Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.28389

Tellurium Anomalies Reveal Peak Eruption Rates of Deccan Volcanism Spanning Across the Cretaceous/Paleogene Boundary

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The role of the emplacement of the Deccan Traps on the Indian subcontinent for the Cretaceous/Paleogene boundary (KPB) mass extinction (~66 Ma) remains debated. Unravelling the interplay between the temporally coincident flood basalt emplacement, Chicxulub impact, and extinction event requires reliable geochronologic, geochemical and micropaleontological studies in sediments recording the concurring environmental perturbations.

Since it was first proposed as a proxy for volcanism in sediments, Hg has become the status quo when investigating the link between LIP occurrences and extinction events. However, in the case of the KPB extinction and the Deccan Traps, Hg data seem to yield conflicting results on when peak volcanism occurred and its relative temporality regarding the KPB.

Here, we present new Te (and other trace element) data from multiple sedimentary sections spanning across the KPB (e.g., Wadi Nukhul, and Wadi Mutalla, Egypt; Elles, Tunisia; Gubbio, Italy) to record volcanic outgassing of the Deccan Traps at varying paleo-distances.

We find that the relatively proximal sites to the eruptive centers exhibit similar Te concentrations independent of variations in sediment lithology. These sections agree in exhibiting semi-continuous eruption peaks reflected by high Te fluxes, which are potentially associated with eruptions of the voluminous Wai subgroup within C29r. Furthermore, Te fluxes are in accordance with previous geochronological studies demonstrating that ~70% of the total extrusive volcanism of the main Deccan basalts occurred between approximately 66.1 Ma to 65.6 Ma. This not only suggests a potential contribution of Deccan volcanism to the KPB mass extinction but may also contradict an impact induced increase in the eruption rate.

Using Te as a complementary proxy to existing Hg studies, we evaluate when volcanic emissions in the Deccan Traps peaked to infer the relative eruptive timing of the voluminous Wai subgroup. We conclude that the most intense pulse of Deccan volcanism initiated before the KPB and thus may have amplified the catastrophic effects of the Chicxulub impact.