Title: **Composition and origin of Archean lower crust, Northern Tanzania**

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Abstract

Granulite-facies xenoliths from tuff cones erupted on the margin of the Tanzanian craton and within the adjacent Mozambique belt in northern Tanzania offer an opportunity to assess the role of lower crustal processes in the tectonic evolution of these two terranes. Both terranes are Archean, but record very different histories, starting in the Proterozoic and continuing today. Whereas the craton experienced little metamorphism or igneous activity following its stabilization around 2.8 Ga, Archean rocks of the Mozambique belt in the study area experienced at least one episode of high-grade metamorphism during the East African orogeny (ca. 640 Ma). Today, the East African rift exists at the contact between the Mozambique belt and the craton, implying a fundamental lithospheric weakness at this boundary. Granulite xenoliths come from Labait, on the craton margin, and Lashaine and Naibor Soito in the metamorphic belt. Most xenoliths are mafic and all are igneous in origin. Cratonic xenoliths (pl- opx±cpx±gt±hbl) are primarily anhydrous two-pyroxene granulites that likely originated as crystallized high-Ni, Archean basaltic melts. Xenoliths from the Mozambique belt are dominated by mafic granulites (pl-cpx-gt±opx) at Lashaine and banded, mafic to intermediate granulites at Naibor Soito. Positive Sr and Eu anomalies imply that the Lashaine granulites originated as plagioclase cumulates. The wide range in SiO2 (47-65 wt%) and correlation of Ni-MgO in the Naibor Soito xenoliths suggests they may have originated as igneous rocks that subsequently underwent partial melting to form the mafic (pl- opx±cpx±gt±hbl±bt) and felsic bands (pl-qtz-opx±kfs). U-Pb zircon ages for xenoliths from both terranes are Archean, as are most TDM ages, though younger TDM ages are seen in some Lashaine samples that were contaminated by rift magma. High pressures (up to 2.7GPa) are recorded by the Mozambique belt xenoliths, suggesting equilibration in thickened crust during the East African orogeny, but no igneous activity related to metamorphism has been detected and our samples suggest that the Tanzanian lower crust has persisted without significant chemical modification since the Archean. Proterozoic magmatism is also absent from the upper crust in this section of the Mozambique belt, raising the question of the heat source during metamorphism.