

Unit division and metamorphic conditions of the Northern Chichibu belt in central Shikoku

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There is a general consensus that part of the Northern Chichibu belt underwent the Sanbagawa metamorphism (i.e., Cretaceous high P/T metamorphism). However, the Sanbagawa belt proper represents metamorphosed Late Cretaceous accretionary complex, and thus tectonic implications of the Sanbagawa metamorphism in the Mikabu and N. Chichibu belts (Jurassic to Early Cretaceous accretionary complex) must be reconsidered. For this purpose, it is important to unravel metamorphic history of each unit within the N. Chichibu belt. The present study focuses on the Motoyama district of central Shikoku whereby primary structural relationship among the Sanbagawa, Mikabu and N. Chichibu belts are well preserved. I will report the results of geological mapping and petrological observation on ~200 metabasite samples from the Mikabu and N. Chichibu belts in the Motoyama district.

The N. Chichibu belt in the Motoyama district is composed of three units: the Kashiwagi, Kamiyoshida and Sumaizuku units, following to the unit terminology of Matsuoka et al. (1998). The Kashiwagi unit shows an interfinger relationship with the Mikabu ophiolitic unit, and they can be treated as the Mikabu-Kashiwagi unit. The Kamiyoshida unit overlays the Kashiwagi unit and is overlain by the Sumaizuku unit by south-dipping boundaries.

The Mikabu-Kashiwagi unit was unambiguously affected by the Sanbagawa metamorphism, and the occurrence of metamorphic aragonite (Suzuki & Ishizuka, 1998) suggests peak metamorphic pressures of >0.7 GPa at 300 °C. However, relatively low jadeite content in alkali pyroxene coexisting with quartz, and amphibole compositions (magnesian riebeckite to actinolite) in the presence of epidote suggest that the main stage of metamorphic recrystallization took place at lower pressure conditions.

Although the general trend of southward decrease in metamorphic grade has been inferred from the degree of metamorphic recrystallization and deformation structures, quantitative metamorphic conditions of the Kamiyoshida and Sumaizuku units have not been constrained. The Kamiyoshida unit is characterized by the occurrence of alkaline basaltic volcanic breccia with metamorphic minerals of magnesian riebeckite, calcite and stilpnomelane. Recently, jadeite has been discovered from quartz- and riebeckite-free metaigneous rocks in the Kamiyoshida unit. Decompression P-T path from 0.6-0.7 GPa, 300 °C to 0.4 GPa, 210-260 °C has been derived from zoned sodic pyroxene with a jadeite core and an aegirine rim (Endo, 2015).

The Sumaizuku unit is characterized by the occurrence of prehnite-pumpellyite-epidote-quartz veins in massive basalt and dolerite. No alkali pyroxene or Na amphibole is found. These observations appear to imply the lack of high-P/T metamorphism on this unit. However, lawsonite-pumpellyite-quartz veins were newly discovered from this unit. Lawsonite in the vein locally forms fine-scale Lws-Qz intergrowths with a prismatic outline, interpreted as pseudomorphs after laumontite. This texture suggests compression to >0.3 GPa at 200-250 °C. It is likely that prehnite-bearing veins formed during a decompression stage.

The N. Chichibu belt has long-term history in the accretionary wedge. Apparently gradual Sanbagawa metamorphism of the N. Chichibu belt may be related to exhumation-related metamorphism caused by underplating of new accretionary units in the Cretaceous subduction zone.

Keywords: Northern Chichibu belt, low-grade metamorphism, pressure-temperature history, jadeite, lawsonite