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 ^{60}Fe 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 ^{26}Al, ^{53}Mn and ^{60}Fe 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 ^{60}Fe, which is not produced in-situ on Earth, cosmogenic production of ^{26}Al and ^{53}Mn in the atmosphere and in-situ adds to a potential extraterrestrial signal. Therefore, accurate data are required for these radionuclides. The cosmogenic isotope ^{10}Be, produced from cosmic rays in the Earth's atmosphere, is analysed for dating purposes.

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