Thermogenic gas release from CAMP as a trigger for the end-Triassic crisis

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Sill emplacements of the Central Atlantic Magmatic Province (CAMP) into the volatile-rich Amazonas and Solimões sedimentary basins (Brazil) are likely to have played a key role in the end-Triassic crisis, which is characterized by a global mass extinction (the end-Triassic extinction; ETE) and major carbon cycle disruptions.

Thermal modeling and geochemical investigations based on sill samples and logs from boreholes drilled in the two basins suggest that magma-sediment interactions and contact metamorphism generated sediment-derived volatiles such as CO_2, CH_4, SO_2 and Cl-compounds. The release of such volatiles could explain both the severity of the biotic loss and the carbon cycle disruptions.

The majority of sills are defined as low-Ti (< 2.0 wt.% TiO_2) and are widespread in upper Paleozoic evaporite and carbonate. Both low- and high-Ti (> 2.0 wt.% TiO_2) varieties are locally present in lower Paleozoic organic-rich shales. High-presicion U-Pb geochronology demonstrates at least two pulses of magmatism, starting with low- and high-Ti sill emplacement active simultaneously, followed by a later pulse of predominantly high-Ti magmatism.

Recent correlations, based on a variety of methods, including palynology, ammonite stratigraphy, $\delta^{13}C_{org}$ data and radiometric dating, suggest that the Amazonas and Solimões sills coincide with the ETE and negative CIEs. Carbon cycle modeling demonstrates that mantle-derived carbon alone cannot account for the negative CIEs. In contrast, sediment-derived thermogenic carbon represents a plausible candidate for the isotopically depleted carbon responsible for the negative CIEs. The modeled emission scenario includes an early release of both inorganic- and organic-derived thermogenic carbon, and a later release of predomintantly organic thermogenic carbon, following the temporal evolution of the low- and high-Ti sills in the Brazilian basins.