Trace element chemostratigraphy of the Paleoproterozoic Turee Creek and uppermost Hamersley Groups, Western Australia

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The Turee Creek Group was deposited during the oxygenation of Earth's surface resulting from the 'Great Oxidation Event' (GOE). The age of the group is constrained by the underling Wongarra rhyolite, dated at 2,449±3 Ma [1], and intruding mafic sills with an age of 2,208±10 Ma [2]. Three strategically-placed diamond drill cores were obtained through the 'Turee Creek Drilling Project' in an effort to investigate the stratigraphic changes in mineral and rock geochemistry spanning the irreversible rise of oxygen and Earth's oldest widespread glacial event. Drilling was performed through (1) the Bolgeeda Iron Formation of the uppermost Hamerseley Group, which marks the Archean-Proterozoic transition; (2) diamictites of the Meteorite Bore Member, an equivalent of the Huronian Glaciation; and (3) mudstones and stromatolitic carbonates of the Kazput Formation. High-resolution major and trace element chemostratigraphy will be presented for the three cores. Of particular importance is the occurrence of intervals showing authigenic enrichments in various trace elements (e.g., Ni, Cr) and more importantly in redox-sensitive metals, specifically Mo and U, particularly in hydrogenous sediments of the Bolgeeda Iron Formation. These elements were likely supplied to the ocean by oxidative weathering of crustal minerals. Significantly, these episodic enrichments of redox-sensitive metals are associated with strongly ^{34}S-depleted sedimentary pyrite displaying no mass-independent sulfur isotope fractionation [3]. The data presented here supports the idea that the GOE is best seen as a protracted process rather than a discrete event and that the presence of small amounts of O_2 were present in the environment before the start of the GOE.

[1] Barley *et al*. (1997) *Nature* **385**: 55-58. [2] Müller *et al*. (2005) *Geology* **33**: 577-580. [3] Philippot *et al*. (2015) *This volume*.