Eclogite-to-granulite transition in the Ufipa Complex (Tanzania): the time-lag between collision and the granulitization

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Eclogite-to-granulite transition found in the collisional tectonic regime can provide not only regional tectonic history but also basic principles underlying crustal thickening attributed to the continent-continent collision at convergent plate boundary. In order to understand the dynamics and timescale of collision-induced crustal thickening, we conducted petrological and geochronological research for partially granulitized eclogite and associated metamorphic rocks of the Ufipa Complex (Tanzania).

The Ufipa Complex is a newly confirmed Neoproterozoic metamorphic complex that is equivalent to the Mozambique Belt formed during 'Pan-African orogeny'. Granulitized eclogite is a coarse-grained kyanite-bearing retrograde eclogite with the major mineral assemblage of garnet + omphacite + kyanite + rutile; kyanite contains both omphacite and clinozoisite. Kyanite-free eclogite is medium-grained less-retrograded, bimineralic eclogite. Garnet–omphacite–kyanite–quartz geothermobarometry yielded a P = ~1.9–2.1 GPa and T = ~920–960°C for eclogite stage and P = ~1.3–1.6 GPa and T = ~900–940℃ for high-pressure granulite stage.

LA-ICPQMS zircon U–Pb geochronology for the eclogites revealed that time-lag Δt between collision at ~588 Ma and granulite-facies recrystallization at ~559 Ma was ~30 m.y. Zircon growth during eclogite-facies was confirmed by both mineral inclusions and trace-element abundances. In-situ zircon dating using petrographic thin-sections also confirmed the timing of granulitization. The inferred Δt of ~30 m.y. is consistent with other continental collision zones even in Cenozoic orogens in the literatures.

Keywords: Eclogite, Granulitization, Zircon U-Pb age, In-situ dating, Neoproterozoic, East Africa

