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Silicate magnesium isotope trends ($\delta^{26}Mg_{sil}$) correlate to carbon cycle disturbances at the Triassic-Jurassic boundary

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Large igneous province (LIP) volcanism has been linked to multiple Phanerozoic mass extinctions via volcanogenic emissions, sea level change, ocean acidification, and ocean anoxia. Central Atlantic magmatic province (CAMP) volcanism coincided with the End-Triassic Mass Extinction (ETME) and Triassic-Jurassic Boundary (TJB). However, carbon isotope records show disturbances preceding and postdating known CAMP age dates, and early intrusive events could have contributed to C cycle disturbances leading up to the ETME. Existing silicate weathering proxies for the TJB rely on seawater records, and models disagree on the potential for CAMP basalt extrusion to mitigate CO2 buildup.

We used silicate magnesium isotopes ($\delta^{26}Mg_{sil}$) in two well-constrained marine TJB sections (Levanto, Peru & St Audrie's Bay, UK) to constrain potential weathering changes in lower latitude W. Panthalassa and mid latitude NW. Tethys leading up to the ETME. Magnesium isotope excursions (MgIEs) occur in both sections corresponding to 1st order carbon isotope excursions (CIEs), but with different timing and direction at each. At Levanto, an rapid negative MgIE preceding known CAMP ages mirrors a positive organic CIE at ca. ~202Ma, ending ca. 201.6 Ma with the onset of the ETME. At St. Audrie's Bay, the negative MgIE occurs along with a well-documented negative organic CIE that post-dates the TJB, suggesting a delayed or different effect at work compared to Levanto.

This study demonstrates potential sensitivity of silicate Mg isotopes to climate change effects at different latitudes. An earlier onset of Mg cycle disturbance is seen at Levanto, in closer proximity to a hot/arid W. Pangea at the onset of CAMP vs. the higher latitude/wetter St. Audrie's Bay, where the effect manifests slightly after the TJB. Limited contribution from weathering of extrusive CAMP basalts with mantle-like $\delta^{26}Mg$ values could also contribute to a -MgIE, but this would only apply for St. Audrie's Bay because the -MgIE postdates CAMP activity. The good correlation between C_{org} and Mg isotope excursions may help further work in determining tempo of CO2 emissions and consumption surrounding an LIP event.