Geophysical Research Abstracts
Vol. 15, EGU2013-9643, 2013
EGU General Assembly 2013

Metamorphic Evolution of the Main Collisional Suture Zone Between East and West Gondwana

Tamer Abu-Alam (1,2) and Eugene Grosch (3)

(1) Graz Univ., Austria (tamer.abu-alam@uni-graz.at), (2) Tanta University, Egypt, Faculty of Science, Geology Department, Tanta, Egypt, (3) Depart. of Earth Science & Centre for Geobiology, University of Bergen, Bergen, Norway

Petrological and metamorphic constraints from five metamorphic complexes which were exhumed during the collision between East- and West-Gondwana across the main collisional suture zone are presented. These include: (a) Meatiq complex in Eastern Desert of Egypt, (b) Feiran-Solaf complex in Sinai, Egypt (c) Sa'al-Zaghra complex in Sinai, Egypt, (d) Great Ruaha River area in the Mozambique Belt, and (e) Western Dronning Maud Land, East Antarctica. The metamorphic results from these complexes are compared and provide insight into the nature of Pan-African crust formation processes during Gondwana assembly. In this study we present differences and similarities between various field areas in the central collisional suture zone of Gondwana that sheds light on the crustal accretion and supercontinent assembly process from a metamorphic perspective.

The Meatiq complex in the Eastern Desert of Egypt consists of a low-grade volcanic arc sequence that covers a higher-grade, biotite-garnet gneiss metamorphic core complex. A sinistral shear zone - the Najd Fault System - separates the high-grade rocks from the low-grade volcanic sequence. The combination between published data and new thermodynamic modeling shows that both the high-grade and the low-grade rocks record single clockwise $P-T$ paths. The peak metamorphic conditions of the high-grade rocks are T = 650-700 ^{o}C and P = 7-7.5 kbar, whereas the low-grade rocks record conditions of T = 400-450 ^{o}C and P = 3-4 kbar.

In Sinai, the Najd Fault System is not exposed due to the voluminous intrusion of ca. 540 Ma post-tectonic granites. However, both the garnet-biotite gneisses of the Feiran-Solaf complex (T = 700-750 ^{o}C and P = 7-8 kbar) and the low-grade rocks (T = 400-450 ^{o}C and P = 2-3 kbar) of Wadi El Kid record very similar metamorphic conditions and clockwise $P-T$ paths to those in Eastern Desert, Egypt. Conversely, the Sa'al-Zaghra complex shows anticlockwise P-T path with peak conditions of 2.5 kbar and 42 ^{o}C. It worth mention that the peak metamorphic age of the Sa'al-Zaghra complex is much older than the Pan-African event (ca. 1100 Ma).

In western Dronning Maud Land (Antarctica), a petrological and metamorphic comparison of Mesoproterozoic metabasic rocks on the eastern margin of the Archean Grunehogna Craton and the adjacent Maud Belt, revealed a difference in peak metamorphic conditions from T = 280 $\pm$ 30 ^{o}C to 710-750 ^{o}C and P = 2 $\pm$ 1.5 to 8.5-11 kbar over a distance of only 30 km across a major glacial valley. The high-grade *PT*-constraints derived for the western extreme of the Maud Belt, is very similar to that reported for the eastern Maud Belt dated at ca. 550 Ma. These *PT*-constraints do not support the presence of a westward decreasing metamorphic field gradient within the Maud Belt as previously proposed. The data presented here suggests that the inferred sub-glacial boundary between the Grunehogna Craton and the Maud Belt, might reflect a major Pan-African thrust, with the Maud Belt representing the continuation of the East African Mozambique Belt into East Antarctica.