



## Reconstructing the redox conditions of Paleoproterozoic oceans: Insights from the Zaonega Formation

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The Paleoproterozoic is marked by profound changes in global tectonics, climate and biogeochemical cycling of redox sensitive elements. Determining the redox state of marine environments at this point in Earth's history is fundamental in understanding the connections between the geosphere and biosphere, including possible microbially-assisted phosphogenesis. One hypothesis suggests that oxidative weathering following Earth's first significant rise in atmospheric oxygen, resulted in an increased supply of sulfate and phosphate to the oceans, culminating in the first significant phosphorite deposits some 300–400 Ma later (Lepland et al., 2013). Thus Paleoproterozoic ocean structure has been envisaged as stratified, through mildly oxygenated shallow water and anoxic deep water, with temporally and spatially variable phases of euxinia possibly linked to transient changes in the size of the seawater sulfate reservoir (Scott et al., 2014).

New cores obtained from the upper part of the 2 Ga Zaonega Formation in the Onega Basin of Karelia, NW Russia, have recovered a variety of organic-rich mudstones and carbonate rocks, containing several discrete mm–cm scale P-rich beds that may represent seep or hydrothermally-influenced depositional settings (Lepland et al., 2013). Here we present new Fe-speciation data and pyrite derived S-isotope data spanning one of these new cores in order to: i) evaluate the redox state of the water column, determining the extent of water column euxinia, and ii) assess the potential influence of S-cycling on phosphogenesis. Preliminary Fe extractions show that total Fe is broadly dictated by lithology, but generally lower in samples where the P-rich intervals occur, possibly supporting extensive sulfate reduction and the formation of a euxinic water column. Further S-isotope analyses on associated pyrites will determine the extent to which additional biogeochemical S-cycling (e.g., sulfide oxidation) could also have contributed to the P-rich intervals.

### References:

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