The feasibility of antipodal volcanism as a result of the K/T impact

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Research regarding the impact event at the Cretaceous-Tertiary (K/T) boundary at Chicxulub, Yucatan Peninsula, and the Deccan flood basalts of western India has shown both possibility and dismissal of the two as being a series of interrelated events, although most workers agree that the two sites were relatively antipodal at the K/T boundary. Subsequent 2D & 3D computer models following the development of Simplified Arbitrary Lagrangian-Eulerian (SALE) and similar code have shown that axial focusing of seismic waves following an impact for a planet analogous to Earth is most significant at ~100 km depth below the antipode surface. However, calculations of the initial kinetic energy, total seismic energy produced as a function of the seismic efficiency for a CM2 Chondrite bolide impact, and total energy delivered to a basaltic volume near its melting point at a depth of ~100 km generate a thermal pulse, or sudden change in temperature, of 1 millikelvin. This temperature increase is not sufficient to create or enhance pre-existing melts at depth.

Estimates of the total volume of lavas produced at the Deccan Traps range from 5 x 10^5 to 1 x 10^6 km^3 over a duration of ~3 m.y., with average intervals between eruptions of sub-groups within the traps of 2-10,000 years. A stratigraphic section composed of main eruptive units within the traps shows one sub-group, the Wai, which is responsible for 50% of the total eruption volume from 66 to 64.5 Ma, peaking with the Ambenali Formation within the sub-group producing 200,000 km^3 of basalt 66 to 65.5 Ma. Activity substantially drops during the last two formations within the sub-group, Panhala and Desur, producing 25,000 km^3 and 10,000 km^3, respectively. A ~65 Ma date for the K/T impact would have had no effect on the Deccan volcanic system whose eruptive volumes were dropping per successive formation at this time.

An Iridium-rich limonite layer has been identified within an intertrappean sediment layer between two separate basalt flows in a stratigraphic column representing the Deccan volcanic province, and has been constrained by dates from the preceding (65.1±0.6 Ma) and succeeding (64.7±1.5 Ma) flows. This is most consistent with a K/T boundary/impact date of ~65 Ma. Osmium/Iridium ratios found within this limonite layer are ~1.1, similar to meteoritic ratios, and are found in no other intertrappean sedimentary layers. Rapidly erupted basalt flows following the event also show no such ratios, indicating that no volcanic process would have contributed to such high Os and Ir contents and ratios, and that volcanic activity had been underway before, during, and after the impact, ruling out an impact-initiated igneous province.