Geophysical Research Abstracts
Vol. 21, EGU2019-5666-4, 2019
EGU General Assembly 2019

Timing and paleoenvironmental implications of Deccan volcanism relative to the KPg extinction revealed by mercury anomalies.

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Mercury (Hg) as indicator of large-scale volcanism in marine sediments provides new insights into relative timing between biological and environmental changes, mass extinctions and delayed recovery. Several studies evaluated the relationship between Hg anomalies in sediments and LIP activity across mass extinction horizons. The bulk (80%) of Deccan Trap eruptions occurred over a relatively short time interval in magnetic polarity C29r. U-Pb zircon geochronology reveals the onset of this main eruption phase 250 ky before the Cretaceous-Tertiary (KT) mass extinction and continued into the early Danian suggesting a cause-and-effect relationship.
We present the first comprehensive high-resolution analysis of Deccan Traps Hg loading, climate change and end-Cretaceous (KTB or KPB) mass extinction from a transect, which includes 27 sections deposited in both shallow and deep environments. We investigate the Hg contents of around sections located in France (Bidart), Spain (Zumaya, Caravaca, Agost), Denmark (Nye Klov, Stevn Klint), Austria (Gams), Croatia (Hvar, Brac) Italy (Gubbio), Tunisia (Elles, El Kef), Turkey (Goynuk, Okçular), Egypt (Wadi Nukhul, Sinai, Duwi), Israel (Negev), Oman (Abat), India (Megalaya, Anjar, Podgavan, Cauvery Basin), Demarara Rise, Texas USA (Brazos River) and NE Mexico (El Penon, La Parida). In all sections, results show that Hg concentrations are more than 2 orders of magnitude greater during the last 100ky of the Maastrichtian up to the early Danian P1a zone (first 380 Ky of the Paleocene). These Hg anomalies are correlative with the main Deccan eruption phases. Hg anomalies generally show no correlation with clay or total organic carbon contents, suggesting that the mercury enrichments resulted from higher input of atmospheric Hg species into the marine realm, rather than organic matter scavenging and/or increased run-off. Significant and coeval Hg enrichments are observed in multiples basins characterized by proximal and distal, as well as shallow and deep-water settings, supporting a direct direct fallout from volcanic aerosols. At Gams, Bidart, Elles and Demerara, the highest Hg anomalies correlate with high shell fragmentation and dissolution effects in planktic foraminifera indicating that paleoenvironmental and paleoclimate changes drastically affected marine biodiversity especially during the last 25 ky preceding the KPg. These observations provide further support that Deccan volcanism played a key role in increasing atmospheric CO_2 and SO_2 levels that resulted in global warming and acidified oceans, increasing biotic stress that predisposed faunas to eventual extinction at the KPB