

Comparing records of end-Cretaceous and end-Permian volcanism

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Sedimentary mercury (Hg) concentrations are increasingly utilized as a geochemical proxy for volcanism associated with emplacement of Large Igneous Provinces (LIPs). Volcanoes represent a major natural source of gaseous Hg to the environment, and the element has an atmospheric residence time of 1–2 years, allowing it to be globally distributed before being deposited into sediments. Elevated Hg concentrations in sedimentary records have been used to suggest a precise coincidence between numerous Mesozoic environmental perturbations and episodes of LIP volcanism. However, one key issue in the use of Hg as a volcanic proxy is whether all LIP eruptions produce volatiles that can perturb the global mercury cycle, or whether such emissions are only associated with certain volcanogenic processes.

The end-Cretaceous extinction has long been suggested to have a potential link with the emplacement of the Deccan Traps. However, eruption of Deccan basalts is known to have commenced approximately 300 kyrs prior to the extinction, based on radioisotopic and palaeomagnetic studies of the basalts themselves, and on sedimentary osmium-isotope ratios. Here, multiple sedimentary Hg records of the latest Cretaceous are presented, to ascertain whether the Hg cycle was perturbed throughout the last 300 kyrs of the Mesozoic Era, during the active phase of Deccan volcanism. A comparative study is performed on published data of the end-Permian extinction and its association with the Siberian Traps. In both cases, Hg anomalies do not correlate with other sedimentary proxies for volcanism, nor appear in sediments deposited coevally with the first erupted volcanic rocks of their respective LIPs. This result suggests that not all LIP eruptions were associated with major emissions of Hg, raising questions as to what specific volcanic (or volcanism-related) processes are key for perturbation of the global mercury cycle.