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GRANULITE FACIES METAMORPHISM IN THE PARE AND USAMBARA MOUNTAINS, NE-TANZANIA

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The Pare and Usambara Mountains are located in North-eastern Tanzania and are part of the north south trending Mozambique Belt. The Mozambique Belt on his part belongs to the East African Orogen, which ranges from the Sinai Peninsula to Antarctica. It was formed during the collision between East Gondwana and West Gondwana and consists of the Arabic Nubic Shield in the north and the Mozambique Belt in the south.
The Pare and Usambara Mountains can be subdivided into 3 mountain ranges: (1) the Northern Pare Mountains which are characterized by east dipping foliation planes and north - south directed faults, (2) the Southern Pare Mountains which are also characterized by east dipping foliation planes and northwest southeast directed faults and (3) the Usambara Mountains which show east dipping foliation planes and north south and northwest - southeast directed faults.

The most common rock types in these areas are Grt-Cpx-Opx granulites (enderbites), Grt-Px gneisses, migmatites, amphibolites, as well as rare occurrences of metapelites, meta-ultrabasites, quarzites, calcsilicates, pegmatites and anorthosites. Petrographic observations indicate a two-phase garnet growth in Grt-Px granulites as well as in metapelites. In a metapelitic sample the two stage garnet growth is seen by an inclusion-poor core, surrounded by a concentric sillimanite-rich zone and again an inclusion-poor rim. In Grt-Px-bearing granulites the two stage garnet growth is indicated by inclusion-poor cores and inclusion-rich rims. Although the petrographical observations clearly show the two-phase nature of garnet, garnet core and rim compositions are similar as a result of the fast diffusion rates of elements at granulite facies conditions.

P/T calculations on migmatites and enderbites of the Usambara Mountains indicate peak temperatures around 800°C and pressures of ca. 10 – 12 kbar. From other studies in the Pare and Usambara mountains (APPEL et al., 1998) and Taita Hills (HAUZENBERGER et al., 2005) a slow isobaric cooling period could be determined. The prograde path is still debated but most likely not the result from a magmatic assisted geodynamic setting.

References

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