

New conodont data from Waili (South China) and Mud (Northern India) and implications for the definition of the Induan-Olenekian Boundary

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New conodont collections recovered from Waili (Guangxi, South China) and Mud (Himachal Pradesh, India), the latter being a GSSP candidate for the Induan-Olenekian Boundary (IOB), led us to describe several new taxa and to recognize numerous new morphotypes of the important neospathodid *dieneri*, *cristagalli*, *pakistanensis* and *waageni* groups.

Based on our revised taxonomy we also reassessed the published material from the North Pingdingshan section near Chaohu (South China), the other candidate GSSP for the IOB. Our revised determinations enable to construct new, higher resolved local biozonations based on the more robust maximal association approach. Our new biochronological scheme around the IOB has a good lateral reproducibility in the Tethyan realm. Intercalibration with the ammonoid record and the implications for the definition of IOB are also discussed.

Exploring mass extinction events (Permian/Triassic & Triassic/Jurassic): Association with global warming events using molecular fossils and stable carbon and hydrogen isotopes

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Biomarker evidence for photic zone euxinic (PZE) conditions within Permian/Triassic (P/Tr) sections, where concentrations of sulfide are sufficient to support anoxygenic photosynthesis, come from components derived from pigments of Chlorobi. Evidence for such conditions occurs at 6 localities globally. Perturbations in the marine sulfur cycle and thus the redox-state of the ancient seas are also reflected in  $\delta^{34}\text{S}$  of pyrite (e.g. from China, Italy, Iran, Western Australia, East Greenland, Western Canada and Spitsbergen) supporting widespread euxinic conditions in both Palaeotethys & Panthalassa oceans. Various aromatic biomarkers have been detected in high abundances in samples prior to the marine ecosystem collapse in East Greenland, Spitsbergen, South China & Western Canada. We have proposed that lignin derived from land plants, present during the Late Permian is their likely source. We provide sedimentological data, biomarker abundances & compound specific isotopic data ( $\delta^{13}\text{C}$  &  $\delta\text{D}$ ) along with bulk isotopes ( $\delta^{34}\text{S}_{\text{pyrite}}$ ,  $\delta^{13}\text{C}_{\text{carbonate}}$ ,  $\delta^{13}\text{C}_{\text{org}}$ ) for Late Permian sections. At two localities sedimentological and geochemical data supports a marine transgression & collapse of the marine ecosystem occurring in the Late Permian.  $\delta^{13}\text{C}$  data of algal and land-plant derived biomarkers,  $\delta^{13}\text{C}$  carbonate & organic matter support synchronous changes in  $\delta^{13}\text{C}$  of marine and atmospheric  $\text{CO}_2$ , attributed to a  $^{13}\text{C}$ -depleted source ( $^{13}\text{C}$  depleted methane &/or  $\text{CO}_2$  derived from degradation of organic matter due to the marine ecosystem collapse). Evidence for waxing and waning of PZE throughout the Late Permian is provided by Chlorobi derived biomarkers &  $\delta^{34}\text{S}$  pyrite implying multiple phases of  $\text{H}_2\text{S}$  outgassing and potentially several prolonged pulses of extinction. A number of mechanisms have been proposed to account for the Triassic/Jurassic mass extinction, including the release of  $\text{CO}_2$  associated with emplacement of the Central Atlantic Magmatic Province. A negative carbon isotope excursion has been detected in many sections, also supporting a perturbation in the global carbon cycle. It is clear that major and abrupt ecological change including 80% extinction among terrestrial plant species coincides with increased atmospheric  $\text{CO}_2$  concentration ( $\text{CO}_{2\text{atm}}$ , based on stomatal analysis of fossil Ginkgoales leaves) & a negative excursion in  $\delta^{13}\text{C}$  of fossil wood from a section at Astartekløft, East Greenland. We have evidence for carbon cycle perturbation, extreme heat stress and fire in the form of molecular and compound specific stable isotopic compositions of biomarkers from the boundary section.