

U-Pb zircon geochronology of partially-melted granulites from the Wannu Complex, Sri Lanka: implications for the timing and duration of high-grade metamorphism

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Sri Lanka is regarded as one of the important regions that record complex tectonic processes of Gondwana amalgamation because of its location in the central part of the collisional orogens formed during Late Neoproterozoic. Although the metamorphic ages of this region have been reported as ca. 550 Ma, the timescale of high-grade metamorphism is not clearly understood. In this study, we therefore focused on the evaluation of the duration of granulite-facies metamorphism based on zircon U-Pb geochronology for two types of leucosomes (garnet-bearing and cordierite-bearing leucocratic rocks) crystallized during prograde and retrograde metamorphisms in order to unravel the period of collisional metamorphism related to the assembly of Gondwana supercontinent. Mineral assemblages of the rocks from Walpita in the Wannu Complex are garnet + quartz + biotite + plagioclase + zircon + magnetite (garnet leucosome) and cordierite + quartz + biotite + plagioclase + K-feldspar + zircon + magnetite + spinel (cordierite leucosome). FIB-TEM analysis of mineral grain boundaries in the leucocratic rocks identified the occurrence of chlorite and sillimanite between quartz grains. Zircon U-Pb analyses of the leucocratic rocks using LA-ICP-MS as well as detailed investigations of zircon microstructures in CL images and REE patterns suggest three age groups of ca. 580 Ma, 550 Ma, and 520 Ma, which probably correspond to prograde, peak, and retrograde metamorphisms, respectively, based on which we estimated the duration of high-grade metamorphism as ca. 60 million years.

Keywords: Gondwana, Sri Lanka, Wannu Complex, zircon U-Pb geochronology, partial melt, FIB-TEM analysis