## Petrography and the composition of apatite in the Paleoproterozoic Pilgujärvi Sedimentary Formation

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The first significant P-rich deposits appear in the global rock record during the Paleoproterozoic around 2 Ga but their origin remains under debate. In this contribution we study phosphorus-rich rocks (up to 8 wt% $P_2O_5$) in ca 1.9 Ga old Pilgujärvi Sedimentary Formation, Pechenga Greenstone Belt, NW Russia. Phosphate minerals (primarily apatite) in these rocks occur in allochthonous sand-to-gravel sized clasts that have been transported and redeposited. They often exhibit soft-deformation features suggesting the semi-lithified nature of clasts during deposition.

Phosphate clasts can be subdivided into four petrographic types (A-D), each being represented by a distinct REE signature reflecting different early-to-late diagenetic conditions and/or metamorphic overprint. Type A represents angular to subangular clasts of massive, impurity-free submicrometer size apatite crystal aggregates; Type B clasts are elongated and subrounded and consist of quartz-feldspar-mica/chlorite siltstone-shale or chert with pore-filling of submicrometer crystal-size apatite cement; Type C clasts are subangular to rounded and comprise apatite aggregates with abundant quartz and feldspar, possibly representing a transitional type between A and B types; Type D clasts contain apatite crystal aggregates with abundant pyrite. Petrographic and trace element characteristics suggest that the Type D clasts are the best preserved amongst the four types, hence carry the best record of the environmental conditions during apatite precipitation. The negative Ce anomaly and positive Eu anomaly in PAAS normalized REE patterns of Type D particles suggests precipitation under (sub)oxic basinal conditions with significant hydrothermal influence.