Ocean sediment sample holds iron believed to be from a supernova

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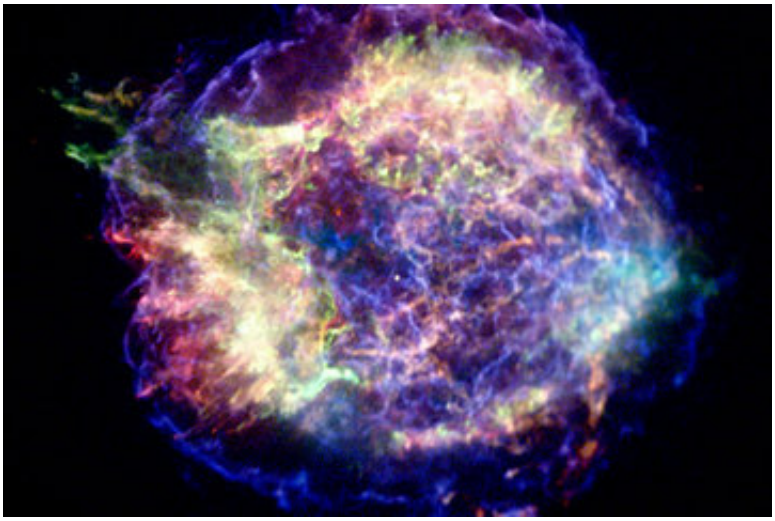

Credit: NASA

A team of researchers from several institutions in Germany and Austria has found possible evidence of iron from a supernova in sediment cores taken from the floor of the Pacific Ocean. In their paper published in *Proceedings of the National Academy of Sciences*, the team describes how they analyzed the core samples and why they believe they hold evidence of an ancient supernova.

The study began, the researchers report, when team members came across information regarding magnetotactic bacteria during internet searches. It is a type of bacteria that lives in ocean sediments and absorbs

tiny amounts of iron. As sediment builds, the bacteria die leaving behind bits of iron in the layers of sediment. And because they have been at it for millions of years, these sediment layers may contain a type of iron that came from space millions of years ago—iron-60, which prior research has shown is spewed into space when supergiant stars explode.

Iron-60, the researchers note, is extremely rare on this planet, with a half-life of just over two and a half million years; thus, any iron-60 present when our planet formed would have disappeared long ago. And since there is no known natural means to produce it, that leaves arrival from space as the logical origin. Prior research has shown that there are two likely sources, micrometeorites and possibly material sent millions of miles across space due to a supernova.

To learn more, they obtained core samples taken from the Pacific Ocean by researchers working on other projects. To look for iron-60 among the much more common iron-56 and other material, they used accelerator mass spectrometry—which is capable of isolating single atoms.

The team reports that they found concentration levels of iron-60 from single atoms to small clusters of atoms. The greatest concentrations, they also report, were from a time approximately 2.2 million years ago, which just happens to coincide with a massive marine die-off.

The researchers believe it is more likely that the iron-60 came from a supernova rather than micrometeorites because magnetotactic bacteria absorb iron from hydroxides—micrometeorites tend to harbor iron in magnetite or silicate.

More information: Peter Ludwig et al. Time-resolved 2-million-year-old supernova activity discovered in Earth's microfossil record, *Proceedings of the National Academy of Sciences* (2016). DOI: 10.1073/pnas.1601040113