Gondwana assembly: Geochronology and Hf isotopes constraints from NE Mozambique

B. Bingen[1], G. Viola[1], W. L. Griffin[2], J. Jacobs[3], A. Engvik[1], I.H.C. Henderson[1], R. Boyd[1], R.J. Thomas[4], E. Daudi[5], Ø. Skar[1], R.M. Key[4], A. Solli[1], J.S. Sandstad[1], M. Smethurst[1], T. Bjerkgård[1]

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

Results of an integrated mapping program in NE Mozambique bring improved constraints on the sequence of events leading to the assembly of Gondwana along the East African Orogen. From NW to SE, a crustal transect through NE Mozambique divides into 4 main lithotectonic units. (1) The Palaeoproterozoic Ponta Messuli Complex is part of the Congo-Tanzania foreland of the orogen. It preserves a 1950±15 Ma granulite-facies metamorphism typical for the Usagaran belt, 1056±11 Ma granites (εHfi =-15), and is overlain by the Neoproterozoic Txitonga Group. (2) The Unango and Marrupa Complexes form a Mesoproterozoic felsic basement, probably indigenous to the Congo-Tanzania margin and correlated with the southern Irumide belt. They consist mainly of 1062±13 to 946±13 Ma felsic orthogneiss (-11 <εHfi <+7) with an up to ganulite-facies late-Grenvillian metamorphism at 962±18 to 945±33 Ma. Pan-African high-grade metamorphism at 569±16 to 536±6 Ma is increasingly pervasive southwards, towards the Lurio Belt. (3) The Cabo Delgado Nappe Complex (CDNC) consists of Neoproterozoic magmatic suites and metasediments, including marbles. It is characterized by a granulite-facies event at 735±4 Ma (Xixano Complex) and high-grade metamorphism at 631±6 to 607±11 Ma. The CDNC is interpreted as remnants of an early Pan-African 631–607 Ma accretionary belt, involving lithologies indigenous to the Congo-Tanzania margin (973±11 to 946±12 Ma orthogneiss, εHfi =+2) and outboard volcanic arcs formed and assembled in the Mozambique ocean. These include 818 ±10 Ma rhyolites, 744±11 to 735±4 Ma enderbites and granites (Xixano Complex, +4 <εHf <+10), and 696±13 Ma granodiorites (Lalamo Complex, εHfi =+10). The CDNC was transported northwestwards onto the Unango-Marrupa Complexes after 596±11 Ma (youngest pluton in the nappes). The CDNC correlates with the Western Granulite Nappes in Tanzania and Vohibory Complex in Madagascar. (4) The Nampula Complex consists mainly of 1148±1 to 1028±7 Ma felsic orthogneiss (+1 <εHfi <+4). It lacks Grenvillian high-grade metamorphism, but is characterized by 543±23 to 493±8 Ma late Pan-African metamorphism and abundant 511±12 to 508±3 Ma felsic plutonism. It is overlain by the Mugeba and Monapo klippen, related to the CDNC. The Nampula Complex underwent late Pan-African unroofing and has affinity with the Dronning Maud Land belt in Antarctica. North of the Nampula Complex, the Lurio Belt is a ENE trending, NNW-dipping, 500 km long linear structure, cored by granulites and fading away westwards. It reworks the previously established nappe stack (units 2-3). It records final Pan-African shortening, as evident from granulite-facies metamorphism between 576±6 and 539±15 Ma (up to 1.55 GPa) and extreme flattening of 949±13 to 612±6 Ma lithologies. It is characterized by widespread 538±10 to 504±11 Ma syn- to post-kinematic felsic plutonism. The status of the Lurio Belt as a Pan-African suture zone between the Zimbabwe and Congo-Tanzania cratons is discussed.