

Sedimentary Mercury signals from Large Igneous Province volcanism: insights from the end-Triassic and end-Cretaceous

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Large Igneous Provinces (LIPs) represent the geologically abrupt eruption or crustal accumulation of millions of cubic kilometers of (chiefly) basaltic material. Radiometric dating indicates that many LIPs appear to coincide with times of mass extinction and/or major environmental change. However, a conclusive indicator for LIP volcanism in the sedimentary record remains desirable. Mercury (Hg) has previously shown promise as a sedimentary tracer for volcanic activity, in particular for the end-Permian extinction and Toarcian Ocean Anoxic Event. Emitted as an inert, trace gas from volcanoes in the modern, mercury has an atmospheric residence time of 1–2 years, allowing it to be globally distributed before being deposited to sediments.

This study presents new data comparing multiple sedimentary Hg records of two similar LIPs: the end-Triassic Central Atlantic Magmatic Province (CAMP), and the end-Cretaceous Deccan Traps. Both were emplaced subaerially, at low latitudes, and coincided with major mass-extinction events. Multiple excursions in Hg concentrations are observed in latest-Triassic sediments, potentially indicative of an episodic emplacement of CAMP, which is supported by geological evidence. Contrastingly, we find no Hg excursions in latest Cretaceous sediments, despite previous studies indicating that Deccan volcanism commenced 300kyrs prior to the KPg boundary. It is proposed that the Hg excursions observed from records of the end-Triassic (and other events) were caused by release of thermogenic Hg following intrusion of organic sediments by LIP magmas, whereas the Deccan Traps did not intrude organic sediments and could not have produced thermogenic mercury. These new data reinforce previous hypotheses that most volatile output associated with LIPs was thermogenic, rather than magmatic.