Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.23493

The Shuram anomaly: What do we know now thirty years on?

GRAHAM A. SHIELDS

University College London

Presenting Author: g.shields@ucl.ac.uk

The Shuram anomaly, the largest negative carbon isotope excursion of the marine sedimentary record, was first reported in 1993 from late Ediacaran carbonate rocks in Oman, Australia and Russia. Thirty years later, it has been found in rock successions the world over, sandwiched between evidence for global cooling at c. 580 Ma (Gaskiers event) and c. 560 Ma (Luoquan event). The Shuram anomaly is now known to coincide with the radiation of benthic fauna across the newly oxygenated ocean shelves of Avalonia, while its recovery heralded the appearance of bioturbation, biomineralisation and the Ediacaran-Cambrian bioradiations. Geochemical proxies (Mo, U, S isotopes) confirm that the anomaly represents net oxidation of the marine environment, most likely caused by the transfer of oxidising power from the sedimentary sulfur cycle to the carbon cycle during a time of enhanced continental weathering (Sr isotopes). Although a primary, global interpretation of the Shuram anomaly has been questioned repeatedly, it has not only stood the test of time, but been joined by several other similar carbon isotope excursions throughout the Neoproterozoic Era. Major carbon isotope anomalies precede both of the 'snowball earth' Cryogenian ice ages, strongly suggesting that substantial 'sink switching' between the carbon and sulfur exogenic reservoirs was a diagnostic feature of the Neoproterozoic Era that exerted a major control on global climate and ocean redox before the onset of the Phanerozoic Eon. Positive feedbacks are expected to be key drivers of such extreme fluctuations, with the effective recycling of nutrient phosphorus under euxinic conditions being one such internal forcing mechanism. In this presentation, I will outline the geochemical advances that have led to our current understanding of the Shuram anomaly in particular, and the workings of the Neoproterozoic Earth system more generally.