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Possible Jurassic/Cretaceous boundary regional stratotype for West Carpathian area near Žilina, Slovakia

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Continuous Jurassic – Cretaceous pelagic limestone sequence of the Kysuca Unit (Pieniny Klippen Belt) of the Brodno section offers the best possibility to document the J/K passage in a wide area of the Western Carpathians. Good calpionellid, and nannofossil stratigraphic record complements the older paleomagnetic data. High-resolution quantitative analysis of calpionellids, dinoflagellates and calcareous nannofossil assemblages indicates major variations in their abundance and composition. Correlation of the calcareous microplankton distribution and stable isotope analyses was used in the characterization of the J/K boundary interval as well as in the reconstruction of the paleoceanographical proxies during this time.

The calpionellid study allowed us to distinguish the Dobeni Subzone of the Chitinoidella Zone in the Brodno sequence. The J/K boundary interval can be characterized by several calpionellid events – the onset, diversification, and extinction of chitinoidellids (Middle Tithonian); the onset, burst of diversification, and extinction of crassicollarians (Late Tithonian); and the onset of the monospecific *Calpionella alpina* association just on the J/K boundary. The J/K boundary in the Brodno section is situated between the Crassicollaria and Calpionella Zone (C24A-C24B). It is defined by morphological change of *Calpionella alpina* tests. The base of Crassicollaria Zone is coinciding with the reverse Kysuca Subzone (in L99), and the base of standard Calpionella Zone is located just below the reverse Brodno Subzone

(in C24B). Abundance peak of obliquipithonellid cysts in the Semiradiata Zone (L69-L74) isochronous with flourishing *Conusphaera* spp. was used as the indicator of warmer surface waters.

For the first time, two nannozones: the Conusphaera mexicana mexicana, and the Microstaurus chiastius zones were distinguished in Western Carpathians. Calcareous nannofossils from lower half of the studied sequence (L52 to L96) are correlated with the Early to Middle Tithonian Conusphaera mexicana mexicana Zone (NJ-20). This zone comprises the Polycostella beckmanii Subzone; the latter one consists of the Hexalithus noeliae – or NJK-A, NJK-b- and NJK-c subzones. Calcareous nannofossils formed poorly diversified associations at the J/K boundary. The abundance of *Watznaueria* spp., *Cyclagelosphaera* spp., *Conusphaera* spp., and *Polycostella* spp. in the section studied is relatively high. Other nannofossils are rather rare. *Conusphaera* predominates in the Tithonian nannofossil assemblage (showing the Middle Tithonian peak). *Polycostella* increased in abundance during the Boneti Subzone of the Chitinoidella Zone. On the basis of the appearance of the *Polycostella beckmannii* nannoliths, the Early and Middle Tithonian boundary was located in the Polycostella beckmannii Subzone. The Middle and Late Tithonian boundary was determined by the FO of *Helenea chiastia* coccolith accompanied by the first small nannoconids. Small nannoconids appeared during Late Tithonian and increased in abundance during Berriasian. *Polycostella* group diminished in abundance towards the onset of the Crassicollaria Zone. The Late Tithonian interval was dated more precisely by the appearance of *Hexalithus noeliae* and *Litraphidites carniolensis* within the frame of the Microstaurus chiastius Zone. From the point of view of nannofossil stratigraphy, the Tithonian/Berriasian boundary interval should be limited by the FO of *Nannoconus wintereri* together with small nannoconids up to the FO of *Nannoconus steinmanni minor*. Evolution of nannofossil, calpionellid and dinoflagellate genera coincided with assumed paleoceanographical changes across the J/K boundary interval.

Sequence stratigraphy and stable isotope ($\delta^{18}O$, $\delta^{13}C$) data gave good results, too, enabling the sequence to be compared with important key sections in the Mediterranean Tethys area. Stable isotopes ($\delta^{18}O$, $\delta^{13}C$) analyses indicated relative cold conditions disturbed by several warmer episodes. This is documented also by low content of organic carbon. Near the J/K boundary the oxygen isotope values indicated temperature and salinity changes probably influenced by an invasion of warm water (or stagnancy of cold water input) into the basin resulting in nannoconid bloom episodes. Late Tithonian cooling was followed by temperature increase during very end of Tithonian and at the beginning of the Berriasian.