LATE TECTONIC EVOLUTION OF THE NAMPULA COMPLEX, NE MOZAMBIQUE

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The Nampula Complex is the largest of several Proterozoic crustal blocks which makes up the crust of NE Mozambique. It is largely composed of supracrustal and intrusive gneisses, at upper amphibolite grade, with Mesoproterozoic protolith ages (1.15 to 1.05 Ga) and evidence for a Mesoproterozoic orogenic event (D1). The rocks underwent pervasive tectonic reworking during the late Neoproterozoic ("Pan-African") collision orogeny at ca 550 Ma (D2), which led to the assembly of the various constituent blocks within this part of Gondwana. During this event, two small Neoproterozoic granulite remnant klippen were thrust over the Nampula Complex. The current distribution of rocks types and virtually all the fabrics seen in the rocks of the Nampula Complex are considered to be due to the Neoproterozoic orogeny which destroyed nearly all the evidence of earlier fabrics and structures Macey et al., 2010). The Nampula Complex is bounded in the north by the ENE-trending Lúrio Belt, a polyphase structure which has been much debated over the years.

Recent work has revealed that the juvenile Mesoproterozoic basement of the Nampula Complex is overlain by two sequences of high-grade paragneisses of early Cambrian age (<530 ± 18 Ma), known as the Mecubúri and Alto Benfica Groups (Thomas et al., 2010). The former is composed of clastic metasedimentary rocks, including meta-conglomerates, -psammites and siliceous calc-silicate rocks, with rarely preserved primary sedimentary structures. They are preserved in the core of a large-scale upright, NW–SE-trending synform (Ticue structure; D3), which is oriented at a high angle to the nearby ENE– trending Lúrio Belt. The rocks are considered to have been deposited unconformably on the older basement prior to subaerial weathering and lateritisation. Structural coherence between the Mecubúri Group and the basement gneisses within the synform reveal a high degree of fabric realignment and a hitherto unrecognised degree of late deformation in the basement. In other words, many of the fabrics and structures attributed to the main collision event at 550 Ma in the northern Nampula Complex were extensively re-worked after 530 Ma. Metamorphism of the Mecubúri Group attained sillimanite grade, dated at ca 500 ± 10 Ma (U-Pb metamorphic zircon rims; metamorphic monazite), associated with coeval migmatisation and granite intrusion (U-Pb zircon).

New U-Pb SIMS analyses of metamorphic rims to Mesoproterozoic zircons from basement gneisses within the Ticue structure date high-T metamorphism at 514 ± 5 Ma. Similar ages of ca. 519 and 517 Ma were obtained from sheared granitoids of the adjacent central Lúrio Belt, contrasting strongly with a much more protracted history of ages ranging from 600–545 Ma, recorded from samples taken from the easternmost part of the belt. In order to constrain post-peak metamorphic cooling history, U-Pb LA-ICPMS analyses were obtained from titanite separated from a metamorphosed, foliated mafic dyke intruding the Mecubúri Group. These gave a date of 471 ± 9 Ma, indicating the time at which the rocks cooled through ca 600°C. In addition, 40Ar/39Ar age spectra of biotite separated from a meta-psammite of the Mecubúri Group gave a plateau age of 431 ± 3 Ma. Further such analyses are in preparation. These data indicate slow cooling in the northern Nampula Complex subsequent to peak metamorphism at ca 500 Ma, consistent with a protracted high-temperature regime and previous models which suggest that the Lúrio belt forms the northern limit of a delaminated lithospheric root beneath the Nampula Complex that underwent high heat-flow from associated asthenosphere uprise. Furthermore, we suggest that late NE– SW directed shortening in the northern Nampula Complex (e.g. the late Ticue structure) was accommodated by local renewed tectonic activity of the Lúrio Belt, and has effectively served to limit the late deformation to south of the Lúrio Belt.