

Electron microprobe age dating of monazite from the meta-sedimentary rocks, central-eastern Madagascar

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Madagascar is situated within the interior of the Neoproterozoic East African Orogen (EAO; Stern, 1994) that marks the join between East and West Gondwana. The Betsimisaraka Unit exposed on the eastern margin of EAO experienced Neoproterozoic-Early Paleozoic metamorphism and deformation. Monazites from biotite gneiss in the Betsimisaraka Unit, sillimanite-biotite gneiss and kyanite-biotite-muscovite schist, and garnet-sillimanite gneiss in the Antananarivo Block were dated by the field emission Electron microprobe. The ages and zoning characteristics varied between the samples, but the U-Th-Pb monazite data confirm that at least Early Paleozoic (Cambrian) metamorphic events are recorded in the area.

Monazites from the Betsimisaraka Unit are subhedral to anhedral, and occur both as inclusions within biotite porphyroblasts and the matrix. Analyzed grains gave ages from 400 to 610 Ma with the 500 Ma age being dominant. Compositional zoning in monazites from samples in the Masora Block demonstrates complex growth relationships. Monazites are subhedral to anhedral, and yield two distinct ages. The cores of monazite grains give ages of ca. 930 Ma whereas the rims of grains generally give ages of ca. 500 Ma. A second sample from the Masora Block contained subhedral to anhedral monazite grains both within biotite and matrix minerals. Analyzed grains gave ages ranging from 450 to 550 Ma with the 510 Ma age being dominant. Discontinuous zoning in monazites from sample in the Antananarivo Block demonstrates complex growth relationships. Monazites are anhedral and yield two distinct ages. The cores of monazite grains give age of ca. 2500 Ma whereas the rims of grains generally give ages of ca. 490 Ma.

The occurrence of monazites suggests that Cambrian-Ordovician history is preserved within metamorphosed equivalents in the central-eastern Madagascar. The monazite data support the previous monazite ages in central-southern Madagascar reported by Giese et al. (2011) and requires re-evaluation of tectonic model of Gondwana formation along the eastern margin of EAO.

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