Precambrian metaigneous xenoliths of Vestfjella: Implications for lithospheric architecture in western Dronning Maud Land, Antarctica

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Lamproite- and basalt-hosted xenoliths from Kjakebeinet (73º47' S, 14º53' W) and Muren (73º43' S, 15º02' W), south Vestfjella, represent unique samples of the unexposed continental crust at the rifted margin of western Dronning Maud Land. The lamproite-hosted xenolith suite indicates 1) heterogeneity of the crust, 2) mainly igneous protoliths, and 3) granulite facies metamorphic conditions. Two leucocratic tonalite gneiss samples yielded U-Pb SHRIMP zircon ages of ~1.3–1.0 Ga (J. Jacobs, personal communication, 2006). The mafic granulites exhibit compositional affinities to Proterozoic lower crustal xenoliths from Lesotho, South Africa [1], and to mantle-derived lower crustal material in general [2]. Interpretation of mineral–whole-rock Sm-Nd isotope data on the mafic granulites is complicated by lamproite overprint; the data are accordant with equilibration of the Sm-Nd -system during Grenvillian and Jurassic magmatic events. In contrast, whole-rock Sm-Nd isotopic data on basalt-hosted leucocratic metatonalite xenoliths show highly negative ε_{Nd} values (ca. –50 @ 180 Ma) indicative of Archean origin [3]. Overall, the present results imply proximity of the Archean-Proterozoic lithospheric boundary in south Vestfjella. New U-Pb SIMS zircon data on the basalt-hosted and lamproite-hosted felsic metaigneous xenoliths will be available in May 2008 and are expected to facilitate precise dating of tectonic and magmatic events related to the evolution of the poorly exposed crust of East Antarctica.

[1] Rogers & Hawkesworth (1982) *Nature* **299**, 409-413. [2] Condie (1998) *Lithos* **46**, 95-101. [3] Luttinen & Furnes (2002) *Journal of Petrology* **41**, 1271-1305.

Multi-component isotopic mixing in the Ethiopian Rift: Modeling plume contributions to recent magmatism

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Primitive basalts erupted in the Wonjii Fault Belt (WFB), Debre Zeyit (DZ) and Butajira (BJ) areas of the northern and central main Ethiopian Rift define pseudo-binary mixing trends in Nd-Sr-Pb-Hf multi-isotope diagrams. The arrays for the sub-populations WFB, BJ and DZ extend away from a common Afar plume (AP) end-member towards distinct depleted mantle (DM)–African continental lithosphere (ACL) binary-like components. Preliminary Hf isotopes confirm that the Afar Plume component has a C-like and not HIMU radiogenic isotope signature. We choose to model the data trends by 3-component mixes between AP, ACL, and DM end-members. Principal component analysis using the Sr, Nd, and Pb data and the 3 end-member components shows that 98.72% of the total variation is accounted for within the plane of the first two eigenvectors, providing support that the model is justified. The Nd-Sr-Pb inverse isotopic ternary mixing model shows that contribution to magmatism from the Afar plume decreases while the influence of DM correspondingly increases as a function of the radial distance from Erta 'Ale volcano in Afar, the presumed plume location today. The contribution of the ACL component is nearly constant, but is unusually strong near the Boru-Toru structural high. $^{3}He/^{4}He$ values correlate positively with the weight fraction of the Afar plume component and, hence, inversely with distance from Erta 'Ale. We further tested the model by using the weight fractions of the 3 end-member components and published averages for the trace element composition of OIB, DM, and continental lithosphere to show that we can replicate the spider plots for the actual basalt data.