



## **Possible Triggering of the Largest Deccan Eruptions by the Chicxulub Impact**

Mark Richards (1), Walter Alvarez (1), Stephen Self (1), Leif Karlstrom (2), Paul Renne (1), Michael Manga (1), and Courtney Sprain (1)

(1) University of California, Berkeley, Department of Earth and Planetary Science, United States (mark\_richards@berkeley.edu), (2) Stanford University, Department of Geophysics, United States

New constraints on the timing of the Cretaceous-Paleogene (K-Pg) mass extinction, the Chicxulub impact, and a particularly voluminous and apparently brief pulse within the “main-stage” eruptions of the Deccan Traps continental flood basalt province suggest that these three events may have occurred within less than several hundred thousand years of each other. Partial melting induced by the Chicxulub event does not provide an energetically-plausible explanation for this coincidence, and both geochronological and magnetic-polarity data show that Deccan volcanism was underway well before Chicxulub/K-Pg time. However, historical evidence for the triggering of distant volcanic and hydrologic events due to earthquakes suggests that surface waves excited by the Chicxulub impact might plausibly have caused a transient increase in the effective permeability of the deep magmatic system beneath the Deccan province (“plume head”), depending upon the efficiency of coupling between the impact energy and seismic waves. Recently published seismic modeling [Meschede et al., 2011] suggests that the Chicxulub impact may have generated seismic energy densities of order 0.1–1.0 J/m<sup>3</sup> globally throughout the upper ~200 km of the Earth’s mantle, just sufficient to trigger volcanic eruptions worldwide. It therefore seems reasonable to ask whether the Chicxulub impact might have triggered the enormous Poladpur, Ambenali, and Mahabaleshwar (Wai Subgroup) lava flows that account for >50% of the entire Deccan Traps volume. High-precision radioisotopic dating of the main-phase Deccan flood basalt formations should be able to either confirm or reject this hypothesis. In the former case, this singular outburst within the Deccan Traps (and possibly volcanic eruptions worldwide) may have contributed significantly to the K-Pg extinction. In the latter case, a major role for the Deccan Traps in the K-Pg extinction would seem unlikely.