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Fluid-fluxed partial melting of the Buncheon granitic gneiss in the Yeongnam Massif, Korea: Protracted (ca. 1.86–1.84 Ga) reworking of the Paleoproterozoic Korean arc

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In order to investigate the fluid-fluxed melting in the Buncheon granitic gneiss, Yeongnam Massif, we combined field, microstructural, and geochemical studies with the U–Pb and oxygen isotopic analyses of zircon and monazite. The granitic gneisses are typified by metatexitic migmatites containing (un)segregated leucosomes, although neither melanosomes nor peritectic phases are associated with neosomes. These migmatites underwent syn-kinematic wet melting that took place at ~650–750 °C and 4–6 kbar. SHRIMP U–Pb ages of zircon and monazite were determined from two granitic gneisses and three leucosomes. Zircon grains are oscillatory-zoned, except for homogeneous overgrowth rims rarely present in two leucosomes. Both zircon domains were dated at ca. 1.98–1.97 Ga and ca. 1.86 Ga, respectively, suggesting that igneous protoliths were partly recrystallized during the late Orosirian. Monazites from two gneisses containing former melts yielded a pooled $^{207}Pb/^{206}Pb$ age of 1859 ± 6 Ma. In contrast, monazites from a leucosome are inclusion-free, and yielded the youngest age of 1840 ± 16 Ma. This result is interpreted to represent the melt crystallization at ca. 1.84 Ga following the ca. 1.86 Ga anatexis. The $\delta^{18}O$ values of ca. 1.98–1.97 Ga igneous zircon in granitic gneisses are 7.1–7.2 ‰, but those from the leucosome are reduced at 5.9–6.7 ‰. The latter is largely identical to 5.7–6.7 ‰ estimated from ca. 1.86 Ga domains of zircons in the leucosome and monazites in the gneiss; in contrast, slightly lower $\delta^{18}O$ values of 5.46 ± 0.61 ‰ are recorded in ca. 1.84 Ga monazites of the leucosome. The relatively low $\delta^{18}O$ values are most likely accounted for by an influx of fluid enriched in seawater component that has apparently triggered partial melting in the granitic gneiss. Taken together, in contrast to the majority of zircons preserving the crystallization age of igneous protoliths, monazites are more susceptible to recrystallization during the fluid-present melting and permit us to decode a protracted (~20 Ma) episode from partial melting to melt crystallization in the Yeongnam Massif. Such a longevity of melt-present system typifies the prolonged crustal reworking of Paleoproterozoic Korean arc situated at the eastern margin of the North China Craton.