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Timing and tempo of Deccan volcanism: evidence from mercury anomalies

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Mercury is a very toxic element, with a long residence time (1-2 years) and wide distribution by aerosols. Volcanic emissions and coal combustion are the two main natural sources of mercury. Several studies [1-4] 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 [5]. In a related study we investigate the mercury (Hg) contents of sections in France (Bidart), Spain (Zumaya), Denmark (Nye Klov), Austria (Gams), Italy (Gubbio), Tunisia (Elles, El Kef), Egypt (Sinai), India (Megalaya), Texas USA (Brazos River) and Mexico (La Parida). In all sections, results show 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 phase. 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. At Gams, Bidart and Elles, Hg anomalies correlate with high shell fragmentation and dissolution effects in planktic foraminifera indicating that paleoenvironmental and paleoclimate changes drastically affected marine biodiversity. 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 KTB.