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Search for r-process Pu-244 in the K-Pg boundary layer

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The K-Pg (Cretaceous–Paleogene) boundary at 66 Ma marks one of five major mass extinctions in Earth's fossil history. Based on strong enrichments of platinum-group elements, Alvarez et al. [1], in 1980, suggested that the impact of a large asteroid was responsible for the K/Pg event. To exclude other causes for the mass extinction, e.g., a nearby supernova(SN)-explosion, they also searched for a long-lived radionuclide, ^{244}Pu ($t_{1/2}$=81 Myr), assuming that this is predominantly produced and ejected in SNe. No ^{244}Pu was detected, leaving an impact as the most plausible cause. This was also confirmed by discovering the Chicxulub impact structure.
However, since 1980, strong evidence evolved that heavy r-process elements, like ^{244}Pu, are produced in rare explosive events [2]. Furthermore, the method of Accelerator Mass Spectrometry has since emerged with superior detection efficiency for ^{244}Pu [3]. The enormous gain in sensitivity prompted us to reinvestigate the ^{244}Pu content in the K-Pg boundary layer, despite the overwhelming evidence for an asteroid impact. However, no enhanced ^{244}Pu concentration was found, again ruling out the SN hypothesis.
[1] Alvarez et al., Science 208 (1980) 1095. [2] Wallner et al., Science 372 (2021) 742. [3] Fields, Wallner, Annu. Rev. Nucl. Part. Sci. 73 (2023) 365.

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