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Trace element archives in deep time: Availability vs bioavailability

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Trace elements are vital for all life forms on Earth today and have played a key role in Earth's early evolution of life. They form key components of biomacromolecules, and present as inorganic co-factors in proteins, enabling their catalytic and electron transfer properties as well structural stability. Trace elements also facilitate a range of complex metabolic reactions essential for life. A variety of geochemical proxies are used to better understand the evolution of the marine trace element inventory through deep time and its effect on the biosphere.

This presentation will discuss interpretation of the marine pyrite database (~7000 *in-situ* sedimentary pyrite analyses) alongside other existing databases (such as stromatolites and temperature). Trace element composition (Ni, Co, Se, Mo, Zn, Cu) of marine pyrite provides an excellent measure of a broad first-order availability through time. A special emphasis will be placed on the importance of both availability and scarcity of trace elements in light of their utilisation patterns in organisms. Availability or abundance of an element does not necessarily imply uptake. Similarly, scarcity may not be detrimental as the biosphere's response to changing availability of nutrients is highly nuanced. The presentation aims to analyse the trace element archives in conjunction with evolution of early life. While early evolution of life was driven by a myriad of geological factors, trace element archives provide a unique perspective on the interplay of chemical-biological evolution on Earth.