Paleoproterozoic manganese enrichments of Pletrug in the Guiana Shield, South America: a record of changes in global redox conditions?

S.M. Amattaram1, P.R.D. Mason1, L.M. Kriegsman1,2, S.B. Kroonenberg3,4

1. Utrecht University, department of Earth Sciences, the Netherlands: samattaram@uu.nl, p.mason@uu.nl 2. Naturalis Biodiversity Center, the Netherlands: lea.kriegsman@naturalis.nl 3. Anton de Kom University of Suriname: salomon.kroonenberg@gmail.com 4. Delft University of Technology, the Netherlands

INTRODUCTION

Manganese deposits, occurring as Mn-carbonate or Mn-oxides, are globally common around 2.1 Ga. Manganese was initially deposited as a result of local/global changing redox conditions after the GOE and simultaneously with the Lomagundi-Jatulii carbon isotope excursion. In this study, we explore the trace element and C-isotope geochemistry of the Pletrug Mn deposit in one of the Ryhanian Greenstone Belts of the Guiana Shield (2.3-2.1 Ga), Suriname, South America. Diamond drill core provides fresh samples of intercalated Mn-carbonates, marbles, volcanioclastic sediments and mafic and felsic intrusives. The rocks are metamorphosed to lower amphibolite facies but appear to record primary REE and δ13C variability.

Objective: Provide constraints on the chemistry of the volcano-sedimentary basin and paleo oceanic redox conditions during carbonate deposition at Pletrug in Suriname.

GEOLICAL SETTING

The Pletrug Mn deposit occurs in the predominantly mafic Paramaka Formation at the base of the NW-SE trending Marowijne Greenstone Belt in Suriname.

Manganese enrichments occur in chemical sediments dominated by Mn-carbonates that coexist with finely-laminated quartzites and mudstones, intruded by mafic and felsic dykes. Supergene alteration resulted in the formation of Mn oxides now hosted in thick saprolite. We sampled fresh core obtained by scientific drilling in the 1970s.

MICROSCOPIC STUDY

MINERAL ANALYSIS

CONCLUSIONS

- Mn-poor carbonates are enriched in HREE relative to LREE, with clear positive LaREE anomalies and elevated Y/Ho (> 39) indicative of precursor carbonate deposition in a marine environment. δ13C in the range 10-12 %‰ is consistent with shallow-water Lomagundi carbonate.
- Mn-rich carbonates also have elevated HREE/LREE but with crustal Y/Ho. The clear positive Ce anomaly and lower δ13C (-2 to 0 %‰) could be consistent with diagenetic reworking of Mn oxides and organic matter. The higher V content might be consistent with mildly oxygenated water column conditions. Elevated Al2O3 suggests deposition under shallow seawater conditions with periodic input of terrigenous sediments.
- Mildly positive Eu anomalies could be inherited from 2.1 Ga seawater but could also indicate some overprinting from high temperature (> 250°C) hydrothermal fluids.
- Further work will aim to confirm these results using a second core from the same site, as well as providing geochronological constraints.

REFERENCES