

CRUSTAL ARCHITECTURE IN THE MOZAMBIQUE BELT, NORTHEASTERN MOZAMBIQUE: PERSPECTIVE FROM U-PB AND LU-HF ISOTOPES IN ZIRCON

B. Bingen¹, G. Viola¹, W. L. Griffin², J. Jacobs³, R. Boyd¹, R. Thomas⁴, X. Daudi⁵, I. Henderson¹, E. Beyer², A. Engvik¹, R. Key⁴, A. Solli¹, J.S. Sandsad¹, E. Tveten¹, T. Bjerkgård¹, D. Jamal⁶

1. Geological Survey of Norway, 7491 Trondheim, Norway, bernard.bingen@ngu.no
2. Department of Earth and Planetary Sciences, Macquarie University, NSW 2109 Australia
3. Department of Earth Science, University of Bergen, 5007 Bergen, Norway
4. British Geological Survey, NG125GG Keyworth, UK
5. National Directorate for Geology, Maputo, Mozambique
6. Eduardo Mondlane University, Maputo, Mozambique

Reconnaissance geological mapping was performed at 1:250000 scale over 31 degree square sheets in Northeastern Mozambique (Nordconsult Consortium 2007), supported by airborne magnetic and radiometric survey over key areas, U-Pb geochronology of zircon and monazite by LA-ICPMS and SIMS in 80 samples, and Lu-Hf isotope data on zircon by LA-ICPMS in 32 samples. The study leads to a new tectonostratigraphy of the area and improved understanding of the relations between the Mozambique, Zambezi, Irumide and Dronning Maud belts.

The area hosts the NE-SW trending Karoo-aged Maniamba graben, probably concealing a major late-/post-Pan-African structure, as evident from a 444 ±5 Ma ultramylonite in the SE shoulder of the graben. The area also hosts the SSW-NNE trending, NNW dipping, Lurio belt, a major poly-phase linear Pan-African structure, gradually disappearing westward, and containing 557 ±16 Ma high-P granulite boudins, evidence for deformation between 587 ±23 and at least 532 ±13 Ma and abundant 612 ±6 to 504 ±11 Ma plutons. To the NW of the Maniamba graben, the Paleoproterozoic Ponta Messuli Complex shows a 1950 ±15 Ma metamorphic phase and 1056 ±11 Ma granite intrusives with Archean Hf model age ($\text{Hf}_i = -15$). This complex is related to the Northern Irumide and Usagaran belts forming the margin of the Congo-Tanzania craton. It is overlain by the Txitonga Group containing 714 ±17 Ma felsic volcanics with $\text{Hf}_i = -6$, and interpreted as a Neoproterozoic rift sequence in this margin. To the SW of the Maniamba graben, the Mesoproterozoic Unango and Marrupa complexes consists of 1062 ±13 to 949 ±13 Ma felsic orthogneiss with Paleo- to Mesoproterozoic Hf model age ($-11 < \text{Hf}_i < +7$). They show a Grenvillian 962 ±18 Ma metamorphism reaching granulite-facies in the Unango Complex, 799 ± 8 Ma alkaline plutons, a 551 ±6 – 536 ±6 Ma Pan-African metamorphism, and 547 ±14 – 486 ±27 Ma granite plutons. The Unango and Marrupa complexes can be interpreted as an extension of the southern Irumide belt, linking the Zambezi and Mozambique belts.

The Marrupa complex is overlain by a Pan-African upper nappe system including from NW to SE, the M'Sawize, Muaquia, Xixano, Lalamo, Meluco and Montepuez complexes. It consists of Neoproterozoic sedimentary rocks, including marble, and comparatively juvenile magmatic rocks, including 973 ±11 to 946 ±12 Ma mafic to felsic orthogneiss (M'Sawize, Muaquia, Meluco, $\text{Hf}_i = +2$), 818 ±10 to 787 ±23 Ma metarhyolite/granite (Xixano, Montepuez), 744 ±11 to 735 ±4 Ma enderbite and granite (Xixano, $+4 < \text{Hf}_i < +10$), 696 ±13 Ma granodioritic gneiss (Lalamo, $\text{Hf}_i = +10$), and 631 ±11 to 579 ±27 Ma felsic plutons. The upper nappe system shows two metamorphic phases at 735 ±4 Ma (granulite, Xixano) and 631 ±6 – 607 ±11 Ma (M'Sawize, Xixano, Meluco). It correlates with the Western Granulites nappes of Tanzania. It is interpreted as remnants of an early Pan-African collision zone (631–607 Ma), including indigenous and accreted lithologies, and transported onto the Congo-Tanzania margin between 596 ±11 Ma (youngest pluton specific to the nappes) and ca. 550 Ma (metamorphism in underlying Marrupa Complex). The large 742-735 Ma enderbite in the Xixano Complex is regarded as an accreted arc formed in the Mozambique ocean.

South of the Lurio Belt, the Nampula complex mainly consists of 1148 ±1 to 1028 ±7 Ma felsic orthogneiss ($+1 < \text{Hf}_i < +4$), in average older and more juvenile than equivalent lithologies N of the Lurio belt. It is affected by 543 ±23 and 520 ±8 – 493 ±8 Ma metamorphism and hosts abundant 511 ±12 to 508 ±3 Ma granite plutons. It is overlain by the Mugeba and Monapo klippen possibly correlated to the upper nappe system. The Nampula complex is characterized by late Pan-African unroofing (post 493 ±8 Ma) and has clear affinity with the Dronning Maud Belt. The status of the Lurio belt, as a Grenvillian or Pan-African suture zone, or not, is a matter of debate.

Reference

Nordconsult Consortium, 2007. Mineral resources management capacity building project, Republic of Mozambique, Component 2: Geological infrastructure development project, Geological Mapping Lot 1, Report No. B6.f. Unpublished, 778 pp.