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Characterization of the influence of the rising pelagic calcification on seawater chemistry in the Late Triassic First proxy used: Strontium Isotopes

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Based on theoretical considerations and modelling studies, the appearance of calcifying plankton and the related rise in pelagic biogenic carbonate production had a fundamental effect on the evolution of seawater chemistry and thus on the global marine carbon cycle. In most modelling approaches, this turning-point is roughly pinned down at the Triassic – Jurassic boundary. However, youngest findings of calcifying plankton are dating back to the Late Triassic. Our aim is to characterize and to quantify the role of the new pelagic calcite production on seawater chemistry throughout the Late Triassic based on a detailed paleontological, mineralogical, trace elemental and isotopic study of several key locations worldwide.
Bulk carbonate rock samples representing different palaeo-environmental settings (hemipelagic high, intraplatform basin, tie-of-slope and basin) and palaeo-geographic latitudes (20°N, Equator, 10-20°S) were chosen for our multi-proxy approach, in order to constrain the relative importance of calcification rate, continental weathering and hydrothermal input. In the first approach, radiogenic strontium isotopes were measured with MC-ICP-MS along transects of key locations from Austria, Oman and Turkey. Strontium isotope ratios ($^{87}Sr/^{86}Sr$) range from 0.708176 to 0.707932 in the Norian, than there is a declining trend in the Rhaetian reaching as low values as 0.707689. Corresponding trace elemental data preclude the impact of diagenesis and therefore support their global significance. The provided new continuous Sevatian – Hettangian $^{87}Sr/^{86}Sr$ record from Austrian sections and additional Norian – Rhaetian samples from Oman and Turkey provide good signal reproducibility and confirmed the previously roughly defined downward trend through the Norian – Rhaetian boundary and better constrain its onset. This negative trend is puzzling: there is no information available about a climatic change toward a more arid climate and in the contrary enhanced clastic deposition is recorded in several localities (i.e. Iran, Armenia, Indian Himalaya). The decline should be thus rather due to increase in the hydrothermal flux at mid-oceanic ridges, but this event predate any known dating of the Central Atlantic and/or a rapid weathering of unknown juvenile arc terranes.