The base of the Maastrichtian at the Oslen-Krivodol reference section, Bulgaria, based on nannofossils, inoceramids and strontium isotope stratigraphy

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Abstract

The base of the Maastrichtian as defined by the GSSP at Tercis-de-Landes, France, is currently in investigation and testing by a newly installed Maastrichtian Working Group due to advancing stratigraphic methods since its ratification more than twenty years ago (Odin & Lamurelle, 2001). Although the Golden Spike point was set at a mean of marker bioevents, it was actually very near the guide event of the first occurrence of the ammonite *Pachydiscus neubergicus*, ca. 35 ka younger than the GSSP level. The main calcareous nannofossil marker is the last occurrence of *Uniplanarius trifidus* (*Quadrum trifidum* in Odin & Lamurelle, 2001), estimated at ca. 750 ka younger than the GSSP mean. Paleogeographically, Tercis was situated in the marginal realm of the Tethys-Atlantic transitional to the cooler temperate realm.
A largely similar paleogeographic situation at the northern Tethyan-European margin is provided by the Upper Cretaceous sedimentary successions cropping out in western part of Bulgaria in the area of the western Fore-Balkan Mountains. One of the most representative section comprising the Upper Campanian-Lower Maastrichtian interval is the Oslen-Krivodol section, situated in the western part of the so-called Central Balkan–Fore-Balkan (CBFB) Tectonic Zone, that forming the northern (marginal) segment of the Balkan Orogen in Bulgaria (Ivanov, 1998).

At the section of Oslen-Krivodol, a several meter thick succession of glauconitic limestones, clayey to nodular limestones and chalky sediments is exposed that includes inoceramids and belemnites. The lower part of the over 7 m thick Oslen-Krivodol succession is composed of green to greenish glauconitic limestones of the Darmantsi Formation (3.1m thick), overlying unconformably the Aptian sandstones of the Roman Formation. The succeeding Kunino Formation (over 4.5m) is represented by thin- to medium bedded limestones, clayey and nodular limestones. Belemnites rostra occur in the entire section, whereas inoceramid bivalves were collected only from two levels in upper part of the Kunino Formation. For a preliminary study, the sediments were tested for calcareous nannofossils using a simple suspension method, and belemnite rostra were used for strontium isotope stratigraphy. Although the sediments show minor thickness compared to other Campanian-Maastrichtian boundary interval (CMB) sites in more pelagic settings, a complete nannofossil zonal succession could be

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established, from the uppermost Campanian to the lowermost Maastrichtian. The following subzones could be distinguished: UC15cTP, UC15deTP, UC16aTP (uppermost Campanian of Thibault et al., 2016), and UC16bTP (basal Maastrichtian). The nannofossil bioevent for the base of the Maastrichtian, the LO of *U. trifidus*, is at 3.25m in the section. Strontium isotope stratigraphy indicates the CMB at a value of 0.707728 $\pm$0.000004, at 3.15m. Additional nannofossil bioevents in the CMB interval include the FO and LO (2.15m) of *Microrhabdulinus ambiguus* (curved spines) below those two levels, and the sudden decrease of warm-water nannofossil indicators like *Watznaueria* spp. (2.73m). Higher in the section (4.08m), *Arkhangelskiella maastrichtiensis* s.str. occurs, although smaller ($< 10\mu$m) morphotypes of this group exist already below that level.

Only two levels from the upper parts of the Kunino Formation have yielded abundant, but badly preserved (as internal moulds) inoceramid bivalves. The inoceramids are represented mainly by the representatives of genus *Cataceramus*, but *Endocostea* is also presented. The inoceramid assemblage is composed of the following species: *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 eponymous inoceramid zone at the base of the Maastrichtian.

Ivanov, . 2017. Tectonics of Bulgaria. University Press "St. Kliment Ohridski", Sofia. Bulgaria, 331 p.

Odin, G.S. and Lamaurelle, M.A. 2001. The global Campanian-Maastrichtian stage boundary at Tercis les Bains, Landes, SW France. Episodes, 24 (4), 229-238.

Thibault, N., Harlou, R., Schovsbo, N.H., Stemmerik, L., Surlyk, F. 2016. Late Cretaceous (late Campanian-Maastrichtian) sea-surfaces temperature record of the Boreal Chalk Sea. Climate of the Past, 12, 429-438.
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