Nd-isotopic mapping of the Archaean–Proterozoic boundary in southwestern Tanzania: Implication for the size of the Archaean Tanzania Craton

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Abstract

Nd-isotopic data are presented for the granitoids that straddle the Archaean–Proterozoic (A–P) boundary in southwestern Tanzania along the Itigi–Makongolosi road traverse. On the basis of their Nd depleted mantle (T_{DM}) ages, two groups of granitoids can be identified: those which show T_{DM} ages of 2541–2894 Ma and are therefore belonging to the Archaean and those which have Proterozoic T_{DM} ages of 2031–2430 Ma. Archaean granitoids are deformed, grayish in colour and consist of plagioclase, biotite and quartz and include a few microcline-rich, rare biotite pink alkali granites whereas the Proterozoic ones include mainly undeformed, microcline-rich, pink alkali granites. Although there are several compositional overlaps between the two, Proterozoic granitoids differ from those of the Archaean in showing enrichment in incompatible elements and overall higher abundances of the rare earth elements. Both Archaean and Proterozoic granitoids show negative to slightly positive Eu anomalies. These geochemical characteristics are attributed to the involvement of plagioclase in their magmagenesis indicating their generation at low pressures and shallow depths with the Proterozoic granitoids being derived from a more felsic protolith.

Nd-isotopic data, coupled with petrography and lithological field relationships as well as major and trace elements geochemistry of the granitoids, places the A–P boundary approximately 150 km inside from the southern traditionally accepted boundary near Lake Rukwa in southwestern Tanzania. This implies that the size of the Archaean Tanzania Craton is smaller than hitherto understood. Small vestiges/domains showing Archaean ages within the Proterozoic regions could be explained as being slivers of tectonically interleaved Archaean material found within the Proterozoic terrane in southwestern Tanzania.

Keywords

Tanzania Craton; Nd-isotope; Geochronology; Archaean granitoids; Proterozoic granitoids