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Crustal architecture in Northern Mozambique: results from a regional bedrock mapping project

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The bedrock geology of Northern Mozambique has been investigated as part of an infrastructure development program funded by the World Bank and other donors. The project has a significant component of technology transfer and training. The work involved reconnaissance geological mapping at the 1:250000 scale over 31 degree square sheets, acquisition of petrographic, mineralogical, geochemical and geochronological data, and a survey of mineral resources. The maps integrate results from a new airborne magnetic and radiometric survey over key areas. The geochronological database includes LA-ICPMS and SIMS U-Pb zircon and monazite data from 28 samples, Re-Os sulphide data from one deposit and chemostratigraphic 87Sr/86Sr and δ13C data from two carbonate sequences.

The region is subdivided into a number of gneiss complexes characterized by distinct lithological, structural and magnetic signatures. The northwesternmost Ponta Messuli complex, along Lake Niassa, contains a Paleoproterozoic basement and evidence for amphibolite-facies migmatitization at 1954 $\pm$15 Ma. It is associated with the Txitonga group, dominated by metasediments and hosting Au-bearing quartz veins controlled by late Pan-African shear zones (ca. 485 Ma and younger). The Unango and Marrupa complexes consist of granitic and charnockitic gneisses formed between 1065 $\pm$16 and 988 $\pm$20 Ma, and intruded by 799 $\pm$8 Ma alkaline granite and 576 $\pm$15 to 475 $\pm$9 Ma magmatic rocks. The above complexes are juxtaposed along tectonic contacts. Deposition of the carbonate-bearing Geci group, now preserved in tectonic lenses,

is estimated between 635 and 595 Ma. Pan-African amphibolite- to granulite-facies metamorphism occurred between 560 and 520 Ma. A mylonite along a NE-SW trending sinistral shear zone records late Pan-African escape tectonics at 444 ±5 Ma. The Xixano complex corresponds to a radiometric low, and includes granulites juxtaposed alongside various metasedimentary rocks along greenschist- to amphibolite-facies shear zones. Granulite-facies metamorphism is dated at 735 ±4 Ma. The Lalamo and Montpuez complexes include abundant metasediments and felsic metavolcanic rocks. Deposition of marble is estimated at ca. 1050-1000 Ma. In the southern part of the map area, the Nampula complex is composed mainly of granitic and charnockitic orthogneisses, one of which is dated at 1051 ±13 Ma, with screens of high-grade paragneiss (Molocue group). The complex is overlain by sillimanite-grade, possibly Neoproterozoic, metasediments, including meta-conglomerates. The Nampula complex is juxtaposed with the northern complexes along the prominent WSW-ENE trending Lurio structure. The Lurio complex dips to the NNW and structures reflect interference of at least two major deformation phases. The Lurio complex is cored by granulite lenses decreasing in abundance to the west. Granulite-facies metamorphism and deformation is bracketed between 556 ±4 and 536 ±6 Ma. The Lurio complex does not always correspond to a major lithological break between the Nampula and Marrupa complexes, and consequently does not have all the attributes of a Pan-African suture zone.

On a regional scale, the 1.95 Ga metamorphism in the Ponta Messuli complex links this complex with the Usangaran belt of Tanzania. The 1.07–0.99 Ga magmatism in the Unango complex is coeval with the peak of magmatic activity in the Irumide belt of Zambia, possibly restoring this complex at the margin of the Congo-Tanzania craton before the Pan-African orogeny. The penetrative 560-530 Ma high-grade metamorphism is related to the collision between the Congo-Tanzania craton and a couple made by the East-Antarctica and Kalahari cratons. Preservation of 735 ±4 Ma granulites in the Xixano complex is evidence for a polyphase Pan-African assembly on the south-eastern side of the Congo-Tanzania craton.