Eclogite-to-granulite transition in the Ufipa Complex (Tanzania): Pressure—Temperature—time paths of a Pan-African continental collision zone

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Eclogites and eclogite-facies rocks in most high pressure–ultrahigh pressure (H*P*–UH*P*) metamorphic complexes have generally experienced retrograde metamorphism. In collision zones, deeply subducted continental crust rocks undergo recrystallization/overprinting throughout exhumation. During crustal stabilization of H*P*–UH*P* rocks after a collisional event, granulite- and/or upper amphibolite-facies often obliterates the records of prograde and/or metamorphic peak. Pressure-temperature-time paths often expressed these metamorphic histories in several complex such as the Western Gneiss Region, Eastern Himalaya, and North Qinling. We conducted petrological and geochronological research for partially granulitized eclogite and associated metamorphic rocks of the Neoproterozoic Ufipa Complex (Southwestern Tanzania). We distinguished at least three metamorphic stages, an eclogite stage (M1), a granulite stage (M2), and a retrograde amphibolite stage (M3). Mineral assemblages and geothermobarometry revealed *P*–*T* conditions of 2.4–2.6 GPa and 920–960℃ for the M1 eclogite stage, and 1.3–1.6 GPa and 900–940℃ for the M2 granulite stage. *In-situ* zircon LA-ICP-QMS U–Pb dating and REE geochemistry combined with inclusion mineralogy on polished thin-section yielded an eclogite-facies stage at 588 ±3 Ma. H*P* granulite-facies recrystallization zircons yielded 562 ±3 Ma. These new data suggest a time interval Δt between eclogite facies peak and retrograde H*P* granulite-facies recrystallization of ~26 Mry. Based on these estimations, a clockwise *P*–*T* path was constructed and exhumation rate was yields ~1.0–1.6 km/Mry. This data is consistent with the results of one-dimensional numerical modelling for double thickened crust that assumes that the *P*–*T* path was attributed to tectonic thermal perturbation and relaxation. This model also suggest a clockwise *P*–*T*–*t* path, followed by strong isothermal decompression, which similar to the thermobarometric calculations on the Ufipa eclogites. This model also support high exhumation rate of ~1.0-1.6 km/Mry.

Keywords: eclogite, granulitization, Neoproterozoic, heat transfer, P-T-t path

