

## Precise timing of HP metamorphism in the Hida Gaien Belt, Japan: Implications for the Paleozoic tectonic history of proto-Japan

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Paleozoic tectonic history of Proto-Japan is important in understanding the geology of Japan and its relation to Eurasia. Hida Gaien Belt is one of the key geological units that expose high-pressure (HP) rocks associated with serpentine mélangé. In the Omi area, Niigata prefecture, HP metamorphic rocks belonging to the Hida Gaien Belt are distributed in a narrow belt. Two new eclogite localities were discovered, for which contrasting P-T paths are deduced, one is a medium temperature (MT) -type and the other low temperature (LT) -type. The metamorphic evolution of the LT-type eclogite is characterized by a tight hairpin shaped P-T path from blueschist facies to eclogite facies and back to blueschist facies, whereas MT-type eclogite has been affected by higher temperature metamorphism. The prograde stage of the MT-type eclogite is characterized by various types of amphibole (winchite, barroisite, glaucophane) inclusions in garnet.

Equilibrium conditions of the MT-type eclogite estimated from the residual pressure and conventional geothermobarometric estimates range from 670 to 730 °C at c.2.2 GPa, which is about 100 °C higher than LT-type eclogite at a given pressure condition. The blueschist facies overprint after peak eclogite facies condition is identified by the abundant occurrence of glaucophane in the matrix. Barroisite grains occur in the contact between glaucophane grains suggesting its formation during isothermal decompression to 0.7–1.5 GPa, constrained using the maximum stability of barroisite. Quartz + albite vein crosscutting eclogite schistosity and the occurrence of euhedral actinolite and chlorite in the vein suggests greenschist facies retrogression.

Zircon grains in the blueschist facies samples collected from two localities have distinct core and rim structure with a clear oscillatory zoning in the core. LA-ICP MS U-Pb ages of detrital core suggest ages in a wide range of 3200–400 Ma with a peak at 600–400 Ma. In early Paleozoic, the proto Japan is supposed to have located in the continental margin of South China whereby older population of detrital zircon grains (3200–600 Ma) were deposited in the trench-fill sediments. In addition, subduction related plutonism (around 500–400 Ma) is observed in the crust below the proto Japan. The peak metamorphic age was constrained by the SHRIMP dating of rims, which gave Tournaisian ages of 347 ± 4 Ma, which suggest plate subduction has occurred in the early Carboniferous. Our results provide a tight constraint on the timing of accretion, subduction, and the development of arc-trench system in the continental margins of South China craton and help to unravel the Paleozoic tectonic history of proto-Japan

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