

An overview of the Archaean Antongil Block, northern Madagascar

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The oldest recognised crust of Madagascar, the Antongil Block, occurs in the north, along Antongil Bay and on the islands of Nosy Boraha (Isle St. Marie) and Nosy Mangabe. Previous reported ages are Archaean for various granitoids of the Antongil Block, which is tectonically bounded to the north by the Neoproterozoic arc-terranes of the Bemarivo belt and to the west by the Neoarchaean Antananarivo Block. In the NE it is overlain by Andrarona Group metasediments. The Antongil Block has traditionally been correlated with the "Masora Block" along the central-east coast of the island.

Over 95% of the exposed part of the Antongil Block consists of coarse-grained, generally massive to weakly-foliated, plutonic igneous rocks termed the Masoala Suite. These range from diorite/quartz diorite to tonalite, granodiorite, syenogranite and volumetrically dominant monzogranite. Outcrops are typically heterogeneous. Where cross-cutting relationships are preserved, the dioritic to tonalitic phases are the oldest, while relationships between the other granitic (s.l.) facies tend to be complex with mutually intrusive or gradational contacts. Migmatization is variable, but often intense, with the local development of end-member anatectic leucogranite. The granitoids contain enclaves of mafic schistose rocks which form dismembered remnants, collectively named the Mananara Group. An older, Mesoarchaean nucleus composed of tonalitic orthogneisses has been recognised in the south (Nosy Boraha Suite).

New zircon U-Pb SHRIMP data largely confirm the previous age constraints. The presence of the Nosy Boraha Suite is only confirmed through 3.18 Ga xenocrysts in plutonic rocks of the Masoala Suite. The Masoala Suite rocks yielded ages between 2546 ± 11 and 2528 ± 3 Ma, while low Th/U rim overgrowths on zircon of one sample of augen gneiss gave an upper intercept age of 2514 ± 13 Ma, suggesting a metamorphic event subsequent to granitoid emplacement. Several imprecise lower intercepts are consistent with a Pb-loss event in the late Neoproterozoic.

The greenstones of the Mananara Group gave ages between 2541 ± 9 and 2511 ± 10 Ma and record xenocrystic ages of 3.18 Ga, again indicating the presence of the Nosy Boraha Suite source rocks. Low Th/U rim overgrowths on zircons or lower intercepts indicate a metamorphic event around 540 Ma.

Analysis of detrital zircon from a meta-conglomerate of the Andrarona Group yielded a unimodal age population for which an age of 2355 ± 5 Ma could be calculated. Such sources

are unknown in the underlying Antongil Block, but are reported from mafic dyke swarms in the correlative Dharwar craton of India. A gabbro intrusion (Ankavarana Suite), associated with a prominent NNE- oriented dyke swarm that occurs in the eastern parts of the Antongil Block, gave a younger Palaeoproterozoic age of 2147 ± 6 Ma and these possibly record an early rifting event that affected the Antongil Block at that time.