by a minor increase in the C isotope value (less than 1 ‰). The Lower to Middle Norian crisis is marked by a turning point from Lower Norian slowly increasing carbon isotopic values to gradually decreasing ones (Oman, Sicily and Austria). In the Upper Norian the isotopic values are relatively stable, and show no shift across the newly proposed Norian/Rhaetian boundary (Steinbergkogel, Austria and Oman) before increasing again in the Lower Rhaetian (Oman, Turkey, Austria and British Columbia). The isotopic record remains constant until the top of the Rhaetian and its significant negative shift of up to 8.0 ‰, identified in a number of marine sections in close proximity to the new Rhaetian-Hettangian boundary (e.g., RUHL et al. 2009). This excursion starts below the highest occurrence of conodonts and Triassic ammonites and the lowest occurrence of Jurassic ammonites, allowing a very good correlation and demonstrating unequivocally that the base of the shift lies still in the Rhaetian.
From an isotopic point of view, only the mid-Lower Carnian, the Reingraben event (Lower-Middle Carnian Boundary) and the Triassic-Jurassic Boundary can be interpreted as events, whereas other biotic crises of the Late Triassic seem to have occurred during periods of gradual changes in the carbon isotopic composition of seawater.

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Drastic redox changes across the Triassic-Jurassic boundary: from anoxia to euxinia

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The Triassic-Jurassic boundary (T-J; 201.6 Ma) marks one of the so called Big Five mass-extinction events that may have led to the extinction of more than 80 % of all marine invertebrates. The extinction of marine and terrestrial biota is increasingly linked to the outgassing of large volumes of CO_2 and SO_2 during the emplacement of the Central Atlantic Magmatic Province. Here, we present multi-disciplinary data, including organic geochemical proxies, isotope (C, N), and palynological data, from cores in Luxemburg (Rosswinkel), and northern (Mariental) and southern Germany (Mingolsheim) that provide evidence for changes in type of black shale deposition that reflect major environmental perturbations across the T-J boundary. Prior to the T-J extinction, the Uppermost Rhaetian in Germany contains black shales that are rich in dinoflagellate cysts, and show high amplitude nitrogen isotope excursions. No biomarker evidence for photic zone euxinia was found in the Rhaetian. Because cyst-building dinoflagellates require oxygenated bottom waters, Rhaetian organic-rich sediments were deposited through high-productivity in well mixed shallow marine basins. Following the major overturn of terrestrial vegetation (fern spike) and the marine extinction level, black shales in the lowermost Hettangian reveal extremely low dinoflagellate cyst abundance, but high abundance of prasinophyte green algae and acritarchs. These black shales also show elevated quantities of the biomarker isorenieratane. Isorenieratane derives from the brown strains of photosynthetic green sulphur bacteria (Chlorobiaceae) that require both light and free hydrogen sulfide in the water column. The presence of abundant aryl isoprenoids (isorenieratane and its diagenetic products) in Luxemburg and N Germany suggests that marginal marine basins in NW Europe became salinity stratified and developed intense Photic Zone Euxinia (PZE) after the mass extinction event. This change in low oxygen conditions is consistent with the long-term effects of CO_2 release, greenhouse warming and post-extinction productivity breakdown. Isorenieratane occurs repeatedly in Hettangian and Sinemurian organic rich sediments. Hence, repeated PZE in epicontinental seas bordering the Tethys Ocean may have contributed to the slow recovery of shallow marine ecosystems after the Triassic-Jurassic boundary.

Regionale Schwerefeldberechnungen mit GOCE und Numerische Vorwärtsmodellierung zur Analyse von Wechselwirkungen zwischen Eismassen- und Schwerefeldvariationen

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Im Zuge der globalen Erwärmung werden verschiedenste Methoden zur Überwachung von Gletschern und Eiskappen eingesetzt. Variationen von Eismassen aufgrund von Abschmelzvorgängen spiegeln sich in Veränderungen des Schwerefeldes der Erde wider. Deshalb liefert ein de-