

New constraints on the assembly of the East African Orogen from northern Madagascar

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The Late Precambrian to Early Palaeozoic geology of Madagascar preserves a unique record of Gondwana assembly and occupies a critical position for constraining the development of the East African Orogen (EAO).

In northern Madagascar, the Bemarivo Belt consists of a Neoproterozoic complex of metasedimentary and meta-igneous rocks interpreted as a juvenile magmatic arc, and a correlative with rocks in the Seychelles and the Rajasthan belt in NW India (Ashwal et al., 2002). The Bemarivo Belt occupies a remnant triple junction between the Meso- to Neoproterozoic granitoid terrane of the Antongil craton to the southeast, thought to be a correlative of the Dharwar craton of India, and the Antananarivo craton to the southwest, a unit dominated by Neoproterozoic granitoid gneisses, paragneisses and mafic rocks of uncertain affinity. Some authors interpret the highly strained zone that separates the two Proterozoic terranes of Madagascar as a suture that marks the position of a strand of the Mozambique Ocean (e.g. Collins, 2006). The tectonic history of the Bemarivo Belt and its margins is therefore important for testing collisional models of this part of the EAO. Our studies show that the Bemarivo Belt comprises two tectonically-bounded units: the Doany domain to the south and Zarambavy domain to the north. These contain contrasting assemblages of metasedimentary, metavolcanic and plutonic rocks of suprasubduction zone affinity. The Doany domain is distinguished by the presence of extensive quartzitic, psammitic, calc-silicate rocks and pelitic rocks, interpreted as being derived from a mature continental margin and metamorphosed under highest amphibolite to granulite facies conditions. In contrast, the Zarambavy domain contains a significant component of mafic and felsic meta-volcanic rocks and units of lower, greenschist to amphibolite facies, metamorphic grade.

Within the Doany domain an early phase of deformation (D1) is preserved as a gently dipping schistosity and recumbent intrafolial isoclinal folds that record orthogonal shortening, formation of an imbricate thrust stack, and southward translation across the foreland of the composite Proterozoic craton. The present contacts between the Doany domain and the Antananarivo craton are defined by steep transcurrent shear zones that appear to be syn- to post- D2. The structural history suggests early orthogonal contraction along the cratonic margin (D1) prior to final assembly with the outboard Zarambavy domain during D2. Reactivation along the margin of the Antananarivo Craton followed, and involved both shortening and transcurrent deformation as part of an overall compressive system.