

Accepted Manuscript

Did mantle plume magmatism help trigger the Great Oxidation Event?

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PII: S0024-4937(15)00469-7
DOI: doi: [10.1016/j.lithos.2015.12.017](https://doi.org/10.1016/j.lithos.2015.12.017)
Reference: LITHOS 3788

To appear in: *LITHOS*

Received date: 2 October 2015
Accepted date: 17 December 2015



Please cite this article as: Ciborowski, T.Jake.R., Kerr, Andrew C., Did mantle plume magmatism help trigger the Great Oxidation Event?, *LITHOS* (2016), doi: [10.1016/j.lithos.2015.12.017](https://doi.org/10.1016/j.lithos.2015.12.017)

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Did mantle plume magmatism help trigger the Great Oxidation Event?T. Jake. R. Ciborowski^{1*}, and Andrew C. Kerr²¹*School of Environment and Technology University of Brighton, Brighton, BN2 4GJ, UK*²*School of Earth & Ocean Sciences, Cardiff University, Cardiff, CF10 3AT, UK***Corresponding author (e-mail: j.ciborowski@brighton.ac.uk)***Abstract**

The Great Oxidation Event (GOE) represents the first sustained appearance of free oxygen in Earth's atmosphere. This fundamental event in Earth's history, has been dated to approximately 2450 million years ago (Ma), that is, hundreds of millions of years after the appearance of photosynthetic cyanobacteria in the fossil record. A variety of mechanisms have been suggested to explain this time lag between the onset of photosynthesis and atmospheric oxygenation, including orogenesis, changes in the areal extent and distribution of continental shelves, the secular release of hydrogen to space, and methanogenic bacterial stress. Recently, it has been proposed that subaerial volcanism during the early Proterozoic could have provided a large pulse of sulphate to the ancient oceans, the reduction of which liberated the oxygen to drive the GOE. Here we show that the Matachewan Large Igneous Province (LIP), which is partially preserved in Scandinavia and North America, is both exactly coincident with the onset of the GOE, and of sufficient magnitude to be the source of this sulphate release. We therefore propose that the volcanism associated with the emplacement of the Matachewan LIP was a principal driver of the oxygenation of our planet.

1. Introduction

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