



## Cover sequences at the northern margin of the Antongil Craton, NE Madagascar

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### ABSTRACT

The island of Madagascar is a collage of Precambrian, generally high-grade metamorphic basement domains, that are locally overlain by unmetamorphosed sedimentary rocks and poorly understood low-grade metasediments. In the Antalaha area of NE Madagascar, two distinct cover sequences rest on high-grade metamorphic and igneous basement rocks of the Archaean Antongil craton and the Neoproterozoic Bemarivo belt. The older of these two cover sequences, the Andrarona Group, consists of low-grade metasedimentary rocks. The younger sequence, the newly defined Ampohafana Formation, consists of unmetamorphosed sedimentary rocks.

The Andrarona Group rests on Neoproterozoic granites and monzogranites of the Antongil craton and consists of a basal metagreywacke, thick quartzites and an upper sequence of sericite-chlorite meta-mudstones, meta-sandstones and a volcanoclastic meta-sandstone. The depositional age of the volcanoclastic meta-sandstone is constrained in age by U–Pb laser-ablation ICP-MS analyses of euhedral zircons to  $1875 \pm 8$  Ma ( $2\sigma$ ). Detrital zircons of Archaean and Palaeoproterozoic age represent an input from the Antongil craton and a newly defined Palaeoproterozoic igneous unit, the Masindray tonalite, which underlies the Andrarona Group, and yielded a U–Pb zircon age of  $2355 \pm 11$  Ma ( $2\sigma$ ), thus constraining the maximum age of deposition of the basal part of the Andrarona Group. The Andrarona Group shows a low-grade metamorphic overprint in the area near Antalaha; illite crystallinity values scatter around  $0.17^\circ \Delta 2\theta$  CuK $\alpha$ , which is within the epizone.

The Ampohafana Formation consists of undeformed, polymict conglomerate, cross-bedded sandstone, and red mudstone. An illite crystallinity value of  $>0.25^\circ \Delta 2\theta$  CuK $\alpha$  obtained from the rocks is typical of the diagenetic zone. Occurrences of rhyodacite pebbles in the Ampohafana Formation and the intrusion of a basaltic dyke suggest a deposition in a WSW-ESE-trending graben system during the opening of the Indian Ocean in the Upper Cretaceous, that was characterized by extensive rhyolitic to basaltic magmatism along Madagascar's eastern coast.

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### 1. Introduction

The Precambrian shield of Madagascar consists of a number of geological domains, ranging in age from Mesoarchaeal to Neoproterozoic, which were finally amalgamated during the formation of

Gondwana in the Cambrian (De Wit, 2003; Collins, 2006). In the Antalaha area of NE Madagascar, the Neoproterozoic Bemarivo belt is juxtaposed against the Archaean Antongil craton (Collins and Windley, 2002; Thomas et al., 2009). The Antongil craton extends over a distance of ca. 300 km down the east coast south of Antalaha (Fig. 1). It consists mostly of Meso- to Neoproterozoic orthogneisses and granitoids with minor amounts of paragneisses and schists. The last pervasive tectonometamorphic event exceeding low-grade conditions was recorded at the Archaean/Proterozoic boundary at around 2.5 Ga, when large volumes of granitoid intrusions (the Masoala Suite), were emplaced (Tucker et al., 1999, 2011a; Paquette et al., 2003; Schofield et al., 2010). The Antongil craton, together

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