The Boring Billion Years in Earth's History and its Significance

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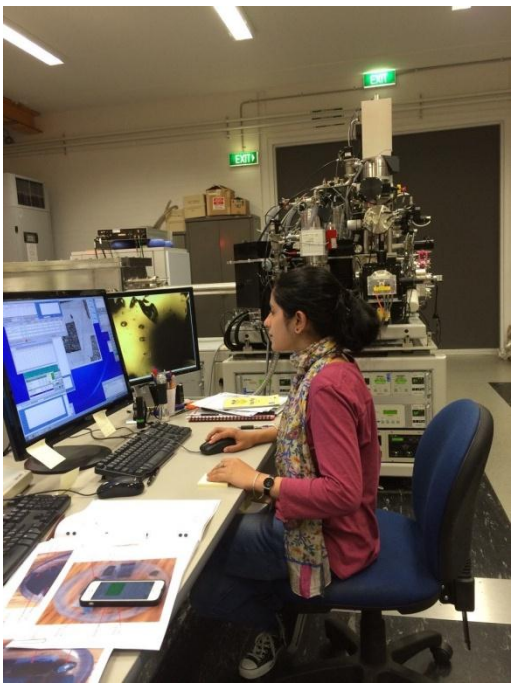
Abstract

The time period from 1.8 billion years ago to 0.8 is widely known as the "Boring Billion" period. It is believed during this time, the earth witnessed a period of geological and biological stand-still marked by low oxygen levels in the atmosphere & ocean along with suppressed tectonic activity. This affected various geochemical and geophysical processes that control trace element nutrient supply in the ocean. That, in turn bogged down evolution of ancient life forms. Interestingly enough, it is not just boring for geoscientists, but for paleobiologists, chemists and climatologists as well. It is however still unclear whether the coinage of such a term (boring billion) is because of the stand-still in geological activity or because of the gap in our knowledge due to lack of sufficient and authentic data in deep deep time.

This study, therefore probes into the above matter by analysing a range of nutrient trace elements (TE) in sedimentary pyrite in black shales. TEs' play an important role in advancing evolution in life forms in the ocean. Appropriate quantities would aid in fostering life forms, and help in their proliferation and sustenance. However, scarcity or overabundance would inhibit the same. Therefore, redox sensitive nutrient TE in marine sedimentary pyrites have been used to provide clues to nutrient supply, productivity and atmosphere oxygenation during the boring billion years. Our study shows nutrient TE concentration in marine pyrite (Zn, Cd, Cu, Ni, Mn, Co, Mo and Se) started to decrease at the start of the boring billion at ~1.8 billion years ago, dropped to a minimum around 1.65 billion years ago, peaked at 1.36, dropping again to a second minimum around 0.8, before rising gradually at the time of Cambrian explosion. This pattern may have created a sling-shot effect for the explosion of life in the oceans that followed.

Biography



Indrani Mukherjee has been a researcher in Earth Science, University of Tasmania, since early 2014. She did her undergraduate and masters degrees at University of Delhi, India. She is currently studying for a PhD in the area of deep time geology. Her research work focuses on using laser-based analytical techniques to bring new insights to geochemical processes operating in the oceans during the boring billion years (1.8 to 0.8 billion years ago). She conducts field studies both in India and Australia. Her prime interests are to understand ocean and atmosphere oxygenation and the role of trace elements in chemical and biological evolution.