Geophysical Research Abstracts
Vol. 15, EGU2013-9188, 2013
EGU General Assembly 2013

Neoproterozoic/Lower Palaeozoic geodynamic evolution of Dronning Maud Land: integrating geology and geophysics

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East Antarctica probably formed by amalgamation of a number of cratons along distinct Ediacaran mobile belts, including the ca. 600-500 Ma East African-Antarctic Orogen (EAAO) that dissects Dronning Maud Land (DML). New field-work during the international expeditions Geodynamic Evolution of East Antarctica (GEA) I + II in the austral summers 2010/11 and 2011/12, and first geochronological results from eastern DML reveal a complex tectonic architecture across the belt.

In western DML, the EAAO reworks older Mesoproterozoic crust of the Maud Belt; the westernmost boundary of the mobile belt is characterized by a major dextral transpressional shear zone. In central DML, a major magnetic anomaly, the Forster anomaly, was interpreted as a cryptic suture of the EAAO (Riedel et al. 2012). The area where the Forster anomaly crosses the DML mountains is poorly investigated so far, but appears to coincide with a major strike slip shear zone in the southern Kurze Mts. and the occurrence of major Ediacaran granulite bodies. East of the Forster anomaly, the magnetic anomaly pattern changes significantly and typical Maud type crust is not present any longer. GEA II targeted a range of nunataks between Sør Rondane and central DML that had never been visited previously (from Blåklettane and Bergekongen in the E to Urna and Sørsteinen in the W). These nunataks are dominated by medium- to high-grade metasedimentary and metavolcanic rocks of possibly Neoproterozoic age, including abundant marble and graphite schists. Sør Rondane in eastern DML, is dominated by two distinct blocks separated by the dextral Main Shear Zone. The northwestern block is still part of the eastern EAAO, where new SHRIMP zircon data from metamorphic rims provide ages of ca. 560 Ma. The southeastern block is made up of a TTG terrane, which provides four new SHRIMP zircon dates between 990-980 Ma, interpreted as igneous crystallization ages (oceanic arc). The TTG terrane shows limited tectonic overprint and is likely the southeastern foreland of the EAAO. Close to the contact of the two blocks grey geisses and augen-gneisses gave zircon crystallization ages of ca. 750 Ma, ages which were previously unknown from the EAAO. The Forster anomaly therefore separates distinctly different parts of the EAAO: a) a reworked, mainly Grenville-age crust to the W (the overprinted margin of the Kalahari Craton) and b) a part of the orogen dominated by Neoproterozoic accretionary tectonics to the E. This difference is also reflected in the geochemistry of voluminous late-tectonics granitoids across the belt.

Riedel, S. et al., 2012, Tectonophysics, doi.org/10.1016/j.tecto.2012.10.011