Expansion of Reducing Marine Environments during the Ireviken (Silurian) Biogeochemical Event

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Abstract

The Silurian was a dynamic interval in Earth's history with an overall high sea level and shallow epeiric seas covering large basins. There are several major biogeochemical events recorded globally in the extensive carbonate sections that formed during this period. One of these events, the Ireviken Biogeochemical Event (IBE), occurs across the Llandovery-Wenlock boundary and includes a major positive carbon isotope excursion, increased biotic turnover, and other significant geochemical perturbations. Recent work hypothesized that an expansion of reducing environments led to an increase in organic carbon burial – driving the Ireviken Carbon Isotope Excursion (ICIE). The IBE is recorded in the Altajme core from Gotland, Sweden, which provides a well-preserved and expanded stratigraphic section ideal for high-resolution sampling. Previous work on this core has resulted in the creation of the highest resolution record of the ICIE ever produced. Here, we present δ34Spy (pyrite) and δ34SCAS (carbonate-associated sulfate) data through this interval from the Altajme core that are indicative of a local signal of increased microbial sulfate reduction (MSR) and therefore an increase in the expansion of reduced environments locally. Additionally, δ34SCAS data compiled from nearby and distant basins provide further evidence for the global expansion of reducing environments throughout the oceans during the IBE.

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