Detrital zircon U-Pb and Hf isotope studies of the Paleozoic successions in the Korean Peninsula: Implications for the provenances and tectonic evolution of the Phanerozoic orogenic belts

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Paleozoic orogenic belts developed between the basement rocks in the southern Korean Peninsula records important information to reconstruct the tectonic evolution of East Asia. Here we present SHRIMP and LA–(MC)–ICP MS U-Pb ages and Hf isotopes of detrital zircon grains from the Paleozoic metasedimentary successions that are incorporated into the major Phanerozoic orogenic belts (Okcheon and Hongseong-Imjingang Belts) in South Korea, providing new insights into provenances and tectonic evolution during the Paleozoic period. Based on the internal structures of the zircons from all the samples, they are mostly derived from igneous source rocks, showing two distinct spectra patterns in their presence/absence of Neoproterozoic ages. Our results suggest that (1) the presence/absence of the Grenville-age (ca. 1.3–0.9 Ga) detrital zircons and Hf data from the Early Paleozoic Joseon Supergroup in the Okcheon Belt suggest their derivations from different peripheral clastic provenances at least after the Early Cambrian, (2) ages and Hf isotope signatures of dominant Early Neoproterozoic and Silurian-Devonian detrital zircon populations from the Middle Paleozoic metasedimentary rocks in the Hongseong-Imjingang Belt reflect magmatic history involving juvenile input and crustal reworking, and (3) zircons from the Late Paleozoic Pyeongan Supergroup in the Okcheon Belt display dominant Paleoproterozoic and Carboniferous-Permain ages with Hf patterns showing vertical mixing trends between juvenile and recycled crustal material. These results, integrated with U-Pb and Hf isotope data from other parts of the Korean Peninsula and the Chinese cratons, will eventually help to understand the spatial and temporal relations of basins and orogenic belts in the Korean Peninsula, and will further provide important clues about Paleozoic evolution of the Korean Peninsula in relation to the tectonic history of East Asia.