

AMS measurements of cosmogenic and supernova-ejected radionuclides in deep-sea sediment cores

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Accelerator Mass Spectrometry (AMS) provides the highest sensitivity for measurements of long-lived radionuclides with half-lives in the order of million years. We apply this method to search for live supernova (SN)-produced radionuclides on Earth.

The first indication of a SN close-by to the solar system was published by Knie et al. in 2004. AMS measurements of a ferromanganese crust from the Pacific Ocean showed an excess of ⁶⁰Fe corresponding to a time some 2 Myr ago. We have obtained two deep-sea sediment cores from the Indian Ocean, which provide a better time resolution due to higher accumulation rates. We use AMS for measuring concentrations of the long-lived radionuclides ²⁶Al, ⁵³Mn and ⁶⁰Fe in these sediment cores with high time resolution. All three radionuclides, with half-lives between 0.7 and 3.7 Myr, are produced in the late burning phases and during a supernova explosion of a massive star and are ejected into the interstellar medium in the explosion. In contrast to ⁶⁰Fe, which is not produced in-situ on Earth, cosmogenic production of ²⁶Al and ⁵³Mn in the atmosphere and in-situ adds to a potential extraterrestrial signal. Therefore, accurate data are required for these radionuclides. The cosmogenic isotope ¹⁰Be, produced from cosmic rays in the Earth's atmosphere, is analysed for dating purposes.

We will present our first AMS measurement results for ¹⁰Be (DREAMS facility, Germany) and ²⁶Al (VERA, Austria) and will show that, in addition to ¹⁰Be, ²⁶Al might be a valuable isotope for dating of deep-sea sediment cores for the past few million years.