



Crustal Architecture of Northern Madagascar: Results from Recent Geological Mapping

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A major World Bank funded regional reconnaissance geological mapping project, undertaken by a BGS-USGS-PGRM team, allows a revision of the crustal architecture of northern Madagascar. The work confirms the presence of the Archaean Antongil and Antananarivo Domains, but without identifying a major suture zone between them. Where observed, the two cratonic blocks are juxtaposed along a S-directed thrust zone. The Archaean domains are juxtaposed against the Neoproterozoic Bemarivo Domain to the north, whilst a newly-identified Neoproterozoic tectono-metamorphic crustal fragment, the Anaboriana Belt is tectonically sliced within the northern Antananarivo Domain. This crustal slice, in part, corresponds to the previously interpreted suture zone between the Antongil and Antananarivo Domains.

U-Pb zircon geochronology has shown that the Bemarivo Domain is composed of rocks with a bimodal age distributions clustered at ~750 Ma and ~720 Ma. The older rocks occur predominantly in the south and the younger rocks are restricted to the northern part of the belt. Shear zones separates the two age domains, which also marks a change in the lithostratigraphy of the supracrustal assemblages present. Both regions are composed of rocks with island-arc affinities. The southern zone is composed of high grade metasedimentary rocks (the Sahantaha Group), tectonically interlayered with arc-related plutonic igneous rocks (Antsirabe-North Suite) dated between 740 and 750 Ma. Detrital zircons from quartzites of the Sahantaha Group give a maximum age of deposition of ~1750 Ma and very similar age-distribution spectra to those published for the Itremo Group of central-west Madagascar and the Maha Group of central-east Madagascar. The Sahantaha Group may thus represent a sequence of Palaeoproterozoic allochthonous metasediments involved in the Neoproterozoic collision of the Bemarivo arc terrane with the Archaean cratonic blocks to the south. The northern part of the Bemarivo Domain is composed entirely of juvenile arc rocks, both plutonic (the Manambato Suite) and their volcanic equivalents (the Daraina and Milanoa Groups), dated predominantly at 720 to 715 Ma, but with a 750 Ma age component. In the extreme NW margin of the northern Bemarivo Domain, a thin belt of metasedimentary rocks, the Betsiaka Group, has only recorded Archaean detrital zircon components and may thus represent a vestige of older crust. The Bemarivo Domain is intruded by a suite of Cambrian late- to post tectonic granitoids and charnockites (the Maevarano Suite), dated at ~530 Ma

In the SW of the study area, the older French geological maps show the Bemarivo Domain in tectonic contact with the northern part of the Antananarivo Domain. However, our work has identified a



sequence of rocks that is distinct from, yet entirely within, the Antananarivo Domain. These non-Antananarivo rocks comprise a sequence of highly migmatised, and in places charnockitised, paragneisses, including probable metamafic volcanics, intruded by, and occurring as remnant septa between, voluminous batholiths and plutons of the Maevarano Suite. This fragment has a characteristic aeromagnetic-topographic signal and appears to be entirely composed of Cambrian to Neoproterozoic rocks no older than ~700 Ma. Thus, the crustal components of northern Madagascar form a complex collage of accreted crustal fragments composed of rocks ranging from Archaean, Palaeoproterozoic and Neoproterozoic age, that were juxtaposed during the E-W Gondwana collision at ~550 Ma and stitched by voluminous granitoids and charnockites at ~530 Ma.