A high-resolution, multi-isotopic study of mantle heterogeneity beneath the southeast Indian Ridge: Preliminary Pb and Hf results

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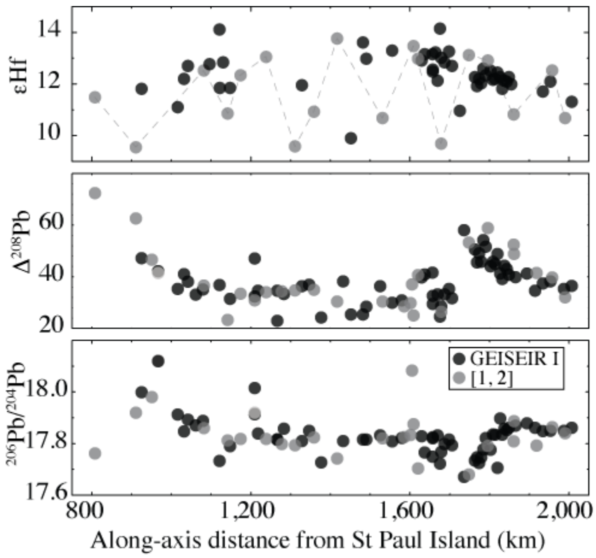
This investigation is designed to constrain mantle melting conditions and composition at high resolution. Fresh basalt glass was recovered from ~130 localities along ~1200 km of the Southeast Indian Ridge (SEIR) axis between 89.5° and 99.3°E during the GEISEIR I expedition. From 89-96° the sampling density was 0.1 km^{-1} and for 96-99° it was 0.2 km^{-1}.



The new data are consistent with the bimodal Hf isotope distribution and presence of ancient compositional streaks along the SEIR [1]. The Pb isotope variation is highly structured, similar to [2], likely reflecting variable melting of an isotopically heterogeneous mantle.

[1] Graham *et al*. (2006), *Nature* **440**, 199-202. [2] Mahoney *et al*. (2002), *J. Petrol*. **43**, 1155-1176.

Characterization of pedogenic Mn concretions and coatings in redoximorphic soils

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Secondary Mn minerals play an important role in many soil chemical processes such as sorption of metal ions and degradation of organic contaminants. Redoximorphic soils such as Gleysols and Stagnosols are characterized by spatially separated enrichment and depletion zones of pedogenic (hydrous) Fe and Mn oxides, which appear as a result of the periodic change between reducing and oxidizing conditions.

We investigated stagnic and gleyic subsoil horizons developed from loess, Early Triassic sandstone, calcareous gravel and Middle Jurassic loamy sediments with pH values from 3.7 to 7.3. The concretions, coatings and parts of the surrounding matrix were characterized by electron microprobe analysis and polarizing microscopy on thin sections, XRD, FTIR spectroscopy and analyzed for their total element contents and their oxalate- and dithionite-extractable fractions. Diffractograms and FTIR spectra often showed a signal overlapping of clay and Mn minerals. Nevertheless, birnessite [$Na_4Mn_{14}O_{27}$•$9H_2O$] was detected in a gleyic horizon (pH 7.3). We further assume todorokite [$(Mn^{II},Ca,Mg)Mn_3^{IV}O_7$•$H_2O$] in an acidic stagnic horizon (pH 3.7).

Backscattered electron images and EDX measurements showed that Mn phases in stagnic horizons always occur together with clay minerals in a matrix. Iron precipitates are partly present in a clay matrix like Mn phases and also as pure Fe precipitates at the edges of pores inside the concretions. Single particles cannot be discerned and are thus <500 nm. Concretions formed in Middle Jurassic sediments showed a shell-like structure, which suggests a periodic genesis. In contrast, concretions developed in stagnic horizons from sandstone were formed by the flow of the soil solution into the interior of aggregates, where Mn phases precipitated. All pedogenic Mn precipitates were enriched in Co (360 μg/g) and Ni (480 μg/g). The presence of Ni in the Mn precipitates was confirmed by EDX.

Further studies with TEM and EXAFS are required to clarify the detailed mineralogy of the Mn precipitates.