Goldschmidt2007

Polymetamorphism in the Paleoproterozoic Ubendian Belt, Tanzania

NELSON BONIFACE AND VOLKER SCHENK

Institute für Geowissenschaften, CAU, 24098 Kiel, Germany (nb@min.uni-kiel.de, vs@min.uni-kiel.de)

The Paleoproterozoic (ca. 2.0-1.8 Ga) Ubendian-Usagaran orogens surrounding the SE and SW margins of the Archaean Tanzania craton contain eclogites of MORB-like chemistry which are among the oldest eclogite occurrences exposed in orogenic belts on Earth. Our study of metamorphic events by petrology and U-Pb SHRIMP dating of zircons is aimed to unravel the orogenic history of the Ubendian Belt southwest of the Tanzania Craton.

The Ubendian Belt has been subdivided into eight NW to SE elongated lithotectonic blocks the formation of which is interpreted to be of late Paleoproterozoic or Pan-African age. Lithologically the belt consists, besides minor eclogites, mainly of granitic gneisses, metapelites, some mafic granulites and amphibolites, i.e. rocks attributed to a continental environment. Metapelitic samples from the Wakole, the Ufipa and the Ubende terranes all revealed the same type of clockwise P-T path and thus a crustal thickening event dated with zircons (SHRIMP) at 1900±14, 1901±37, 1949±16 and 1817±26 Ma. Metamorphic mineral assemblages include biotite-muscovite-garnet-staurolite-kyanite and garnet-biotite-K-feldspar-kyanite (partly replaced by sillimanite). Peak metamorphic conditions were calculated for rocks of different parts of the belt and of different blocks. They range from 7kbar / 640°C over 9.4kbar / 670–800°C to 12.4kbar / 800°C, indicating low geothermal gradients during the crustal thickening event that was followed by a strong erosion of the crust.

Locally, metapelites of different parts of the Ubende block experienced a mylonitic overprint within the kyanite stability field. Zircon rims in these mylonites revealed a Kibaran overprint (1086±21 Ma), an age that is also found in metamorphic zircons of some non-mylonitic schists (1166±14 Ma) of that block.

Lenses of eclogites (meter to 100 meter scale) occur widespread in the Ubende and Ufipa blocks (over a distance of ca. 200 km). Some of these eclogites contain metamorphic zircons grown during a Pan-African eclogite-facies metamorphism at 520 to 590 Ma. However, at three localities the eclogite zircons contain inner metamorphic growth zones that revealed a Paleoproterozoic age (1877±20, 1886±16 Ma) in addition to the Pan-African age of the outermost rims (596±41, 548±39 Ma).

Neither the Kibaran mylonitic overprint nor the Pan-African eclogite-facies subduction metamorphism have been described so far. Their discovery demands major revision of the interpretation of the Proterozoic evolution along the southwestern margin of the Tanzania Craton.