

Zircon U-Pb and Hf-O isotope compositions of the Paleoproterozoic granitoids in southwestern Yeongnam Massif, South Korea: the development of the Paleoproterozoic magmatic arc

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The Yeongnam Massif is located in the southern part of the Korean Peninsula and forms a part of the basement of the Korean Peninsula along with Kwanmo, Nangnim and Gyeonggi massifs. The multiple Paleoproterozoic magmatic activities occurred between 2000 Ma and 1860 Ma are preserved in the central to northeastern part of the Yeongnam Massif, and these events are considered to be crucial for understanding the tectonic evolution of northeast Asia. However, it remains unclear whether the multiple magmatic activities occurred in the western part of the Yeongnam Massif. In this study, we conducted zircon U-Pb and Hf-O isotope analysis on the newly identified Paleoproterozoic granitoids (biotite granite and leucogranite) in the southwestern part of the Yeongnam Massif. The result of zircon U-Pb analysis shows that the granitoids emplaced at ca. 2000–1987 Ma. Zircon Lu-Hf isotopic compositions yielded negative to positive $\epsilon\text{Hf}(t)$ values (+ 4.52 to -9.49) with Paleoproterozoic to Neoproterozoic modal age indicating a derivation from ancient crustal materials. Oxygen isotope ratios of magmatic zircon yielded 6.1–7.1 ‰. These geochronological and isotopic data closely align with those of the Paleoproterozoic arc-related granitoids in the central to northeastern Yeongnam Massif. It indicates that the Paleoproterozoic magmatic arc developed whole of the Yeongnam Massif (~ 400 km in lineal distance). Since there is no evidence of the Paleoproterozoic (ca. 2000–1987 Ma) arc-related magmatic activity in other parts of the Korean Peninsula and North China Craton, the Yeongnam Massif may have existed as a separate terrane, distinct from the major continental block in northeast Asia during the Paleoproterozoic.