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.