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Modeling the effects of carbon release from the Central Atlantic Magmatic Province on atmospheric pCO_2 and oceanic $\delta^{13}C$ at the Triassic-Jurassic boundary

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The Central Atlantic Magmatic Province (CAMP), the end-Triassic mass extinction, and major carbon cycle perturbations occurred synchronously around the T-J boundary. Terrestrial and marine carbon isotope records show the presence of three negative excursions (CIEs), suggesting input of isotopically depleted carbon into the ocean-atmosphere system. The first two CIEs, which are temporally linked to the ETE, overlap with widespread sill emplacement in volatile-rich sedimentary basins in northern Brazil. Here we use the LOSCAR carbon cycle box model to explore the effects of pulsed volcanic and thermogenic carbon release from CAMP on atmospheric pCO_2 and oceanic $\delta^{13}C$. We propose a new model for the end-Triassic/early-Jurassic carbon cycle perturbations, based on realistic scenarios for the evolution of CAMP, including the newest U-Pb geochronology from both the flood basalts and the sub-volcanic sills. Our modeling demonstrates that the release of six individual carbon pulses can replicate the observed Triassic-Jurassic pCO_2 and $\delta^{13}C$ proxy records. The model results further show that mantle-derived CO_2 from CAMP lavas alone cannot account for the negative CIEs, and that organic-rich shale affected by contact metamorphism around CAMP sills represent a likely source for the ^{13}C-depleted carbon. Our results strengthen the case for an active involvement of CAMP in the end-Triassic crisis, and that the sub-volcanic part of a LIP represents a key driver for global carbon cycle perturbations.