Tracing old SCLM in Pan-African granitoids from Dronning Maud Land (East Antarctica) with Sr-Nd isotope signatures

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Dronning Maud Land (DML) represents the southern end of the East African Antarctic orogen that was created during the final amalgamation of Gondwana in the Neoproterozoic. The suture between parts of East and West Gondwana spans over more than 8000km from present Egypt-Arabia to present Mozambique-Antarctica. The part north of the Lurio belt (LB) is characterised by accretionary tectonics visible in the Arabian-Nubian Shield contrary to the part south that shows evidence for continent-continent collision. Within southern Mozambique and DML numerous late-tectonic granitoids are observed, which are characterised as ferroan A-type granitoids that evolved under high-T conditions. The geodynamic regime is explained by extensional tectonics within a collapsing orogen accompanied by astenospheric upwelling through delamination of the orogenic root [1]. In this project we studied an E-W-profile along the 72°S-latitude starting from the Mühlig-Hofmann mountains (MH) (4°-7°E) via central Dronning Maud Land (cDML) (8°-14°E) and finally samples from Sør Rondane (SR) (23°-25°E). TDM (Nd) for MH and cDML samples are of Meso- to Paleoproterozoic age although the oldest (yet detected) crust in that region is of Grenville-age. We take this as evidence for the existence of an old subcontinental lithospheric mantle underneath this part of East Antarctica and its contribution to the granitoids. SR granitoids are different as they show grenville-aged TDM (Nd) and could thus have been developed by simple crustal melting. Initial Sr isotope signatures for both regions are similar and indicate homogenisation during time of emplacement. Finally, samples from the LB show large similarities with MH and cDML, but are different to SR granitoids. This allows to place certain paleogeographical constraints on Gondwana configuration.

[1] Jacobs *et al.* (2008) In: Satish-Kumar *et al.* Geol. Society, London, Spec. Pub. **308**, 69-90

Experimental study of trace element partitioning between spinel and silicate melts: Effects of oxygen fugacity and spinel composition

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Spinel is a common accessory mineral that occurs in a variety of rocks such as evolved basaltic magmas or chromitites in ultramafic rocks. Spinels often contain large amounts of transition metals or other redox sensitive elements, but the partitioning of these elements in these rocks is not well constrained, probably because it depends on several parameters which are difficult to disentangle: temperature, pressure, oxygen fugacity and composition of the crystals and melt.

Experiments are performed in 1 atm. gas mixing furnaces at temperatures between 1200 and 1430ºC and oxygen fugacities ranging from log -12 to log -0.7. Starting materials consist of glasses in the system (Cr_2O_3-FeO)-CaO-MgO-Al_2O_3-TiO_2-SiO_2 doped with a large number of trace elements.

The experimental run products were characterized with electron microprobe for major elements and 193nm Laser Ablation ICPMS for trace elements. The experiments all contained spinels and glass, some experiments contained additional phases (olivine or plagioclase).

The Fe^{2+}/Mg^{2+} ratio in spinel has little effect on trace element partitioning, but the concentration of trivalent cations such as Al, Fe and Cr appears to have an (large) effect on the partitioning of Ti, Sc and the HFSE; D values for these elements are lowest in Al rich spinels, are slightly elevated in spinels that contain chromium, and are about an order of magnitude higher in spinel high in Fe^{3+}.

Our results show that partition coefficients for some elements are redox sensitive; D_{Ni}, D_{Co}, and D_{Mo} decrease slightly with increasing fO_2 and D_V decreases over four orders of magnitude. In contrast, D_{Pt} and D_{Rh} increase strongly with increasing oxygen fugacity. To investigate peculiar high Pt and Rh concentration in the some of the experimental spinels, a TEM study was performed to investigate the presence of platinum group element nuggets as inclusions in the spinel. However, preliminary TEM results show no inclusions in these spinels suggesting that the measured high D's are correct.

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