Calcareous nannofossil study of a possible West Carpathian regional stratotype profile of the Jurassic/Cretaceous boundary (the Brodno section, near Zilina)

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This contribution presents some results on calcareous nannofossils in the Brodno section, a possible candidate for a Western Carpathian regional J/K boundary stratotype. The continuous Jurassic-Cretaceous pelagic limestone sequence of the Brodno section offers the possibility to document the J/K passage in a wide area of the Western Carpathians. The Brodno section is situated in an ancient quarry on the eastern side of the narrow straits of the Kysuca River Valley, north of the town of Zilina (NW Slovakia). It yields a record of hemipelagic marine sedimentation in a marginal zone (the Pieniny Klippen Belt) of the Outer Western Carpathians. The Late Jurassic sedimentation rate in the Pieniny Klippen Belt was low. The condensed red nodular limestones of the 'Ammonitico Rosso Facies' (the Czorsztyn Formation), which represent the Kimmeridgian and Tithonian part of the Kysuca Succession, received only a limited terrigenous clastic input. During the Berriasian, subsiding West Carpathian basins were affected by a great acceleration in the 'planktic rain' of organic matter and calcareous microskeletons. This change produced pelagic sediments of the 'maiolica' type (the Pieniny Limestone Formation). This sedimentary pattern persisted until the Early Aptian in the Pieniny Klippen Belt.

Calcareous nannofossils were analyzed in 40 smear slides prepared from all the lithologies under a light microscope at 1250x magnification. The abundance was determined by counting all specimens in at least 200 fields of view in each sample. The preservation of the fossil material has been characterized as moderately to heavily etched by dissolution.

Calcareous nannofossils form relatively low-diversity associations. Eighteen nannofossil species were recognised. The coccolithophorids are represented by Watznaueriaceae: *Watznaueria barnesiae*, *W. britannica*, *W. manivitiae*, *W. ovata*, *Cyclagelosphaera margerelii* and *C. deflandrei*. *Zeugrhabdotus embergeri* is also frequently recorded. Dissolution-resistant coccolith taxa, such as *Helenea chiastia*, *Cruciellipsis cuvillieri*, and other more delicate taxa, such as *Z. erectus*, *Diazomatolithus lehmanii* and *Discorhabdus ignotus* occur more sporadically. Nannoliths *Conusphaera mexicana mexicana*, *C. mexicana minor*, *Polycostella beckmannii*, *Assipetra* spp., *Hexalithus noeliae*, *Lithraphidites carniolensis*, *Nannoconus infans*, *N. wintereri*, *N. steinmanni minor*, *N. globulus minor* and *N. kamptneri minor* are also present. Abundance fluctuations of dissolution-resistant nannoliths (*Conusphaera*, *Polycostella*, *Nannoconus*) and coccoliths (*C. margerelii*, *W. barnesiae*, *W. manivitiae*) have been detected by quantitative study. The nannofossil zonation of Bralower *et al.* (1989), as modified by Tavera *et al.* (1994), was used. Two nannozones, the *C. mexicana mexicana* and *H. chiastia* zones, were distinguished in the Western Carpathians. Calcareous nannofossils from the lower half of the studied sequence (L52 to L96) are correlated with the Early to middle Tithonian *C. mexicana mexicana* Zone (NJ20). This zone comprises the *P. beckmanii* Subzone; the latter one consists of the *H. noeliae,* or NJKA, NJKB and NJKC subzones.

For this section, calpionellid stratigraphy is also available, along with older paleomagnetic data. Calcareous nannofossils formed poorly diversified associations at the J/K boundary. The abundance of *Watznaueria*, *Cyclagelosphaera*, *Conusphaera* and *Polycostella* species in the section studied is relatively high. Other nannofossils are rather rare. *Conusphaera* predominates in the Tithonian (showing a Middle Tithonian peak). *Polycostella* increased in abundance during the *Boneti* Subzone of the *Chitinoidella* Zone. The Middle/Late Tithonian boundary was detected by means of the FO of *H. chiastia* accompanied by the first small nannoconids. Small nannoconids appeared in the Late Tithonian and increased in size and abundance during the Berriasian. *Polycostella* diminished in abundance towards the onset of the *Crassicollaria* Zone. The Late Tithonian interval was delimited by the FOs of *L. carniolensis*, *N. infans*, *N. wintereri* and *C. cuvillieri* within the *H. chiastia* Zone, which is correlated with the standard *Crassicollaria* Zone. From the point of view of nannofossil stratigraphy, the Tithonian/Berriasian boundary interval should be placed between the FO of *N. wintereri* (Sample C17, Upper Tithonian) and the FO of *N. steinmanni minor* (Sample C28, lowermost Berriasian). In this interval, the onset of the *Alpina* Subzone of the standard calpionellid zonation is also recorded (the C23A-C25A beds), which corresponds to the calpionellid J/K boundary zone.

Sequence stratigraphy and stable isotope ($\delta^{18}O$, $\delta^{13}C$) data also provided good results, enabling the studied section to be compared to important key sections in the Mediterranean Tethys area.

This is a contribution to the 506 IGCP UNESCO Project, supported by VEGA grant projects 6026, 2035 and 3178, APVV-0465-06, APVT 51-011305 and Project APVV - 0280-07.

References

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