

Crustal assembly of the Masora and Antananarivo domains, central-eastern Madagascar

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In reconstructions of the Gondwana supercontinent, correlations of Archean domains between Madagascar and India remain debated (e.g., Key et al., 2011; Ishwar-Kumar et al., 2013; Brandt et al., 2014; Collins et al., 2014; Plavsa et al., 2014; Rekha et al., 2014; Tucker et al., 2014). In this study, we aim to establish correlations among these Archean domains using whole-rock geochemistry and U-Pb zircon geochronology of meta-granitoids from the Masora and the Antananarivo domains, central-eastern Madagascar.

A meta-granitoid from the central part of Masora domain is dated at 3277 Ma and shows strongly fractionated REE pattern with high La/Yb ratio, which is a typical Archean tonalite-trondjemite-granodiorite composition. A tonalitic gneiss from the southeastern part of the Antananarivo domain is dated at 2744 Ma and shows a positive Eu anomaly and relatively fractionated REE pattern with high La/Yb ratios. The major and trace element abundance of the tonalitic gneiss is consistent with the melt-depleted facies i.e., restitic rocks out of which some melt has been extracted (e.g., Barberton granitoids, south Africa; Moyen et al., 2007), different from that of the ca. 2500 Ma granitoid of the northwestern part of Antananarivo domain (e.g. Kroner et al., 2000; Macey et al., 2009). In addition, the major and trace element compositions of the ca. 760 Ma granitic gneisses are consistent with volcanic-arc origin for the protoliths.

Based on the geochemical and geochronological results, along with existing data, we identified three episodes of granitic magmatism at ca. 3300 Ma, 2700 Ma, and 2500 Ma in central-eastern Madagascar. Three diachronous magmatism events are consistent with those reported for the Dharwar Craton in India (Jayananda et al., 2013; Peucat et al., 2013), suggesting that the Archean Masora and Antananarivo domains in Madagascar were part of the Dharwar Craton at the end of Neoproterozoic (Tucker et al., 2011, 2014). The 700-800 Ma volcanic arc granitoids identified in central Madagascar (e.g. Handke et al., 1999; Kroner et al., 2000) have not been reported from the Dharwar Craton in India. Therefore, the subduction of the oceanic plate that led to the formation of these granitoids likely took place at the western margin of the Dharwar Craton, which included part of central-eastern Madagascar.

Keywords: Madagascar, Masora domain, Antananarivo domain, Archean, whole-rock geochemistry, U-Pb zircon geochronology