Timing of exhumation of a high-pressure mafic granulite terrane of the Paleoproterozoic Ubende belt (West Tanzania)

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Abstract

The Ubendian belt, west of the Archean Tanzanian craton, is known as a prominent crustal structural weakness. The belt is composed of different terranes set in a NW–SE oriented lateral shear pattern sharply outlined by steeply inclined inter-terrane shear fault zones. Its predominant mafic terranes (Ubende and Mbozi) display different and more complex evolutionary characteristics than their adjacent felsic terranes (Ufipa). Metamorphic studies reveal that mafic and ultramafic high-pressure granulites and rare eclogites subsist as rigid blocks and lenses within the highly sheared amphibolite facies country rock. *P*–*T* studies suggest two succeeding decompressional stages for the uplift of the high-pressure mafic granulite terranes, the second stage being identified on high-pressure blastomylonites. Included in the latter are amphibolites (mafic tectonites), for which barroisite constitutes a *P*–*T* marker. Near the southwestern boundary of the NW–SE oriented mafic terranes, these barroisite-bearing tectonites display a pronounced extensional shear banding. Considering that this tectonite has been formed during the second stage of uplift of the Ubende high-pressure mafic granulites, timing of that stage is pursued.

Ar–Ar stepwise heating analyses on different barroisite separates from this mafic tectonite have yielded a weighted average cooling age of 1848±6 Ma for the argon fractions released at intermediate temperatures. This age falls in the time range (1950–1850 Ma) associated with the second phase of the evolution of the Ubende belt characterized by amphibolite facies metamorphism. The isotopic composition of argon released at higher temperature steps from compositionally different phases in the separates, yields apparent ages tentatively considered only as indicative for a possible older Paleoproterozoic event.

Based on geochronological and structural data, the uplift of the high-pressure granulite Ubende terrane is interpreted as related to a late Paleoproterozoic dextral lateral shear deformation in ductile amphibolite facies conditions. This appears to be associated with the emplacement of granites. Subsequent Proterozoic strike-slip reactivation of the Paleoproterozoic Ubende shear

belt did not fundamentally contribute to the near surface exhumation of the high-pressure mafic granulites.

Keywords

- Ar–Ar;
- Exhumation;
- High-pressure granulites;
- Paleoproterozoic;
- Tanzania