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Extraterrestrial dust on Earth - Micrometeorites and traces of nearby Supernovae

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As our Earth moves through space, it traps particles originating from within our Solar System and from the surrounding interstellar medium.

Each year, about 30.000 tons of interplanetary dust accumulate on Earth. A large fraction can be found as micrometeorites on the Earth's surface - submillimetre-sized particles liberated from larger bodies such as asteroids and comets. Additionally, interstellar dust signatures from supernovae were observed in deep-sea archives, indicating recent nearby stellar explosions.

We analysed sediment samples from a depth of 4200 m below the sea surface originating from the Indian Ocean for their ⁶⁰Fe content. This long-lived radionuclide, with a half-life of 2.6 million years, is produced and ejected by exploding stars. Using accelerator mass spectrometry (AMS) at ANU, Canberra, we detected an excess of ⁶⁰Fe corresponding to a time period of 2-3 million years ago. Dating of the samples was achieved with AMS measurements (HZDR, Dresden, and VERA, Vienna) of cosmogenic ¹⁰Be and ²⁶Al - both are long-lived radionuclides produced in the Earth's atmosphere.

Micrometeorites contribute to a continuous extrater restrial influx of ¹⁰Be, ²⁶Al, and possibly ⁶⁰Fe. These cosmogenic radio nuclides accumulate within the microparticles as they are irradiated by cosmic rays in space. Measuring the concentrations of ¹⁰Be, ²⁶Al, and ⁶⁰Fe within a single micrometeorite yields information on its cosmic ray exposure duration and its origin within our Solar System.

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