A Paleoproterozoic basement beneath the Rangrim massif revealed by the in situ U-Pb ages and Hf isotopes of xenocrystic zircons from Triassic kimberlites of the North Korea

YU-SHENG ZHU[1,2]*, JIN-HUI YANG[1,2,3], HAO WANG[1,2], FU-YUAN WU[1,2,3]

[1]State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, 100029, China

[2]Institutions of Earth Science, Chinese Academy of Sciences, Beijing, 100029, China

[3]University of Chinese Academy of Sciences, Beijing 100049, China

(Correspondence: zhuyusheng@mail.iggcas.ac.cn)

Zircon xenocrysts from the kimberlites offer a unique opportunity to identify the cryptic basement components hidden in the deep crust and thus to image lithospheric structure and crustal evolution. Zircon xenocrysts from the Triassic kimberlites, exposed in the Rangrim massif of North Korea, were selected for in situ U-Pb and Hf analyses. These zircon xenocrysts are all crust-derived. Their U-Pb age spectrum is characterized by one prominent age population at ca. 1.9-1.8 Ga without any Archean ages, indicating a Paleoproterozoic-dominated basement in the depth of the Rangrim massif. Archean basement should be very limited or absent at depth. This is different with the previous thought of the Rangrim massif being an Archean terrane. However, most of those Paleoproterozoic zircons display negative $\varepsilon_{Hf}(t)$ values (-9.7~+0.7) with the average Hf model age of 2.83 ± 0.09 Ga (2σ), implying that protoliths of those zircons were not juvenile but derived from reworking of the pre-existed Archean basement. These observations argue for a strong crustal reworking event occurred in the Rangriam massif during Paleoproterozoic, which exhausted most of the pre-existed Archean basement rocks and generated a large abundance of Paleoproterozoic rocks. The 1.9~1.8 Ga thermal event has been well documented in the adjacent Jiao-Liao-Ji orogenic belt of the North China Craton. Both of them are characterized by the widely distributed 1.9~1.8 Ga magmatism and share similar igneous rock assemblage. We suggest that the Rangrim massif may be the eastern extension of the Jiao-Liao-Ji belt in North Korea, constituting part of a huge Paleoproterozoic orogen in the eastern margin of the Sino-Korean craton.