LATERAL EXTRUSION AT THE EASTERN MARGIN OF THE EAST AFRICAN-ANTARCTIC OROGEN IN DRONNING MAUD LAND, SØR RONDANE

A. Ruppel[1], Läufer A.[1], Jacobs J.[2,3], Elburg M.[4], Krohne N.[5], Eagles G.[6], Mieth M.[7], Jokat W.[6], Damaske D.[1], Lisker, F.[5]

[1]Federal Institute for Geosciences and Natural Resources (BGR), Hannover, Germany,

email: antonia.ruppel@bgr.de

[2]University of Bergen, Bergen, Norway

[3]Norwegian Polar Institute, Tromsø, Norway

[4]University of of Johannesburg, Johannesburg, South Africa

[5]FB 5 Geoscience, University of Bremen,Bremen, Germany;

[6]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany

[7]Statoil, Harstad, Norway

The geology of Sør Rondane has been the focus of intense research and occupies a key position for reconstructing the late Neoproterozoic to early Paleozoic geodynamic evolution in eastern Dronning Maud Land (DML). Sør Rondane appears to be located close to the supposed intersection of the East African-Antarctic Orogen (EAAO) and the Kuunga Orogen.

The western part of Sør Rondane is subdivided in two distinct terranes. The amphibolite to granulite-facies NE terrane is mainly composed of metasupracrustal rocks, with detrital zircon ages in part younger than 750 Ma, deposited on older basement of unknown, possibly Rayner-type, crust (Shiraishi et al., 2008). Metamorphism has been dated by U-Pb on zircon at ca. 640-600 Ma and amphibolite-facies retrogression dated at ca. 590-530 Ma. The SW terrane is subdivided by the Main Shear Zone (MSZ) into two lithothectonic units, i.e. Pan-African greenschist- to granulite-facies metamorphic rocks with “East African” affinities in the N and a Rayner-age early Neoproterozoic gabbro-tonalite-trondhjemite-granodiorite (GTTG) complex with “Indo-Antarctic” affinities in the S. The GTTG complex has suffered Pan-African greenschist- to lower amphibolite-facies thermal overprint, but also contains large domains with only weak deformation except for its northern margin close to the MSZ. The deformation there is related to high shear strain along this structure. New zircon crystallisation ages of the GTTG cluster around 1000-930 Ma. It is interpreted to have formed along a juvenile oceanic arc, in which the wide age range might indicate a long-lasting accretionary orogen.

The MSZ is characterized by a right-lateral sense of movement and high-strain ductile deformation under peak amphibolite-facies conditions. The structure can be traced over a distance of ca. 120 km between Lågkollane in the W and Lunckeryggen in the E and reaches several hundred meters in width. The MSZ cannot be traced further to the W where it seems to terminate at the north-eastern border of the NW-SE oriented prominent magnetically defined SE DML Province. The north-eastern border zone may coincide with a significant dextral shear

zone that runs from the Schirmacher Oasis into the region S of Sør Rondane (Schirmacher-Rondane Lineament). The SE DML Province most likely consists of Rayner-age (1000-900 Ma) crust with evidence of intense Pan-African reworking indicated by new geochronological data and was part of a large Tonian Oceanic Arc Super Terrane (TOAST). The continuation of the MSZ into eastern Sør Rondane and beyond is not clear either, since it appears to terminate at a N-S oriented region with low magnetic signatures (central Sør Rondane corridor) that is possibly related to extensional tectonics. Crosscutting relationships with dated magmatic rocks bracket the activity of the MSZ between Latest Ediacaran to Cambrian times (c. 560-530 Ma). Based on new combined aeromagnetic and structural results from a four-seasons survey of the greater Sør Rondane region, we propose that the crustal structural architecture of eastern DML and is strongly influenced by N-directed (with Africa/Antarctica restored to its original position in Gondwana) lateral extrusion of the EAAO. This process was likely driven by the combination of (i) indentation of the SE DML block towards the conjugate stable Kalahari-Grunehogna cratonic foreland, (ii) extensional collapse of the previously (c. 580-550 Ma) thickened and gravitational instable crust of central DML, and (iii) large-scale tectonic escape of crustal blocks in eastern DML along major shear zones such as the Schirmacher Rondane Lineament and MSZ towards an unconstrained yet unknown region at a lateral position of the EAAO.