Title: **Composition and Thermal History of the Lower Crust Beneath the Tanzania Craton and the Adjacent Mozambique Belt**

Authors: Mansur, A. T.; Manya, S.; Rudnick, R. L.

Abstract

The Tanzanian craton has undergone little deformation since its formation 2.6 Ga ago, but Archaean crust of the adjacent Mozambique Belt (MB) has been reworked by at least two high-grade metamorphic events. An old, thick (~~200-km) lithospheric keel appears to have stabilized the craton during these deformational events. Although a thick keel appears to be absent beneath the MB today, ancient mantle lithosphere is preserved beneath much of the MB and the original thickness of this lithosphere is uncertain. Studies of the present-day lower crust can help to constrain the compositional and thermal evolution of this region. Granulite xenoliths from the Labait volcano (craton margin) are exclusively mafic and are mostly two pyroxene granulites, but also include gt-opx granulites and a gt-cpx-spinel-corundum anorthosite. Most samples also have orthoclase as a major phase. Two-pyroxene thermometry yields temperatures of 710 to 810°C for an estimated lower crustal pressure of 1 GPa; whereas the anorthosite appears to have equilibrated at a somewhat hotter temperature (gt-cpx T = 970°C). All Labait xenoliths exhibit high K2O (0.8 to 2.6 wt., excluding the anorthosite), Ba (530 to 6730 ppm), Sr (440 to 1040 ppm) and Ni contents (100 to 400 ppm) and relatively high Mg# (47 to 63). The combined high Ni, Mg# and alkali and alkaline-earth elements may reflect an unusual igneous protolith (e.g., adakitic magma) or mafic cumulates that have been metasomatically enriched in the lower crust. Granulite xenoliths from Lashaine (MB) are also exclusively mafic and form two groups: 1) anorthositic, high Al2O3 (17 to 23 wt. %) and Mg#, plag-ky-cpx-gt granulites, which are enriched in Sr and have positive Eu anomalies and 2) lower Al2O3 (13 wt. %), two pyroxene ± gt granulites, which are enriched in Ti, K, P and Ni. The latter may be meta-cumulates from alkaline magmas. Temperatures for Lashaine granulites range from 770 to 980°C. Unlike Labait and Lashaine, the Naibor Soito (MB) xenolith suite includes both mafic and intermediate granulites. Mafic granulites from Naibor Soito are similar mineralogically to the Labait xenoliths except that they contain gt. Intermediate xenoliths are two pyroxene garnet granulites. All Naibor Soito samples are LREE-enriched, and two of three intermediate xenoliths exhibit positive Eu anomalies. Like Labait, xenoliths from this locality exhibit high K2O (0.5 to 2.7 wt. %), Ba (207 to 1120 ppm), and Sr (241 to 1146 ppm) contents. Equilibration temperatures of all the xenoliths are significantly hotter than projected present-day lower crustal temperatures, and are probably relicts of the last major orogeny (pan-African). Like elsewhere in the world, lower crustal xenoliths from both the craton and MB are dominated by mafic compositions.