

Geochemistry and zircon U-Pb dating of Paleozoic high-pressure metamorphic rocks in South Kitakami Belt, northeastern Japan: Constraints on Paleozoic tectonics along proto-East Asian continental margins

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High-pressure metamorphic rocks associated with serpentinite and amphibolite are distributed in the Motai, Yamagami, Matsugadaira, and Yaguki areas in South Kitakami Belt, northeast Japan. They have been considered to be a series of Paleozoic high-pressure metamorphic rocks (called Motai-Matsugadaira Belt). In the present study, we examined geochemical characteristics and zircon U-Pb age of Paleozoic high-pressure metamorphic rocks in South Kitakami Belt to constrain Paleozoic tectonics along proto-East Asian continental margins. Meta-igneous rocks are classified into four groups according to metamorphic facies and trace-element characteristics. Group 1 to Group 3 underwent epidote-amphibolite to amphibolite facies metamorphism, and Group 4 suffered blueschist facies metamorphism. The comprehensive examinations of rare earth- and trace-element patterns indicate that Group 1 has island arc affinities, and Group 2 and Group 4 were formed at spreading environments. The geochemistry of Group 3 is similar to that of MORB-like depleted lavas formed at subduction initiation. The weighted-mean ages of igneous zircon obtained from Group 1 and Group 2 were about 482 and 475 Ma, respectively. In addition, the metamorphic age of 468 Ma was obtained from low Th/U zircons in Group 2. These lines of geochemical and geochronological evidence indicate that ridge subduction occurred in an Ordovician hot mantle wedge and also promoted tectonic erosion. Detrital zircons in psammitic schists from Motai-Matsugadaira Belt show similar U-Pb age-distribution patterns with Devonian depositional ages, indicating that Motai-Matsugadaira Belt formed the same Carboniferous high-pressure metamorphic rocks. In addition, the psammitic schists contain Neoproterozoic detrital zircons, suggesting that the South China Craton was included as a provenance. The psammitic schists and Group 4 experienced subduction and metamorphism in a Carboniferous cold mantle wedge. The petrological and geochronological features of Motai-Matsugadaira Belt are similar to Renge and the Kurosegawa Belts, southwestern Japan. These were formed in a series of plate convergence regions developed in the Early Paleozoic. From the Ordovician to the Carboniferous, South Kitakami Belt records subduction initiation, ridge subduction, and tectonic erosion in the subduction zone that developed along the margins of the South China Craton.

Keywords: South Kitakami Belt, Zircon U-Pb dating, Paleozoic subduction zone tectonics