Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.16712

Ocean redox and nutrient cycling in the ~1.64 Ga Chuanlinggou Formation, North China Craton

CHONG HE[1], BENJAMIN J. W. MILLS[1], FRED BOWYER[2], XIUQING YANG[3], YAFANG SONG[1] AND SIMON W. POULTON[1]

[1]University of Leeds
[2]The University of Edinburgh
[3]Changan University

Presenting Author: eech@leeds.ac.uk

While the Earth system remained poised at a low oxygen state across Earth's 'middle age' (~1.8-0.8 Ga) , it is increasingly apparent that oxygenation levels fluctuated, with considerably temporal and spatial heterogeneity in the redox chemistry of the oceans. However, the evolution of global and local ocean redox conditions across this interval remain poorly constrained, as do the underlying controls on apparent variability in ocean redox conditions. Here, we have focused on the ~1.64 Ga Chuanlinggou Formation on the North China Craton, to investigate temporal and spatial variability in oceanic redox conditions and associated nutrient cycling. High resolution samples from two drill cores have been analysed, with a focus on redox controls on phosphorus phase partitioning and cycling. The two drill cores, which were deposited in a shallow shelf setting only 2 kilometres apart, surprisingly show diverse features. For example, the succession begins with the deposition of an iron formation in the shallowest setting, while this iron formation is absent in the slightly deeper water setting. Nevertheless, multiple independent redox proxy data reveal that the deeper water Chuanlinggou Formation samples were generally deposited under ferruginous conditions, with periodic development of oxic intervals, and the iron formation is interpreted to have formed during upwelling of anoxic ferruginous waters in oxic shallow waters. Our focus on high resolution P phase partitioning analyses reveals new insight into the nature of biogeochemical P cycling and its control on planetary oxygenation in the late Paleoproterozoic.