High-resolution 87Sr/86Sr record from the Csövár section (Hungary): Linking the volcanism of the Central Atlantic Magmatic Province and continental weathering at the Triassic-Jurassic boundary

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Abstract

The Triassic-Jurassic Boundary (TJB, _˜201.3 Ma) marks a turning point in the evolution of life, as it is associated with one of the Big Five" mass extinction events in Earth history. The event has been tied to the volcanism of the Central Atlantic Magmatic Province (CAMP) as the primary cause of the extinction. Despite advances in our understanding of the effects of the CAMP's emplacement and associated environmental, biogeochemical and biotic perturbations, the intensity and timing of continental weathering in response to CAMP-driven elevated atmospheric CO2 levels remains unclear. Several previous studies have presented evidence of intensified chemical weathering around the TJB. However, the links between volcanic activity, carbon isotope excursions, and continental weathering have remained largely inferential and require further validation. Strontium isotope stratigraphy is a well-established and powerful tool for studying the stratigraphic record at the times of emplacement of large igneous provinces, as it provides insight into the timing and intensity of continental weathering, which in turn can help to elucidate the causes of the extinction event. Recent studies of Kovács et al. (2020) and Onoue et al. (2022) provide new 87Sr/86Sr data for the Late Triassic and the interval of the end-Triassic mass extinction event, indicating a rapid increase in continental weathering towards the boundary, after a decrease in the latest Triassic. These studies supplement the data obtained by Jones et al. (1994) and Korte et al. (2003) and used for the Rhaetian to Hettangian interval in the *Geologic Time Scale 2020* (McArthur et al. 2020). However, until now, there has not been any 87Sr/86Sr study that would cover the entire TJB interval from the late Rhaetian into the early Hettangian in a single section, thus avoiding inherent correlation uncertainties. Here, we present new high resolution 87Sr/86Sr data on bulk carbonates from the Csövár section in Hungary, which is an important continuous marine section spanning 3 million years. Seventy samples were measured, with an average 87Sr/86Sr value of 0,7077, ranging between 0,7076 and 0,7081. These results are in broad agreement with previously available data but their interpretation must

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await further screening for possible minor diagenetic overprint. An apparent Rhaetian shift towards less radiogenic values probably reflects the trends of global environmental and plate tectonic changes prior to CAMP. The impact of CAMP volcanism on seawater 87Sr/86Sr ratios is expected as a shift to higher values related to intensified continental weathering. However, the observed rise in the continental weathering flux is smaller than the increase estimated by studies of seawater Os isotope changes during the TJB (Cohen and Coe 2007), suggesting that hydrothermal forcing may have played a larger role than previously considered. Alternatively, the weathering of CAMP basalts, situated in the humid belt, may have counterbalanced the expected shift towards radiogenic Sr values, due to the weathering of isotopically more unradiogenic fresh flood basalts. Further studies of our new dataset will allow more precise reconstructions of paleoclimatic, paleoenvironmental, and paleoceanographic changes around the TJB. The evolution of seawater Sr isotopic composition during this event will also be compared with other intervals of LIP-related environmental and biotic crises.

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