Reassessment of the base of the Maastrichtian Stage at the GSSP locality Tercis-les-Bains (SW France)

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Abstract

The ratified GSSP locality for the base of the Maastrichtian Stage is the abandoned quarry at Tercis-les-Bains in southwestern France. The boundary is defined by the arithmetic mean of 12 biostratigraphic criteria 90 cm beneath the first occurrence of the ammonite *Pachydiscus neubergicus* (Odin and Lamaurelle, 2001). The 12 biohorizons include ammonoids, dinoflagellate cysts, planktonic and benthic foraminifera, inoceramid bivalves, and calcareous nannofossils with some potential of global correlation. However, the GSSP decision earned some criticism over the years, mainly because of the diachroneity of *P. neubergicus*, the poor definition of first and last occurrences of planktonic foraminifera and calcareous nannofossils, and the lack of magnetostratigraphy due to a weak magnetic remanence (Gale et al., 2020). The main concern however is the missing definition of a primary marker for the base of the Maastrichtian Stage mandatory for a GSSP. Therefore, the International Subcommission on Cretaceous Stratigraphy assembled a new Maastrichtian Working Group that was appointed in October 2022.
Beside the abovementioned criticism, the Tercis section has clear advantages as GSSP locality. The succession is unusual extended and continuous across the boundary interval with a cyclic bedding of limestones, cherts and marls. Further, the carbon-isotope record of the section has a distinct variability permitting correlation with Boreal chalks, deep-water Tethyan succession at Gubbio (Italy) as well as open oceanic sites in the Atlantic and Pacific oceans (Voigt et al., 2012).

In early March 2023, some members of the Maastrichtian Working group revisited the GSSP section in Tercis to overcome the problems. Main aim is the definition of a primary marker for the base of the stage. Further, the sedimentary cyclicity of the succession will be studied to achieve an astrochronology for the boundary succession. This approach has the potential to develop an astronomically tuned timescale for the entire Maastrichtian Stage.

During the field campaign, the section was resampled to establish modern biozonations for calcareous nannofossils, planktonic and benthic foraminifera, inoceramids and palynomorphs. Quality assurance for the microfossil zonations will be achieved by duplicate assessment by specialists for nannofossils, planktonic and benthic foraminifera. Further, the succession was sampled in high resolution to resolve orbital cyclicity and to improve the resolution of carbon isotope stratigraphy. The common field work allows the establishment of a new stratigraphic

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framework on the same set of samples.

In addition to the work on the Tercis section, the working group plans to develop auxiliary boundary sections for correlation. Potential candidate sections in the Boreal Realm are the Vistula and Kronsmoor sections (Poland, Germany) with new stratigraphic data published over the last years (e.g., Plasota et al., 2015, Wilmsen et al., 2019). The Gubbio section in Italy is a good reference for the Tethys with a robust magnetic stratigraphy (Gardin et al., 2012), and the stratigraphic record of ODP Sites 1209 and 1210 (central Pacific Ocean) may allow for correlation of the boundary to the deep ocean.

Gale, A.S., Mutterlose, J., Batenburg, S.J. with contributions by F.M. Gradstein, F.P. Agterberg, J.G. Ogg and M.R. Petrizzo (2020). The Cretaceous Period. In: F.M. Gradstein et al., Geologic Time Scale 2020. Elsevier, 1023– 1086.

Gardin, S., Galbrun B., Thibault N., Coccioni R., Premoli Silva, I. (2012). Biomagnetochronology for the upper Campanian – Maastrichtian from the Gubbio area, Italy: new results from the Contessa and Bottaccione sections. Newsletters on Stratigraphy, 45, 75–103.

Odin, G.S., and Lamaurelle, M.A., 2001, The global Campanian-Maastrichtian Stage boundary. Episodes, 24, 229–238.

Plasota, T., Nawrocki, J., Walaszczyk, I. (2015). Magnetostratigraphy of the Campanian/Maastrichtian boundary succession from the Middle Vistula River section, central Poland. Geology Quaternary, 59, 831–842.

Voigt, S., Gale, A.S., Jung, C., Jenkyns, H.C. (2012). Global correlation of Upper Campanian–Maastrichtian successions using carbon-isotope stratigraphy: development of a new Maastrichtian Timescale. Newsletters on Stratigraphy 45, 25–53.
Wilmsen, M., Engelke, J., Linnert, C., Mutterlose, J., Niebuhr, B. (2019). A Boreal reference section revisited (Kronsmoor, northern Germany): high-resolution stratigraphic calibration of the Campanian-Maastrichtian boundary interval (Upper Cretaceous). Newsletters on Stratigraphy, 52, 155–172.

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