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Timing of palaeoenvironmental and climatic change at the Triassic/Jurassic boundary on land and in the sea

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Late Triassic to Early Jurassic continental and marine key sections document a major phase of environmental perturbation world-wide. Timing the processes that changed the ecosystems and biodiversity within this period is a challenging task to be solved for a better understanding of palaeoenvironmental and climatic change in general.
In Hungary, continuous sedimentary series of different continental and marine depositional environments are exposed and permit detection and interpretation of the timing of events at the Triassic/Jurassic (T/J) boundary. The Csővár section in the NE Transdanubian Range represents a key marine section, displaying facies successions controlled by sea-level changes of different hierarchies. Cyclic patterns, inferred to result from orbital eccentricity forcing, are also reflected in the stratigraphical distribution of sedimentary organic matter. Based on a high-resolution temporal framework, the following sequence of events was reconstructed for the boundary interval within a single, presumably 400 ky cycle: 1) disappearance of ephemerally abundant platform-derived biota; 2) decline of both planktonic and benthic biota (reduction in biogenic sedimentary components, and conodont and foraminifera diversity); 3) significant perturbation of the biosphere as documented by marine and terrestrial palynomorph assemblages; 4) geochemical anomalies in C and O isotopes; and 5) concurrent reduction of TOC. The first appearance of a new, Jurassic radiolarian fauna, the final extinction of decimated conodont populations, and the recovery of primary production occurred in the following cycle (Götz et al., 2009; Haas et al., 2010).
The southern Hungarian Mecsek Coal Formation of Late Triassic (Rhaetian) to Early Jurassic (Hettangian/Sinemurian) age is exposed in continuous depositional series yielding numerous land plant fossils and diverse palynomorph assemblages (Ruckwied et al., 2008). An integrated study on plant macroremains and palynomorphs was carried out to reconstruct the palaeoenvironment and to detect stratigraphic and lateral changes in vegetation. The stratal architecture of the Mecsek Coal Formation clearly reflects a hierarchically organized cyclic sedimentation pattern which enables us to interpret palaeoenvironmental and floral changes at high time resolution (Götz et al., 2011).
A cascade of events led to the drastic global environmental perturbation at the T/J boundary. However, in spite of these major changes the effects of the orbitally forced cyclic climatic and related sea-level changes are recorded in the successions. The time framework inferred from the cyclicity documented in different settings will enable us to compare the pacing and duration of events on land and in the sea.

References

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