GEOCHRONOLOGY OF PAN-AFRICAN TERRAIN ASSEMBLY IN NE MOZAMBIQUE

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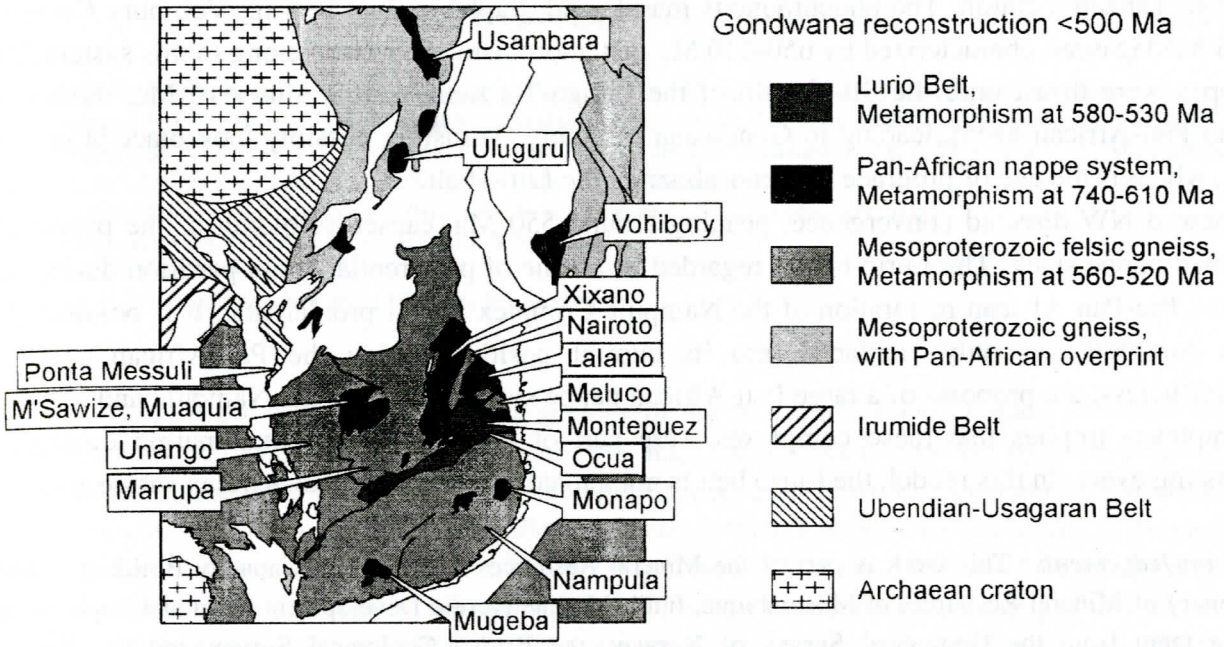
Geological mapping, supported by U-Pb geochronology and airborne geophysical data, was performed at the 1:250000 scale on 31 degree square sheets in NE Mozambique. U-Pb LA-ICPMS and SIMS isotopic data were collected on zircon and monazite from 30 samples. An updated tectonostratigraphy is proposed for NE Mozambique. NE Mozambique consists of a number of gneiss complexes imbricated during the Pan-African orogeny. The complexes are juxtaposed along tectonic contacts, showing a general NW-NNW directed transport.

The north-westernmost Ponta Messuli Complex (Fig. 1) contains a Paleoproterozoic basement, which has experienced amphibolite-facies migmatitization at 1954 ±15 Ma, as deduced from monazite data. The low-grade Txitonga Group, of unknown age, overlies the Ponta Messuli Complex. The Maniamba Graben contains a sequence of Karoo sediments. Southeast of the graben the Unango, Marrupa and Nampula Complexes are exposed and consist mainly of 1.1-0.9 Ga granitic and charnockitic orthogneisses associated with screens of high-grade paragneiss. The Unango and Nampula Complexes are intruded by widespread Pan-African granitic plutons. The Marrupa Complex structurally overlies the Unango and Nampula Complexes. Geochronological constraints for magmatic events in the Unango Complex are obtained from 11 orthogneiss samples, dated between 1065 ±16 and 988 ±20 Ma, a poorly deformed alkaline granite at 799 ±8 Ma, one foliated charnockite pluton at 576 ±15 Ma and four undeformed granite plutons and dykes between 516 ±6 and 475 ±9 Ma. The 1.07-0.99 Ga magmatism includes deformed granodiorite, granite, leucogranite, charnockite, granite with proto-rapakivi texture, and metadolerite. A monazite upper intercept age at ca. 1.03 Ga provides evidence for pre-Pan-African metamorphism in the Unango Complex. Pan-African amphibolite- to granulite-facies metamorphism in the Unango and Marrupa Complexes is estimated between ca. 560 and 520 Ma. The most precise estimate is a zircon age of 536 ±6 Ma from a granulite-facies paragneiss. One low-Th zircon at 444 ±5 Ma in a mylonite records Ordovician deformation along a NE-SW trending sinistral shear zone close to the northwest boundary of the Unango Complex.

The Meluco and Nairoto Complexes consist of felsic orthogneisses and are tentatively correlated with the Marrupa Complex. The M'Sawize, Muaquia, and Xixano Complexes overly the Marrupa and Nairoto Complexes. The M'Sawize and Xixano Complexes comprise dominantly mafic to intermediate orthogneisses, and are commonly at granulite-facies grade. These complexes are characterized by a low radiometric signature in radiometric surveys, suggesting dominance of low-K orthogneiss suites. A granulite-facies tonalitic gneiss in the M'Sawize Complex yields an intrusion age of 641 ±5 Ma. In the Xixano Complex, granulite-facies rocks are juxtaposed with various amphibolite-facies metasedimentary rocks, including arkose, graphite schist, and tremolite marble. Granulite-facies dehydration melting in the Xixano Complex is estimated at 735 ±4 Ma recorded from zircon in a garnet-orthopyroxene paragneiss. The Lalamo Complex consists mainly of paragneiss, including biotite gneiss, meta-arkose, marble and graphite schist. It probably belongs to the same tectonostratigraphic level as the Xixano Complex.



The complexes are affected by polyphase deformation mainly along the WSW-ENE trending Lurio belt. The structures most visible on airborne surveys in the Lurio belt are a moderately NW dipping SW-NE trending lithological banding and megascopic isoclinal folds with moderately upright axial surface parallel to this direction. The high-strain eastern part of the Lurio belt progressively fades out to the SW where it intervenes between the Nampula and Marrupa Complexes and between the Nampula and Unango Complexes. This observation is tentatively related to the fact that, to the SW, the Lurio belt transects progressively deeper tectonostratigraphic levels affected by late-Pan African high-grade metamorphism and crustal melting. Lithologically, the Lurio belt can be regarded as a tectonic melange including granulites and sheared gneisses (the newly established Ocua Complex) and metasediments (Montepuez Complex). Amphibolite- to granulite-facies metamorphism and deformation in the Ocua Complex is bracketed between 578 ±10 and 545 ±6 Ma, and a 531 ±6 Ma monazite age is related to later extensional structures.

New data can be integrated into a revised geotectonic model for the Pan-African orogeny in NE Mozambique and adjacent areas. The Ponta Messuli Complex, characterized by 1.95 Ga metamorphism, probably represents an extension of the Ubendian-Usagaran belts. The Unango Complex extends south-westwards into Malawi, where coeval magmatic and metamorphic events are recorded. The 1.07-0.99 Ga magmatic activity in the Unango Complex is coeval with that in the Irumide belt of Zambia, but has a distinctly more juvenile character. The Unango and Marrupa Complexes, and possibly the Nampula Complex, were probably adjacent to the margin of the Congo-Tanzania Craton before the Pan-African orogeny.

The uppermost tectonostratigraphic level exposed in NE Mozambique and Tanzania include the M'Sawize, Muaquia, and Xixano Complexes north of the Lurio belt, the Mugeba and Monapo "klippen" to the south, and a number of fault-bounded complexes and nappes exposed in Tanzania, including notably the Uluguru and Usambara Mountains. These different complexes share a number of unifying characteristics, including mafic orthogneisses, early Pan-African metamorphism dated between 740 and 610 Ma and platform sediment sequences containing graphite-schist and marble. Granulite-facies metamorphism in the Mugeba klippe is well dated at 614 ±8 Ma. We speculate that these complexes pertain to a >1500 km long nappe system made up of Mesoproterozoic

microcontinents and/or arcs assembled episodically between 740 and 610 Ma, outboard of the Congo-Tanzania craton. The allochthonous marble and graphite-schist-bearing Vohibory Complex in S Madagascar, characterized by 650-610 Ma metamorphism, may also belong to this system. The nappes were thrust onto the SE margin of the Congo-Tanzania craton, after 610 Ma, during the main Pan-African event, leading to Gondwana assembly. Thrusting possibly took place at ca. 580 Ma, which is the age of prograde metamorphism in the Lurio belt.

Renewed NW-directed convergence, peaking around 550 Ma, caused refolding of the previously formed nappe stack. The Lurio belt is regarded as a zone of preferential strain partition during this event. Pre-Pan African restoration of the Nampula Complex is still problematic. It is possible that this complex was only emplaced into its current position during the Pan-African orogeny. Nevertheless, the proposal of a large Pan-African nappe system covering the Nampula and Marrupa Complexes implies that these complexes were part of the same continental margin during the thrusting event. In this model, the Lurio belt is not a major 580-540 Ma Pan-African suture zone.

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