Business meeting of the

INTERNATIONAL SUBCOMMISSION ON CRETACEOUS STRATIGRAPHY

https://cretaceous.stratigraphy.org/

at the 12th International Cretaceous Symposium – Hannover

2 September 2025, 18.00–19.00

Officers

Chair: Ian Jarvis: Kingston University London, UK. E-mail: ian.jarvis@kingston.ac.uk

Vice-Chair: Francesca Falzoni, Consiglio Nazionale delle Ricerche, Milano, Italy. E-mail: francesca.falzoni@cnr.it

Secretary: Zofia Dubicka, University of Warsaw, Poland. E-mail: z.dubicka@uw.edu.pl

AGENDA

Welcome from the Officers

Ian Jarvis and Francesca Falzoni

Officers and members for the term 2024–2028

a. Executive
b. Voting members
c. Corresponding members
d. Proposals for new members

Overview of the ratified GSSPs and recent golden spike ceremonies

a. Albian GSSP 2016 – ceremony June 2024
b. Hauterivian GSSP 2019 – ceremony June 2024
c. Barremian GSSP 2023 – ceremony November 2024

Valanginian GSSP ratified 18 December 2024

Preparation for the GSSP ceremony - Stéphane Reboulet

Updates on the activities of the Working Groups

a. Aptian WG (appointed 2016) - Elisabetta Erba, Helmi Weissert
b. Berriasian WG (appointed 2020) - Jacek Grabowski
c. Maastrichtian WG (appointed 2022) - Silke Voigt

New Guidelines for GSSP proposals to the ICS

Planning for the future

a. Standard Auxiliary Boundary Stratotype (SABS) - Ian Jarvis

b. Definition of Cretaceous Substages - Ian Jarvis
c. Working Group proposal - Peter Ward, University of Washington

Task Group on the *Coniacian - Maastrichtian of the Pacific Ocean Basin: assessing correlations between the Northwest (Japan and Sakhalin) and Northeast Pacific (Cordilleran North America)*

Any other business

Participants: *(66 participants in person and 8 participants on-line)*

Officers: Ian Jarvis (*Chair*), Francesca Falzoni (*Vice-Chair*), Zofia Dubicka (*Secretary*)

Voting and Corresponding Members: Sietske Batenburg (Utrecht University; on-line), Bruno Granier (Univ. Brest; on-line), Takashi Hasegawa (Kanazawa University), Brian Huber (National Museum of Natural History, Smithsonian Institution; on-line), Eduardo Koutsoukos (Universität Heidelberg; on-line); Josep Anton Moreno-Bedmar (Universidad Nacional Autónoma de México), Polina Pavlishina (Sofia University), Maria Rose Petrizzo (University of Milan), Shin-Ichi Sano (University of Toyama), Jean Self-Trail (U.S. Geological Survey; on-line), Brad Singer (University of Wisconsin-Madison), Reishi Takashima (Tohoku University Museum), Michael Wagreich (University of Vienna), Ireneusz Walaszczyk (University of Warsaw), Markus Wilmsen (Senckenberg Naturhistorische Sammlungen, Dresden), Dangpeng Xi (China University of Geosciences).

Chairs of the WGs: Jacek Grabowski (Polish Geological Institute, National Research Institute), Elisabetta Erba (University of Milan), Silke Voigt (Goethe-University Frankfurt), Helmut Weissert (ETH)

WG members and others: Antonina Nosowska ((University of Warsaw), Jan Bohadlo (Czech Geological Survey), Markèta Chroustovà (Czech Geological Survey), Yukiko Kozaka (Kanazawa University), Ottilia Szives (Hungarian Natural History Museum), Beatriz Aguirre-Urreta (University of Buenos Aires), Hisao Ando (Fukui Prefectural University Japan), Mariusz Niechwedowicz (University of Warsaw), Józef Pálfy (Eötvös Loránd University), Mathieu Martinez (Université de Rennes), André Bornemann (Federal Institute for Geosciences and Natural Resources, BGR), Ricardo Barragán (Universidad Nacional Autónoma de México), Mikel A. Lopez-Horgue (Euskal Herriko Unibertsitatea), Antoine Pictet (University of Lausanne), Christina Ifrim (Jura-Museum Eichstätt), José Manuel Castro (University of Jaén), Ginés A. de Gea (University of Jaén), Masashi Ikeda (Hokkaido University), Retsa Nishiyama (Kanazawa University), Mads E. Jelby (Aarhus University), Frans van Buchem (KAUST, Saudi Arabia), Mike Bidgood (GSS Geoscience), Peter Ward (University Washington), Mike Simmons (Halliburton), Simon Sehnkider (CASP), Gabriele Gambacorta (University of Florence), Francois-Nicolas Krencker (Leibniz University), Petr Pruner (Czech Geological Survey), Thierry

Adatte (University of Lausanne), Brahimsamba Bomou (University of Lausanne), Gianluca Frijia (University of Ferrara), Maria Ovechkina (Geological Survey of Israel), Francesco Miniati (CNR), Mara Fant (University of Milan), Cinzia Bottini (University of Milan), Thomas Pürner (Czech Geological Institute), Seongyeung Kim (G-LAMP Research Centre, KNU), Mayuko Kamimura (Kanazawa University), Damian Lodowski (Polish Geological Institute, National Research Institute), Jordan Todes (Chicago University), Ziyuan Xiao (China University of Geoscience), Shuai Shi (China University of Geoscience), Huifeng Guo (China University of Geoscience), Xi Chen (China University of Geoscience), Tianpeng Huang (China University of Geoscience), Hanzhou Zi (China University of Geoscience), Agata Jurkowska (AGH University), Tatiana Gaona (College of Arts and Science, Florida Int; on-line), Sabrina Amodio (Parthenope University of Naples; on-line), Mariano Parente (Università di Napoli Federico II; on-line).

Opening at 18.00

1. Welcome of the Chair Ian Jarvis

2. Officers and members for the term 2024–2028 *(I. Jarvis)*

- The Chair presented new officers of the Cretaceous Subcommission as well as Voting and Corresponding Members.
- The Chair briefly summarised Working Group's tasks. Working Groups propose GSSP criteria, select reference sections, and write GSSP proposals. Proposals are reviewed by voting and corresponding members of the Cretaceous Subcommission. Corresponding members are former voting members who have stood down after serving 12 years, the maximum allowed by the ICS statutes. They have long experience of working in the Subcommission and offer important additional expertise, but they can no longer vote.
- The Chair pointed out that there is constant turnover among the voting members of the Cretaceous Subcommission. Current voting members that are approaching the end of their 12-year mandate (Bruno Granier in 2025, Eduardo Koutsoukos in 2026, and 7 other members in 2028) will need to be replaced. A call for nominations of new voting members will be opened in September 2025.

3. Overview of the ratified GSSPs and recent golden spike ceremonies *(I. Jarvis)*

The golden spike ceremony for the Hauterivian and Albian GSSPs was held on 29 June 2024 in Arnayon and at La Charce in southeast France. The GSSP that defines the base of the Albian Stage was ratified by IUGS in April 2016 (Kennedy et al. 2017, *Episodes*). The GSSP that defines the base of the Hauterivian Stage was ratified by IUGS in December 2019 (Mutterlose et al. 2021, *Episodes*).

The golden spike ceremony for the Barremian GSSP was held on 9 November 2024 in Rio Argos (Caravaca de la Cruz), southeast Spain. The GSSP that defines the base of the Barremian Stage was ratified by IUGS in March 2023 (Company et al. 2024, *Episodes*).

The Chair emphasised that GSSP ratifications and golden spike ceremonies are important because they promote the activities of the Subcommission and have positive impact on the appreciation of geology and stratigraphy by local communities, local administration and government, and offer opportunities for wider public outreach.

4. Valanginian GSSP ratified 18 December 2024 - Preparation for the GSSP ceremony – update from Stéphane Reboulet *(I. Jarvis)*

Preparation for golden spike ceremony for the Valanginian GSSP is in progress (development of Vergol section in discussion with the municipality of Montbrun-les-Bains, the department of Drôme, and the Baronnies Provençales Regional Nature Park).

The ceremony originally scheduled for June–July 2026, may be delayed of a few months due some administrative issues and budget cuts encountered by local government. Funding for development (i.e. signs/media to be designed, manufactured and installed on site, construction of stone walls, parking spaces/areas, etc.) is proving challenging due to French government budget cuts.

The paper on the Valanginian GSSP by Reboulet et al. is currently in press in *Episodes* (https://www.episodes.org/journal/view.html?uid=2440&vmd=Full).

5. Updates on the activities of the Working Groups

5.1. **Aptian WG** (appointed 2016) – *H. Weissert*

The informal definition of the base of the Aptian was the base of the M0r magnetic Chron. Frau et al. (2018) showed that M0r is of Barremian age, as traditionally defined by ammonite biostratigraphy. The new proposed primary marker for the base of the Aptian selected by the WG is the base of the sharp negative $\delta^{13}C$ excursion defining the base of OAE1a. This $\delta^{13}C$ excursion is around ~800 kyr younger than the base of M0r and has been well known since the 1990s (Menegatti et al., 1998; Erba et al., 1999). The new primary marker has many advantages: it can be recognized at a global scale across latitudes, in pelagic, hemipelagic and coastal settings as well as in terrestrial and lacustrine environments.

The candidate GSSP section is Cau in Spain, which was selected among 5 candidate sections following two rounds of voting within the WG. First round: Cau (Spain) – outer shelf section, 13 votes, Cismon (Italy) – pelagic section, 13 votes, Gorgo a Cerbara (Italy) – pelagic section, 7 votes, El Pui (Spain) – shelf section 9 votes and La Bedoule (France) – hemipelagic section, 6 votes. Second round: Cau 17 votes, Cismon 9 votes; 3 people abstained and 6 persons did not vote.

The exposed boundary section at Cau is complemented by a nearby research core D4 that spans the boundary interval (Castro et al., 2021). The $\delta^{13}C$ record is available at high resolution and the negative $\delta^{13}C$ spike is well documented both in the outcrop and in the core. However, superficial weathering is suspected to have altered the C-isotope signal in the outcrop. Therefore, the WG propose placing the GSSP in the Cau core D4, an unconventional but already applied procedure (e.g., the GSSP for the base of the Holocene is in the NGRIP ice core). The WG is aware of the challenges in selecting the core for the GSSP, e.g. precise correlation of the core isotope stratigraphy with the ammonite ranges that have been obtained from the outcrop.

The first draft of the GSSP proposal is completed and is being reviewed by the authors. The WG plans to circulate the proposal for comments within the WG in autumn 2025 and submit the revised version to the Cretaceous Subcommission by early 2026.

Discussion

Preservation, accessibility and sampling of the Cau outcrop section and D4 core

The core is housed and protected at the University of Jaén (Spain) and it is envisaged that it will be available with archive and working material on a similar basis to ODP cores. If needed, a new core may be drilled, or if necessary, another GSSP might be selected in the future. Splits of previous sampling and residues from core samples will be made available upon request for additional geochemical and micropalaeontological analyses. The outcrop can also be sampled in case larger-sized samples are needed.

(Contributed to the discussion: J. Todes, J. Bohadlo, M. Niechwedowicz, T. Gaona, E. Erba, H. Weissert)

B. Granier remarked that the new GSSP proposal implies a 50% reduction of the duration of the lower Aptian.

5.2. **Berriasian WG** (appointed 2020) – *J. Grabowski*

The Chair of the Berriasian WG provided an update of the WG activity.

The potential primary marker for the base of the Berriasian is still not selected, therefore a stepwise correlation from one palaeogeographic domain to another is currently being applied.

The following developments were introduced since the beginning of the WG activities:

a) The ammonite stratigraphy around the Jurassic–Cretaceous boundary interval was revised by Szives and Főzy (2022) and the *jacobi* Zone is no longer used.
b) The traditional marker for the base of the Berriasian, the base of the *Calpionella alpina* Subzone, has been re-evaluated as a primary marker and is considered to be unsuitable based on the following arguments:
    1. The base of the *C. alpina* Subzone cannot be verified on traditional range-charts.
    2. Subjectivity: when studied by different specialists in the same section, the *alpina* event is not always placed at the same level.

3. Stratigraphic changes within the '*alpina* event' are poorly characterised (only 2–3 fully quantitative studies have been undertaken in last 30 years!)
4. Although the calpionellid assemblages of the upper *Crassicollaria* Zone are clearly different from those of the lower *Calpionella* Zone, in the case of high-resolution analyses it is difficult to establish the zonal (J/K) boundary without detailed quantitative studies.
5. The subzonal divisions in the underlying *Crassicollaria* Zone are not standardized. The uppermost *Cr. colomi* Subzone should be revised or abandoned.
6. The base of the *C. alpina* Subzone is difficult to locate precisely (from bed to bed) even in well-studied calpionellid-rich sections. Hence, the level does not meet the criteria of a primary marker for a system boundary.

The WG has decided to move the boundary down into the upper Tithonian, between the short, reversed magneto subzone M20n1r and the base of M19r. This choice is supported by the identification of additional markers in the type area – the Alpine Tethys, as follows: the base of the "*Durangites*" (*Andreai*) ammonite Zone; the base of the *Crassicollaria* Zone or the base of the *Intermedia* Subzone; the base of the calcareous nannofossil NJT 17 Zone (FO of *N. globulus minor*); the calcareous nannofossil calcification events (NCEs); the demise of the *Saccocoma* microfacies (easy to trace); and a change in the composition of calpionellid loricas.

In addition, this interval is likely in proximity to the middle/upper Volgian boundary and close to the base the radiolarian UAZ 13 Zone. The first appearance of the calcareous dinoflagellate cyst *Stomiosphaerina proxima* occurs within the new proposed boundary interval and seems to be an important marker; it has also been identified in South America.

The primary marker for the J/K boundary will be selected among a calpionellid event (i.e., the base of the *Crassicollaria* Zone or the base of the *Crassicollaria intermedia* Subzone), a magnetostratigraphic event, or the base of the NJT17 calcareous nannofossil Zone.

The WG is optimistic to efficiently correlate the Tethys markers with South American (Argentina) sections as well as with Europe, Russia and Arctic (Greenland). The proposed boundary in the Tethys would be placed in the lowest part of the upper Volgian of eastern Siberia or in the lowermost part of the *primitivus* ammonite Zone in Greenland.

No magnetostratigraphy is available in Dorset (England), however the lower boundary of the Portlandian, coinciding with the base of the *albani* ammonite Zone, correlates with the *Chitinoidella* Zone and this might be correlated with magnetostratigraphy (mid M20r to lowermost M20n).

The sequence stratigraphy might provide an additional tool for extra-regional correlations. Three third-order sequences can be identified between the base of Portlandian and the base of the Ryazanian. When plotted against the time scale they encompass ~3.6 million years (three cycles of 1.2-million-year duration each).

In addition, in the Tethyan area there is evidence for the Purbeckian regression and aridification, and the trace element enrichment might have additional correlation potential.

The current unofficial GSSP candidate is the Torre de' Busi section (Lombardian Basin, Italy), which yields almost all important stratigraphical markers, except ammonites. The orbital stratigraphy is completed and can be correlated with Argentina.

Conclusions:

1. The BWG recommends shifting the J/K boundary to the upper Tithonian (between magnetozones M20n1r and the base of M19r).
2. There is a problem with the base of the *C. alpina* Subzone: particularly the absence of a formal quantitative definition – just a recent observation.
3. Extra-regional correlation (between Tethys, Siberia (Russia) and Argentina (different palaeobiogeographic domains) is likely possible in the upper Tithonian using magnetostratigraphy.
4. There are several possible primary/secondary markers (alternatives).

- magnetostratigraphic: short magnetosubzone M20n1r or base of M19r.
- biostratigraphic: calpionellids – base *Crassicollaria* Zone (e.g. FO of *Tintinopsella carpathica*) or the base of the *Cr. intermedia* Subzone (e.g. FO of *C. alpina* or *C. grandalpina*); FO of the calcareous nannofossil *N. globulus minor.*

4. Correlation to the Arctic must consider likely condensation and/or stratigraphical gaps in the upper Volgian (M20n1n to lower M17r). This affects the record of the VOICE event ($\delta^{13}C_{org}$), which may be related to hydrothermal activity or to oxygen deficiency and stratification of the basin and will be investigated in the future.
5. The J/K boundary would fall within a spectacular palaeoenvironmental trend (aridification and regression), which is possible to follow in both the Tethyan and Sub-Boreal domains.

Discussion

I. Jarvis reminded the WG that the primary and secondary markers should be decided soon and then they should be placed in the selected section.

Reply (J. Grabowski): The primary marker should be defined this year. In the case of the stratotype section, different successions are being actively investigated to choose the best stratotype and SABS. Currently, the Las Alcantarillas section in Argentina is a favoured candidate SABS.

The idea of shifting the boundary into the upper Tithonian was presented at the 2022 Jurassic Congress in Budapest and was well received by the Jurassic community.
(Contributed to the discussion M. Wilmsen, J. Grawboski, I. Jarvis)

5.3. **Maastrichtian WG** (appointed 2022) – *S. Voigt*

The Chair of the Maastrichtian WG provided an update of the Maastrichtian WG activities.

The GSSP for the base of the Maastrichtian ratified in 2001 at Tercis les Bains (France) is defined by the arithmetic mean of 12 biostratigraphic criteria with no primary marker, which limits the identification of the boundary level in other localities. The GSSP section was re-

sampled in 2023 for new carbon-isotope stratigraphy, cyclostratigraphy and additional biostratigraphic studies (foraminifera and organic walled dinoflagellate cysts) with the aim to select the primary marker.

A new highly resolved carbon-isotope curve has been completed at Tercis. Several significant carbon-isotope events at the Campanian–Maastrichtian boundary have been identified both at Tercis and in several sections around the world. However, there is no magnetic remanence, hampering the possibility to establish a magnetostratigraphy. Because of early diagenesis, foraminifera are poorly preserved but the new dinoflagellate records show several species lowest and highest occurrences. However, the primary marker for the base of the Maastrichtian has not been selected yet.

A very good SABS candidate is the Vistula River section in Poland, where a well-established macrofossil zonation, new nannofossil biostratigraphy, magnetostratigraphy and new carbon-isotope stratigraphy are available. The carbon isotope curve is completely consistent with that of the Tercis section.

New cyclostratigraphic data from Tercis plotted against the carbon-isotope stratigraphy provide very interested results: (1) the CMBE's are the carbon cycle response to the 405 kyr cycle; (2) CMBE-4 can be correlated between Tercis and Bidart consistent with calcareous nannofossil events and cyclostratigraphy; (3) CMBE boundaries can be defined on a precessional scale within the Basque-Cantabrian astrochronology.

Astro-cyclostratigraphy is a very promising approach. Maastrichtian calcareous nannofossil events and carbon-isotope data are available from Shatsky Rise (ODP Sites 1209 and 1210) at very high resolution and these have been astronomically tuned (Kim et al., 2022 *Climate of the Past*). The very high-resolution carbon-isotope record from Shatsky Rise provides a reference curve that can be correlated to Tercis.

Discussion

A common practice for the scale to be used for the illustration of isotopic curves is recommended because the identification of a single isotopic event by its magnitude is not reliable. Isotopic events must be calibrated using biostratigraphy or other stratigraphic tools.

It was noted that if Tercis proved to be unsuitable as a GSSP it might be necessary to propose an alternative section.

(Contributed to the discussion: E. Erba, H. Weissert, S. Voigt)

6. New guidelines for the preparation of GSSP proposals *(I. Jarvis)*

The new guidelines for the writing of GSSP proposals have been prepared by ICS and circulated to the members of the Subcommission. The aim is to standardize GSSP proposals for all future stages across the ICS.

Anyone interested in those changes should e-mail the Subcommission secretary (z.dubicka@uw.edu.pl) and she can forward the document.

7. Planning for the future

7.1 Selection of Standard Auxiliary Boundary Stratotypes *(I. Jarvis)*

SABS are a valuable addition particularly where major stratigraphic tools are missing in the GSSP section. The idea is not to erect SABS that simply duplicate data recorded in the GSSP but to establish reference sections from different areas and to select SABS that can cover gaps in the GSSP characterization.

7.2 Working Group proposal and definition of Cretaceous substages

Campanian and Maastrichtian substages – *P. Ward*

A Task Group on the *Coniacian - Maastrichtian of the Pacific Ocean Basin: assessing correlations between the Northwest (Japan and Sakhalin) and Northeast Pacific (Cordilleran North America)* was proposed.

The Campanian is divided into either two (e.g. in Europe) or three (e.g. in the US Western Interior) substages and it is very difficult to correlate between them. Magnetostratigraphy might be an especially important tool, because it has potential to correlate stage and substage boundaries globally. Peter Ward put forward a proposal to set up a new Working Group that would focus on Campanian and Maastrichtian magnetostratigraphy to use polarity patterns to define Campanian and Maastrichtian substages.

Discussion

E. Erba, Chair of ICS, reminded the meeting that the primary task of the WGs is to define GSSPs and the lower boundary of each stage, a task which has been almost completed. A common procedure to moving forward for new 'task working groups' will be established following discussion with all Subcommission chairs.

I. Jarvis remarked that there is no reason why people with a particular interest cannot convene an informal group to work on a particular problem and input their information into any more formal procedure that may be set up within the Subcommission. Clearly, the definition of substages remains a major issue and is a very important part of global stratigraphy that needs to be addressed. He would certainly encourage further work in this area.

8. Any other business

Elisabetta Erba announced the STRATI 2026 meeting that will be held in Suzhou (China) from June 28 to July 03, 2026. Information at https://www.strati2026.org/

No additional items were raised.

Closure at 19.50