Metamorphism and geochronology of metapelites and felsic orthogneisses from the Dete-Kamativi Inlier, NW Zimbabwe: Implications for a Rodinia-related intracratonic orogen in Southern Africa

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The Magondi Belt, which outcrops on the western part of the Zimbabwe Craton has been regarded as a Paleoproterozoic orogen formed by the collision of the Zimbabwe Craton and an unknown continental block (terra incognita) during the ca. 2.0 Ga Magondi orogeny (e.g., Master et al., 2010). The Dete-Kamativi Inlier (DKI) situated approximately 200 km west-southwest of the main Magondi Belt has been regarded as an extension of the Magondi Belt because of remarkable lithological correspondence, together with the similarities in terms of ages (e.g., Master, 1991). Here, we report new geochronological data for pelitic schists and a felsic orthogneiss from the DKI using monazites (CHIME method) and zircons (LA-ICP-MS analysis) and discuss the tectonic evolution of the region. Geochronological analysis of zircon grains inherent in a felsic orthogneiss from the Kamativi area revealed a magmatic and metamorphic age of 2279 ± 25 Ma and 2020 ± 28 Ma, respectively. Similar Paleoproterozoic ages of ca. 2.1–1.8 Ga were also obtained from subhedral and rounded monazite grains in the pelitic schists. In contrast, irregular-shaped monazite intergrown with biotite in a different pelitic schist gave three latest Mesoproterozoic isochron ages of 1196 ± 37 Ma, 1143 ± 32 Ma, and 1070 ± 25 Ma, suggesting a long-lived (>120 million years) thermal event with several monazite-growing stages. Consistent isochron ages of 1062 ± 41 Ma and 1061 ± 26 Ma were obtained from monazites in the felsic orthogneiss and metapelite samples from an adjacent region. Garnet-biotite geothermometers revealed a peak *P–T* condition of 520–600 °C and 1.5–2.5 kbar for the peak mineral assemblage in the garnet-andalusite-biotite-cordierite-bearing pelitic schist with 1196-1070 Ma metamorphic ages, suggesting low-pressure amphibolite-facies metamorphism. The condition is lower than that obtained from the hornblende-plagioclase geothermometry of amphibolites (>700 °C) from the southwest part of the DKI, which probably corresponds to an earlier (ca. 2.0 Ga) high-grade metamorphic condition. The youngest thermal event, 994–982 Ma, from monazite rim in a mylonitic orthogneiss might correspond to the timing of later heating related to deformation. The latest Mesoproterozoic (1.2–1.1 Ga) amphibolite-facies metamorphism was likely associated with an intracratonic orogeny related to the activity of broadly coeval orogenic events (e.g., Namaqualand orogen) related to the amalgamation of the Rodinia supercontinent (e.g., Li et al., 2008).

References

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