

PhD project on: Tracking basin-scale phosphorus cycling across the Great Oxidation Event

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Description: Phosphorus is an essential nutrient for all life as we know it. It's availability controls primary productivity over geological timescales (Tyrell, 1999) and thus impacts biogeochemical fluxes, including O₂ production by cyanobacteria. Phosphorus may thus have played a significant role in pacing the oxygenation of Earth's atmosphere and oceans (Dodd et al. 2025; Alcott et al. 2022). However, phosphorus concentrations in the Precambrian ocean across the Great Oxidation Event are poorly constrained with estimates ranging over five orders of magnitude (see review in Boden et al. 2024). The aim of this project is to resolve this large uncertainty with a new basin-scale approach that also accounts for phosphorus redox speciation. Reduced phosphorus has recently moved into focus as it may have been a significant constituent of the Precambrian phosphorus inventory (Baidya et al. 2025). New samples will be analysed from multiple sedimentary facies, spanning the GOE. We will use a combination of techniques for sequential extraction of phosphate and phosphite phases. The project is expected to yield new important insights into the habitability of Earth's early oceans and the major sources and sinks of bioessential nutrients across this time period.

References:

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