Impact vs volcanism in the Cretaceous–Paleogene Boundary: insights from Hg chemostratigraphy and Hg isotopes

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The mass extinction which marks the K/Pg is perhaps linked to a catastrophic event of gigantic proportion. Cr and Os isotopes, and $^{3}He/^{4}He$ ratios of He encapsulated in fullerene structures in Ir-rich K/Pg layer advocate in favor of an extraterrestrial cause, while Hg/TOC spikes suggest Hg loading from volcanism straddling this boundary. Three Hg/TOC spikes were found in classical sections in this study: (a) spike I within the CF2 planktic foraminiferal biozone (Højerup, Gola del Bottaccione, Um Sohryngkew and Poty Quarry sections), (b) except for the Poty Quarry, spike II was seen at the K/Pg boundary and (c) spike III, within the P1a planktic foraminiferal subzone. These spikes are probably fingerprints of volcanic episodes of the Deccan phase-2 (spike I is perhaps linked to the Poladpur eruptive pulse and spike III, to the Ambenalli one). The Chicxulub impact may have triggered the Poladpur, Ambenalli and Mahabaleshwai (Wai Subgroup) lava flows of the Deccan phase-2. The Hg/TOC spike II has, perhaps, resulted from Hg loading from both, asteroid impact and volcanism contributions. Scavenging of Hg by anoxia on seafloor may have contributed Hg to the generation of spike II, as Mo/Al redox proxy exhibits negative shift around the K/Pg boundary due to decrease in oxygenation.

In a $\delta^{202}Hg$ vs $\Delta^{201}Hg$ plot, samples from the studied K/Pg sections lie within the box for volcanic emission (just samples from Bidart, France, added for comparison, lie within the volcanic emission/chondrite Hg field). Samples show small positive $\Delta^{201}Hg$, favoring long-term atmospheric transport prior to deposition, supporting volcanic origin for the Hg. This reinforces the use of Hg as stratigraphic marker and support Hg loading to the environment by Deccan phase-2 in three distinct episodes.