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GEOCHRONOLOGY AND GEOCHEMISTRY OF LATE CARBONIFEROUS–MIDDLE PERMIAN I- AND A-TYPE GRANITES AND GABBRO–DIORITES IN THE EASTERN JIAMUSI MASSIF, NE, CHINA: IMPLICATIONS FOR A TECTONIC TRANSITION

Junhui Bi and Wenchun Ge
College of Earth Sciences, Jilin University, Changchun, China (gewenchun@jlu.edu.cn)

The late Paleozoic magmatism in the Jiamusi Massif of northeast China, located in the eastern segment of the Central Asian Orogenic Belt (CAOB), was dominated by an active continental margin environment due to subduction of the paleo-oceanic plate. Nevertheless, what deep geodynamic processes controlled the late Paleozoic evolution of the Jiamusi Massif are still poorly constrained. In this contribution, we present zircon U-Pb ages and geochemical data of late Carboniferous–middle Permian magmatism in the Jiamusi Massif, aiming to provide constraints on the question. Precise LA–ICP–MS U–Pb zircon ages indicate that the granitoids and gabbro–diorites were emplaced in the late Carboniferous–middle Permian (302–267 Ma). The granites belong to a high-potassium calc-alkaline series, are weakly peraluminous I- and A-type granites, and show high SiO_2 and K_2O contents; they are depleted in high field strength elements (HFSEs), enriched in light rare earth elements (LREEs) and large ion lithophile elements (LILEs), show weakly to mildly fractionated REE patterns, and on spidergrams show arc-type affinities with strong depletions in Nb, Ta, and Ti. The combination of heterogeneous values of ε_{Hf}(t) for magmatic zircons in all granitoids (ranging from +7.9 to –5.6) and two-stage Hf model ages (T_{DM2}) of 0.8–1.7 Ga suggests that the granites originated from partial melting of a predominantly “old” Meso–Neoproterozoic crustal source. The gabbro–diorites of the Longtouqiao pluton are depleted in Nb, Ta, P, and Ti, and show flat distributions of most LILEs and HFSEs, except for marked large positive anomalies in Ba, K, and Pb. These features reflect limited degrees of crustal contamination associated with subduction-related magma processes. These data, together with previously reported data and the occurrence of arc magmatic rocks along the eastern part of the Jiamusi Massif, suggest that the intrusive rocks formed during westward subduction of the Paleo-Pacific Ocean lithosphere. The coeval A-type granites and gabbros identified in the eastern Jiamusi Massif indicate a significant Permian extensional event in the region, likely caused by slab break-off of the subducting Paleo-Pacific oceanic plate. During this geodynamic process, strong rapid linear upwelling of asthenospheric mantle caused regional extension of overlying continental lithosphere, thus providing the mantle components for the large-scale late Paleozoic magmatism observed in the eastern Jiamusi Massif.