine incursions from the South Atlantic Ocean at the upper Aptian, with the establishment of a shallow marine environment in the region. [Acknowledgements: CNPq project 405679/2022-0]

Poster

Poster Sessions 1a, 1b, 1c, 2b

Palynological, Palynofaciological, and Organic Geochemical Characterization of the Urucutuca Formation – Upper Cretaceous of the Almada Basin, NE – Brazil

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This study integrates palynological, palynofacies, and organic geochemical (TOC and Rock-Eval pyrolysis) analyses of the Late Cretaceous Urucutuca Formation (Almada Basin, eastern Brazil). Fifty-six core samples from onshore wells SST-02 and SST-03 were examined. The palynofloristic assemblage comprises 11 pollen grains, eight spores, 14 dinoflagellate species, and rare freshwater and marine forms. The recognition of the Palaeocystodinium lidiae, Dinogymnium acuminatum, Tricornites elongatus, Cricotriporites almadensis, and Crassitricolporites brasiliensis species enabled the recognition of the Tricornites elongatus palynozone, placing the interval within the Upper Maastrichtian. Two distinct palynofacies were identified: Palynofacies 1, dominated by phytoclasts (67% and 73%) with lesser AOM (28% and 25%) and palynomorphs (2% and 5%) in both wells, respectively. Palynofacies 2, characterized by AOM dominance (64% and 67%) over phytoclasts (31% and 30%) palynomorphs (5% and 2%) on average for SST-02 and SST-03, respectively. TOC values range between 0.32–1.42% (SST-02) and 0.11–1.37% (SST-03). Rock-Eval pyrolysis results indicate poor hydrocarbon potential and predominantly Type IV organic matter. The depositional environment evolved from a dysoxic-anoxic marginal setting to a suboxic-anoxic, restricted marine basin under tropical to subtropical conditions inferred from peridinioid dinoflagellate assemblages. This integrated approach refines the biostratigraphic framework and paleoenvironmental interpretation of the Almada Basin.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Paleobiogeography of Marine Ostracodes During the Albian-Cenomanian Interval

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Global marine ostracod databases have great potential for use in paleogeographic studies of the Cretaceous, but they have been scarce so far. In this study, the relationship between different ostracod assemblages is analyzed and discussed for the Albian and Cenomanian. The distribution of 168 genera for the Albian and 174 for the Cenomanian was used for quantitative paleobiogeographical analysis. The affinity between different ostracod assemblages from different regions allowed for the delineation of 30 operational geographic units (OGUs) for the Albian and 32 OGUs for the Cenomanian, grouped in three paleobiogeographic units (PBUs; Megatethys, Persia, Austral) and one sub-unit (PBSU; Maghreb associated to the Megatethys). The relationship among the OGUs grouped in each PBU is related to different factors, like eustatic sea level events, similar climatic zones, and marine current circulation patterns. A relationship was observed between the Gabon and Nigeria OGUs with the Persia PBU, which suggests a direct east-west connection between them during the Cenomanian. The affinity observed in the Austral PBU between the South American, South African, and Australian regions during the Albian can be explained by their relative geographic isolation due to the Walvis Ridge barrier. The eventual flooding of this barrier led to the relationship observed between the SE Brazilian and Bolivian regions with the Austral PBU. Finally, the data also suggested that the separation of the Indian subcontinent from the Austral PBU took place during the Cenomanian.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Campanian, Maastrichtian and Danian planktic foraminiferal and calcareous nannofossil assemblages of Ultrahelvetic marls from Upper Austria

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Early to Middle Campanian to Danian planktic foraminiferal and calcareous nannofossils assemblages provide new information on age and paleo-environments of the Ultrahelvetic Zone of Upper Austria. Tectonic windows within Penninic Zone deposits give access to up to 200 m thick stacks of mainly gray but also red coloured marlstones. A c. 80 m thick nearly continuously exposed section in the Hochhub area and several single samples from nearby outcrops were analysed. The measured section ranges from late Maastrichtian to middle Danian, including a Cretaceous – Paleogene transition. The nearly uniform sediments (marlstones and clayey marlstones) and the absence of turbidites points to continuous sedimentation processes. Preliminary quantitative analyses of Late Cretaceous planktic foraminifera show that deposition took place at bathyal paleo-water depths of about 1,000 m or even at greater depths but above the carbonate compensation depth (CCD). Living conditions were generally stable and oligotrophic. Some exceptional assemblages point to increased mixed layer paleo-productivity indicated by reduced equilibrium species contents and increased contents of species with opportunistic reproductive strategy. Danian strata contain abundant calcareous nannofossils with less reworking from Cretaceous pointing to stable marine conditions with normal salinity and well stratified water column.

Poster

Poster Sessions 1a, 1b, 1c, 2b

New data on the stratigraphy of the Upper Cretaceous in the Central Balkan Mts (Central Bulgaria)

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The Upper Cretaceous in the Central Balkan Mts is represented by the carbonate deposits of the Bazov Dyal, Darmantsi, Kunino and Mezdra formations, which have previously been assigned to the upper Campanian–lower Maastrichtian based on rare, poorly-preserved macrofauna. We have studied seven sections in an attempt to better characterise these lithostratigraphic units by means of calcareous nannofossils, foraminifera and macrofauna. Nannofossil preservation has largely been thwarted by facies and diagenetic factors, particularly in the Bazov Dyal Formation. In one section, benthic foraminifera (Nonionella austinana, Idalina cf. antiqua, Cibicidoides velascoensis, Stomatorbina binkhorsti) from the middle part of the latter unit indicate Campanian age, whereas the uppermost part yielded late Maastrichtian nannofossils Lithraphidites quadratus and Micula murus. Nannofloras from the Darmantsi Formation indicate late Campanian–early Maastrichtian age. The lower part of the Kunino Formation in most sections contains moderately-diverse nannofossil assemblages that indicate early Maastrichtian age, which is further supported by rare finds of Pachydsiscus spp. (ammonites) and Endocostea typica (inoceramid). In one section, in the upper part of the same unit, single specimens of Paleogene taxa (Sphenolithus cf. S. primus, Neochiastozygus cf. N. perfectus, Coccolithus pelagicus) were observed. The Mezdra Formation is largely barren of nannofossils, except for one section, where lower Maastrichtian taxa were noted. These data show that the stratigraphic extents of the studied lithostratigraphic units are highly variable between each section and much wider than previously thought, reaching up to the Paleogene.

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Poster

Poster Sessions 1a, 1b, 1c, 2b

Morphometric Insights into Aspidolithus parcus: Evolution, Palaeonvironment, and Biostratigraphy

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The calcareous nannofossil group Aspidolithus parcus (Broinsonia parca of former authors and Nannotax3) including the forms traditionally classified as Aspidolithus parcus constrictus, Aspidolithus parcus parcus, and Aspidolithus parcus expansus, plays a crucial role in Upper Cretaceous biostratigraphy, yet its taxonomy remains unresolved. This study integrates high-resolution morphometric analysis, bulk carbonate $\delta^{13}C$ stratigraphy, and palaeoecological indices from the Niobrara Formation (Western Interior Basin, USA), with data from two Tethyan localities (Loibichl and Postalm, Austria) to assess evolutionary versus environmental control on coccolith morphology. A total of 2440 specimens were measured for coccolith length (L) and the central area-to-rim ratio (b/a). Finite mixture models revealed three statistically significant morphogroups based on b/a ratio and two for coccolith length. A consistent threshold at ~8.5 µm distinguishes Aspidolithus enormis from A. parcus, supporting its biostratigraphic utility across palaeogeographic settings. However, b/a-based subspecies assignments were not robust, indicating a morphometric continuum likely shaped by surface water temperature, as supported by strong correlations with the Nannofossil Temperature Index (NTI). The $\delta^{13}C$ profile aligns with known Santonian–Campanian isotope events and enables refined chronostratigraphic placement. Morphometric trends across the studied sections suggest an evolutionary turnover near the base of Chron C33r but also emphasize ecophenotypic plasticity. This study proposes a revised, statistically supported morphometric framework for Aspidolithus and highlights the need to standardize size-based criteria for improved global correlation and taxonomic consistency.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Early-Mid Albian planktic foraminifera from the South Atlantic Ocean (Sergipe-Alagoas Basin): Biostratigraphy and paleoenvironmental approaches

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Planktic foraminifera are preserved abundantly within the stratigraphic succession of Core SER-03, drilled in the Sergipe-Alagoas Basin. Assemblages are composed of typical post-extinction taxa that diversified after the Aptian-Albian boundary. The recovered planktic foraminiferal families and genera are HEDBERGELLIDAE (Microhedbergella and Muricohedbergella), ROTALIPORIDAE (Ticinella) and FAVUSELLINIDAE (Favusella). Acnes of Favusella were associated with sea level falls, and slight increases of HEDBERGELLIDAE and ROTALIPORIDAE taxa with rising sea level. We identified four zones at Core SER-03: The base of the Microhedbergella renilaevis Interval Zone was defined by the first occurrence of M. renilaevis (at 171.55 m), and its top by the first occurrence (FO) of Microhedbergella rischi (at 168.14 m); The M. rischi Interval Zone has its base defined by the FO of M. rischi (at 168.14 m), and its top by the FO of Ticinella madecassiana (at 122.57 m). The base of the Ticinella madecassiana Interval Zone is defined by the FO of T. madecassiana (at 122.57 m), and its top is defined by the FO of Ticinella primula (at 117.51 m). The T. primula Interval Zone was identified between 117.57 and 6.26 m, with its base defined by the FO of T. primula and extending up to the top of the studied succession. Changes of planktic foraminiferal distributions and abundances at Core SER-03 suggest a link with sea level changes.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Foraminiferal response to the oceanic anoxic events OAE1b and OAE1d across the ammonite-bearing Aptian–Cenomanian Kotraža succession in Central Serbia

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This study presents new micropaleontological data on benthic and planktonic foraminiferal assemblages from the Aptian–Cenomanian ammonite-bearing succession of Kotraža (Central Serbia), focusing on palaeoecological dynamics and biostratigraphy in relation to global oceanic anoxic events (OAEs). In contrast to the fine-grained, organic-rich sediments typical of the Atlantic domain, the Kotraža succession, linked to the Tethys realm, is dominated by coarse-grained deposits.

The studied section includes four ammonite-bearing sedimentary units (A–D). Analysis of 22 thin sections revealed distinct foraminiferal responses to OAE1b and OAE1d intervals. Unit A (Late Aptian) is characterized by agglutinated benthic foraminifera indicating low-oxygen bathyal environments. Unit B (Aptian/Albian transition) records a shift to small, thin-walled planktonic forms (Microhedbergella spp.), reflecting stressed conditions linked to OAE1b, with associated Douvilleiceras mammillatum Superzone ammonites.

Units C and D (uppermost Albian–lowermost Cenomanian) document increasing planktonic diversity (Parathalmanninella appenninica, Planomalina cf. buxtorfi, Praeglobotruncana delrioensis) alongside typical ammonite fauna (Phylloceras velledae, Kossmatella agassiziana, Puzosia mayoriana, Stoliczkaia dispar). Significant faunal changes during OAE1d include a rise in infaunal agglutinated and calcareous benthic taxa (Bulbobaculites problematicus, Gaudryina sp., Pleurostomella sp.) and a decline in epifaunal species, reflecting a shift from dysoxic to suboxic conditions.

This study integrates planktonic and benthic biostratigraphy, correlating local foraminiferal and ammonite assemblages with global mid-Cretaceous oceanographic and climatic perturbations.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Palynostratigraphy of the Upper Aptian interval (Lower Cretaceous), northern region of the Onshore portion of the Espírito Santo Basin, Brazil.

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The Early Cretaceous section of the Espírito Santo Basin covers a set of rocks from its active petroleum system. However, detailed studies are needed to characterize the Albian-Aptian section, particularly in its emerged area - the shallow portion of the São Mateus Platform. This work presents analyses of two continuously cored wells (PEI-12 and PEI-3) containing strata deposited above the salt section in this area belonging to the São Mateus Formation, deposited on the edge of the basin, comprising a succession with alternating sandy and carbonate layers, integrating palynostratigraphic and palynofacies data. The palynozones Sergipea variverrucata and Complicatisaccus cearenses were recognized to correspond to those established by Regali & Santos (1999) for the Sergipe-Alagoas Basin. The presence of Sergipea variverrucata, Equisetosporites maculosus, Trisectoris reticulatus, and Spiriferites chebka species assures the occurrence of the Sergipea variverrucata palynozone (P-270). Its upper limit is the species' extinction level that gives the palynozone name, as shown in the species distribution in well PEI-3. The Complicatisaccus cearenses (P-280) palynozone was better identified in well PEI-12, where the extinction of the Sergipea variverrucata species and the occurrence of Equisetosporites maculosus immediately above marks its lower limit. Based on the characterization of the palynozones, the Upper Aptian age is signed for the section crossed by both wells. The strata analyzed show a constant post-salt palynoflora dominated by spores, pollen grains, and woody organic residue of continental origin, co-occurring with essentially marine forms, such as dinoflagellates and foraminiferal linings evidenced deposition in shallow and coastal areas.

Poster

Poster Sessions 1a, 1b, 1c, 2b

An Upper Cretaceous mesophotic coral reef (Gosau Group, Eastern Alps, Austria): Significance for the palaeoreef record

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Cretaceous reefs that record coral growth under mesophotic conditions apparently are very rare. Hereunder we present a middle-upper Coniacian to lower Santonian reef composed mainly of coral platestone that is located within the synorogenic wedge-top succession of the Eastern Alps (Gosau Group, Turonian to Ypresian) near Strobl am Wolfgangsee (Salzburg, Austria). In the studied reef, an exposed 15-18 m of coral platestone is overlain by a few meters of domestone-mixstone and bioclastic limestones. The platestones display a dense, continuous, interlocked fabric with a matrix of wackestone with planktic foraminifera and calcareous nannoplankton. Bioencrustation of coralla and boring traces are scarce. Hippuritids and radiolitids settled on the corals, but only few developed into adults. The dome/mixstones comprise massive and branched corals, show a packed fabric, and contain intercalated singles and clusters of rudists. In the reefal interval, one helioporid octocoral and 25 colonial scleractinian species (25 % pennular species) were identified. The top bioclastic limestones contain dasycladaleans, Miliolina, Textulariina and rare Rotaliina. The vertical succession from coral platestones to bioclastic limestones indicates shoaling. The platyfoliaceous shapes and packing of coralla in the platestones, and the scarce encrustation suggest constratal to low-superstratal growth under mesophotic conditions. In the dome/mixstones, toppled corals and rudists indicate episodic disturbance. In Jurassic seas mesophotic reefs were widespread, yet the studied reef is the first Upper Cretaceous example. This contrast in reef style may be attributable to: (1) intensified production and dispersal of chalk; (2) extinction/emigration of Jurassic microsolenids; and, (3) implicit description of Cretaceous mesophotic reefs.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Mid-Cretaceous Orbitolinidae: Taxonomic inventory, origination, diversification, and extinction

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Conical agglutinated larger benthic foraminifera (Orbitolinidae, Coskinolinidae) are an integral part of the Cenomanian megadiversity within the preserved biota of Neotethyan carbonate platforms. Three subfamilies (Orbitolininae, Dictyoconinae, Dictyorbitolininae) are present with varying numbers of taxa that fluctuate through the duration of the stage. Understanding the Cenomanian diversity and abundance of the group also requires a critical assessment of the relevant assemblages of the previous stage, the Albian, allowing assessment of taxa unique to each stage, boundary crossers and generic newcomers. With 27 Cenomanian species considered to be taxonomically valid, orbitolinids are present in almost equal numbers by comparison to the other important group of mid-Cretaceous larger benthic foraminifera, the porcelaneous Alveolinoidea. In contrast to the assemblages reported from the peri-Mediterranean carbonate platforms (e.g., Italy), Orbitolinidae are reported from the late Cenomanian of the Arabian Plate, co-occurring with Cisalveolina fraasi but becoming extinct prior to the Alveolinoidea. After a stratigraphic gap of roughly 5.7 mya, representatives of the Orbitolinidae reappear (but with different genera) during the early Coniacian. A comparable order of magnitude for recovery (again with different genera) is also observed for the second large-scale extinction of the Orbitolinidae at the K-Pg boundary.

Poster

Poster Sessions 1a, 1b, 1c, 2b

The Micula-Watznaueria nannofossil bioevent in the Campanian-Maastrichtian boundary interval – cooling-induced assemblage changes in the western Tethys

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Calcareous nannofossil assemblages of Cretaceous strata provide valuable information on surface water temperature (SST), as some taxa are considered typical of warm or cool waters. Several temperature indices (TI, NTI) have been reported for different time intervals (e.g., Thibault et al., 2016), involving multiple warm- and cool-water taxa. The main warm-water taxon used as numerator is Watznaueria, especially W. barnesiae, a long-ranging, conservative species dominating low-latitude assemblages from the Early to the Late Cretaceous. In contrast, the denominators typically include several different cooler-water taxa, selected based on their restricted stratigraphic ranges. M. staurophora, which first appears in the Coniacian, is often used as part of the cool-water taxa (e.g., Jain et al., 2022; Granero et al., 2024), and occurs generally in low percentages in Coniacian-Campanian Tethyan assemblages (Švábenická et al., 2002). Across the carbon-isotope Campanian–Maastrichtian Boundary Event we observe a sudden and consistent shift in western Tethyan (Austria, Turkey) and Peri-Tethyan (northern Bulgaria) assemblages, from Watznaueria-dominated (>25%) to Micula-dominated (>50%). This shift, also reported from other areas (e.g. Doeven et al., 1983), defines an acme of Micula spp., here proposed as the Micula–Watznaueria Event (MWE). The MWE likely reflects palaeoceanographic changes associated with the peak of long-term Campanian–Maastrichtian cooling (Linnert et al., 2013), and may serve as a valuable biostratigraphic and palaeoenvironmental marker.

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Poster

Poster Sessions 1a, 1b, 1c, 2b

Cretaceous nautiloids, paleobiogeography, and tectonics: A case example provides new support for the Baja British Columbia Hypothesis (that current, western North America was formed by collision with the Insular Microcontinent in the latest Cretaceous or earliest Paleogene)

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Extant Nautilus and Allonautilus hatch at large size and immediately begin a nektobenthic existence tied to the bottom and never move in the water column either as adult or juveniles, based on new ultrasonic tracking data presented here. Since all post-Triassic nautiloids except Aturia hatched at approximately similar, large size and morphology, the observed distribution of nautiloids can provide clues for paleobiogeography and terrane study. Here, a highly diverse (11 species in four genera) assemblage of previously unstudied, endemic Nautilus, Allonautilus (the first recognized in the fossil record) and Eutrephoceras from the Turonian to Paleogene Nanaimo Group of British Columbia, Canada, provide important clues to the tectonic assembly of Cordilleran North America during the Cretaceous. Here, new oxygen isotope analyses of nautiloids, ammonites, gastropods and bivalve fossils including inoceramids and rudistids from Mainland North America show no systematic temperature change from the Coniacian through Campanian, and only a minor temperature reduction in the Maastrichtian, whereas the same groups from the Nanaimo Group demonstrate a systematic reduction in temperatures of shelf temperatures of ~ 25-30oC in the Santonian to around 10oC in the latest Campanian, over the same time intervals. This combination of data is consistent with the Baja British Columbia Hypothesis of Cowan et al, 1997, that the Insular Terrane now making up much of coastal British Columba and southern Alaska migrated northward from a mid-Cretaceous latitude of current Baja California. The nautiloid evidence suggests that it did so, while at least 100km offshore of the Western North coastline.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Acme foraminiferal assemblages of the variegated Farony Shales of the Ropianka Formation (Magura Nappe, Outer Carpathians)

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In the upper part of the medium-bedded turbidites of the Ropianka Formation within the Bystrica Zone of the Magura Nappe, a distinct horizon of variegated mudstones, designated as the Farony Shale, has been recognized. This unit potentially serves as a valuable correlation marker, extending at least to the Lubomierz–Limanowa region. It was deposited during the late Campanian to early Maastrichtian in a deep-water environment of the Magura Basin.

The foraminiferal assemblages are characterized by low to very low taxonomic diversity and abundance. In the samples, certain foraminiferal species predominate. In some samples, excluding fragments of tubular specimens, the genus Caudammina - particularly Caudammina ovula (Grzybowski) and Caudammina gigantea Geroch - comprises up to 70% of the foraminiferal assemblage. In others, Placentammina placenta (Grzybowski) and Saccammina grzybowskii (Schubert) collectively represent between several percent and 50% of the specimens. These assemblages display characteristics of an acme. The Caudammina gigantea-ovula acme and Saccammina-Placentammina acme assemblages developed concurrently across the Magura Basin.

The Caudammina gigantea-ovula acme is associated with red or green, homogeneous, and very fine-grained mudstones rich in clay minerals, deposited in low-energy environments. Conversely, the Saccammina-Placentammina acme is found in coarser-grained grey mudstones deposited under conditions of increased clastic input and elevated delivery of organic matter. Placentammina placenta (Grzybowski) exhibits considerable variability in test size and surface granulation. Two morphological types are distinguished: smaller forms (approximately 0.3–0.6 mm in diameter) with a distinct short neck, and larger forms, attaining 0.8 mm or greater in diameter, provisionally referred to as var. gigantea.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Multiple terminal apertures in the foraminiferal genus Arthrodendron

Waśkowska, Anna (1); Wolfgring, Erik (2); Machaniec, Elżbieta (3); Kaminski, Michael A. (4); Hikmahtiar, Syouma (4)

1: AGH University of Krakow, Poland; 2: University of Vienna, Austria; 3: Jagiellonian University, Poland; 4: King Fahd University of Petroleum and Minerals, Saudi Arabia

The primitive deep-water agglutinated genus Arthrodendron Ulrich, 1904 is one of the largest foraminifera known from deep water environments. It is characterized by chambers arranged in uniserial or occasionally horizontally branching sequences. Arthrodendron is known for inhabiting benthic environments in bathyal to abyssal settings and is generally considered to display a single terminal aperture presented on a small neck, or at most two apertures in the case of specimens that display branching.

A taxon commonly reported from the Tethyan realm is Arthrodendron grandis (Grzybowski), and for the first time, this study documents the presence of multiple apertures in this species. We observed two to seven apertures arranged on small necks, that are commonly organised a circular or subcircular pattern on the terminal chamber.

Material was recovered from three localities: two in the Polish Outer Carpathians (Siekierczyna and Żurawnica sections) and one in the Italian Umbria-Marche Basin (Contessa section). The sediments represent outer bathyal to abyssal depositional environments, with low-diversity agglutinated assemblages indicating low-oxygen conditions in the Carpathians, and normal oxygenation in Contessa.

As the majority of specimens observed document only the isolated terminal chambers, thus, limiting interpretations of growth patterns. The occurrence of multiple apertures may indicate intraspecific variability within the genus, potentially linked to environmental adaptation. They occur rarely, together with chambers or sequences of several chambers from the middle part of the chain, as well as with terminal chambers with a single aperture. These findings add to the known morphological variability in Arthrodendron

Poster

Poster Sessions 1a, 1b, 1c, 2b

The ChaSE project: Chalk Sea Ecosystem and Cretaceous environmental change in the Chalk Group of the United Kingdom

James Witts[1], Deborah Tangunan[2], Thomas Fogerty[1], Harriet Bohun[1], Chloe Griffiths[1], Sarah Jamison-Todd[1,2], Kaia Spence[1,3], Emma Bernard[1], Katie Collins[1], Michael Day[1], Leila D'Souza[1], Timothy Ewin[1], Richie Howard[1], Zoë Hughes[1], Marc Jones[1], Nadia Santodomingo[1], Stephen Stukins[1], Jonathan Todd[1], Kim Chandler[1], Darcy Adhami[1], Liam Gallagher[4], Charlie Underwood[5], Andy Gale[6], Paul Bown[2], Richard Twitchett[1]

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This poster showcases the ChaSE (Chalk Sea Ecosystems) project. As an economically important resource, the UK Chalk Group has been studied and quarried for >200 years and a detailed stratigraphic framework is available. The sequence is abundantly fossiliferous, recording every marine trophic level from phytoplankton to apex predators. Key events recorded in the Chalk include peak Cretaceous warming and biodiversity crises across the Cenomanian – Turonian boundary (Oceanic Anoxic Event 2), the highest global sea-levels of the last 250 million years, and the coldest temperatures of the Late Cretaceous.

The Natural History Museum, London (NHM) contains >50,000 UK Chalk Group macrofossil specimens, including rare taxa and material from now inaccessible localities. Only a fraction of these have been published or are available in public datasets. Many specimens contain limited metadata, and ages or stratigraphic position are poorly constrained. To unlock these 'dark data' we are re-dating >1,500 macrofossil specimens using calcareous nannofossil biostratigraphy. Combining these with data from new fieldwork, we are conducting the first whole-ecosystem study of the functional diversity and ecology of the Chalk Sea. These data will provide an unprecedented record of the effects of global Cretaceous climate change at a variety of temporal and spatial scales, within the same depositional system.

Poster

Poster Sessions 1a, 1b, 1c, 2b

Cretaceous integrative stratigraphy, biotas, and paleogeographical evolution of the Qinghai-Tibetan Plateau and its surrounding areas

Xi, Dangpeng

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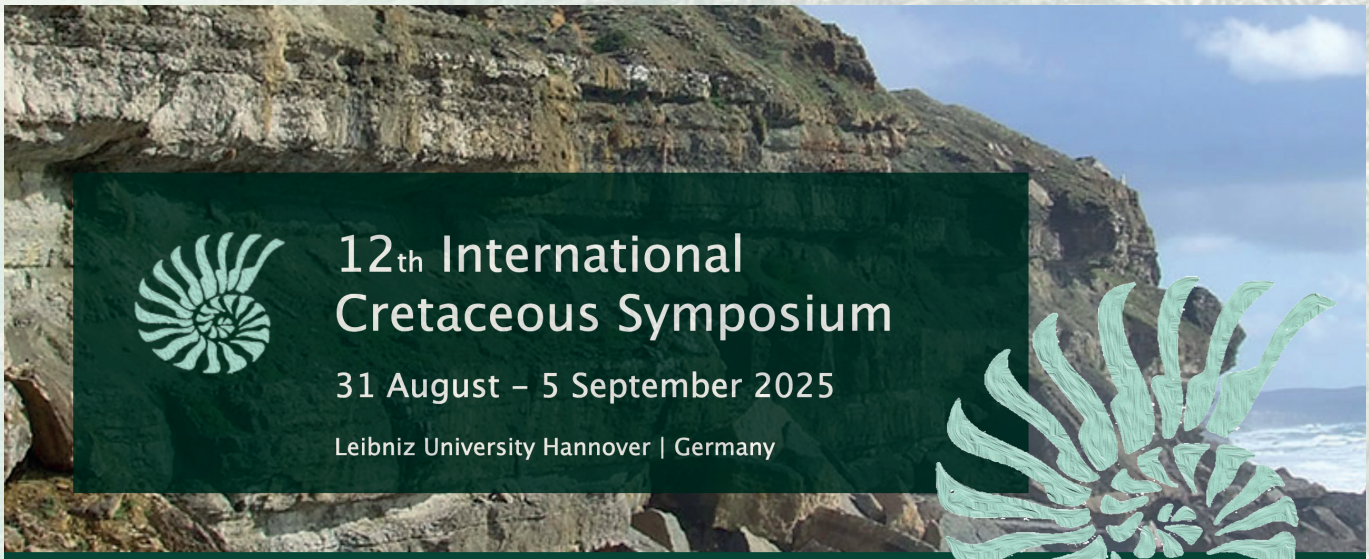
The Cretaceous Period is a vital time interval in deciphering the evolutionary history of the Neo-Tethys Ocean and the convergence of different plates and blocks across the Qinghai-Tibetan Plateau. Here, the Cretaceous stratigraphy, biota, paleogeography, and major geological events in the Qinghai-Tibetan Plateau are analyzed to establish an integrative stratigraphic framework, reconstruct the paleogeography during the Cretaceous Period, and decode the history of the major geological events. The Indus-Yarlung Tsangpo Suture Zone was responsible for the deposition of deep marine sediments. To the south, the Tethys Himalayas and Indus Basin received marine sediments; to the north, the Xigaze and Ladakh forearc basins are also filled with marine sediments, the Lhasa Block, Karakorum Block, western Tarim Basin, and West Burma block consist of shallow marine, interbedded marine-terrestrial, and terrestrial sediments, while he Qiangtang Basin and other areas are dominated by terrestrial sedimentation. The Cretaceous strata of the Qinghai-Tibetan Plateau and its surrounding areas are widely distributed and diversified, with abundant foraminifera, calcareous nannofossils, radiolarians, ammonites, bivalves, and palynomorphs. On the basis of integrated lithostratigraphic, biostratigraphic, geochronologic, and chemostratigraphic analyses, we proposed herein a comprehensive stratigraphic framework for the Cretaceous Period of the eastern Neo-Tethys. By analyzing the Cretaceous biota of different biogeographic zones from eastern Neo-Tethys and its surrounding areas, we reconstructed the paleobiogeography of different periods of eastern NeoTethys. The eastern Neo-Tethys and its surrounding areas experienced a series of major geological events, including the formation of the large igneous province, oceanic anoxia events, and mass extinction during Cretaceous.



12th International Cretaceous Symposium

31 August – 5 September 2025

Leibniz University Hannover | Germany

POSTERS

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

2a: Drivers of Cretaceous climate change: Evidence from new proxies and numerical modeling

2c: Land-Ocean linkage in the circum-Pacific and Asia during the Cretaceous

2d: Cretaceous Eustasy: State of the Art – contributions in honour of Peter R. Vail

2e: Terrestrial environments and climates in the Cretaceous

3a: Cretaceous Environmental Benchmarks: Volcanism, Oceanic Anoxia and climate change

3b: Cretaceous Oceanic Anoxic Events

3c: Cretaceous environmental perturbations: paleoecology, paleoceanography and geochemistry

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Lithium isotopic composition of Late Cretaceous seawater: Implications for a correlation between climate, weathering and sea level fall

Huber, Sandra Janina (1,2,3); Schlidt, Vanessa (1,2); Seitz, Hans-Michael (1,2); Kniest, Jorit Florian (1,2,4); Raddatz, Jacek (1,2,4); Voigt, Silke (1)

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The linkage between silicate weathering as a sink for atmospheric CO_2 and the late Cretaceous climate cooling is not well constrained so far. The lithium isotopic composition (δ^7Li) of marine carbonates is a proxy for the chemical weathering intensity of silicate rocks, and thus provides information about the role of silicate weathering as Earth's thermostat.

Here, we present a 20 Myr δ^7Li record (86.3–66.0 Ma) using chalk from Northern Germany as an archive to evaluate the role of weathering as a sink for atmospheric CO_2 during the Late Cretaceous. The late Santonian to Maastrichtian record shows an overall increase of ~4.5‰ with superimposed increases in the late Santonian, early Campanian and across the Campanian–Maastrichtian transition and a decrease in the mid- to late Campanian. The overall increase in δ^7Li corresponds to the Late Cretaceous change in radiogenic seawater strontium isotopes ($^{87}Sr/^{86}Sr$), which is also a tracer for continental weathering, indicating an increase in continental weathering. Furthermore, a correlation between δ^7Li and the benthic foraminiferal $\delta^{18}O$ curve occurs, indicating a close link between weathering flux, lowered atmospheric pCO_2 and climate cooling on a multi-million-year time scale.

For the Late Cretaceous, we suggest that an enhanced formation of clay minerals in lowlands – which were increasingly exposed during the long-term sea level falls in the Late Cretaceous – promoted more incongruent weathering and stronger lithium isotope fractionation.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Sclerochemistry of Albian Oyster Shells: A Robust Tool for Reconstructing Cretaceous Climate Seasonality and Ocean Chemistry

Navidtalab, Amin (1,2); de Winter, Niels J. (1); Heimhofer, Ulrich (3); van der Lubbe, Jeroen (1); Verdegaal-Warmerdam, Suzan (1); Hagen-Peter, Graham (1); Claeys, Philippe (4); Vroon, Pieter (1); Goderis, Steven (4)

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Sea surface temperature (SST) is a key parameter for reconstructing past climate conditions. Most Cretaceous SST estimates rely on molecular biomarkers or on oxygen isotopes from foraminifera and belemnites, both being affected by habitat depth and seasonal biases. SST reconstructions for the Cretaceous remain rare, especially for lower paleolatitudes during the Albian stage, which presents a critical 4-million-year gap in available data. Additionally, there is very limited data on seasonality during the Cretaceous. This study addresses that gap by reconstructing precise seasonal SSTs for the middle Albian (~110–106 Ma) using exceptionally well-preserved oyster shells from the Kazhdumi Formation in Iran. Three large specimens were cleaned, thin-sectioned, and screened for preservation using transmitted light and semi-quantitative trace element mapping via micro-X-ray fluorescence (μXRF). Their ages were constrained through chemo-and strontium isotope stratigraphy. To capture full seasonal cycles, annual growth increments were micro-sampled along the maximum growth axis for $\delta^{18}O$ and $\delta^{13}C$ analyses. Resulting $\delta^{18}O$ profiles provide sclerochronological estimates of mean, minimum, and maximum SSTs. To account for flawed knowledge of $\delta^{18}O_{seawater}$ values, Mg/Ca ratios were also measured using high-resolution (25 μm) μXRF line scanning, validating SST trends. Assuming a $\delta^{18}O_{seawater}$ value of 0‰ near the paleoequator, the oysters record average SSTs of 36.8 °C, ranging from 31 to 43 °C. Mg/Ca variations confirm these cyclic seasonal patterns. These preliminary findings highlight the strong potential of oyster shells as reliable archives for reconstructing Cretaceous SSTs and seasonality in equatorial regions, where other climate proxies are limited, absent, or poorly preserved.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Tectonic control on the late Cretaceous cooling : an overview from combined mineralogical and Hf-Nd isotopic composition of clays.

Pucéat, Emmanuelle (1); Shmeit, Majd (2); Gaitan, Camilo Esteban (1); Corentin, Pauline (1,3); Pellenard, Pierre (1); Vigier, Nathalie (4); Bayon, Germain (5); Guiraud, Michel (1)

1: Université Bourgogne Europe, CNRS, Biogéosciences UMR 6282, Dijon, France; 2: Université Paris-Saclay, CEA, Service de Physico-Chimie, , Gif-Sur-Yvette, France; 3: Géosciences Montpellier, Université de Montpellier, CNRS, France; 4: Oceanography Laboratory of Villefranche (LOV), CNRS, Sorbonne University, Villefranche-sur-Mer, France; 5: Univ Brest, CNRS, Ifremer, Geo-Ocean, Plouzané, France

The late Cretaceous period encountered a long-term climatic cooling, along with a decrease in pCO_2 hinting to the involvement of processes driving the long-term carbon cycle (Royer et al., 2012). This interval coincides with major tectonic uplifts of part of the south African and south American continents (ex. Raab et al., 2005), that may have impacted climate through atmospheric CO_2 consumption by silicate weathering reactions. Our work explores the response of erosion and weathering to these tectonic uplifts occurring in different climatic belts using a combination of clay mineralogy and isotopic composition. Importantly, this approach allows to capture the evolution of chemical weathering of silicate rocks at the catchment scale (Bayon et al., 2016) and thus to identify regions affected by enhanced silicate weathering during the late Cretaceous, an information required to constrain geochemical-climate models able to quantify associated CO_2 consumption.

A compilation of published clay Hf-Nd isotopic data along with new clay mineralogical and isotopic data from DSDP site 369 offshore Spanish Sahara and from southern African (Cape Basin) highlight an increase in weathering occurring at all analyzed sites along west Africa and eastern South America. The onset of this increase differs between the sites, highlighting the complexity in tectonic-climate-weathering links and the importance of local climatic and geodynamic contexts. Overall, data show that enhanced chemical weathering is most pronounced during the Campanian-Maastrichtian interval but initiated as early as the Turonian at some sites, suggesting a potentially important role of tectonic uplift in the late Cretaceous cooling.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Cretaceous continental arc–trench system of the Japanese Archipelago and wide-area Cretaceous stratigraphical correlations of backarc, intra-/inter-arc, and forearc basins

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Fukui Prefectural University, Japan

Spatiotemporal distributions of Cretaceous rocks, namely, plutonic, volcanic, sedimentary rocks, and accretionary complexes along the Japanese Archipelago are compiled, using the Seamless Digital Geological Map of Japan (1: 200,000), as well as a large amount of published geological research. The distributions of these rocks were delineated on reconstructed palaeogeographical maps of the Southwest (SW) and Northeast (NE) Japan arc masses prior to the opening of the Japan Sea (25 Ma). Their zonal arrangements can be broadly recognized throughout both arcs: 1) mostly non-marine sedimentary rocks in intra-/inter-arc and backarc basins; 2) granitic and volcanic rocks in the magmatic arc; 3) mainly marine and subordinate fluvial sedimentary rocks in forearc basins; and 4) sedimentary rocks of turbidite and mélange facies in accretionary complexes. A total of 71 Cretaceous sedimentary successions in backarc, intra-/inter-arc, and forearc basins from Kyushu to Hokkaido, including a southern Sakhalin succession and two eastern Hokkaido (Kuril arc) successions, are correlated on three stratigraphic charts. Stratigraphic ranges and major sedimentary facies are generally similar between the SW and NE Japan arcs, except for the pre-Aptian Lower Cretaceous in Hokkaido of NE Japan, suggesting continuity throughout the two arcs during the Cretaceous. Although Cretaceous strata are sporadically exposed in northern Honshu, NE Japan, interpretation of seismic sections suggests that Cretaceous forearc strata measuring several tens of kilometres laterally are developed offshore beneath the present Pacific forearc. In contrast, Cretaceous forearc strata in SW Japan are distributed along two narrow belts that may have been deformed by post-Early Miocene tectonism.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

C40:2Et alkenone, a biomarker of Cretaceous haptophytes: paleothermometric importance of its cis stereoisomer

Hasegawa, Takashi (1); Takahashi, Tsukika (1); Ikeda, Masashi A. (1,2); Komiya, Hiromichi (1,3)

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Alkenones, biomarkers of haptophyte algae, allow for the reconstruction of past SST based on the ratio of di-unsaturated and tri-unsaturated alkenones with a carbon chain length of 37. Consequently, they are widely used in Quaternary paleoceanography. Meanwhile, Hasegawa & Goto (2024 Organic Geochemistry) advanced research on the OAE2 horizon and discovered C40:2Et, a diunsaturated alkenone, in the high latitude of the Southern Hemisphere, as well as C40:3Et, a triunsaturated alkenone, marking the first such finding from the Cretaceous. It has significantly expanded the potential application of alkenone paleothermometry to Cretaceous research. The authors also noted the presence of an isomer of C40:2Et that co-eluted with C40:3Et in gas chromatography; however, as its abundance was relatively low compared to the exclusively trans-configured C40:2Et, they deemed it negligible in their discussion.

Alkenones were extracted from the upper Cenomanian underlying OAE2, and their relative abundances were preliminarily compared using selected ion monitoring (SIM) mode on a GCMS for three molecular species: C40:2Et (all-trans), C40:2Et (cis isomer), and C40:3Et. The results revealed that variations in the abundance of C40:2Et (cis isomer) were similar to those of C40:3Et, suggesting that C40:2Et (cis isomer) may also exhibit temperature dependence, akin to C40:3Et. Furthermore, even in stratigraphic intervals where the abundance of C40:3Et decreased—presumed to correspond to relatively higher temperatures—C40:2Et (cis isomer) was still detectable. This finding indicates the potential to develop a novel tool for paleotemperature reconstruction, enabling temperature estimations in high-temperature intervals where the conventional UK'40 index, based on C40:3Et, is not applicable.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Coniacian–Maastrichtian depositional sequences along the southern NeoTethys margin (Western Jordan)

Kalifi, Amir (1); Haj Messaoud, Jihede (1); Ibrahim, Khalil (2); Ardila-Sanchez, Maria (1); Abu Laila, Wesam (1); Powell, John (3); van Buchem, Frans (1)

1: King Abdullah University of Science and Technology, Thuwal, Saudi Arabia; 2: Department of Earth Sciences, The Hashemite University, Zarqa, Jordan; 3: British Geological Survey (BGS), United Kingdom

The Coniacian–Maastrichtian succession of the Belqa Group in western Jordan records a diverse array of marine lithofacies—including chalk, sandstone, chert, phosphorite, oyster mounds, and organic-rich marls—deposited along the passive southern margin of the Neo-Tethys Ocean. Exceptional outcrop exposures along deeply incised wadis allow to reconstruct the stratigraphic architecture along a ~300 km N-S transect. In contrast to equivalent successions on the southern and eastern side of the Arabian Plate margin (e.g. Oman, Iran), the succession in western Jordan was only locally affected by structural deformation which makes it a prime candidate for the Arabian Plate during this time period.

This study integrates a recently published high-resolution chronostratigraphic framework with a newly developed high-resolution sequence stratigraphic model. Preliminary results reveal four major depositional sequences: Sequence I (Upper Coniacian–Santonian, ~4 My) comprises a transgressive chalk at the base, overlain by prograding siliciclastics with a distal transition to the first phosphorite-chert facies and oyster mounds; Sequence II (Lower Campanian, ~5 My) also has transgressive chalk at the base transitioning into aggrading shallow-marine chert-rich marls and limestones containing thin phosphorites and oyster coquinas; Sequence III (Upper Campanian, ~5 My), is characterized by transgressive chalk at the base overlain by shallow-marine phosphorites transitioning laterally to decametric thick oyster mounds; and Sequence IV (Maastrichtian–Paleocene), represents an abrupt shift to organic-rich pelagic marls.

These sequences can be correlated to the neighbouring countries. Together they allow to map out the gradual installation and migration of a long-lived upwelling system along the Levant margin.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

AI-based palynofacies analysis of Mongolian lacustrine deposits to decipher terrestrial environmental changes during the OAE1a

Kawabe, Mihoko (1); Hasegawa, Hitoshi (1); Itaki, Takuya (2); Mimura, Kazuhide (2); Heimhofer, Ulrich (3); Ichinnorov, Niiden (4); Hasegawa, Takashi (5); Kozaka, Yukiko (5); Yamada, Keitaro (6)

1: Kochi University, Japan; 2: AIST, Japan; 3: Leibniz University Hannover, Germany; 4: Paleontological Institute, Mongolia; 5: Kanazawa University, Japan; 6: Yamagata University, Japan

The mid-Cretaceous period is characterized by high atmospheric pCO_2 and frequent occurrences of Ocean Anoxic Events (OAEs); however, the response of terrestrial environments to OAEs remains uncertain. There is only a limited number of studies assessing changes in continental vegetation during OAEs based on palynological analysis, such as the OAE2 interval in southern France (Heimhofer et al., 2018), and the OAE1a interval in northern China (Lu et al., 2025).

In this study, we investigated Lower Aptian lacustrine deposits located in southeastern Mongolia, which has recently been considered to potentially cover the OAE1a interval. The material used in this study has been collected from the CSH01 and CSH02 research cores (Hasegawa et al., 2018, 2022). To quantitatively reconstruct changes in land plant-derived organic matter input, we attempted to establish a palynofacies analysis method utilizing an AI-based image recognition system developed by Itaki et al. (2020).

Initially, we analyzed a total of 40 samples from the CSH01 core. The results reveal a clear correlation between lithofacies and palynofacies. Abundant pollen and plant fragments are observed in layers reflecting high lake-levels, while abundant charcoal is observed in deposits representing low lake-levels.

In a next step, analysis of ~200 samples from the CSH02 core covering the OAE1a period revealed a significant increase in pollen and plant debris, accompanied by an overall decrease in charcoal, in the interval considered to represent the onset of OAE1a. This finding is consistent with a scenario of increased humidity occurring during the onset of OAE1a.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Carbon isotopic stratigraphy of the Aptian lacustrine deposits (Shinekhudag Formation) in Mongolia

Kozaka, Yukiko (1); Hasegawa, Takashi (1); Hasegawa, Hitoshi (2); Heimhofer, Ulrich (3); Ichinnorov, Niiden (4)

1: Kanazawa University, Japan; 2: Kochi University, Japan; 3: Hannover University; 4: Paleontological Institute, Mongolia

While it has been suggested that increased terrestrial chemical weathering and enhanced oceanic surface productivity during OAE1a, direct evidence of terrestrial environmental changes is limited. We are currently investigating the Aptian lacustrine deposits (Shinekhudag Formation) in Mongolia to reconstructing the terrestrial environmental changes during OAE1a. In this presentation, we report the high-resolution carbon isotope stratigraphy of the Shinekhudag Formation. The Shinekhudag Formation is lacustrine deposits possibly covering OAE1a interval and is characterized by the preservation of distinct annual laminations of 50-120 μm thick (Hasegawa et al., 2018, 2022). Compared to marine sediments used in previous OAE studies, the sedimentation rate is much faster (about 10 cm/ky), and it is expected to reconstruct changes in the terrestrial environment with high temporal resolution. The organic carbon in the lake sediments is a mixture of that formed by freshwater algae and that derived from higher plant sources that enter from the surroundings. Since the isotopic composition of the organic carbon varies greatly depending on their mixing ratio, C/N was used to evaluate the ratio. Carbon isotope ratios are gradually decrease to -30‰ in the middle part of the formation, and then increase to -22‰ toward the top, possibly reflecting the negative to positive excursion of the OAE1a event. In order to correlate with the OAE1a event, reconstruction of a high-resolution carbon isotope ratio stratigraphy is ongoing.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Refining Relative Sea-level Change and Sedimentary Dynamics Across the Hauterivian–Aptian of the Lusitanian Basin (Portugal) Using Strontium Isotope Stratigraphy

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We present new chronostratigraphic data from Hauterivian–Aptian coastal marine successions of the Lusitanian Basin (Portugal), based on $^{87}Sr/^{86}Sr$ measurements from twenty-five diagenetically screened bivalve shells. These successions record rich fossil assemblages, including exceptionally preserved early angiosperm pollen, and feature multiple transgressive-regressive cycles linked to relative sea-level fluctuations. Shallow-marine environments such as these are ideally suited for capturing the dynamics of shoreline migration; yet their chronostratigraphic resolution often remains poor, hindering regional and global correlations.

To address this, we apply a Bayesian approach to strontium isotope stratigraphy (SIS), enabling probabilistic age modeling and integration of stratigraphic priors, and thereby overcoming the limitations of traditional look-up table methods. The resulting age model refines the timing of key stratigraphic discontinuities, improves alignment with global sea-level trends, and highlights the local expression of relative sea-level fall and carbonate platform turnover coeval with OAE 1a. These findings shed light on how Hauterivian–Aptian eustatic and environmental changes influenced marginal marine sedimentation across the western Tethys, and contribute to broader efforts to constrain the timing, magnitude, and drivers of Early Cretaceous sea-level change.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Paleoenvironment during the OAE2 interval from the Exmouth Plateau in the southern Paleo-Indian Ocean

Nishiyama, Retsu; Hasegawa, Takashi

Kanazawa University, Japan

The Cenomanian–Turonian Oceanic Anoxic Event 2 (OAE2) is known for the widespread oceanic anoxia. Recent studies focus on the significant environmental changes in southern high latitude, especially the paleo-Indian Ocean. However, due to the hiatus and low carbonate and low organic content, geochemical records from this region remain limited.

This study examines the geochemical characteristics of ODP Sites 763 and 766, located on the Exmouth Plateau in northwestern Australia, where limited organic geochemical data for the OAE2 period have been previously reported. The aim is to capture environmental changes in the marine ecosystem during OAE2 in the high-latitude Southern Hemisphere. Analyses of stable carbon isotope ratios, organic carbon content, carbonate content, and biomarkers as environmental proxies were conducted.

The results confirm positive shifts in carbonate carbon isotope values ($\delta^{13}C_{carb}$) during the early OAE2 at both sites. At Site 763, however, these values were unobtainable above the black mudstone layer due to reduced carbonate content, while Site 766 showed lower $\delta^{13}C_{carb}$ values, likely influenced by diagenesis, highlighting the need to re-evaluate methods and interpretations. Biomarker analysis at Site 763 indicates well-preserved organic matter, including C^{40} alkenones, allowing reconstruction of surface ocean changes. In contrast, no alkenones were detected at Site 766, suggesting organic decomposition during early diagenesis. However, isorenieratene derivatives which are indicatives of photic zone euxinia were observed, implying that OAE2 impacted even the photic zone on the Exmouth Plateau.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Some Middle Cretaceous ammonites from the north-western Pacific Province

Yazykova, Elena (1); Shamakov, Viktor (2)

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The Albian-Cenomanian collection studied comprises 33 taxa of Tetragonitidae, Kossmaticeratidae, Hoplitidae and Cleoniceratidae. Phylogenetic lineages appearing in the Albian continued their development into the latest Cenomanian. The early Albian temperature maximum (12.5-21.6˚C) is reflected in a diversity increase and the emergence of cosmopolitan forms. In the Albian, connections between the Pacific palaeobiogeographical realm and Tethys were still preserved, and ammonite migration thus continued. However, starting from the Albian-Cenomanian boundary, these links were severed as a result of a relatively short-term regressive episode and active tectonic rearrangements. Albian-Cenomanian ammonite faunas everywhere differ from both precursors and successors not only in taxonomic composition, but also in some morphological aspects. Important changes seem to have occurred across the Aptian-Albian and Cenomanian-Turonian boundaries. Both of these mark important bioevents also for numerous other marine biota. Some evolutionary aspects recorded in sections across the globe have often been discussed within a threefold division of the Cretaceous, and variations noted for the Middle Cretaceous could well refer to the Albian-Cenomanian interval. Naturally, for a formal threefold division of the Cretaceous, data would need to include information on significant groups such as ammonites, inoceramids, micro- and nannofossils, as well as results of magnetic, event- and sequence-stratigraphical studies. Our research confirms that the Albian-Cenomanian interval did differ from older and younger time slices with respect to the evolution of Pacific ammonites. Thus, this is an argument favouring the distinction of a Middle Cretaceous Series. Who’s in favour, who’s against? Let the discussion commence ...

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Refining the Campanian/Maastrichtian stage boundary in the Aruma outcrops in central Saudi Arabia

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The Aruma Formation was deposited over the Arabian platform during a tectonically active period with sealevel fluctuations, posing challenges to regional correlations. In this study, we measured a North-South transect of the Aruma outcrops in Central Saudi Arabia to define the Campanian/Maastrichtian boundary using foraminiferal, sedimentological, and isotopic data. The Khanasir Member is a 45 m thick, bioturbated wackestone with abundant dasyclad algae and rare micro- and megalospheric forms of Pseudedomia complanata interpreted to be of Campanian age. It is capped by layers of large radiolitid rudists in the northern Argouba section and transitions to meter-scale low-angle cross-bedded wackestones interpreted as shallow channels in the southern sections (Buwaibiyat and Al-Kharj). It is overlain by an undated shale unit followed by the carbonate dominated Hajajah Member with dasyclads and foraminiferal floatstones including Orbitoides sp., Lepidorbitoides sp., and the Maastrichtian Omphalocyclus macroporus. Carbon isotope measurements show a positive CIE in the Kanasir Member, followed by negative values in the overlying clays and carbonates of the Hajajah Member, interpreted as the Campanian/Maastrichtian Boundary Event (CMBE).

This study positions the Campanian/Maastrichtian boundary around a sequence boundary that has been recognized in the region (Iran, Jordan), and suggests a relative sea level component. Therefore, the paleoenvironment for the Aruma outcrops evolved from a Campanian carbonate platform with rudist reefs to a terrestrially influenced shale dominated flat ramp with poor fauna at the CMBE. Sea level rise during The Maastrichtian restarted the carbonate factory resulting in a widespread distribution of larger benthic foraminifera and rudists.

Poster

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Early Cretaceous Barremian-Albian Sea Level, France, Oman and Gulf of Mexico: Relative or Eustatic?

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Long-term Barremian-Aptian-Albian oceanic-atmospheric-biogeochemical megacycles span from deep-water, siliciclastic, locally organic-rich deposits to carbonate-rich shelf deposits. New research documents two cycles in the Aptian, and two in the Albian. The basal Aptian megacycle begins with the Deshayesites oglanlensis Zone overlying the ~124.8-124.5 Ma unconformity, and grades up into deeper facies in the Deshayesites forbesi Zone of chemozone OAE 1a.

The second deepening megacycle is at base of the upper-lower Aptian Dufrenoyia furcata Zone at the ~119.9-119.8 Ma unconformity and extends into uppermost Aptian. This interval spans a variably long hiatus beginning in the upper Aptian Epicheloniceras martini Zone during the “cold snap”. The third megacycle begins with mud-rich, multiple organic deposits comprising OAE1b and warming in the “Hypacanthoplites” jacobi Zone spanning the Aptian-Albian transition. The fourth megacycle overlies the lower-upper Albian Dipoloceras cristatum Zone at the widespread subaerial unconformity ~104.8-104.6 Ma at base of Pervinquieria/Mortoniceras pricei Zone. This megacycle is overlain by the unconformity in the uppermost Albian Arrhaphoceras briacensis Zone ~101.2-100.5 Ma. This contact in Texas records subaerial exposure, drowning and widespread oceanic paleoecological change into the Cenomanian.

These events on the Arabian Platform, in the Vocontian Basin and in cratonic basins surrounding the Gulf of Mexico were numerically dated in a chronstratigraphic database of 108 localities and more than 2700 biostratigraphic and chemostratigraphic events and polarity chrons integrated with radioisotopic dates. These sea-level changes appear to be coeval among the three sites suggesting eustatic processes associated with ocean-basin tectonics, LIPs, volcanism, and possible polar glaciation, which were modulated by local tectonics.

Poster

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Uppermost Cenomanian to lowermost Turonian successions in Central Europe reflect orbitally controlled high-frequency sea-level changes

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Integrated chemo-, bio-, event and sequence stratigraphic calibration of upper Cenomanian sections in several sedimentary basins around the Mid-European Island (Münsterland, Lower Saxony, Subhercynian, Saxonian and Danubian Cretaceous basins) reveal a conspicuous geslinianum- and juddii-zonal cyclicity reflecting high-frequency sea-level changes potentially paced by the long- and short-eccentricity cycles of the Milankovitch band. Resting on a conspicuous mid-late Cenomanian 3rd-order sequence boundary (SB Ce 5), the following depositional sequence DS Ce-Tu 1 consists of three high-frequency sequences of inferred ~405 kyr up to its capping unconformity SB Tu 1 (lower–middle Turonian boundary interval). The lower long-eccentricity cycle ranges from SB Ce 5 up to the Cenomanian–Turonian boundary (CTB) and consists in stratigraphically complete basinal successions of four shallowing-upward cycles (~100 kyr each); the lowermost short-eccentricity cycle is commonly absent in sections located towards the basin margins, reflecting the lack of accommodation associated with the sea-level fall and lowstand across SB Ce 5. A major marine onlap started with the second short-eccentricity cycle that is associated with the inter-regional plenus Event. Up-section, two additional shallowing-upward cycles up to the CTB reflect the infilling of the accommodation generated by the plenus Transgression. A moderate unconformity at the top of the uppermost short-eccentricity cycle terminates the latest Cenomanian high-frequency sequence, the stacking pattern of which reflects a long-eccentricity with four superimposed short-eccentricity cycles (405 vs. 100 kyr). Another major transgressive pulse at the base of the following high-frequency sequence culminated in a global earliest Turonian maximum flooding interval at ca. 93.8 Ma.

Poster

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Paleoclimate reconstruction using paleosols from the Cretaceous Dakota Fm. in Kansas

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The Dakota Formation (Albian-Cenomanian) in Kansas contains abundant paleosols that are preserved in outcrop exposures and core materials, providing the opportunity to explore the paleoclimate and greenhouse conditions thought to have persisted during the Cretaceous. Paleosol morphology varies throughout the study area, but many contain features including abundant sphareosiderite that is consistent with high and/or fluctuating water tables and a humid climate. By analyzing the mineralogical, stable isotopic, and major element composition of clay minerals that crystalize in the paleosols, details about the Cretaceous climate, including temperature and precipitation patterns, can be evaluated. The data also provide the unique opportunity to compare samples collected from outcrop and core to evaluate possible influence from modern weathering effects on mineralogical and stable isotopic composition. This study presents new oxygen and hydrogen stable isotope data from isolated pedogenic phyllosilicate samples collected from the Dakota Fm. Stable hydrogen isotope values of paleosol pedogenic phyllosilicates range from -86‰ to -72‰ and stable oxygen isotopes range from 17.1‰ to 19.5‰. The stable isotopic composition of the pedogenic phyllosilicates used in conjunction with their respective mineral and chemical compositions produced in-situ soil crystallization temperature estimates ranging from 14 ± 3 ℃ to 28 ± 3 ℃. Samples collected from the lower Dakota Fm. reveal an average temperature of 19 ℃ versus the upper Dakota Fm. which averages 24 ℃, indicating a possible warming event. These results confirm warm and humid paleoclimatic conditions along the eastern margin of the Western Interior Seaway, consistent with a pervasive greenhouse climate.

Poster

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Principle of Hydrogen Isotope Geochemistry Paleo-altimeter and its Potential in Reconstructing Paleo-elevation of the Southeastern Tibetan Plateau

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The reconstruction of paleo-elevation serves a dual purpose to enhance our comprehension of geodynamic processes affecting terrestrial landforms and to contribute significantly to the interpretation of atmospheric circulation and biodiversity. The oxygen (δ^{18}Ow) and deuterium (δDw) isotopes in atmospheric precipitation are systematically depleted with the increase of altitude, which are typical and widely applicated paleo-altimeters. The utilization of hydrogen isotope of hydrous silicate minerals within the shear zone system, volcanic glass, and plant leaf wax alkanes offers valuable insights for addressing evaporation and diagenesis. we review the principle, application conditions, and influencing factors of the hydrogen isotope paleo-altimeter. In addition, we discuss the feasibility of utilizing this technique for quantitatively estimating the paleo-elevation of the southeastern Tibetan Plateau, where multiple shear zones extend over hundred kilometers parallel to the topographic gradient.

Poster

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Cretaceous Paleoclimates and Their Gaps: Is the Southern Hemisphere Still a Forgotten Land?

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The Cretaceous Period is recognized as a distinctive episode in Earth's history, being the last epoch in geological interval during which the planet experienced globally uniform warmind. This unique condition resulted from a series of geological events that triggered particular climatic conditions during the Cretaceous. Hasegawa et al. (2012) suggest a poleward expansion of the subtropical high-pressure belt during the Early and Late Cretaceous, and an equatorward shift of this belt during the mid-Cretaceous (Barremian–Turonian) “supergreenhouse” period, associated with a significant weakening of the Hadley cell. Chumakov et al. (1995) also propose the absence of a humid equatorial zone from the Berrasian to the Aptian. In this context, it is important highlighting that most paleoclimatic studies have predominantly focused on the northern hemisphere, with a notable gap of data from the southern hemisphere. Recently, Santos et al. (2022) reported the establishment of a humid equatorial belt in Late Aptian, challenging the prevailing conception of a predominantly arid Equatorial Gondwana before the Albian, as similarly suggested by Burgener et al. (2023). In this context, it becomes pertinent to question the extent to which data limitations influence our understanding of southern hemisphere paleoclimates, and how many other climate interpretations remain obscured by a predominantly northern hemisphere-centered gaze?.[Acknowledgements: PaleoClima Project].

Poster

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Orbital Cycles in Action: Precession-Driven $\delta^{13}C$ and $\delta^{18}O$ Dynamics in Latest Maastrichtian Sediments from Central Anatolia, Turkey

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The influence of orbital forcing, particularly precession cycles, on the $\delta^{13}C$ and $\delta^{18}O$ compositions is a key to understanding the Late Cretaceous climate variability. In Haymana Basin, Turkey, high-resolution $\delta^{13}C$ and $\delta^{18}O$ isotopic records from planktonic and benthic foraminifera reveal precession-driven climate cyclicity, with supplementary insights from mineralogical and trace element data. Spectral analyses highlight that precessional forcing strongly influenced oceanic $\delta^{13}C$ and $\delta^{18}O$ dynamics in the Haymana Basin, with minima (high insolation) driving arid conditions, elevated salinity, and deep-water convection that triggered ocean mixing and diminished surface-to-deep isotopic gradients. Conversely, precession maxima (low insolation) promoted wetter conditions, enhanced stratification, and intensified organic matter remineralization. Trace element analysis shows increased volcanic activity during the uppermost Maastrichtian, evidenced by tellurium (Te) proxy. In addition, a notable iridium (Ir) peak at the K-Pg boundary, with concentrations up to 3.57 ppb further confirms the Chicxulub impact. Our study provides new insights into the role of orbital forcing in steering stable isotope records and environmental shifts in the Earth's history. Our findings not only highlight the role of orbital forcing in shaping Late Cretaceous ocean-climate dynamics, but also imply a complex interplay between astronomical cycles, volcanic activity—likely linked to Deccan Traps eruptions—and the cascading environmental stressors that culminated in the end-Cretaceous mass extinction.

Poster

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Did the Urgonian carbonate Platform undergo palaeoenvironmental changes as a result of volcanism?

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During the warm Cretaceous period, extensive carbonate platforms were established, particularly at subtropical and equatorial latitudes. However, the development of these carbonate platforms was punctuated by several crises. One of these occurred during the late Early Aptian period, known as the Oceanic Anoxic Event OAE1a, and is characterised by the global demise of carbonate platforms and the accumulation of black shale in deeper environments.

Prior to the definitive drowning of the Urgonian carbonate platform during the OAE1a, some precursor episodes occurred during the Barremian-Aptian transition, during which marls strongly enriched in orbitolinids were deposited. The orbitolinids are generally associated with mesotrophic conditions and high nutrient inputs. This episode, known as the “Lower Orbitolina Beds”, suggests a significant climatic change, characterised by wetter and warmer conditions, leading to an increase in detritism and a change in carbonate production. These changes may have been triggered by an increase in volcanic activity associated with the onset of the Ontong Java plateau.To confirm the relationship between volcanism and the deposition of the Lower Orbitolina Beds, mercury measurements (used as volcanic marker) were conducted in several sections of the Urgonian carbonate platform in the Vercors area. The Ecouges section, along with the Gorges du Nan and the Gorges du Frou sections, show significant mercury anomalies in the Lower Orbitolina Beds intervals.

These data suggest the relationship beween the onset of the Ontong Java Plateau and the eutrophication of the Urgonian Carbonate Platform as a precursor to Oceanic Anoxic Event 1a in shallow marine environments.

Poster

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Amber in the deep sea: evidence for large-scale paleo-tsunamis?

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Large-scale tsunamis are mainly caused by dramatic submarine/coastal crustal shifts and asteroid impacts. They destroy coastal areas and rapidly transport huge amounts of plants and other debris over long distances. However, due to their poor preservation potential and the lack of unequivocal identifying features, tsunami deposits are rarely recognized in the geological record except for geologically young Holocene coastal deposits. This study focuses on pelagic settings as potential archives of large-scale paleo-tsunami events. Here we describe extraordinarily rich amber concentrations in Early Cretaceous deep sea deposits. The amber is distinctively deformed in a manner comparable to typical soft sediment deformation structures such as flame structures. As resin exposed to the air hardens quickly in weeks, the flame deformation of the resin suggests that it reached pelagic seafloors without significant subaerial exposure. This new observation of amber as a soft-sediment unveils the whole sedimentary process from erosion to burial, a view neglected by previous sedimentological studies that focused on clastic and carbonate sediments. The most plausible cause for the presence of this enigmatic amber in a deep-sea setting is large-scale tsunamis, which are supported by the mode of occurrence of amber, associated sedimentary structures, and a massive coinstantaneous landslide.

Poster

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Biogeochemistry of calcareous nannofossils from Upper Cretaceous in the São Paulo Plateau: Synchrotron light for characterization in volcanic ashes

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Marine phytoplankton has a wide diversity of microorganisms, including calcareous nannofossils, which respond to changes in the water column, particularly to nutrients increases (such as P and Fe), which result from sediment input. However, the ecology of these organisms remains a topic of considerable debate, especially regarding volcanic events effects on the composition and distribution of this fossil group. In this context, were studied samples from DSDP Leg 39 – Site 356, focusing on the presence of volcanic ashes and the results on calcareous nannofossils assemblage. The samples were processed for biostratigraphic, geochemical (XRF and Hg content), paleoecological, and morphometric analyses of Watznaueria barnesiae and Eiffelithus spp., as well as biogeochemical analyses using Synchrotron Light for μXRF measurements. The presence of Lithastrinus grillii and L. septenarius enabled the determination of a Coniacian–Santonian interval. The ash layer shows low abundance of calcareous nannofossils, high concentrations of Fe, Hg, and Mn, along with decreased of Ca and Al content. Morphometric analyses of W. barnesiae revealed abundance and size decreasing during ashes depositions, and more circular shapes. Morphometric analyses of Eiffelithus spp. showed high variation in size and ellipticity during the volcanic event. The geochemical results provided a better understanding of the volcanic event's influence on the assemblage, revealing a small coccoliths associated to biogeochemical processes marked by increased Fe and Zn levels during ashes deposition.

Acknowledgements: Mar interior Project

Poster

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Geochemical and Biotical Fluctuations across the Cenomanian-Turonian Boundary Interval in the Eastern Carpathians

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This study is focused on the upper Cenomanian - lower Turonian depositional interval, located in the outer skinned-thrusted nappes of the Eastern Carpathians. Two sections spanning this interval have been studied. The southernmost one, 19.8 m-thick (situated in the S Eastern Carpathians) is characterized by hemipelagic deposits, i.e., green and grey marlstones. This succession has been sampled in detail for pointing out calcareous nannofossil and geochemical fluctuations. Based to the calcareous nannofossils, the succession spans the upper Cenomanian – lower Turonian interval, covered by the biozones UC3d up to UC7. The values of $\delta^{13}C$ are increased by 1.83‰, showing four distinctive peaks attributed to the OAE2. The northern studied succession from the Eastern Carpathians, 10.2 m-thick, is mainly made by pelagic and hemipelagic deposits grading up into turbidites, i.e., grey-dark shales, marlstones and carbonate sandstones, with red and green shales in the upper part. The values of $\delta^{13}C_{org}$ fluctuates between -27.3‰ and -24.4‰, showing three peaks in the Cenomanian and one peak in the lower Turonian, where the base is marked by the successive FOs (first occurrence) of nannofossils Eprolithus moratus, E. octopetalus, and Quadrum gartneri. In both studied sections, the fluctuation pattern of the $\delta^{13}C$ isotope led to the identification of several intervals related to the OAE2 setting, such as the first build-up, trough, second build-up and plateau.

Poster

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Paleoenvironmental Dynamics During the Aptian–Albian and OAE-1b in the Araripe Basin, Brazil

Bom, Marlone H. Hünnig (1); Kochhann, Karlos Guilherme Diemer (1); Heimhofer, Ulrich (2); Guerra, Rodrigo do Monte (1,3); Krahl, Guilherme (1); Fauth, Gerson (1); Mota, Marcelo Augusto de Lira (4); Lima, Francisco Henrique de Oliveira (5); Simões, Marcell

1: itt OCEANEON/UNISINOS, Brazil; 2: Institute of Earth System Sciences, Leibniz University Hannover, Germany; 3: Museu Itinerante de Ciências Naturais, Carlos Barbosa, Brazil; 4: Institute of Geosciences, University of São Paulo, São Paulo, Brazil; 5: Petrobras, Research Center (CENPES), Cidade Universitária, Rio de Janeiro, Brazil,; 6: Institute of Biosciences, University State of São Paulo - UNESP, Botucatu-SP, Brazil; 7: Institute of Geosciences, São Paulo State University - UNESP, Rio Claro-SP, Brazil

This study integrates high-resolution multi-proxy data from the Romualdo Formation (Aptian –Albian), in the Araripe Basin (NE Brazil), to reconstruct palaeoenvironmental changes during the early stages of the South Atlantic Ocean opening and the Oceanic Anoxic Event 1b (OAE-1b). Records from Sobradinho section, including sedimentological, geochemical, micropaleontological, and stable isotope data reveal a complex depositional history influenced by transgressive-regressive cycles, fluctuating oxygenation, and nutrient dynamics. Data from the ~100 m thick section show that dysoxic to anoxic bottom water conditions (V/Cr > 4.25) prevailed, leading to the enhanced preservation of organic matter (up to ~7% total organic carbon - TOC) and diverse fossil assemblages. Stratigraphic and isotopic correlations suggest that the lower black shale interval, containing remarkable fossil-rich carbonate concretions, was deposited during the Kilian sub-event of Oceanic Anoxic Event 1b (OAE-1b; ~113 Ma). The peak of negative carbon isotope excursion coincides with high C/N ratios, increased fluvial input, and extended oxygen minimum zones, favoring carbon burial and exceptional fossil preservation. Ostracod and foraminiferal records, combined with Sr/Ba and S/TOC ratios, indicate episodic changes in salinity and marine incursions during periods of maximum flooding. Magnetic susceptibility and log(Zr/Rb) data further support variable terrigenous input and energy conditions across depositional system tracts. Our results demonstrate that low-latitude epicontinental seas played a key role in global biogeochemical cycles during mid-Cretaceous climate perturbations. The Romualdo Formation provides a unique Southern Hemisphere record for understanding the interplay between sea-level change, redox dynamics, and carbon cycling during OAE-1b.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Oceanic Anoxic Events (OAEs) in the South Atlantic Ocean during the Albian: calcareous nannofossils and geochemical responses to paleoceanographic conditions

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Oceanic Anoxic Events (OAEs) represent significant perturbations in the global carbon cycle, marked by the deposition of organic matter-rich horizons in various oceanic basins during the mid-Cretaceous. This study applies a multiproxy approach, integrating calcareous nannofossil biostratigraphy and paleoecology, carbon and oxygen isotopes, and organic/inorganic geochemistry to identify the Albian OAEs (OAE 1b, OAE 1c, and OAE 1d) in the South Atlantic Ocean and assess their effects on nannoplankton assemblages. Here, we analyzed samples from DSDP Hole 363 (Walvis Ridge) and DSDP Hole 327A (Falkland Plateau) to identify the OAE 1b; DSDP Hole 363, DSDP Hole 356 (São Paulo Plateau), and DSDP Hole 364 (Kwanza Basin) to OAE 1c; and DSDP Hole 363 and ODP Hole 962D (Ivorian Basin) to OAE 1d. The results show that these Albian OAEs lack evidence of volcanic activity, indicated by low mercury concentrations. OAE 1b and OAE 1d are marked by increased input of continental sediments, high Total Organic Carbon (TOC), low oxygenation, and high abundance of eutrophic/mesotrophic species of calcareous nannofossils, suggesting elevated primary productivity mainly driven by terrigenous nutrient input. During OAE 1c, despite high TOC, low oxygenation, and increased continental input, no significant changes are observed in the calcareous nannofossils assemblage. Our results suggest that the high primary productivity during OAE 1b and OAE 1d was primarily influenced by nutrient input. In contrast, OAE 1c appears to have had minimal impact on nannoplankton assemblages.
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Poster

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Regional Heterogeneities in Organic Matter-Rich Sediment Deposition on the Levant Platform during Oceanic Anoxic Event 2 (OAE 2): Insights from Jordan

Chirakal, Tojo (1); Haj Messaoud, Jihede (1); Alibrahim, Ali (1); Grélaud, Carine (2); Kalifi, Amir (1); Ibrahim, Khalil (3); Powell, John (4); van Buchem, Frans (1)

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The Oceanic Anoxic Event 2 (OAE 2) at the Cenomanian-Turonian Boundary (CTB) marks a major perturbation in Earth's carbon cycle, characterized by widespread deposition of organic matter (OM)-rich sediments. While globally recorded mechanisms relating to enhanced productivity and reduced oxygenation are well established, significant local variations in the timing of OM-rich sediment deposition and total organic carbon (TOC) values occur on the Levant Platform at the CTB. Such variations suggest additional, more localized environmental controls on OM deposition and preservation.

To resolve these spatiotemporal patterns, this study presents preliminary results from a basin-scale investigation of the CTB interval in the Jordanian Ajlun Group, covering a ~124 km transect within an inner platform setting. Detailed sedimentological, geochemical (elemental proxies, RockEval pyrolysis), and micropaleontological observations suggest that locally restricted deposition of high-TOC facies (≤9.5%) was seemingly driven by elevated nutrient input, while suboxic conditions likely developed due to increased oxygen consumption. Reduced carbonate sedimentation rates in these sections suggest a relative lack of carbonate dilution of TOC accumulation, while a detrital surge preceding high-TOC facies and paleo-productivity markers could imply a continental nutrient source.

A broader regional synthesis (Levant Platform-scale), integrating new data and published records, demonstrates a general trend of increasing TOC values from the platform margin (present-day Mediterranean coastline) towards the inner platform setting (Jordan) at the CTB. We discuss differing nutrient sources (upwelling and continental sources) and the role of basin-morphology. These findings underscore the complex interplay between global drivers and local/regional controls on OM deposition during OAE 2.

Poster

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Sedimentology, mineralogy and geochemistry of Late Cenomanian-Early Turonian anoxic Event in Tunisia; evidence of a potential shale play

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The Late Cenomanian–Early Turonian Oceanic Anoxic Event (OAE 2) represents one of the most significant anoxic episodes of the Mesozoic, recognized across the NeoTethys and marked by the widespread deposition of organic-rich black shales and finely laminated limestones. In Tunisia, this event is recorded in the Bahloul Formation, which is divided into three distinct lithological units. This study investigates the Bahloul Formation based on well-time-constrained outcrop and well sections, providing insights into its petrography, geochemistry, and unconventional reservoir potential.

Petrographic analysis of thin section and SEM imagery shows that the Bahloul Formation is composed of various carbonate facies, including finely laminated packstone to grainstone, mud-rich packstone to wackestone, and mudstone. These facies are enriched with planktonic foraminifera, radiolarians, and other microfossils, with a matrix dominated by coccoliths, kaolinite, quartz, and framboidal pyrite.

Rock-Eval pyrolysis indicates total organic carbon (TOC) values ranging from 2 to 7 wt%, with high petroleum potential (above 10 mg HC/g rock) and a hydrogen index (HI) averaging around 600 mg HC/g TOC. This suggests good to excellent oil-prone Type I/II organic matter, deposited under anoxic, stratified conditions.

X-ray diffraction (XRD) analysis confirms a consistent mineral composition dominated by carbonates, quartz, and clays, with minor plagioclase and pyrite. These results suggest that the Bahloul Formation in Tunisia contains well-preserved organic-rich facies developed during specific anoxic conditions, highlighting its potential as an unconventional calcareous mudstone shale reservoir, particularly where it is sufficiently buried in near onshore basins.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Early Cretaceous OAEs from the Zagros Basin (Central Tethys) in Iran: evidence from calcareous nannofossils and stable carbon isotope

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The lower Cretaceous (Valanginian – Aptian) is characterized by several significant environmental perturbations, accompanied by black shale depositions. Faunal and floral changes go along with significant excursions of the carbon isotope record, marked by Oceanic Anoxic Events (OAEs). These OAEs are well reported from the western Tethys and elsewhere with few reports from the central Tethys. Here a 722 m thick interval of Valanginian – Aptian sediments, lithostratigraphically assigned to the Garau Formation, is investigated with regard to its calcareous nannofossils and stable isotopes. The Garau Formation mainly consists of black marly shales with intercalations of marls, marly limestones, one of the major source rocks of oil.

The lowermost OAE that is recorded from the Garau Formation is the Valanginian Weissert Event. This event is marked by two positive excursions of the carbon isotope data (2.8‰ and 2.4‰) that are separated by a negative carbon isotope excursion (CIE), recorded from the middle part of nannofossil zone NK3a to the middle part of the NK3b-NC4a subzones. The next OAE is the Faraoni Event in the late Hauterivian, which is marked by a negative and a subsequent positive CIE from NC5a to the middle part of the NC5b nannofossil subzone. The early Aptian OAE1a is marked by a negative and a subsequent positive CIE, accompanied by the nannoconid crisis and the FO of Eprolithus floralis. Our data clearly document the various OAE signals of the early Createceous (Weissert, Faraoni, and OAE 1a) from the central Tethys.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Trace metal and nickel isotope evolution of the ocean since the Cretaceous

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Nickel (Ni) isotopes, recognized as a promising tracer for understanding ocean biogeochemistry, are now being applied to investigate the ancient oceans. Modern seawater Ni isotopes ($\delta^{60}Ni_{sw}$) are heavy relative to the global input $\delta^{60}Ni$ ($\delta^{60}Ni_{input}$), driven by the preferential sorption of light Ni to Mn oxide that leads to an isotopically light sedimentary sink. Modern organic-rich sediments from upwelling margins are unfractionated relative to the global seawater reservoir, potentially providing an archive of the past oceanic dissolved pool, and thus the history of deep ocean oxygenation. Here, we present an extensive record of trace metal abundances and Ni isotopes for organic-rich sediments, covering three oceanic anoxic events, OAE1 (Aptian-Albian), OAE2 (Cenomanian-Turonian) and OAE3 (Coniacian-Santonian), and through the Cenozoic, to track the biogeochemical and redox evolution of the ocean since the Cretaceous.

The contemporaneous d60Nisw recorded by authigenic Ni isotopes in organic-rich, open ocean sediments since the Cretaceous reveals two prominent features: 1) $\delta^{60}Ni_{sw}$ increased to the modern value of around +1.3‰ only in the early Cenozoic, suggesting that the deep ocean has not been fully oxygenated until then, later than has previously been suggested; 2) $\delta^{60}Ni_{sw}$ remained relatively constant across each OAE, but at lower than modern seawater. Coupled Ni and Mo mass balance models suggest that $\delta^{60}Ni_{input}$ under the Cretaceous greenhouse warming was most likely lower than modern, and that the areal fraction of the euxinic sink during the OAEs increased by up to a few percent.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Biostratigraphy, cyclostratigraphy and palaeoenvironments of OAE2 in the Southern Tethys (Bahloul Formation, Tunisia)

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The Bahloul Formation of northern Atlas Tunisia comprises deep water deposits rich in organic matter representing Oceanic Anoxic Event (OAE) 2 across the Cenomanian-Turonian boundary interval. Black shale and marlstone samples from a 38m thick section at Oued Kharroub section have been studied for their organic matter (TOC) and carbonate content, field magnetic susceptibility (FMS) cyclostratigraphy, and microfossil content. Biostratigraphy is based on planktic foraminifera and nannofossils. From bottom to top the Rotalipora cushmani zone (Dicarinella algeriana subzone), the Whiteinella archaeocretacea zone, and the Helvetoglobotruncana helvetica Zone could be distinguished, and the nannofossil zones UC4, UC5 and UC6 (first occurrence FO Quadrum gartneri). The positive carbon isotope excursion lasts from the last occurrence (LO) of R. cushmani (peak A) until the FO of H. helvetica (plateau phase with peak D). Two radiolarian acme intervals occur. TOC ranges up to 3-5%, carbonate contents from 20 - 80%. Spectral analysis of FMS indicates eccentricity, obliquity and precession signals, with the 100 ky signal as the most robust cyclicity. The tuned model finds 12.5 100 ky eccentricity cycles, resulting in an approximate duration of the studied section of 1250 ky (between ~1187 ky and 1500 ky, sediment accumulation rate of 3cm/yr). The palaeoenvironments during OAE2 can be reconstructed as highly stressed, with eutrophication and continuously oxygen-deficient waters.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Did redox stratification and volcanic input control the preservation of siliceous microfossils in the Crato Formation (Araripe Basin, Brazil)?

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The Crato Formation (Aptian, Araripe Basin, northeastern Brazil) preserves mineralized radiolarian microfossils characterized by calcite- and manganese oxide-filled casts. Scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM-EDS) and synchrotron-based micro-X-ray fluorescence (μXRF) analyses reveal a predominantly calcium-rich composition, with trace amounts of Mn, Zn, Cr, and Fe. Micro-Raman spectroscopy confirms the presence of mixed-valence manganese oxides (Mn^{3+}, Mn^{4+}), possibly including biogenically influenced phases such as todorokite. Granular and nodular Mn-oxide precipitates, along with micrometric fossil biofilms, support a microbial role in fossilization under low-oxygen conditions. Chemostratigraphic data from the same interval show a negative $\delta^{13}C$ excursion (~2‰), coinciding with a mercury enrichment peak (Hg/Al ~130 ppb), indicating volcanic influence and redox instability in the depositional environment. These results support a model of early diagenetic fossil preservation in a redox-stratified basin, possibly linked to regional volcanism and transient environmental disturbances during the Early Aptian. Geochemical signatures, including a high Zr/Rb ratio, suggest limited continental chemical weathering, consistent with an arid to semi-arid paleoclimate. The replacement of original siliceous structures by carbonates and metal oxides likely reflects silica instability in alkaline, calcium-rich waters, typical of confined lacustrine systems. The presence of chromium, associated with detrital input or reducing conditions, further underscores the complexity of the diagenetic environment. The integration of morphological, mineralogical, and geochemical evidence supports a fossilization model driven by the interplay of biological activity, volcanic influence, and unique diagenetic processes, with microbial mediation playing a key role in the preservation pathway.
[Acknowledgements: Mar Interior project and CNPEM]

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Spatial heterogeneity of the Oceanic Anoxic Event 1b (OAE1b) record in the Araripe Basin, Brazil

Bom, Marlone Heliara Hünnig (1); Kochhann, Karlos Guilherme Diemer (1); Heimhofer, Ulrich (2); Guerra, Rodrigo do Monte (1,3); Krahl, Guilherme (1); Trentin, Franciele (1); Fauth, Gerson (1); Mota, Marcelo Augusto de Lira (4); Simões, Marcello Guimarães (

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At the Aptian–Albian boundary (~113.2 Ma) widespread expansion of oxygen-depleted waters in the global ocean resulted in the development of the so-called Oceanic Anoxic Event (OAE) 1b. A major driving factor for this event was enhanced continental weathering and nutrient runoff, which stimulated high primary productivity and led to the widespread deposition of organic-rich sediments under anoxic conditions. In northeastern Brazil, the Araripe Basin preserves records of OAE1b within a transitional depositional context. To investigate OM characteristics under such conditions, we applied a multiproxy geochemical approach to the Sobradinho and Estiva sections, representing areas closer to the Atlantic Ocean and farther inland, respectively. OM-rich shales at both sites were deposited under stratified water columns with intermittent marine influence. TOC contents reach ~14% at Sobradinho and ~12% at Estiva), with kerogen types I–III and hydrogen indices (HI) below 1000 mg HC/g TOC in both sections. This contrast likely reflects differential, indicating differing OM preservation mechanisms. Redox-sensitive trace elements show U, V, Ni, Cr, and Co enrichment at Sobradinho, while Estiva exhibits elevated Zn, Cu, Cr, As, V, U, and Mo. Volcanic signals inferred from Hg/TOC; Hg/Fe_2O_3; Hg/Al_2O_3 peaks appear twice at Sobradinho and once at Estiva, coinciding with the Kilian subevent. Principal Component Analysis highlights better OM preservation and geochemical consistency at Sobradinho, while Estiva displays greater heterogeneity, influenced by carbonate input and redox variability. These results underscore the role of local and regional environmental factors in shaping OAE1b records in transitional settings.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Congruent records of the Weissert Event with local differences in a western Tethyan pelagic basin (Bakony Mts., Hungary)

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The Valanginian Weissert Event is the earliest and perhaps the most puzzling Cretaceous carbon cycle perturbation. Unlike other OAEs, this event lacks a negative CIE and is characterized solely by a positive CIE, but is not associated with widespread black shales. However, studies of the Weissert Event are more limited compared to other OAEs, hindering the characterization of global to local responses. Here we report preliminary results from the newly excavated Rend-kő section and compare them with two previously studied localities nearby in the Transdanubian Range. Both the HK-12 and HÉK sections yielded ammonites only up to the Verrucosum Zone, but nannoplankton biostratigraphy revealed the presence of zones NK1 to NC5. Carbon isotope stratigraphy allows excellent correlation as pre-event $\delta^{13}C_{carb}$ values are consistently in the range of 1.2–1.4‰ and peak values of the Weissert CIE between 2.7–2.9‰. Differences exist at the onset of the CIE as HK-12 displays a jump of >1‰ at an ammonite-rich condensed bed marking a hiatus, whereas the rising limb of the CIE in the HÉK section is two-stepped, possibly also revealing arrested carbonate deposition. New data from Rend-kő suggest that this section is the most extended and least condensed at the onset of the event. More dense sampling is underway and is expected to yield a high-resolution carbon isotope curve. We will develop an astrochronology to constrain the duration of different phases of the Weissert CIE. Additional geochemical studies are planned to better understand the paleoenvironmental changes during the Weissert Event.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Evidence of marine incursions in the Crato Formation (upper Aptian): insights from Três Irmãos Quarry, Araripe Basin

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The Crato Formation, northeastern Brazil, is one of the most renowned Cretaceous sedimentary sequences due to its exceptional fossil preservation from Aptian–Albian. Although marine incursions have been recorded, their paleogeographic extent remains poorly understood. This study is based on a multi-proxy approach applied to core PTI-01, drilled at the Três Irmãos Quarry,, involving ichnology, palynology, palynofacies, microbiofacies, magnetostratigraphy and X-ray diffraction analyses. The punctual occurrence of Sergipea variverrucata suggests an Upper Aptian age for the upper part of the section. Palynofacies analysis reveals predominance of continental palynomorphs (pollen grains, bio-structured phytoclasts, banded, striped, opaque, and cuticles). Ichnodiversity was low throughout the section (Palaeophycus isp. and Skolithos isp.), indicating a bioturbation index of 1-2. The magnetostratigraphy exhibits a mean inclination of -21.5º, consistent with the expected geomagnetic field inclination for the region. Magnetic remanence is carried by (Ti-)magnetite and hematite. No polarity reversals are observed in the record, supporting the interpretation that rocks record a time interval within the Cretaceous Normal Polarity Superchron (CNPS),. However, the results identified several indicators, which suggest localized evidence of paleosalinity : (i) benthonic foraminifera (textularids) and levels with calcium carbonate concretions at the lower part of the section, (ii) calcareous dinoflagellates (e.g., Colomisphaera heliosphaera) at the middle part of the section, and (iii) Subtilisphaera sp, associated with the most bioturbated interval (bioturbated texture), and higher levels of calcite at the top of the section. Our data suggests deposition in coastal lagoonal setting influenced by incursions marine waters during the late Aptian. [Acknowledgements: Magneto Project]

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Orbitally driven pulses of terrigenous input and iron oxidation during the Valanginian: Evidence from very thin-bedded turbidites of the Polish Outer Western Carpathians

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Deep-marine turbiditic systems rely on the supply of terrigenous material and are typically shaped by autocyclic processes, often interacting with tectonic activity and episodic erosion. In this study, we present evidence for allocyclic (orbital) control on deep-marine sedimentation in the Proto-Silesian Basin (part of the Severin-Moldavidic Basin system in the Outer Western Carpathians) based on a detailed analysis of the Krzyworzeka river section. The Outer Western Carpathians of Poland have played a pivotal role in global sedimentological research, particularly in the study of turbidity currents. Nevertheless, several stratigraphic units remain understudied. Recent advancements in numerical methods now offer powerful tools to explore the influence of orbital forcing on sedimentary processes. At the studied site, the Valanginian-age Upper Cieszyn Beds and Hradiště Beds are exposed as an undivided unit due to limited lithological contrast. Five facies types (F1–F5) were identified and analysed using a suite of time-series techniques to evaluate the presence of deterministic controls on facies distribution and bed thickness. The results reveal distinct periodicities in sedimentation, including phases of intensified terrigenous influx, evidenced by the occurrence of facies F3, F4, and F5, and intervals marked by rusty layers (facies F2), indicative of episodic iron oxidation. These patterns point to orbitally paced environmental changes regulating sediment supply and diagenetic conditions in this deep-marine setting. The detected periodicities were linked to Milankovitch cyclicities. Sideritic bed occurrences are most favourably linked to the cycles of precession and obliquity, while the intensification of terrigenous material supply may also be related to eccentricity.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Climate and oceanographic changes at the Jurassic/Cretaceous transition – insights from the Neuquén Basin (Argentina)

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Recently, a series of studies has brought an attention to some important palaeoenvironmental turnovers which took place during the Jurassic/Cretaceous boundary. Among them, the most characteristic are the so-called VOICE (Volgian Isotopic Carbon Excursion), cool and arid climate mode during the late Tithonian–early Berriasian, as well as climate humidification at the early/late Berriasian transition. However, so far none of those events has been evidenced as manifesting a truly global scope. This study aims to compare paleoclimate and paleoceanographic signals documented via gamma-ray spectroscopy (GRS) in the Tithonian–Berriasian of the Neuquén Basin (Las Alcantarillas and Las Loicas sections, Argentina) with palaeoenvironmental records from coeval successions of the western Tethyan domain. Stratigraphic correlations are ensured by integration of magneto-, chemo- and biostratigraphic tools. Studied sections indicate suboxic/anoxic conditions during the early Tithonian and later on during the late Tithonian–early Berriasian. A stepwise increase in lithogenic influx (Th content) is characteristic of the Berriasian; besides, a sudden increase in Th/K ratio at the lower/upper Berriasian transition is suggestive of climate humidification. Such record, in particular oxygen deficit at the seafloor during the Tithonian/Berriasian transition and climate humidification during the early/late Berriasian corresponds with recent findings in the Transdanubian Range (Hungary), Slovenian Basin and the Vocontian Basin (SE France). This, in turn, may evidence the global scope of those latest Jurassic–earliest Cretaceous environmental processes.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Evidence of the Late Cenomanian–Turonian event in the Babouri-Figuil Basin, northern Cameroon: A palyno- and chemostratigraphic appraisal

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The Cenomanian-Turonian OAE 2 represents significant climatic perturbation associated with global shifts in carbon isotopes and widespread development of black shales. While extensively studied in oceanic environments, its expression in continental environments is still not well understood. This research focuses on the Mayo-Figuil section located within the Babouri-Figuil Basin in Cameroon, using mineralogy, organic matter, phosphorus, mercury, major and trace element contents, chemostratigraphy, and preliminary palynological biostratigraphy, to constrain the depositional age and decipher environmental changes. Although the carbon isotope record lacks a distinct shift, the initial palynomorph dataset, including Classopollis sp., Araucariacites sp., Cicatricosisporites cuneiformis, Tricolpites sp., Ephedrepites sp., Cretacaeiporites sp and Triorites africaensis, suggests a late Cenomanian to early Turonian age, aligning with other basins in West Africa. These findings help defining the Triorites africaensis Zone (II; late Cenomanian), and Cretacaeiporites scabratus Zone (III; early Turonian). During the OAE 2, OM is primarily made up of Type II and I kerogens, consistent with a marine incursion via the Tran-Saharan Seaway. Enrichment in redox and productivity-sensitive trace elements coupled with high Corg/Ptot ratios and TOC contents, suggest that a larger part of P was remobilized and integrated with sediments during this period of fluctuating suboxic to anoxic conditions in the deposition process. During this timeframe, it clearly appears that TOC and P fluctuations have been driven by detrital input and consequently by climate. This study offers for the first time evidence of the OAE 2 in a Cameroonian rift basin, and providing valuable insights into ancient equatorial environmental conditions.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

New geochemical and stratigraphic data from the K/Pg transition in the Adriatic-Dinaric Carbonate Platform (Karst, Italy)

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The Cretaceous-Paleogene (K/Pg) boundary marks one of the most significant mass extinctions in Earth's history, associated with meteorite impact and major environmental changes. Understanding the geochemical, sedimentological, and biogenic signatures of this transition is essential to reconstruct paleoenvironmental conditions and biogeochemical responses after global events. While deep-sea K/Pg boundary deposits have received extensive attention, the shallow-marine sedimentary record remains less explored. The K/Pg transition is recorded in the shallow water carbonates of the Adriatic-Dinaric Carbonate Platform on the Karst Plateau but is often poorly exposed. An 80 m-long core was drilled in Padriciano (Trieste) in an attempt to retrieve a continuous rock record, under the auspices of the Interreg Italy-Slovenia Kras-Carso II project. This effort seeks to enhance the geological heritage of the region by fostering cross-border research collaborations and promoting sustainable development. Detailed analyses on the core will help to enhance knowledge of the K/Pg which is recognized as one of the key geosites in the area. The Padriciano core comprises shallow-water carbonates, predominantly wackestones and packstones, exhibiting variable textural features. The succession includes intraclast-rich horizons, laminated intervals, brecciated layers, and karstified surfaces, reflecting a complex depositional and diagenetic history characterized by episodes of subaerial exposure and subsequent post-depositional alterations. Facies analyses, biostratigraphic investigations, and geochemical analyses (XRF, gamma-ray spectrometry, $\delta^{13}C$ and $\delta^{18}O$) were carried out on the core. The integration of these data enhances the stratigraphic resolution of the K/Pg boundary in shallow-marine environments and provides new insights into environmental changes that occurred across the K/Pg transition.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Integrated stratigraphy and astrochronology of the OAE1d and the Albian-Cenomanian Boundary Event recorded in an archive core from a Tethyan synorogenic basin

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The OAE1d is one of the oceanic anoxic events that punctuate the Cretaceous and represent Earth system-wide changes prominently captured by carbon isotope excursions (CIE). Although the positive CIE near the Albian-Cenomanian boundary (ACB) is known from multiple localities, many of these records disagree in the shape of the $\delta_{13}C$ curve. Interpretations of the OAE1d and a broader ACB Event remain ambiguous, and their duration is insufficiently constrained. Here we present new analyses on high-resolution samples from Core Jásd-42. The >450 m thick Pénzeskút Marl Fm. provides an expanded record across the ACB. We generated elemental and stable isotope geochemical data and used these time series for cyclostratigraphic analyses. The derived astrochronologic age model establishes a depositional duration of 3 Myr and is integrated with ammonite and plankton foraminiferal biostratigraphy updated from previous works. Our high-resolution chemostratigraphy provides a new, calibrated record of OAE1d and the ACB Event that we correlate with other key reference sections, including the GSSP. The combined duration of the rising limb and the peak-to-peak culmination of the positive CIE, equated here with OAE1d, is estimated as 0.78 Myr. With an additional 0.58 Myr of the falling limb, a minimum estimate for the total duration of the ACB Event is 1.36 Myr. The $\delta_{13}C$ record through the OAE1d appears orbitally controlled, where the positive peaks are paced by short eccentricity. Considering the differences between seasonality extremes, we suggest a model for depositional cyclicity in a synorogenic basin with a high sedimentation rate of 15-16 cm/kyr.

Poster

Poster Sessions 2a, 2c, 2d, 2e, 3a, 3b, 3c

Quantifying extinction and ecological change across the Cretaceous-Paleogene (K-Pg) boundary on Seymour Island, Antarctica

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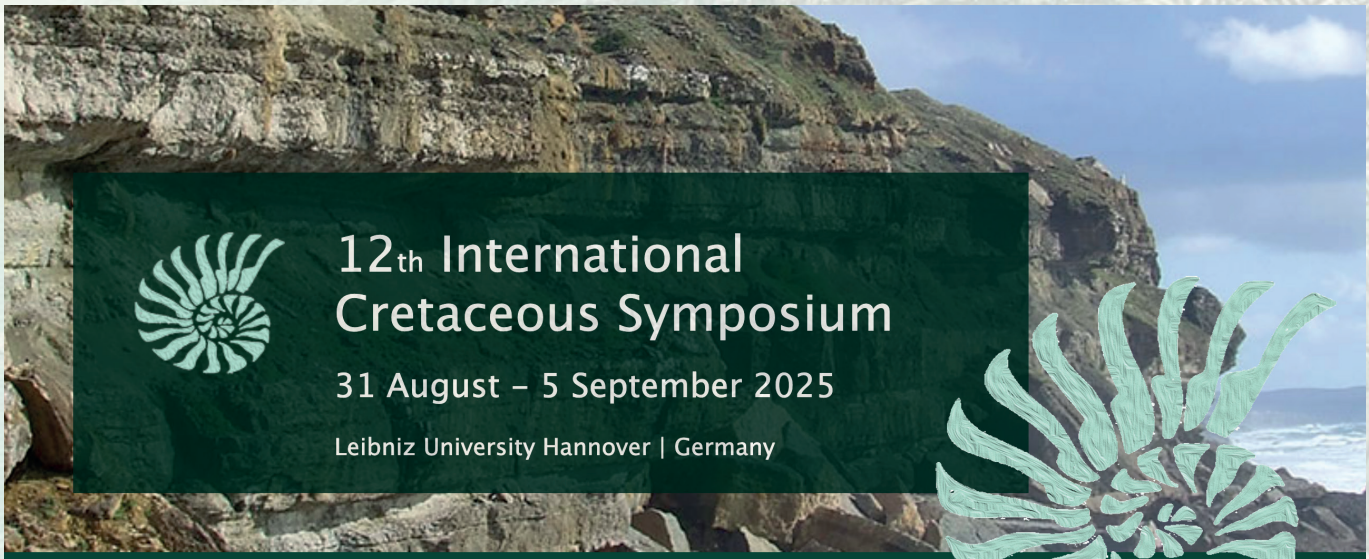
The highest southern latitude onshore record of the Cretaceous-Paleogene (K-Pg) mass extinction is found on Seymour Island, Antarctica. The boundary occurs within the upper levels of the abundantly fossiliferous and expanded (sedimentation rates of 0.2 cm/yr) López de Bertodano Formation. Previous studies based on species richness data have led to persistent debate as to the timing of the K-Pg mass extinction in Antarctica, but little quantitative work exists examining ecological or environmental change across the boundary at high latitudes. During early 2024 we conducted a detailed study of the K-Pg interval on Seymour Island, measuring multiple sections and making quantitative macrofossil collections across the K-Pg along strike for ~2.5 km. New faunal data indicate that existing macrofossil collections from Seymour Island provide an accurate picture of species richness, but do not adequately capture the ecological composition of the marine ecosystem in either the pre- or post-boundary intervals. Shifts in dominance and abundance of certain taxa occur within the final ~1 million years of the Maastrichtian, but the only significant ecological change occurs at the K-Pg itself, with an impoverished early Danian community dominated by the infaunal bivalve Lahillia larseni. Preliminary geochemical data from organic biomarkers suggest minimal temperature change across the boundary. New observations extend the stratigraphic ranges of several taxa closer to, and in one case across, the K-Pg boundary. These data confirm a single extinction event at the K-Pg boundary in Antarctica. Early disappearances of taxa are likely a result of insufficient sampling and poor taxonomic resolution.



12th International Cretaceous Symposium

31 August – 5 September 2025

Leibniz University Hannover | Germany

POSTERS

Poster Sessions 4a, b, c, d, e; 5a, b, c, d, f, g; 6a (Workshop)

4a: Shallow-marine Carbonate Systems
4b: Mediterranean (Tethyan) phophogenic province
4c: Cretaceous Geodynamics
4d: Cretaceous sedimentation patterns in the southern Boreal Realm – regional versus global control
4e: Regional geology and integrated stratigraphy of the Upper Cretaceous of NW-Europe

5a: Cretaceous large benthic foraminifear
5b: Ammonites – what else?
5c: Unravelling the biogeographic, biostratigraphic, palaeoecologic, and taxonomic significance of inoceramid bivalves
5d: Cretaceous Invertebrates
5f: Cretaceous vertebrates – open session
5g: Terrestrial flora evolution during Cretaceous

6a: Cretaceous Earth dynamics and climate in Asia – IGCP 679

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Microfacies of the Upper Cretaceous (upper Campanian–Maastrichtian) deposits of the Bazov Dyal Formation (Central Balkan Mts, Central Bulgaria) – preliminary results

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The present study is focused on the upper Campanian–Maastrichtian sequence of the Bazov Dyal Formation in the Central Balkan Mts (Central Balkan Zone) that is outcropped in four sections (Mountaineers' Memorial, Polenitsi South, Polenitsi and Starna Reka) and one locality (Polenitsi North). The succession is characterized by variable thickness and ranges from a few centimetres up to 12 m. The lower part is composed of light grey limestones, which rapidly grade upwards into grey sandy bioclastic limestones. Scattered coarse-sand to granule-sized grains of quartz and lithic frag-ments also occur and are locally abundant in separate beds.

Four microfacies types (MFT 1–4) have been distinguished and described: MFT 1 Echinoderm packstone/grainstone; MFT 2 Bioclastic grainstone with coralline red algae; MFT 3 Sandy bioclastic grainstone/rudstone; and MFT 4 Sandy bioclastic-intraclastic packestone/grainstone. The observed fossil association (mainly echinoderms, bryozoans, coralline red algae, brachiopods) indicate normal salinity and open-water circulation. Grain-supported limestone varieties (packstones, grainstones and rudstones) characterise agitated hydrodynamic conditions. Commonly presented well-rounded quartz and feldspar clastic grains, as well as lithic fragments with various sizes and composition (different volcanic, igneous, metamorphic and sedimentary rocks), suggest possible fluvial terrigenous supply.

Based on the obtained preliminary data, it can be assumed that the carbonate deposits of the Bazov Dyal Formation have been formed in a high-energy open-marine setting with locally important fluvial terrigenous supply.

Acknowledgements. The Bulgarian National Science Fund of the Ministry of Education and Sci-ence, Grant KP-06-N74/3, supported this study.

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Early Albian Carbonate Platforms in Central Tunisia: A Facies-Based Reconstruction of a Tropical Tethyan carbonate factory

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The early Albian succession in the Jebel Serdj-Bargou mega-anticline (Northern Atlas, Central Tunisia) is characterized by well-developed carbonate platforms, representing a significant component of the last carbonate unit (Cu5) stratigraphic interval of the Serdj Formation. This study investigates the paleoenvironmental evolution of these platforms, addressing a key knowledge gap in the southern Tethys.

Thirteen microfacies (MF1 to MF13) and seven facies associations (FA1–FA7) were identified, primarily based on fossil assemblages (corals, rudists, benthic foraminifera), texture, and fabric. These facies associations reflect a biogenic composition typical of an inner to outer ramp environment within a warm tropical climate.

The succession vertically evolves from an open marine basinal setting (T4) to moderate to high-energy shallow marine carbonates (Cu5), with high productivity evolving laterally from inner platform to marginal settings. Two distinct domains of high carbonate production are recognized: Jebel Bargou in the south and Jebel Cheirich in the north. In contrast, the Drija area, situated between these zones, is characterized by reduced carbonate production (50% lower) and reworked mixed facies suggesting an local intrashelf graben.

A well-developed coralline platform is observed in the northern Cheirich area, indicating favorable conditions for coral growth. This platform displays diverse biogenic components, including porcelaneous larger benthic foraminifera (alveolinids and soritids), which indicate euphotic, shallow marine conditions.

These findings enhance understanding of the early Albian carbonate platform dynamics in Central Tunisia, providing insights into facies distribution, carbonate production, and paleoenvironmental evolution, offering a valuable reference for similar Tethyan settings.

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Cretaceous dolomite(s) from the Lusitanian Basin (W Portugal): What can we learn?

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Understanding the mechanisms that control dolomite distribution within Cretaceous coastal sedimentary sequences remains limited. This study presents an integrated assessment of dolomite occurrence and potential dolomitization processes based on five stratigraphic sections from lithologically heterogeneous coastal successions in the southern sector of the Lusitanian Basin (Ericeira, Portugal). These sections encompass approximately 40 million years of sedimentary record, spanning from the late Valanginian to the late Barremian (São Lourenço to Regatão Formations) and from the early Albian to the early Cenomanian (Rodízio and Galé Formations).

Mineralogical and petrographic datasets were combined to characterize dolomite presence, associated mineralogical assemblages and infer the underlying dolomitization mechanisms. Mineralogical analysis was performed using X-ray diffraction (XRD), and due to the large dataset (N=276), statistical tools were applied to discern compositional trends. These findings were further validated through petrographic and elemental analyses (SEM-EDS), and detailed examination of dolomite crystal structure based on diagnostic XRD peaks.

Dolomite was detected in all studied sections, with its presence ranging from 12% to 68% of the total sampled stratigraphic horizons. Relative abundance estimation indicates that dolomite is the dominant mineral phase (>50%) in 25 samples, typically co-occurring with quartz and calcite. Stratigraphic distribution pattern analysis showed that dolomite-bearing horizons preferentially occur interbedded with siliciclastic levels of mixed mineralogy (quartz and calcite), suggesting a significant control exerted by porosity and/or permeability on dolomitization processes.

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Microfacies as a tool for paleoenvironmental studies of the Early Cretaceous in the Sergipe-Alagoas Basin, Northeastern Brazil

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The Sergipe-Alagoas Basin, located in northeastern Brazil, is a key area for geological and paleontological research, as it hosts some of the most complete Cretaceous stratigraphic successions among Brazilian sedimentary basins. These successions record all tectono-sedimentary stages related to the initial opening of the South Atlantic Ocean during the Early Cretaceous, associated with the f Gondwana breakup. Within this context, the Riachuelo Formation stands out, representing a transitional restricted environment that grades into shallow to deep marine settings. Globally the Early Cretaceous was marked by the widespread development of carbonate platforms, with significant oceanic records. Microfacies analysis is a powerful tool for identifying such records, reconstructing depositional systems, and characterizing associated marine biota. Despite its importance, microfacies-based studies of the Riachuelo Formation remain limited. This study analyzes petrographic thin sections from three onshore cores (SER-01, SER-03, and SER-04) in the Sergipe-Alagoas Basin. The successions represent a mixed carbonate–siliciclastic shelf system, including quartz-bearing sandstones and packstones deposited in a transitional zone protected by carbonate banks. These evolve from sand-bar and shelf-margin facies (packstones, grainstones, and rudstones) to deeper outer shelf environments dominated by mudstones and wackestones. The fossil assemblage is predominantly composed of planktonic and benthic foraminifera, echinoderms, and mollusks, along with local occurrences of cadosinids, green and red algae, microcrinoids, inoceramids, and microbial fragments. As a result, six distinct microfacies were identified, indicating a transition from shallow, high-energy marine environments to deeper, as well as low-energy settings typical of the outer shelf. [Acknowledgements: CNPq project: 405679/2022-0]

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Stylolites as controls on fluid flow and karst development : a case study

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Stylolites, pressure-solution features common in carbonate rocks, significantly influence fluid flow and permeability in reservoir systems. However, the role of clay accumulations along stylolite seams remains poorly understood. This study investigates the relationship between stylolite morphology, associated clay mineralogy, and their influence on permeability and fluid circulation. We present preliminary results from the first study area in southern Italy (Apulia), based on scanning electron microscopy (SEM) combined with micro-XRD and micro-XRF analyses.

The data reveal systematic variations in clay mineral assemblages and their distribution along stylolites, suggesting a potential sealing effect and anisotropic control on fluid pathways, which may influence proto-karst development. Preliminary findings also indicate a correlation between the orientation of major cave systems (under investigation) and dominant stylolite families in the area. Additional SEM and micro-XRD analyses help refine the characterization of mineralogical textures and controls on fluid behavior.

Ongoing work aims to better quantify clay content and evaluate its spatial correlation with fluid migration, porosity evolution, and early-stage karstification. Future research will extend karst-related analysis to two additional areas in Slovenia and the Czech Republic to test the broader relevance of these observations.

Poster

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Bio- and microfacies of the "Hilskonglomerat" (Grenzlerburg Member of the Salzgitter Formation) in the Early Cretaceous Braunschweig embayment (lower Hauterivian, NW-Germany)

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During the mid-Early Cretaceous, the Lower Saxony Basin expanded onto the Central German, Pompeckj and Altmark swells. At the turn of the Valanginian/Hauterivian, the Braunschweig embayment was formed in what is now SE Lower Saxony between the Harz Mountains in the south and the Flechtingen-Roßlau Thrust in the north-east, expanding into the Subhercynian Basin in the course of the subsequent Cretaceous transgressions. The deposits of the Hauterivian transgression were analysed in terms of stratigraphy, bio- and microfacies on the western and southern margins of the Elm, a halokinetic uplift structure east of Braunschweig, and its corresponding marginal depressions, the western Schandelah and the southern Schöppenstedt synclines. The strata reflect a coarse-grained bioclastic carbonate facies (Hilsconglomerate facies = Grenzlerburg Member of the Salzgitter Formation) while different degrees of subsurface salt migration and synsedimentary tectonics differentiated the depositional environments. On the shallow-water shelf of the Elm, patch reefs developed with highly diverse habitats, documented by fossils from around ten classes, representing a range from calcareous sponge and bryozoan reefs to oyster and brachiopod beds. In front of the western margin of this platform, mainly clays were deposited in the basins, intercalated by highly diverse allochthonous bioclastic rud- and floatstones. Despite their fragmentation, the microstructural preservation of the components is excellent due to rapid embedding in an argillaceous matrix. The biofacies with a dominance of bryozoans, brachiopods, echinoderms and oysters characterises the Hilsconglomerate facies as a temperate, moderately productive echino-bryomol carbonate factory, characterised by the absence of significant amounts of micrite (periplatform muds).

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

The North Saharian epicontinental carbonate platform at the Cenomanian/Turonian Boundary: OAE2 signature in shallow water (Akrabou Formation, Southeastern Morocco)

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The Cenomanian/Turonian Boundary was a period of extreme environmental conditions, marked by hyperthermic climate, high sea-levels, and the Oceanic Anoxic Event 2 (OAE2). During this period, huge portions of the continental margins of North Africa were flooded, with the emplacement of an epicontinental carbonate platform known as North Saharian Platform.

The Akrabou Formation in Southeastern Morocco provides an intriguing window into the dynamics of this shallow-marine carbonate system. This formation, up to 100 m thick, is dominated by low-energy, shallow-water facies with fine-grained wackestone/packstone rich in micrite and oligotypic assemblage of small benthic foraminifera, alternated to oyster-rich beds. A temporary shutdown of the benthic community and the deepening of the platform is testified by a fast and short transition to laminated lime-mudstones with planktonic foraminifera. After the return to shallow-water benthic-dominated facies, an increase in energy is observed before the emersion of the platform.

Stable isotope analysis ($\delta_{13}C$) shows a positive excursion of +3‰ VPDB, aligning with global OAE2 signatures. Interestingly, the platform's maximum deepening occurs with a delay relative to the OAE2 isotopic peak, suggesting a complex interplay between global and local factors in platform evolution.

Despite the stress induced by OAE2, evidenced by the temporary shift to deeper environments, the shallow benthic carbonate community demonstrated resilience, quickly re-establishing after the crisis. This study highlights the Akrabou Formation as a valuable archive of epicontinental carbonate platform dynamics during extreme environmental changes, offering insights into the interplay between global events and local responses in shallow-marine carbonate systems.

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Cretaceous depositional architecture along a transform continental margin and volcanic system (offshore East Africa) - insights from regional high-resolution seismic data

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Here we present a tectonic and seismostratigraphic study of the Cretaceous succession from the archetypal East African transform continental margin. This region underwent significant tectonic reconfiguration during the break-up of Gondwana, which began in the Early Jurassic (~183–177 Ma). As a result, Madagascar separated from eastern Africa and drifted southeastward along the Davie Transform Zone (DFZ), reaching its present-day position in the Early Cretaceous (~120.8 Ma). Transform faulting along the studied segment of the East African continental margin was associated with volcanic activity. The post-drift phase was dominated by tectonic and depositional processes related to passive margin development. Cretaceous sedimentation above the oceanic crust was dominated by shales, sandstones, and carbonates.

High-resolution regional 2D reflection seismic data of the East AfricaSPAN™ survey acquired by ION Geophysical has been used to decipher depositional architecture of the Cretaceous succession. The data reveal both regional and local unconformities, numerous erosional incision, and stratigraphic pinch-outs. These seismic features have been interpreted as being related to: (1) syn-depositional volcanic activity, (2) Late Cretaceous uplift of the northern DFZ, (3) bottom currents flowing along bathymetric highs, and (4) terrigenous sediment input from the African mainland, including gravity-driven mass flows. We propose that the observed depositional architecture was likely influenced by pronounced Late Cretaceous exhumation of the eastern Africa hinterland recorded by thermochronological data.

This study was funded by NCN (2024/08/X/ST10/00218), the NAWA Bekker Programme (BPN/BEK/2024/1/00102) and Exxon Mobil. Seismic data was provided by ION Geophysical; academic access to IHS Markit Kingdom software was granted by S&P Global.

Poster

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A new record of the Boreal Lower to lower Upper Aptian and the Oceanic Anoxic Event 1a from the Lower Saxony Basin

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A 49-m-thick succession from a drill core of Early to early Late Aptian age from Garbsen, a small city 6 km northwest of Hannover, has been studied with respect to sedimentology, bulk organic geochemistry and biostratigraphy. During Early Cretaceous times the Hannover area represented paleogeographically the eastern-central part and, thus, the depocenter of the Lower Saxony Basin.

The basal 14 m cover a paper shale-mudstone sequence (topmost Hoheneggelsen Formation) with a 2.3-m-thick “Fischschiefer” bed at the top. It is overlain by partly reddish-colored hemipelagic marlstones representing lithostratigraphically the Sarstedt Member (= Hedbergella Marls). The “Fischschiefer” represents the local expression of the global Oceanic Anoxic Event 1a in northern Germany.

In addition to lithological data, we present high-resolution $\delta^{13}C_{org}$, $CaCO_3$ and TOC data as well as a calcareous nannofossil biostratigraphy for this succession. This new core complements other records in the western part of the basin (Alstätte, Bottini et al., 2012) as well as southeast of Hannover (Hoheneggelsen KB9, Heldt et al., 2012) and, due to its completeness, provides new insights in the transition from the “Fischschiefer” deposit to the hemipelagic marlstones.

References:

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Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Record of tectonics, sea level, and climate-driven sediment supply from nearshore to hemipelagic facies, Upper Turonian of the Bohemian Cretaceous Basin

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During the Late Turonian, the Bohemian Cretaceous Basin was affected by increased rates of subsidence as well as long-term clastic supply rates, as the tectonic inversion of Central Europe intensified. At the same time, signs of both long- and short-term, transgressive-regressive cyclicity are present in nearshore through hemipelagic facies. The present study focuses on reconstructing the depositional system and stratigraphic geometries along a proximal-distal transect in west-central Bohemian Cretaceous Basin, with the aim to address the relative roles of subsidence, sea level, hydrodynamic conditions, and climate-driven supply variations in the depositional patterns. Detailed correlation of c. 100 outcrop and about 130 well-log/core sections made it possible to revise the existing sequence-stratigraphic scheme in the region and construct isopach maps of newly defined genetic sequence units. The results show migration of the principal depocentre through time, likely driven by along-strike changes in flexural subsidence reflecting varying thrusting activity along the marginal fault system. Superimposed on this process were relative sea-level changes of 400-kyr long-eccentricity timescale and shorter. Higher subsidence rates in the basin centre made it possible to preserve record of falling-stage to lowstand interval that is missing in shallower parts of the basin.

This research resulted from a Master's Thesis by JB, supervised by DU and SČ.

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Multi-proxy provenance study of sandstones from the northern Bohemian Cretaceous Basin (Germany, Czechia) focused on tourmaline, rutile and garnet

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The Kreibitz-Zittau area (northern margin of the Bohemian Massif, Czech-German border region) exposes a ~1000-m-thick Cenomanian–middle Coniacian succession of quartz arenites with high compositional but low textural maturity. Translucent heavy minerals are almost exclusively composed of zircon, tourmaline and rutile (Ø-ZTR maturity index of 91) with tourmaline predominating (average of 60 %). Zr-in-rutile temperatures document upper amphibolite-eclogite to granulite facies between 700–930°C. Cr/Nb discrimination of rutile and geochemistry of tourmaline indicate that >95 % of these grains originate from Al-rich and Fe-Mg-poor metapelites. U-Pb-ages of detrital rutile show a distinct peak at 320–330 Ma. If present, garnets of the almandine–pyrope series are dominant. The 95 % predominance of Variscan ages in all samples and the high/ultrahigh temperatures of metamorphism exclude the Neoproterozoic greywackes and granitoids of the Lusatian Massif and the granitoids of the Jizera–Krkonoše Massif in the northeast as sources. Potential proto source rocks were high-grade metamorphic rocks similar to those today exposed within the gneissic-migmatitic Góry Sowie Massif, ca. 120 km east of the depositional area. Since the late Devonian, this massif was uplifted, reaching the surface in late Carboniferous times. Consequently, the widespread Permo–Carboniferous Variscan molasse is the major sediment source for the Cretaceous sandstones, which thus were deposited during at least their 2nd sedimentary cycle. The study shows that integrated approaches combining careful petrography, heavy mineral analyses, mineral-specific geochemistry and thermometry as well as U-Pb age dating with high-resolution stratigraphy are suited to solve complex deep-time provenance puzzles.

Poster

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A Refined Micro-CT and Holographic Projection Workflow for Taxonomic Studies of Cretaceous Benthic Foraminifera

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Taxonomic studies of foraminifera in thin sections have known limitations. Micro-Computed Tomography (Micro-CT) offers an alternative to study the internal and external structures of foraminifera but suffers from long acquisition time. We have, therefore, designed a vertical holder which stacks up to 15 foraminiferal specimens for each circular scan. Our goal is to create a reference library of accurate 3D foraminiferal models to highlight morphological differences and similarities between different genera and enhance taxonomic identification. We generated digital models of many Cretaceous specimens including Omphalocyclus macroporous, Fissoelphidium operculiferum, Chrysalidina hensoni, and Fallotia sp. and produced cross sections at a variety of orientations. The combined database of 3D models and cross sections will assist micropaleontologists in the study and identification of foraminifera in thin section and eliminate ambiguities.

Holographic projection can be an even more effective tool for morphological studies of foraminifera, so we developed a workflow to optimize foraminiferal models for holographic displays. This workflow not only enables the holographic visualization of 3D foraminifera but also the intuitive interaction and creation of real-time cross-sections at any orientation. Finally, we started the development of a classification tool using Artificial Intelligence to match thin section images to best-fit digital slices from our database of 3D foraminifera. These developments aim to help future specialists identify foraminifera, communicate good taxonomic practices and educate audiences about foraminiferal studies.

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Cenomanian “larger” benthic foraminifera and their biostratigraphic utility

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Despite forming a distinctive diverse and sometimes abundant element of the preserved fossil assemblages of mid-Cretaceous Neotethyan and central American carbonate platforms, there is no generally accepted and well-defined bioevent/biozonation scheme for larger benthic foraminifera (LBF), which limits their utility as biostratigraphic tools. To achieve this requires, in turn, a review of the identity of the taxa involved and a critical review of published reports of their stratigraphic ranges. We have reviewed the published occurrences of almost 200 taxa to establish their stratigraphic ranges. Once misidentifications are discounted, it is apparent that the inceptions and extinctions of some taxa (e.g., the alveolinids) provides a useful basis for recognising Cenomanian substages and occasionally events at higher resolution. Endemic forms and facies control on stratigraphic distribution means that the choice and timing of some key bioevents differs between regions within the Neotethyan – central American realm. Intriguingly, some taxa are truly long-ranging and survive the end-Cenomanian extinction event, sometimes reappearing after an apparent absence of several million years. The reasons for this remain unknown but may include survival in refugia or homeomorphy of forms well-adapted to specific environmental niches. In summary, we present a draft biozonation for Cenomanian LBF, calibrated where possible to other fossil groups and the carbon isotope chronostratigraphic proxy, thereby increasing the biostratigraphic utility of this important fossil group.

Poster

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Successful extraction of nitrogen isotopes from both tissue and shells of Nautilus, Sepia, and Allonautilus species demonstrates the utility of aragonitic ammonite fossils to obtain quantitative Trophic Level (TL) and Isotopic Niche values: new understand

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Modern nautiloids are fore-reef slope dwelling cephalopods with distinct morphological and phylogenetic characteristics. We examined their habitat and trophic ecology across the Pacific Ocean regions where they live, using stable isotope analyses (SIA) of tissue samples from multiple populations. Unlike many cephalopods, Nautilus species exhibit scavenging behavior rather than active predation, with $\delta^{15}N$ and $\delta^{13}C$ values reflecting their unique ecological niches. But of relevance to understanding Cretaceous cephalopods is our finding that nitrogen isotopic values from shell and tissue are identical, and not just for bulk $\delta^{15}N$ and $\delta^{13}C$; we show that nitrogen isotopic values of individual amino acids are the same for shell and tissue. Using this tool we have analyzed shells of exquisitely preserved Cretaceous ammonites and nautiloids and obtained not only values for individuals, but values for those individuals through ontogeny. Coupled with the use of the new Cmeta estimations of the amount of dietary carbon individual species used, a proxy for relative energetics, we present a comparative graph of planispiral vs heteromorphic ammonite trophic levels.

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Cenomanian ammonite faunas from the North Cantabrian Basin (Province Cantabria, northern Spain)

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Fossiliferous Cenomanian strata are superbly exposed in the North Cantabrian Basin (NCB) of Cantabria (northern Spain), yielding rich and diverse Cenomanian ammonite faunas. However, a systematic revision of the faunas is still lacking. The NCB is a relatively small, E–W-elongated extensional basin (~50 x 100 km), developing as an independent structural unit on the rifted North Iberian margin as a result of Valanginian distensional movements. During the Cenomanian, the basin formed a gulf-like embayment in subtropical palaeo-latitudes of ca. 30°N, opening to the deeper marine Basque Basin/Navarro-Cantabrian Ramp in the east and shallowing into the peri-Asturian domain towards the west. The successions yielded diverse Cenomanian ammonite faunas consisting of almost 40 taxa, dominated by representatives of the subfamily Acanthoceratinae. Based on the ammonites, the early Cenomanian Mantelliceras-mantelli and M.-dixoni, the middle Cenomanian Cunningtoniceras-inerme, Acanthoceras-rhotomagense and A.-jukesbrownei, and the late Cenomanian Eucalycoceras-pentagonum and Metoicoceras-geslinianum zones have been identified. There is no record of the latest Cenomanian Neocardioceras juddii Zone. Palaeobiogeographically, the NCB belongs to the "Northern Transitional Subprovince", located between the Tethyan and Boreal realms. The Cenomanian ammonoid faunas of the NCB are entirely dominated by cosmopolitan taxa, associated by some Tethyan forms; true Boreal taxa are absent. The ammonoid faunas are relatively diverse and compare well to Cenomanian ammonite assemblages known from other European localities mediating between the Boreal and Tethyan realms (e.g., Cassis, Bouches-du-Rhône, southern France). The Cenomanian ammonite record of the NCB, thus, provides an important piece in the complex palaeobiogeographic jigsaw puzzle of mid-Cretaceous ammonite faunas.

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Inoceramid record around Mid-Maastrichtian Event – evidences from key Bulgarian sections (Western Fore Balkan)

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The Mid-Maastrichtian Event (MME) was related with significant sea level-rise (50–100 m) and anomalously high mercury concentrations in several European Chalk Seas, associated with changes in climate and deep-water circulations. Most probably, the MME was caused by intense volcanic-tectonic activity, related with formation of vast oceanic-plateaus (Dubicka et al., 2024). These dramatic changes have been reflected upon marine ecosystem, and having caused the extinction of the Caribbean-Tethyan rudists and “true” inoceramid bivalves.

The studied Bulgarian stratigraphic sections – Moravitsa, Darmantsi and Chelopek that yielded Maastrichtian inoceramid record fall within the Western Fore Balkan Mountains (Western Bulgaria), are having been formed in Peri-Tethyan Basin System. Their lowest strata are mainly composed of glauconitic sandstones, overlaid by varied limestones. The upper lower Maastrichtian inoceramid assemblages are represented by abundant, large to very large-sized Cataceramus barabini, C. subcircularis, C. bebahoensis, C. glendivensis, C. aff. goldfussianus, Platyceramus stephensoni, P. salisburgensis, Trochoceramus radiosus and “Inoceramus” howletti. The lower upper Maastrichtian inoceramids are small-sized and refer to Endocostea coxi, E. jolkicevi and “Inoceramus” ianjonaensis morgani. During late Campanian–Maastrichtian times, the Bulgarian territory was an arena of tectonic activity, accompanied by gradual sea level rising, where the glauconitic sandstones and the following limestones were accumulated. We assumed that the abundant large-sized inoceramids have lived during the begging of the MME and demonstrating the last flourishing episode of the inoceramids, while small-sized Endocostea and “Inoceramus” showed a decline of the group, prior to its extinction.

This study is financed by project No BG-RRP-2.004-0008-C01.

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Ligaments of the latest Jurassic to earliest Cretaceous inoceramid bivalves from the northern central Japan shed new light on the early evolution of the family Inoceramidae

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The early evolutionary history of the inoceramid bivalves still remains uncertain. Inoceramus maedae Hayami, 1960, described from the Berriasian Mitarai Formation of the Tetori Group, and newly-discovered inoceramid specimens from the Tithonian Kamihambara Formation both in northern central Japan, possibly represent one of the earliest records of this family. Their external morphology is similar to that of typical Cretaceous forms (e.g., Neocomiceramus and Inoceramus). However, the multivincular ligament of the Kamihambara inoceramid has only seven or eight sets of pits and interspaces; pits are rounded rectangular, interspaces are ridge or rectangular in shape; the width of pits is much broader than that of the interspaces; the ratio of the width of interspace to that of pit varies; the pits in the anterior part are vertically long, and change their shape to laterally long in the posterior part; ligamental area is situated parallel to commissural plane, trapezoid in shape, and its height decreases gradually in the postero-dorsal area. These characters are distinct from those of Inoceramus, but similar to those of Anopaea, another late Jurassic to early Cretaceous inoceramid genus, though the external shell shape is different from each other. Furthermore, the ligaments of I. maedae can be interpreted as an intermediate form between the Kamihambara inoceramid and Inoceramus. Thus, in the evolutionary history of the inoceramids, the external shape of Cretaceous forms had been already established by the latest Jurassic, and the ligament morphology was gradually changed to that of Inoceramus over the latest Jurassic to the early Cretaceous time.

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A Santonian–Campanian Sphenoceramus assemblage from Arctic Canada – expression of a circum-Arctic taphonomic event?

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Fossils of the giant, iconic genus Sphenoceramus have been documented from the Cenomanian to early Maastrichtian Kanguk Formation of the Canadian Arctic Sverdrup Basin since the 1960s and assigned to no less than seven species in the literature. They are accompanied by the small oxytomid bivalve Hypoxytoma at several localities, but no additional taxa have been reported from the same horizons. Fieldwork on western Axel Heiberg Island has produced a remarkable, much richer fossil assemblage composed of abundant Sphenoceramus, infaunal bivalves (Astarte, Pholadomya, Mactromya), gastropods (potential Naticopsidae and Aporrhaidae), driftwood and an enigmatic, foliate phosphatic fossil. Zircon U-Pb dating of an overlying volcanic ash layer indicates a stratigraphic age close to the Santonian–Campanian boundary for this assemblage. Curiously, outside this Sphenoceramus interval, which comprises up to five closely spaced sideritic horizons, only a handful of isolated ammonites or bivalves are known from the entire Kanguk Formation. The association of Sphenoceramus and Hypoxytoma occurs in several parts of the Arctic and beyond, including West and East Greenland, the East European Platform and the Polar Urals, and extends as far south as Kazakhstan. In several of these areas, as well as in the Sverdrup Basin, this association forms one of very few notable macrofossil assemblages within the Upper Cretaceous succession. This, together with the extraordinary size of Sphenoceramus, suggests the occurrence of a spatially extensive but stratigraphically restricted ecologic and taphonomic window, which promoted the establishment of the Sphenoceramus association together with its subsequent preservation in otherwise nearly barren strata.

Poster

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Potential Application of Genus “Conchoecia?”/Neorichterina for Paleobiogegraphy and Biostratigraphy

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Although it is a predominantly recent genus, Conchoecia Dana, 1853 has had some Cretaceous forms questionably assigned to it since the description of Conchoecia cretacea Pokorný, 1964. More recently, most of these species have been relocated to genus Neorichterina Toth & Cséfán, 2018, considered a Cretaceous representative of the Entomozoidae family. However, there are still taxonomic uncertainties about this genus, and many aspects about their paleoecology, paleobiogeography and biostratigraphic remain unknown. This study revises the taxon based on the available literature on Neorichterina and the Cretaceous forms previously attributed to “Conchoecia”. Faced with several inconsistencies in the taxonomic description of Neorichterina, we suggest its removal from the Entomozoidae family and identify two potential new species, which remain in open nomenclature. The oldest known occurrence of the genus dates to the late Hauterivian-early Barremian in the Haha Basin, Morocco. Later, Neorichterina expanded into the South Atlantic and the oceans of the Tethys region between the end of the Aptian and the end of the Albian, disappearing in the lower Cenomanian. Neorichterina was probably a planktonic genus adapted to warm neritic environments and able to withstand variations in oxygenation levels. It often appeared associated with proliferations of foraminifera from the Favusellidae group and was especially abundant in the South Atlantic. Despite its wide stratigraphic distribution, its presence in the Santos Basin, Brazil, was only recorded for a short period at the end of the Aptian, which suggests its potential as a regional biostratigraphic marker on the southeastern margin of Brazil.

Poster

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Maastrichtian sea grass environment – benthic foraminifera and ostracods from the former ENCI quarry, Maastricht

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The former ENCI quarry, comprising the type locality of the Maastrichtian Stage, contains around 70 metres of calcareous rocks, including a seagrass horizon in the Gronsveld Member. Seagrasses, fully marine angiosperms, are associated with typical biota such as larger foraminifera, bivalves, gastropods, ammonites and grazing vertebrates (e.g. chelonioid turtles). The ENCI quarry fauna contains all of these, albeit not always in the seagrass horizon. Of foraminifera, a silicified specimen of large benthic foraminifera (Omphalocyclus macroporus) was recovered from the upper Gronsveld Member, lodged between seagrass rootlets.

Our research yields new data on benthic foraminifera and ostracods in this seagrass environment. Epibenthic morphotypes, with a predominance of Cibicidoides and Gavelinella, prevail in the underlying Valkenburg Member and around the seagrass horizon in the Gronsveld Member. Bairdoppilata, an ostracod genus typical of seagrass environments, is recorded from the Lixhe 3 and Lanaye members. Additionally, nanofossil zones UC19 (Lixhe 3 – Valkenburg) and UC20 (Gronsveld Member) were detected.

The occurrence of silicified seagrass remains is interpreted as storm-generated accumulation associated with both washed-in and indigenous macrofossil taxa. The described benthic foraminiferal assemblage contains epibenthic morphotypes as well as infaunal genera (e.g. Gaudryina, Dorothia and Arenobulimina). Moreover, middle-chain n-alkanes (including n-C 21, n-C 23 and n-C 25) confirm the presence of organic matter from the submerged plants, including seagrass, in the studied samples. Our interpretations will result in a more comprehensive model of the Maastrichtian seagrass environment at the former ENCI quarry.

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Late Cretaceous cirripedes (Crustacea, Thoracica) from Liège-Limburg, Belgium-the Netherlands: state of the art

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In the mid-1850s, Bosquet provided the first detailed barnacle descriptions from the wider environs of Maastricht. His collections were subsequently revised by Withers in 1935, who added new species from the area. During recent years, a lot of material has been recovered, mostly from bulk samples, resulting in novel records and taxa. Earliest Campanian forms include Cretiscalpellum obtusum, Arcuatoscalpellum dortangsi (comb. nov.), Fallaxlepas fallax and Zeugmatolepas cretae. Late Campanian taxa include mostly long-ranging forms (Cretiscalpellum glabrum, Jagtscalpellum striatum, Regioscalpellum maximum, Diotascalpellum fossula, Virgiscalpellum beisseli, Brachylepas naissanti and Fallaxlepas fallax, Priscoverruca prisca), plus the endemic Proverruca ornata. Early and late Maastrichtian forms include Bosquetlepas darwiniana, Bosquetlepas gracilis, Bosquetlepas (?) bosqueti, Cretiscalpellum paucistriatum, C. glabrum, J. striatum, R. maximum, Regioscalpellum n. sp. (?), D. fossula, D. gracile, 'Arcoscalpellum' pulchellum, Arcuatoscalpellum n. sp., Virgiscalpellum hagenowianum, V. darwinianum, V. radiatum, V. ryckholti, V. exsertum, Pycnolepas industriosa, Brachylepas guascoi, Pr. (?) smeetsi, Verruca jagti and P. prisca. Of special note is the find of a piece of driftwood, with > 1,130 dispersed valves of at least six species of pedunculate cirripede and a minimum number of 126 individuals, which allowed a better characterisation of Virgiscalpellum radiatum and the erection of a new species, 'Arcoscalpellum' mosense. Particularly during deposition of the Vaals Formation (predominantly during the early Campanian), the upper Gulpen Formation (Lanaye Member) and lowermost Maastricht Formation (Valkenburg and Gronsveld members), there are clear links with the Atlantic seaboard and Gulf Coast of the United States, with a number of sibling species.

Poster

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A new amber Lagerstätte from the Lower Cretaceous (upper Aptian) of northern Japan

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During the Early Cretaceous, terrestrial ecosystems underwent a critical transition driven by the emergence and diversification of angiosperms. Amber deposits from this period provide key evidence for understanding the diversity, interactions, and evolution of terrestrial biota. However, such deposits are geographically and stratigraphically limited. Here, we report a new amber Lagerstätte from the Upper Aptian in northern Hokkaido, Japan. The abundant amber occurs within deep-sea deposits and is rich in bio-inclusions, including arthropods, fungi, and plant remains. These inclusions are preserved in three dimensions and exhibit submicron-scale anatomical details. This is the first report of fossiliferous amber-rich deposits from the Aptian in Asia. It is also one of the oldest amber-rich localities with bio-inclusions after those in northeastern Italy (Carnian, Late Triassic), Austria (Hauterivian), the United Kingdom (early Barremian), the Levant (Tithonian, Late Jurassic; Barremian), and southern Congo (late Aptian). This finding fills a paleobiogeographic gap in the fossil record and provides anatomical and ecological insights into a critical interval marked by the rise of modern-type forest ecosystems.

Poster

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Paleozoogeography, stratigraphic distribution and evolutionary history of the genus Pattersoncypris Bate, 1972 (Ostracoda): a key taxon in Aptian biostratigraphy

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Pattersoncypris is a fossil ostracod genus comprising fourteen species recovered from non-marine, transitional, and marine Cretaceous deposits in Brazil, Argentina, Liberia, Congo, Gabon, Angola, Chad, and the United States. As an abundant and diverse genus in Lower Cretaceous sedimentary basins of Brazil and Africa, regions associated with the opening of the South Atlantic Ocean, the co-occurrence of species across these basins underscores the importance of these ostracods in reconstructing the Brazil–West Africa Gondwana correlation. As it is a key genus in Aptian biostratigraphy, with guide species for biozones and subzones, a morphological, taxonomic and paleozoogeographic study was conducted to identify the most robust diagnostic features that would allow reliable species identification and provide insights into the evolutionary history and paleozoogeographic distribution of the genus. The review results enabled the standardization of morphological terms for Pattersoncypris, enhancing taxonomic identification, minimizing systematic errors, and improving biostratigraphic accuracy. Data also suggested that Pattersoncypris was an euryhaline genus originating in Gondwana continent, in the region that became the African Continent, from an ancestor with the genus Hourcqia, during the early Aptian. The adaptive radiation of the genus peaked during the Aptian, with the diversity center located in Northeast Brazil. From the Albian onwards, there was a reduction in richness, with reduced number of species being recorded only in Africa. An interval with no recorded species occurred during the early–middle Cenomanian. A single species was recorded in the late Cenomanian in United States, and by the end of this age, the genus was extinct.

Poster

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The first Cretaceous in-situ rhabdopleurid pterobranchs (Hemichordata)

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Although rhabdopleurids are known since the Cambrian, the global Mesozoic fossil record is so far limited to a few sites in Germany, Poland, France and the United Kingdom only. The Cretaceous fossil record to date is limited to chemically isolated material from chalk and flint. Here we present the first in-situ finds of rhabdopleurids (gen. et sp. indet. and Rhabdopleura vistulae) from the Cretaceous. Stolon systems of rhabdopleurid hemichordates with different branching patterns are reported from the Early Maastrichtian chalk of the island of Rügen, north-eastern Germany. These colonised secondary hardgrounds on the chalk seafloor, notably belemnite rostra and echinoid tests. The material comes from the sumensis, cimbrica and fastigata belemnite zones. As these rhabdopleurids have mostly overgrown other organisms such as bryozoans, bivalves and octocoral bases, they appear to be the youngest colonisers of hard substrates within chalk sea habitat islands on the seafloor. Previous chemically isolated pterobranch material are confirmed by these in-situ specimens. In addition, possibilities for preservation and reasons for the absence of Cretaceous Pterobranchia to date are discussed.

Poster

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Lissamphibians and mammals from the Barremian-Aptian of Balve-Beckum/Germany

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The Balve-Beckum site (Sauerland, western Germany), a karstic infill into Devonian limestone bedrock, yielded a diverse assemblage of terrestrial vertebrates of Barremian-Aptian age. Among the microvertebrates recovered by screen washing, lissamphibians and mammals have been studied so far.

The preserved lissamphibians include one undetermined anuran taxon, two new genera and species of salamandroid salamanders, and at least one albanerpetontid.

The mammal fauna comprises at least seven taxa. Two mandibular fragments and several teeth document a new relatively large eutricondontan. Multituberculates are represented by a number of isolated teeth of a pinheirodontid and an eobaatarid, the latter also documented by a mandible fragment with p4 Three spalacotheriid molars are the first record of ”symmetrodontans” from Central Europe. Dryolestids are represented by two taxa, which is the youngest occurrence of this clade in Europe. Most remarkable is a lower tribosphenic molar which is only the sixth record of an Early Cretaceous tribosphenidan from Europe.

The composition of the lissamphibian assemblage shows similarities with other European Lower Cretaceous assemblages. In general, the Late Jurassic and Early Cretaceous fossil record is rather patchy on that continent which also applies to the record of mammals from that time period in Central Europe which also applies to the record of mammals from that time period in Central Europe. The late survival of spalacotheriids and dryolestids is possibly an effect of the subdivision of Europe into an archipelago and the resulting isolation of terrestrial environments.

Poster

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The Balve-Beckum vertebrate site (Barremian-Aptian) in Sauerland/Germany

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It has been known since the 1970s that the infilled karst cavities in the Devonian limestone of the Sauerland may contain fossils from the Lower Cretaceous period. At that time, mainly ornithopods were found at the Brilon-Nehden site. In 2000, a similar site was discovered near Balve-Beckum, where excavations have been carried out by the LWL Museum of Natural History ever since. The fossils have been preserved in sediments filling fissures and caves that were formed by meteoric karst processes, augmented by deep hydrothermal karstification, mainly in the Mesozoic era. They originate from the land surface exposed during the Lower Cretaceous period (Barremian-Aptian) and were washed into the cave system.

The mostly isolated remains of the vertebrate fauna show a rich diversity including various cartilaginous and bony fish, as well as remains of amphibians, small reptiles, turtles, crocodiles, various dinosaur groups, pterosaurs and mammals.

The microvertebrate analysis so far revealed a large number of novel lissamphibian and mammal genera. Larger vertebrates, as well as the chondrichthyan fauna, on the other hand, indicate clearer overlaps with other sites in Europe.

The relatively high proportion of endemic microvertebrate taxa is seen in connection with the subdivision of the European area into an island landscape and the resulting geographical barriers in time, as well as with the particular palaeogeographical position of the site, which was not located near the coast but in the upland environment of the hinterland.

Poster

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First Report of Pterosaur Remains from the Lower Cretaceous Quiricó Formation, São Francisco Basin (State of Minas Gerais), Brazil

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The record of pterosaur fossils in Brazil is significant, however, it remains limited to a few sedimentary basins from the Cretaceous period. This study describes an isolated pterosaur tooth assigned to Ornithocheiriformes, collected from the Quiricó Formation, São Francisco Basin, Early Cretaceous (Aptian), of Minas Gerais State. In addition to the description of the tooth, a comprehensive review of pterosaur records in Brazilian basins during the Cretaceous was conducted, aiming to understand the distribution of these animals throughout the period and to highlight the group diversity in Brazilian sedimentary basins. The tooth was found in association with fossil plants and articulate gonorynchiform fishes. The tooth has a narrow elliptical cross-section, which has marked mesial and distal carinae with no denticles. In lateral view, the tooth is triangular in shape, being slightly curved lingually. The enamel is thin with no striations. These features, coupled with the Lower Cretaceous age of the deposits it was found, suggest the tooth belongs to an ornithocheiriform pterosaur. This finding represents the first report of pterosaur material from the São Francisco Basin and fills a geographical gap when previous records of ornithocheiriforms in Brazil are considered (Araripe, Bauru, Grajaú, and Recôncavo basins), suggesting a broader distribution of these flying archosaurs in Brazil. Also, this new ornithocheiriform record in the São Francisco Basin strengthen the similarity of its vertebrate fauna to the vertebrates found in Kem Kem Beds in Morocco.

Poster

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Miracle in stone lost after 400 years – the Brabender fish

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Fossil fish from the Campanian of the Baumberge region in western Germany have been internationally known since the 19th century, but they remain rare finds in this area. Long before their scientific study, primarily by von der Marck, these fossils gained public attention. The oldest verifiable find dates back to 1550. The stone carver Franz Brabender, son of the renowned master Heinrich Brabender in Münster, bought the sought-after sandstone from the nearby Baumberge and, while splitting it, discovered a very complete fish fossil. Quick-thinking, he had the find officially certified by the church.

He intended to sell the miracle in stone for a profit and embarked on a journey to Amsterdam, but only reached Kampen in the Netherlands, where he was accused of having forged the fish. Threats against him caused Franz to flee Kampen overnight, leaving the fossil behind. Despite his efforts, he was unable to recover the fossil during his lifetime. Therefore, shortly before his death, he gifted it to Countess Waldburg of Bentheim, who demanded the stone from the city council of Kampen and eventually succeeded in obtaining it.

Thus, the fossil ended up in the curiosity cabinet at Bentheim Castle. A photograph shows the piece roughly in the 1920s to 1930s. After World War II, the castle was used to house British officers. After the troops left, the fish could no longer be found. It is hoped that the piece, after being treasured and kept as a curiosity for almost 400 years, will eventually be rediscovered somewhere.

Poster

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Re-evaluation of leaf macrofossils from the Klikov Formation of the South Bohemian Basins from macro- and micromorphological perspective

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The two South Bohemian basins are located in the southern part of the Bohemian Massif. Fossil plants of Turonian-Santonian age occur in the basal-most part of the Klikov Formation. The formation is 350 m thick, primarily filled with material of fluvial origin. Fossil leaves, charcoalified mesofossils and large trunks of Paraphyllanthoxylon including roots were recovered there.

Fossil leaves of Ettingshausenia senonensis, Cocculophyllum cinnamomeum, Pandemophyllum sp. were revised. This revision was done exclusively on the collection of Ervin Knobloch, aiming to re-examine the most important leaf macrofossils from his older collections (e.g. Quercophyllum triangulidente, Debeya bohemica), and compare them to newly gathered data, using new methods. Small leaves from bulk-macerations are a few millimetres in size, mostly serrate or dentate; their cuticle is difficult to obtain due to the degree of charcoalification and small size; usually a cuticle without stomata can be observed, occasionally with trichome bases.

This revision enabled a better understanding of the vegetation. While most of the platanoid leaves are assigned to Ettingshausenia senonensis, leaves of Quercophyllum show the same cuticle as Debeya insignis. Lauroids were more diversified. We have recorded trunks of Paraphyllanthoxylon, and leaves of Pandemophyllum and Cocculophyllum. Both platanoids and lauroids are reconstructed as growing on alluvial plains, while plants of the Normapolles complex are reconstructed as growing on slopes. Lagoons in fluvial plain were vegetated by water monocots, their margins with liverwort Ricciopsis and hornwort Notothylacites. Local swamps were dominated by Geinitzia reichenbachii.

Acknowledgements: The study was financially supported by the Czech Science Foundation (GAČR) 23-05142K.

Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Diversity of araucariacean pollen from the Lower Cretaceous Araripe Basin, SE Brazil based on micromorphology of the ektexine using SEM.

Hofmann, Christa-Charlotte (1); Coiro, Mario (2,1); Heimhofer, Ulrich (3); Roberts, Emily A. (4); Seyfullah, Leyla J. (1)

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Here we present five micromorphological groups of Aptian pollen grains affiliated with fifteen taxa of Araucariaceae s.l. by using LM and SEM. In addition to well known araucariacean pollen taxa such as Araucariacites spp., Balmeiopsis spp. and Callialasporites spp., we could also assign Exesipollenites scabratus, E. cf. tumulus, and one Inaperturopollenites taxon as araucariacean and could summarize a collection of pollen taxa named as “Araucariaceae” sp. 1 to sp. 4. This collection looks under LM like Araucariacites but displays a transition to different micromorphological features, thus demonstrating the importance of using scanning electron microscopy in palaeopalynology. Pollen characterized by micromorphological features of micromorphological group 4 comprises Callialasporites spp., Inaperturopollenites sp. and Araucariaceae sp. 1 and are suggested to be the dispersed equivalents of previously described eurypalynous pollen cones. These pollen cones and dispersed pollen might represent an ancient group of Araucariaceae with overlapping characters from Podocarpaceae and Araucariaceae. The fifteen Araucariaceae pollen taxa occurring in the Rio da Batateira Formation exceed the diversity of previously described araucaricean macrofossils and pollen of the Araripe basin and indicate that despite the rapid evolution of angiosperms in the Lower Cretaceous, gymnosperms, particularly Araucariaceae, still played an important role in various ancient vegetation habitats.

Poster

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More diverse and abundant than assumed: Eucommiidites pollen preserved in deltaic sediments of the Araripe Basin (NE Brazil).

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Here we present with LM and SEM abundantly occurring Eucommiidites pollen (Erdtmanithecales) from deltaic sedimentary rocks of the Rio da Batateira and lowermost Crato formations. Separation of individual Eucommiidites species using LM only is insufficient and application of SEM is necessary to observe the position and shape of main sulcus and lateral furrows, and the sculpture and ornamentation of the ektexine. Of the twelve taxa differentiated (Eucommiidites sp. 1 to sp. 12), Eucommiidites sp. 6 from sample CAS 27 of the lowermost Crato Formation is preserved as pollen clumps and represents the dispersed equivalent of in situ Araripestrobus resiniferous pollen found in the limestone laminites of the Crato Formation. Other Eucommiidites taxa are known only as dispersed taxa of which Eucommiidites sp. 2 and E. sp. 3 occur frequently and generally abundantly in medium percentages (4 to 15%) in the pollen sum throughout the section and are interpreted to be wind pollinated or come from stands with no specific requirements. The less abundant taxa are assumed to grow at some distance from the distributary channels in more specialized stands. Eucommiidites sp. 6 and E. sp. 8 are preserved in clumps and display a more ornamented tectum and are suggested to be animal pollinated. The presence of unusual high percentages of Eucommiidites (max. 8 -15%) in the pollen sums reveal that Eucommiidites taxa constituted a significant portion of ancient vegetation habitats located upriver, but only comprise a few fragments in the macrofossil record of the Araripe Basin.

Poster

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Provenance discrimination of quartz grains by cathodoluminescence and application to Cretaceous detritus

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Waseda University, Japan

Cathodoluminescence (CL) is a light emission phenomenon that occurs when a substance is irradiated by an electron beam. The CL intensity and spectrum vary depending on lattice defects and impurity elements in crystals.Therefore, the CL spectrum of quartz will vary the characteristics of its source rocks. CL has been widely applied for provenance analysis (e.g., Zinkernagel, 1978).

In this study, we analyzed the CL spectrum using peak separation to create an index for discriminating rock types and examined its applicability to Cretaceous clastic detritus. We created the index using 19 rock samples, including volcanic, plutonic, high-temperature, and high-pressure metamorphic rocks. Additionally, 3 Cretaceous clastic detritus samples were used to apply to the index. The CL spectrum was measured using an SEM-CL system in the 250 to 950 nm range.

This study identified three indices after conducting spectral analysis and PCA. These indices enable discrimination of rock types; this suggests that this scheme can be applied to the provenance analyses and we practically applied to the Cretaceous clastics.

By using the above indices, we propose a discrimination diagram, which the 70% confidence regions segregate most of rock types, although there was some overlap. In particular, plutonic and high-temperature metamorphic rocks were difficult to distinguish. In addition, the application to the Cretaceous clastics ended in failure suggesting an incorrect provenance. There are challenges in determining the plutonic and high-temperature metamorphic regions and application to geological records.

Poster

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Paleoclimate analysis of the east Asian continent margin during the Triassic to Middle Cretaceous

Hara, Kumpei; Ohta, Tohru; Komiya, Ryutarou

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The Mesozoic era is known as a greenhouse era with gradual climate elevation from the Triassic to a super-greenhouse condition in the mid-Cretaceous, reaching the warmest climate in the Phanerozoic. There have been many studies on Mesozoic paleoclimate in the interior of the Asian continent. Still, few studies have been conducted in the coastal areas of the Asian continent, where regional paleoclimate change can be more accurate and sensitive monitor of the global paleoclimate changes. However, there is a lack of information on paleoclimate in the continental margins of Asia. This study aims to elucidate the paleoclimatic evolution of the east Asian continental margin during the Early Triassic to the Middle Cretaceous in the Kitakami belt of Northeastern Japan.

This study conducted geochemical and mineralogical analyses of mudstone samples collected from five formations ranging from the Early Triassic to the Middle Cretaceous, and estimated the paleoenvironment of the east Asian continental margin.

The result indicates that northeast Japan was generally temperate during the Mesozoic but reached its climatic optimum in the mid-Cretaceous. This result is concordant with the trend of Mesozoic global paleoclimate change. However, we also identified temporal severe aridification or cooling during the Late Triassic. We are uncertain what this result suggests but consider that the present result detected a regional paleoclimate change at the eastern continental margin of Asia during the Late Triassic.

Poster

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A carbon isotope stratigraphy toward composite stratigraphy for regional correlation of the Upper Jurassic to Lower Cretaceous Tetori Group in central Japan

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The Tetori Group is a Jurassic–Cretaceous siliciclastic succession in Japan that records a marine to non-marine transition and preserves diverse fossils from the eastern margin of East Asia, influenced by the Boreal and Tethyan realms. Despite its importance, regional correlation is difficult due to poor exposure and discontinuous sequences.

Carbon isotope stratigraphy was applied across three sections to improve the regional correlation: Itoshirogawa logging road (ILR, type section), Tamodani (continuous stratigraphy), and Shokawa (chronostratigraphically constrained). Paleomagnetic analysis of the ILR and Tamodani was applied. Total organic carbon and δ^{13}Corg values were measured at multiple samples on each horizon, and Rock-Eval pyrolysis was conducted on ILR and Tamodani samples.

Rock-Eval pyrolysis indicated that the organic matter was predominantly from terrestrial higher plants. δ^{13}Corg fluctuations were consistent with each section, showing a positive excursion and a negative interval. A new U–Pb zircon date of 128.8 ± 1.4 Ma from a tuff sample of the Itsuki Formation acts as an anchor of the δ^{13}Corg curve; the positive excursion was likely correlated with the post-OAE1a excursion in the Aptian, while the negative interval aligns with the Hauterivian after the Weissert Event. All paleomagnetic samples show normal polarity, likely due to an overprint.

A combination of carbon isotope stratigraphy and U–Pb chronology proves essential for regional correlation within the Tetori Group and directly to global and East Asian non-marine records. Identifying other isotopic excursions, such as the Weissert Event or Volgian Isotopic Carbon Excursion, will be key to correlating additional horizons.

Poster

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Paleoenvironment and paleoecology of the Cretaceous Sayeonri Formation in Ulju-gun, Ulsan, Korea

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The Ulsan area belongs to the southeastern part of the Cretaceous Miryang Sub-basin of the Gyeongsang Basin, the largest Cretaceous terrestrial basins in Korea. However, it has been geologically isolated by faults and intrusive rocks, resulting in a stratigraphy distinct from the main distribution of the Miryang Sub-basin. Recently, some paleontological records have been reported from the Cretaceous deposits in Ulsan, gradually revealing the previously unknown paleoenvironment and paleoecology of the southeastern Gyeongsang Basin. Nevertheless, research on stratigraphy, sedimentary geology, and paleoenvironmental interpretation remains insufficient. This study describes the sedimentary features and paleontological records from the lowest part of the Cretaceous Sayeonri Formation in Ulju-gun, Ulsan, Korea, and interprets their paleoenvironmental and paleoecological implications. The Sayeonri Formation at the study site is interpreted to have been deposited in an alluvial plain, lake margin, and shallow lake based on sedimentary facies analysis. Diverse sedimentary features and paleontological records are found in the deposit, including mudcracks, wave ripples, current ripples, teepee structures, traces of evaporite minerals, raindrop imprints, microbially induced sedimentary structures, calcretes, quadrupedal ornithopod dinosaur footprints, sauropod dinosaur footprints, small vertebrate footprints and invertebrate trace fossils. These features indicate that the Sayeonri Formation was formed in an alluvial plain, lake margin, and shallow lake under an arid to semi-arid climate. Moreover, they suggest that microorganisms, invertebrates, and vertebrates coexisted in this depositional environment. The results of this study provide foundational data for establishing the stratigraphy and uncovering of the hidden paleoenvironments of the Korean Peninsula during the Cretaceous.

Poster

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Grain shape evaluation by elliptic Fourier and principal component analyses: Application to the paleoenvironment analysis of Cretaceous sediments.

Maeda, Yushiro; Ohta, Tohru

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The shape of clastic grains has been considered as an essential indicator of the depositional environments and hydro-dynamic experience they have undergone. Therefore, many studies have been pursued to quantify the shape of clastic grains.

For example, Suzuki et al. (2015) utilized the elliptic Fourier principal component analysis (EF-PCA) to analyze the shape of sand particles and created two indices: a macroscopic index of the overall shape of grains (REF1) and a microscopic index of surface roughness (SEF).

REF1-SEF indices can be used not only as a quantitative shape indicator but also as a prediction of grains derived from glacial, fluvial, foreshore and aeolian environments. However, previous studies focused on the application of modern sediments, and little research has been done on sand particles from the geological record (sandstones). In this study, we investigate whether this particle shape analysis (EF-PCA) is helpful for the paleoenvironment predictions of sand grains from the geological records.

The sample used in this study is sandstone from the Daerdang Formation, distributed in the Sichuan Basin, China, which was located in the interior of the Asian continent during the Cretaceous Period. Sandstones analyzed are well-sorted quartzite with high-angle cross-bedding and interpreted as Cretaceous aeolian deposits. The EF-PCA analysis was conducted on these sandstones to see if this scheme is valid for paleoenvironment prediction.

Poster

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Provenance discrimination of quartz grains based on the cathodoluminescence spectrum using machine learning

Miyashiro, Naoya; Marumo, Yasunori; Osawa, Masahito; Ohta, Tohru

Waseda University, Japan

Cathodoluminescence (CL) is a light emission phenomenon that occurs when a substance is irradiated by an electron beam. CL intensity and spectra may vary depending on lattice defects and impurity elements inherited in crystals. Since CL spectra of quartz reflect the characteristics of their source rocks, they have been widely used for provenance analysis (e.g., Zinkernagel, 1978). In this study, we evaluated the CL characteristics of quartz using machine learning to develop a source-rock classification model for detrital quartz. This will provide a new scheme to evaluate the source-rock types of the Cretaceous strata.

We analyzed 26 rock samples mainly formed during the Cretaceous period, including volcanic, plutonic, high-temperature metamorphic, and high-pressure metamorphic rocks. Quartz grains were analyzed using a scanning electron microscope equipped with a diffraction grating spectrometer. CL spectra were measured in the 300–800 nm range and transformed using the isometric log-ratio (ilr; Egozcue et al., 2003). A machine learning model was constructed based on spectral differences and evaluated with stratified k-fold cross-validation.

CL spectra of quartz grains are apparently similar and undistinguishable. However the Linear Discriminant Analysis (LDA) and random forest models enabled discrimination of quartz grains from the four source rocks, achieving about 80% accuracy. The present scheme can hopefully be an useful approach to the provenance analysis of Cretaceous sandstones.

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Poster

Poster Sessions 4a, 4c, 4d & 4e, 5a & 5c & 5d, 5b, 5e & 5f, 5g, Workshop IGCP

Enhanced continental weathering during the Oceanic Anoxic Event 2 (OAE2) in the eastern Asian continental margin

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The enhancement of continental weathering during the middle Cretaceous has received wide attention because it may have played a crucial role in causing oceanic anoxic events (OAEs). Global warming may enhance continental weathering, leading to outflow of nutrients into the ocean, provoking excessive primary productivity and raising the middle Cretaceous OAEs (weathering hypothesis). To evaluate the role of continental weathering, this study explores the fluctuation of continental paleoweathering during OAE2 in the east Asian continental margin. The extent of hinterland paleoweathering was quantified using the geochemical weathering index (W values) and the grain size variation was estimated by mineral composition (quartz/phyllosilicate) of the mudstones collected from Saku Fm., Yezo Group, exposed in Hokkaido, northern Japan. The W value ranges from 30 to 50, which is equivalent to recent soils that developed under temperate climates. The W value increases before the onset of OAE2 and during OAE2 that ceased simultaneously with the termination of OAE2. Quartz/phyllosilicate increases during the OAE2 interval. These results indicate an increase in sediment flux during OAE2, which is concordant with a numerical model study showing an increase in precipitation at Mid-latitude Eastern Asia, which is the hinterland of the Yezo Group at elevated atmospheric CO_2levels.

These results are consistent with the weathering hypothesis as a cause of OAE2. Previous studies revealed that continental weathering increased during OAE2 in the Tethys and proto-North Atlantic oceans. Our data suggest that a similar phenomenon also operated in the western margin of the Pacific Ocean.

Poster

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The Cretaceous climate of Vietnam: insights from the geochemical and mineral composition of terrigenous sediments

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The Cretaceous period, characterized by elevated temperatures and high atmospheric CO_2 concentrations, is a crucial subject in paleoclimate studies as it may serve as a reference for understanding the Earth system dynamics under greenhouse conditions. Efforts to elucidate the climatic characteristics of different regions on Earth have been reflected in many studies conducted on various research subjects. Severe aridification has been recognized in low-latitude areas of Southeast Asia during the mid-Cretaceous; however, previous studies have mainly focused on continental interior basins, and the continental margin has not been studied precisely. In this study, we investigated the paleoclimate of Vietnam during the Cretaceous by a detailed assessment of geochemical and clay mineralogical characteristics of mudstones collected from northern Vietnam, the Da Lat region, and Phu Quoc island. The results indicate that Northern Vietnam has experienced a temperate climate in the early Cretaceous but shifted to arid conditions in the Late Cretaceous. Central Vietnam remained in arid conditions and Southern Vietnam was sub-humid through the Cretaceous. The geochemical proxies and clay mineral indicators consistently reveal a decrease in chemical weathering intensity during the Late Cretaceous, suggesting a slight aridification from the Early to the Late Cretaceous. Notably, Central Vietnam is recorded as drier than the North and South during the Cretaceous period. These results indicate that the continent's climate characteristics are strongly controlled by global atmospheric circulation and regional geographical and tectonic factors.

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Mesohibolitid belemnites from the Torinosu Group in Southwest Japan, and their palaeobiogeographical implications

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Belemnites are an extinct order of the coleoid cephalopods flourishing in the world ocean from the early Triassic to the end of the Cretaceous, and are often considered as useful palaeobiogeographical indicators. The belemnite records in Japan potentially provide useful information to discuss the palaeobiogeography in the Northwest Pacific at that time, and the presence of the Boreal belemnites in the Middle Jurassic and earliest Cretaceous strata in the Inner Zone of the Southwest Japan attracts much attention recently. Although the occurrences of the belemnites from the Outer Zone of the Southwest Japan had been known, most of them have not been formally described yet, and then their palaeobiogeographical values are not fully discussed. In this paper, several specimens of the mesohibolitid belemnite rostra were described from the Tithonian–Berriasian Yatsuji Formation of the Torinosu Group in the Sakawa area, Shikoku Island, Southwest Japan. Single specimen is identified as Hibolithes aff. marwicki marwicki sensu Mutterlose (1986) described from the lower Tithonian in Antarctica. Other five specimens are similar to Pachybelemnopsis aucklandica aucklandica, which was described from the middle to upper Tithonian in New Zealand, though the length of a ventral groove and the shape of transverse section of the rostra of Sakawa Pachybelemnopsis are slightly different from those of this species. These belemnite taxa can be considered as the Tethyan-Pacific elements, suggesting the faunal connection between the southern part of the South Pacific and the Northwest Pacific through the equatorial region around the interval near the Jurassic/Cretaceous boundary.

Poster

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Dynamic interchange between deltaic to open shelf environment in the Early Cretaceous at the passive margin of the north-eastern Gondwana (based on sequence in the Thakkhola Graben, central Nepal Himalaya)

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The Late Jurassic to Early Cretaceous succession exposed in the Thakkhola Graben (central Nepal Himalaya) is regarded to develop on a passive margin of the north-eastern Gondwana. The Early Cretaceous deposits mark a significant change in sedimentation compared to the Jurassic succession. An offshore shales of the Jurassic Nupra Formation were replaced by the deltaic siliciclastics deposits at the beginning of Cretaceous that designate the next stage of Tethys Himalaya development, where after incipient opening of the Indian Ocean in Middle and Late Jurassic, an extensional tectonic phase started that led to upwarping of the Indian margin and erosion of exposed sedimentary rocks, which provided source material for the Lower Cretaceous Chukh Group. We examined facial development and the green clay nature and distribution of the Chukh sequence exposed on the western bank of the Kali Gandaki (Thakkhola Graben). Our findings confirm the previous interpretations of a general change in the depositional regime of these deposits from terrigenous-derived deltaic to open shelf calcareous environment. However, the occurrence of several horizons of wave or hummocky-cross lamination between the deltaic sand bodies is indicative of their wave reworking, while interbedding of green layers composed of glaucony marks episodes of condensation during sedimentation of deltaic deposits. This indicates the highly variable sedimentation conditions of the lower part of the Chukh sequence, probably due to the eustatic sea-level rise and tectonic subsidence of the Indian margin that followed the break-up between India and Australia. This is contribution No.6 of the scientific initiative Himalayan Academy.

Poster

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Grain shape evaluation by elliptic Fourier and principal component analyses: Application to Cretaceous thin sections and modern foreshore sands

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Waseda University, Japan

The shape of clastic grains contains essential information about their hydrodynamic transport processes and depositional environments. Many studies have been conducted to quantify grain shape. For example, measuring a grain's longest, intermediate, and shortest axes (three axes) allows the description of its overall shape, such as elongated to rounded forms. However, these axes cannot capture the surface smoothness of grains.

The reverse is also true: conventional surface smoothness indices cannot be used to describe the overall shape of grains.

This study introduces a method to quantify overall shape and surface smoothness texture using elliptic Fourier–principal component analysis (EF-PCA; Suzuki et al., 2015). Elliptic Fourier analysis encodes grain outlines into sinusoidal waves of various frequencies (100 Fourier wave series were used). Principal component analysis was then applied using both the variance–covariance and correlation matrices of Fourier descriptors. The former emphasizes high-amplitude Fourier waves and reflects overall shape (REF1), while the latter emphasizes fine-scale waves and reflects surface roughness (SEF).

Because this method uses only two-dimensional shape information, it can also be applied to thin-section samples (geological records). In this study, EF-PCA was applied to quartz grains in thin-sections of Cretaceous deposits and compared with grains from modern foreshore sands.

Comparative samples included modern foreshore sand and thin section specimens from the Inubozaki Formation of the Cretaceous Choshi Group. Both were analyzed using EF-PCA to compare grain shape characteristics. The results show that thin section analysis can effectively quantify grain shape in ancient deposits and compare them with modern sediments.

Poster

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New non-marine Ostracod fauna from the Lower Cretaceous Xiaonangou Formation of the Baishan Basin, NE China

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A series of rift basins formed along the northern margin of the North China Craton (NCC) during the Early Cretaceous Period, due to the subduction of the paleo-Pacific Plate and the destruction of the NCC. The Baishan Basin (also known as the "Hunjiang Basin") is one of coal-yielding rift basins in the northern margin of the NCC. Cretaceous strata are widely exposed in the Baishan Basin, and consist of five formations: The Guosong, Yingzuilazi, Linzitou, Shiren and Xiaonangou formations, in ascending stratigraphic order. In this study, a new non-marine ostracod fauna from the Xiaonangou Formation in the Baishan Basin has been detailed described and illustrated for the first time. Eight samples from the Guanghuanjie-Yumuqiaozi section were analyzed, and seven taxa were identified, including Cypridea sp., Mongolocypris shai sp. nov., Lycopterocypris sinuolata, Lycopterocypris sp., Candona praevara, Candonidae gen. indet. sp. and Cyclocypris invalida. This comprehensive taxonomic study not only enhances our understanding of Cretaceous non-marine ostracods in China but also provides the first precise age constraint for the Xiaonangou Formation using ostracod biostratigraphic correlation. Based on the ostracod biostratigraphic analysis, the age of the Xiaonangou Formation is early Albian. Additionally, this study supports the hypothesis of invertebrate faunal exchange in northeastern China during the Early Cretaceous.

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Poster

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Paleoenvironmental Reconstruction of the Cretaceous Choshi Group using Elliptic Fourier-Principal Ccomponent Aanalysis

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The shape of sedimentary grains, such as roundness and surface smoothness were acquired during the transportation and depositional processes that grains underwent. Therefore, the shape of sedimentary grains might possess information to reconstruct the transportation histories and depositional environment that grains underwent. Therefore, numerous studies had been pursued to quantify the shape of sedimentary grains. Among them, Suzuki et al. (2015) proposed two shape parameters to quantitatively evaluate grain shapes by utilizing elliptic Fourier and principal component analyses (EF-PCA), which can quantify macroscopic circularity (REF1) and microscopic smoothness (SEF) of grains. Suzuki et al. (2015) furthermore revealed that on the REF1-SEF cross plot, sand grains derived from glacial, fluvial, foreshore, and aeolian environments form distinct clusters, and therefore the depositional environment can be predicted by the two indices.

While Suzuki et al. (2015) focused solely on sand, this study demonstrates that EF-PCA is also effective in assessing the degree of abrasion of gravels. Furthermore, we developed an index for the three-dimensional shape evaluation of gravels by the extension of conventional EF-PCA method.

However, it is uncertain whether this method would be effective for the paleoenvironmental analyses, since application to the geological gravel records has not been attempted. Therefore, this study applies EF-PCA to gravels in the Choshi Group in Chiba Prefecture, Japan, to evaluate the validity of this method to the geological records and investigate the Cretaceous paleoenvironment of east Japan.