Ca isotope constraints on Early Triassic marine carbonate chemistry

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Perturbed global C cycle dynamics characterized the five million years following the end-Permian mass extinction, coincident with reduced biodiversity and expansive anoxic conditions. Early Triassic $\delta^{13}C$ exhibits multiple negative (down to -2‰) and positive (up to 8‰) excursions, which could have resulted from volcanism, acidification, or changes in organic carbon burial, carbonate precipitation, or mineralogy. Because the Ca cycle is linked to carbonate chemistry through $CaCO_3$ acidification/dissolution and burial, Ca isotopes can help constrain C cycle behavior. We present $\delta^{44/40}Ca$ data measured in Upper Permian-Upper Triassic limestones from south China and Turkey. By measuring $\delta^{44/40}Ca$ in two stratigraphic sections located across the Tethys, we can determine whether the data represent global conditions or have undergone local effects, such as diagenesis. At the extinction horizon, a 0.5‰ negative excursion is observed at both sections, followed by a positive excursion of ~0.7‰. In Turkey, this positive excursion is concurrent with the large positive $\delta^{13}C$ excursion at the Induan-Olenekian boundary (~251.22 Ma), whereas a 0.6‰ negative $\delta^{44/40}Ca$ excursion occurs in south China. Records stabilize by the Spathian (~250 Ma). Using a coupled C and Ca model, we test different local and global controls on $\delta^{44/40}Ca$ and $\delta^{13}C$ to identify conditions that explain the observed isotopic excursions in multiple elements.