Nuclear Physics in Astrophysics XI



Contribution ID: 131

Type: Poster

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

Monday 16 September 2024 20:15 (20 minutes)

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, ²⁴⁴Pu ($t_{1/2}$ =81 Myr), assuming that this is predominantly produced and ejected in SNe. No ²⁴⁴Pu 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 ²⁴⁴Pu, are produced in rare explosive events [2]. Furthermore, the method of Accelerator Mass Spectrometry has since emerged with superior detection efficiency for ²⁴⁴Pu [3]. The enormous gain in sensitivity prompted us to reinvestigate the ²⁴⁴Pu content in the K-Pg boundary layer, despite the overwhelming evidence for an asteroid impact. However, no enhanced ²⁴⁴Pu 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.

Primary author: FICHTER, Sebastian (Helmholtz-Zentrum Dresden-Rossendorf)

Co-authors: WALLNER, Anton (HZDR); KOEBERL, Christian (University of Vienna, Vienna, Austria); CHILD, David (Australian Nuclear Science and Technology Organisation, Sydney, Australia); KOLL, Dominik (ANU + HZDR); HOTCHKIS, Michael (Australian Nuclear Science and Technology Organisation, Sydney, Australia); FRÖH-LICH, Michaela (Australian National University, Canberra, Australia); MERCHEL, Silke (Helmholtz-Zentrum Dresden-Rossendorf, University of Vienna, Australian National University)

Presenter: FICHTER, Sebastian (Helmholtz-Zentrum Dresden-Rossendorf)

Session Classification: Poster Session