

## 1. TITLE OF CONSTITUENT BODY and NAME OF REPORTER

Subcommission on Cretaceous Stratigraphy (SCS) <https://cretaceous.stratigraphy.org>

Maria Rose Petrizzo, Chair; Michael Wagreich, Vice-Chair; Francesca Falzoni, Secretary

18 November 2023

## 2. OVERALL OBJECTIVES AND FIT WITHIN IUGS SCIENCE POLICY

- To establish a standard global stratigraphic subdivision and nomenclature for the Cretaceous, as part of the ICS standard global stratigraphic scale.
- To produce a stratigraphic table displaying agreed subdivisions to stage and substage level, marking boundaries that are defined by a GSSP.

## 3. ORGANISATION - interface with other international projects / groups

SCS has always been linked to important international Projects such as IODP, IGCP, Mesozoic Planktonic Foraminiferal Working Group, and ICDP (International Continental Scientific Drilling Project).

### 3a. Current Officers for 2020-2024:

Chair: Maria Rose Petrizzo; Vice-Chair: Michael Wagreich; Secretary: Francesca Falzoni

The elected officers for the term 2024-2028 are Michael Wagreich (Chair) and Maria Rose Petrizzo (Vice-Chair).

Voting Members are 18, from most continents. Over 150 Cretaceous scientists from all over the world and in many different disciplines belong to one or more of the Stage Working Groups and to the Kilian Group. The Stage Working Groups of the SCS are: Berriasian, Valanginian, Aptian, and Maastrichtian. All WG leaders (chairs) and members are treated as Corresponding Members of the SCS.

## 4. EXTENT OF NATIONAL/REGIONAL/GLOBAL SUPPORT FROM SOURCES OTHER THAN IUGS

The SCS has strong links with IGCP projects.

IGCP 679 Cretaceous Earth Dynamics and Climate in Asia (new in 2019, Project Leader Prof. Gang Li, China)

IGCP 710 Western Tethys meets Eastern Tethys (new in 2020, Project Leader Prof. Michał Krobicki, Poland)

IGCP 739 The Mesozoic-Palaeogene hyperthermal events (new in 2021, Project Leader Prof. Xiumian Hu, China)

## 5. CHIEF ACCOMPLISHMENTS IN 2023

### • WORKING GROUPS ACTIVITIES TOWARDS THE DEFINITION OF THE GSSPs

Chairs and updated memberships of each WG are available at <http://cretaceous.stratigraphy.org/working-groups/>  
Memberships are updated continuously by inviting active scientists who are willing to collaborate to the WG activities.

#### Maastrichtian GSSP

The ratified GSSP locality for the base of the Maastrichtian is the abandoned quarry at Tercis-les-Bains in SW France. The stage boundary lacks a primary marker for the definition of its base, and the main task of the Maastrichtian WG is the search for a useful primary marker.

In March 2023, WG members sampled the Tercis-les-Bains section, which is located in a Regional Natural Reserve requiring a permit for any geological fieldwork and sampling. The WG warmly thanks C. Gréaume, J. Le Breton and M. Lo Cascio of the Regional Natural Reserve for welcoming and providing scientific and logistic support. The staff is skilled in Earth Sciences and heritage preservation, and they strongly promote academic studies in the quarry.

About 500 samples were taken along a 70-m interval with a resolution of 20–40 cm to establish modern biozonations for calcareous nannofossils, planktonic and benthic foraminifera, inoceramids and palynomorphs. Further samples were collected to determine the mineralogical composition and microtexture of the lithology, to resolve orbital cyclicity, and to improve the resolution of carbon isotope stratigraphy. Some of the analyses are finished (measurements of magnetic susceptibility, XRF), as well as the sample preparation for palynomorphs. The time-consuming washing of foraminiferal samples is still in progress. The stable isotope analyses will be finalized by the end of 2023. First results were presented at STRATI2023 in Lille in July 2023 (see below)

The German science foundation DFG granted a research proposal to S. Voigt in August 2023 that will support the analytical work and the scientific exchange among the WG members. The work on the collected samples will provide students the opportunity to perform their master thesis project.

*Voigt, et al. (2023). Reassessment of the base of the Maastrichtian Stage at the GSSP locality Tercis-les-Bains (SW France)*  
[sciencesconf.org:strati2023:457796](https://sciencesconf.org:strati2023:457796)

#### Campanian GSSP

The GSSP proposal for the base of the Campanian Stage in the Bottaccione Gorge section at Gubbio, Umbria-Marche Basin (Italy) was ratified by IUGS in October 2022 and includes 5 auxiliary sections. The golden spike ceremony was held on July 26, 2023, in Gubbio (Italy), see <https://cretaceous.stratigraphy.org/news/campanian-ceremony>

Gale, A.S., et al., (2023). *The Global Boundary Stratotype Section and Point (GSSP) of the Campanian Stage at Bottaccione (Gubbio, Italy) and its auxiliary sections (Seaford Head, U.K.), Bocieniec (Poland), Postalm (Austria), Smoky Hill, Kansas (U.S.A.) and Tepeyac (Mexico)*. *Episodes*, vol. 46, n. 3, p. 451-490, <https://doi.org/10.18814/epiugs/2022/022048>.

#### Coniacian GSSP

The GSSP proposal for the base of the Coniacian Stage in the Salzgitter-Salder section (Germany) was ratified by IUGS in May 2021 and includes 3 auxiliary sections. The golden spike ceremony was held on September 19, 2023, at Salzgitter-Salder, see <https://cretaceous.stratigraphy.org/news/coniacian-ceremony>.

Walaszczyk, L., et al. (2022). *The Global Boundary Stratotype Section and Point (GSSP) for the base of the Coniacian Stage (Salzgitter-Salder, Germany) and its auxiliary sections (Ślupia Nadbrzeżna, central Poland; Střeleč, Czech Republic; and El Rosario, NE Mexico)*. *Episodes*, vol. 45, n., 2, p. 181-220, <https://doi.org/10.18814/epiugs/2021/021022>.

#### Aptian GSSP

In July, at the STRATI 23 conference in Lille, the members of the WG confirmed the earlier decision to take the negative C-isotope spike at the base of OAE1a as the new primary marker for the base of the Aptian. The WG agreed to vote on the location of the Aptian GSSP and, on the selection of the auxiliary sections. The following five sections are proposed as potential sites for a GSSP: Gorgo a Cerbara (Italy), Cison (Italy), La Bedoule (France), Cau (Spain) and El Pui (N Spain). Erba and Weissert are currently preparing fact sheets for the five sections identified as possible sites for the Aptian GSSP. The WG will vote on the preferred candidate GSSP section before the end of 2023.

#### Barremian GSSP

The GSSP of the base of the Barremian Stage (at the base of bed 171 of the Rio Argos section, near Caravaca, SE Spain, marked by the first appearance of the ammonite *Taveriaidiscus hugii*), was ratified by IUGS in March 2023. Secondary criteria include: bioevents (foraminifera, calcareous nannofossils), C isotope stratigraphy, sequence stratigraphy, and astrochronology. A new calibration of the Hauterivian/Barremian boundary against the magnetostratigraphic scale is proposed. The protection of the Río Argos section is ensured by the municipality of Caravaca, and its recognition at the regional and national level is also being processed. The publication of the GSSP has been accepted by *Episodes* and will be published soon.

Company et al. (2024). *The Global Boundary Stratotype Section and Point (GSSP) of the Barremian Stage at Río Argos (Caravaca, SE Spain)*. *Episodes*, proof corrected.

#### Valanginian GSSP

In 2023, two informal GSSP proposals were prepared by two teams and submitted to the Valanginian WG for voting: 1) Vergol section (Montbrun-les-Bains, Drôme, SE France) by: Reboulet (reporter of the proposal, (bio-)stratigraphy, ammonites), Adatte (chemostratigraphy, phosphorus), Baudin (organic geochemistry), Company ((bio-)stratigraphy), Deconinck (clay mineral assemblages), Duxbury (biostratigraphy, palynomorphs), Grabowski (magnetic stratigraphy), Granier (bio-)stratigraphy), Janssen (biostratigraphy, belemnites), Klein (biostratigraphy, ammonites), Leng (isotope stratigraphy), Lodowski (magnetic stratigraphy), Martinez (cyclostratigraphy, astrochronology), Mattioli (biostratigraphy, calcareous nannofossils), McArthur (isotope stratigraphy), Olivero (biostratigraphy, ichnofossils) and Reháková (biostratigraphy, calpionellids); 2) Cañada Luenga section (Cehegín, Region of Murcia, SE Spain) by: Company (reporter of the proposal, ammonite biostratigraphy), Adatte (chemostratigraphy), Aguado (calcareous nannofossil biostratigraphy), Duxbury (organic dinoflagellate biostratigraphy), de Gea (chemostratigraphy), Ivanova (calcareous dinoflagellate and benthic foraminifera biostratigraphy), Janssen (belemnite biostratigraphy), Lakova (calpionellid biostratigraphy), Martinez (cyclostratigraphy, astrochronology) and Tavera (ammonite biostratigraphy).

The Vergol section was selected by the Valanginian WG as the candidate GSSP for the base of the Valanginian and Cañada Luenga was selected as the Standard Auxiliary Boundary Stratotype (SABS). The FAD of “*Thurmanniceras*” *pertransiens* (ammonite) was selected as the primary marker. Its FO is recorded in layer VGL-B136 (Vergol) and CL 9 (Cañada Luenga). Main secondary markers are: FAD of *Calpionellites darderi* (calpionellid); FAD of *Calcicalathina oblongata* (calcareous nannofossil), FAD of *Neocomites premolicus* (ammonite) and base of magnetic chron M14r.

A talk on the activity of the Valanginian WG was presented to the Cretaceous Subcommittee business meeting during the STRATI 2023 congress at Lille (France) on July 12, 2023.

#### Berriasian (J/K boundary) GSSP

The Berriasian WG started its work in February 2021. The WG keep being focused on organizing database and ideas concerning possible definitions and placing the Tithonian/Berriasian boundary, as well as its global and regional palaeoenvironmental context. In the first half of 2023, the BWG completed a discussion on which level (not yet the primary marker) should be the best choice for the global J/K boundary definition. The three levels under considerations were: 1) a boundary in the upper Tithonian (between magnetozones M20n1r and M19r)/base Crassicollaria Zone or base Intermedia Subzone; 2) present day Tithonian/Berriasian boundary (base Calpionella alpina Subzone); 3) the lower/middle Berriasian boundary (base M17r/base zone Calpionella elliptica/base zone Subthurmannia occitanica).

A two-step voting was organized, with the following results: First voting: 1<sup>st</sup> option (upper Tithonian) – 7 votes; 2<sup>nd</sup> option (Tith/Berr) – 4 votes; 3<sup>rd</sup> option (low/mid Berr) – 3 votes; No vote – 3. Second voting: 1<sup>st</sup> option (upper Tithonian) – 9 votes; 2<sup>nd</sup> option (Tith/Berr) – 5 votes; abstain – 1, no vote – 2. As a result, the upper Tithonian option was accepted as a

working version of the J/K boundary, which will be elaborated in more detail in 2024.

The BWG in 2022/2023 met online, usually with 1-2 keynote talks and discussion. Up to now 19 meetings were organized (the 20<sup>th</sup> is scheduled for Dec 2023) with the following presentations: 16<sup>th</sup> meeting (30.11.2022), Grabowski – *J/K boundary in the upper Tithonian?* 17<sup>th</sup> meeting (22.02.2023), Grabowski – *Summary of the J/K boundary: three options for voting*; Deconinck – *Organic  $\delta^{13}C$  stratigraphy in Boulonnais section, NW France*; Grabowski – *News about VOICE isotopic excursion*; 18<sup>th</sup> meeting (22.05.2023), Grabowski – *results of indicative voting and report for the Cretaceous Subcommission in Lille*; 19<sup>th</sup> meeting (6.10.2023), Galloway - *The Volgian Carbon Isotopic Excursion: the VOICE*; Pellenard – *The VOICE isotopic excursion in Argentina: astrochronologic calibration and correlation to Global Polarity Time Scale*. The presentations and short reports from the meetings are archived and accessible on dedicated web page, accessible only to BWG members.

The following presentations focused on J/K boundary were realized at STRATI 2023 in Lille (France), sessions SC6: Integrated stratigraphy and GSSPs of the Cretaceous System, SC7: Cretaceous palaeoceanography, biota, climate change and critical events, and SC8: The Jurassic events, correlation and timescale.

Grabowski J., et al. *Sedimentary events at the Jurassic/Cretaceous boundary interval in the Slovenian Basin and Transdanubian Mts (Hungary): evidences from terrigenous input and trace metal enrichments.*

Grabowski J., et al., *Calpionellid stratigraphy and microfacies in the Clue de Taulanne section (Vocontian basin, SE France).*

Lodowski D.G., et al., *Disappearance of the Saccocoma-dominated microfacies: the cause and timing in the light of paleoenvironment evolution in the Transdanubian Range (Hungary)*

Matsuoka A., et al. *Jurassic-Cretaceous transition sequences in Japan and their contribution to defining the Jurassic-Cretaceous boundary.*

Salazar C. *Bio-sequence stratigraphy of Jurassic-Cretaceous transition in central Chile.*

Trabelsi K., et al. *discovery of Purbeckian-type ostracod fauna and charophyte flora across the Jurassic-Cretaceous boundary in the Middle Atlas of Morocco (NW Africa): Biostratigraphic and biogeographic implications.*

Verreusel R. *Palynological records from marine sections across the Jurassic-Cretaceous transition in Netherlands.*

J. Grabowski presented the main points of the BWG activity during the SCS business meeting at STRATI 2023. A short summary was presented also at the Jurassic Subcommission business meeting. The “informal” meeting of the BWG was organized during this Congress.

During a private field trip in February, J. Grabowski visited key J/K boundary sections in Spain: Puerto Escano and Rio Argos. Field works are being continued on Italian sections in November 2023: Torre de Busi and Bosso mostly focused on radiolarian stratigraphy.

#### KILIAN Group

The WG met during the 11<sup>th</sup> International Cretaceous Symposium in Warsaw, Poland (22-26 August 2022). The report is published here:

Szives et al. (2024). *Report on the 7<sup>th</sup> International Meeting of the IUGS Lower Cretaceous Ammonite Working Group, the Kilian Group (Warsaw, Poland, 21<sup>st</sup> August 2022): State of the art on the current Standard Ammonite Zonation of the Western Tethyan Mediterranean Province. Cretaceous Research 105716, <https://doi.org/10.1016/j.cretres.2023.105716>.*

#### 6. SUMMARY OF EXPENDITURE IN 2023:

Contribution to the 4 stages Working Groups for fieldworks + analysis for the GSSPs	1600.00 Euro
Contribution attendance cost to the Campanian GSSP golden spike ceremony in Italy	280.00 Euro
Contribution attendance cost to the Coniacian GSSP golden spike ceremony in Germany	820.00 Euro
Contribution to the Campanian GSSP for the organization of the ceremony (panel)	486.00 Euro
Contribution to the Maastrichtian WG to sampling the stratotype section at Tercis (France)	500.00 Euro
Contribution for secretarial work and updating of the website	512.61 Euro
Bank fees for bank transfer	16.00 Euro
TOTAL expenditure in 2023 = 4214.61 Euro	

#### 7. SUMMARY OF INCOME IN 2023:

ICS Subvention for 2023 US dollars 4500.00 = 4214.61 Euro

#### 8. BUDGET REQUESTED FROM ICS FOR 2024:

Contribution to the stages Working Groups for fieldworks, analyses, meetings	2000.00 Euro
Contribution attendance cost to Albian and Hauterivian GSSPs (France) golden spike ceremonies	1000.00 Euro
Contribution attendance cost to Barremian GSSP (Spain) golden spike ceremony	1000.00 Euro
Contribution for the organization of the GSSP ceremonies	500.00 Euro
Contribution for secretarial work and updating of the website	500.00 Euro

TOTAL budget request from ICS in 2024= 5000.00 Euro

## 9. WORK PLAN, CRITICAL MILESTONES, ANTICIPATED RESULTS AND COMMUNICATIONS TO BE ACHIEVED NEXT YEAR (2024):

### • STUDIES, FIELD WORK TO FINALIZE THE GSSP PROPOSALS

#### Maastrichtian GSSP

Milestones to achieve in 2024 are centered around the documentation of the Tercis section and comprise the (1) accomplishment of sample processing for micropaleontology, (2) biostratigraphic work on the calcareous nannofossils and foraminifera, (3) cyclostratigraphy of the different time series with the scope of the development of an astrochronology for the Maastrichtian stage, (4) further field work at Tercis for macrofossils particularly inoceramids, (5) dissemination of results at conferences and possibly a first manuscript about cyclostratigraphy. A second part of the work plan deals with data compilation for the development of auxiliary sections for correlation. Potential candidate sections are the Vistula and Kronsmoor sections (Poland, Germany), Gubbio section (Italy), and the stratigraphic record of ODP Site 1210 (central Pacific Ocean).

#### Aptian GSSP

Selection of the auxiliary sections following a second round of discussions after the selection of the candidate GSSP.

#### Valanginian GSSP

A formal proposal (Vergol as GSSP and Cañada Luenga as SABS) is currently being written. It should be finished by Jan/Feb 2024 and sent to the Valanginian WG for discussion. If approved, the formal proposal will be submitted (Spring 2024) to the SCS for voting. We hope that by the end of 2024 the proposal will be formally voted and approved by ICS.

#### Berriasian (J/K boundary) GSSP

In 2024, detailed elaboration of the “upper Tithonian” option will be performed with special attention to possible primary markers in the Tethyan area: calpionellid, calcareous nannofossil events and magnetostratigraphy. A discussion on large-scale climatic events and trends and their correlation potential will be continued, as well as possible identification of the VOICE isotopic event in the Tethyan record. Thanks to the economic support from ICS and IUGS, dating of the volcanic rocks is planned, and considering possibilities of astrochronologic calibrations of the J/K boundary interval, which has just started (manuscript in preparation about Neuquen Basin, unpublished data from a Carpathian section in Poland).

#### Kilian Group

The Kilian meetings are usually held every 3 or 4 years (2002; 2005; 2008; 2010; 2013; 2017; 2022). The next Kilian Group meeting will be held in 2025 in Hannover, prior to the first day of the 12<sup>th</sup> International Symposium on the Cretaceous System.

### • FUTURE MEETINGS

- 2024 – 37<sup>th</sup> International Geological Congress 2024, August 25-31, 2024, Bexco, Busan, Republic of Korea.
- 2025 – 12<sup>th</sup> Cretaceous Symposium, Hannover (Germany), between August 31-September 5, 2025. The congress will include a mid-symposium field-trip to the several nearby Cretaceous outcrops.

#### Potential funding sources external to IUGS

The SCS does not envisage being able, as an organization, to obtain significant funding from outside IUGS/ICS sources. Some additional financial support beyond what is already committed could perhaps be obtained by individual members from their host institutions and/or their personal research funds.

## 10. KEY OBJECTIVES AND WORK PLAN FOR THE PERIOD 2024-2028

- Spring 2024: Vote by the SCS of the Valanginian GSSP.
- 29 June 2024: official ceremonies for the inauguration and placement of the golden spikes of the Albian and Hauterivian GSSPs.
- 2024: Finalization of the GSSP proposal for the base Aptian and vote within the WG.
- October 2024: golden spike ceremony of the Barremian GSSP.
- 2024–2026: Research activities toward the preparation of the GSSP proposal for the base of the Berriasian and Maastrichtian Stages.
- 2025: Vote by the SCS of the Aptian GSSP.
- 2026-2028: Finalization of the GSSP proposal for the base Berriasian and Maastrichtian and vote within the WG and SCS.

## APPENDIX [Names and Addresses of Current Officers and Voting Members]

### Nominated officers

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### Working group leaders and corresponding members

#### MAASTRICHTIAN WG

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