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New Evidence links Deccan Traps to the Cretaceous-Tertiary Boundary Mass Extinction

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Recent studies indicate that Deccan Trap volcanism began with a relatively minor eruption phase (∼6% of total volume) during the late Maastrichtian magnetic polarity C30n. The main eruption phase (∼80%) occurred over a short period in C29r just below the Cretaceous-Tertiary boundary (KTB) and the last Deccan phase (∼14%) erupted in the early Danian C29n. Multiproxy studies from sections in Meghalaya (NE India), Jhilmili in central India (Madhya Pradesh), 6 quarry outcrops from Rajahmundry (SE India), 10 deep wells from the Krishna-Godavari Basin (K-G) (Andhra Pradesh) place the KTB mass extinction near the end of the main Deccan phase coincident with the mass extinction. These studies show that the second and third phase of eruptions each produced the world's largest and longest lava megaflows ∼1500 km across India through the K-G Basin into the Bay of Bengal. These megaflows are separated by sand, silt and shale which record the mass extinction across an interval that spans zones CF1-CF2 and most of the nannofossil Micula prinsii zone and is correlative with the rapid global warming and subsequent cooling near the end of the Maastrichtian. The mass extinction began preceding the first of the four mega-flows in C29r. Planktic foraminifera suffered a 50% drop in species richness. Survivors suffered another 50% drop after the first mega-flow, leaving just 7 to 8 survivor species. No recovery occurred between the next three mega-flows and the mass extinction was complete with the last phase-2 megaflow at the KTB. The last phase of Deccan volcanism and its 3 to 4 megaflows in the early Danian C29n (zone P1b) delayed biotic recovery of marine plankton. Correlative with these intense volcanic phases, climate changed from humid/tropical to arid conditions and returned to normal tropical humidity after the last phase of volcanism. Similar environmental conditions, mass extinction and delayed recovery patterns are observed in Meghalaya, NE India.The mass extinction was likely the consequence of rapid and massive volcanic CO_2 and SO_2 gas emissions, leading to high continental weathering rates, global warming, cooling, acid rains, ocean acidification and a carbonate crisis in the marine environment.