

**Petrological and Geochemical Analyses of the Boolgeeda Iron Formation, Hamersley Basin,  
Western Australia**

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The Boolgeeda Iron Formation and overlying Turee Creek Group, Hamersley Basin, Western Australia, represent a conformable succession of sediment deposited between 2.45 Ga and 2.22 Ga. This interval of geologic history is of significant interest because it spans the presumed age of the Great Oxidation Event (GOE), which is defined as the transition from an oxygen-free to oxygen-rich atmosphere. Here we present the geochemical and petrographic data from the uppermost 40 meters of the Boolgeeda Iron Formation and an additional 40 meters of the overlying Kungarra mudstones, as sampled in the Turee Creek Drilling Project 1 drill core (TCDP1). This core captures the termination of BIF deposition in the Hamersley Basin and coincides with a global decline in BIF deposition in the Paleoproterozoic. Using geochemical and mineralogical analyses, we provide a continuous, high resolution chemostratigraphic dataset of trace element concentrations and variations, and assess the relationship between the rise of atmospheric oxygen and the subsequent decline in BIF deposition. We also highlight the interplay between local and global controls on the preservation of redox signatures, including the rise and fall of local baselevel, input of weathered continental material, influx of sulfur associated with the continental weathering of reduced sulfide species, and global increases in atmospheric oxygen.