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Tectonics of the Kamuikotan metamorphic rocks distributed in the western part of Asahikawa-city, Hokkaido, Japan

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We have studied the tectonics of the Kamuikotan metamorphic rocks, central Hokkaido, which were developed in the Sorati-Yezo Belt convergent boundary between the Eurasian continent and the subducting oceanic plate in the Cretaceous. The Kamuikotan metamorphic rocks are known as typical high?P/T type metamorphic rocks, where P is pressure, T is temperature, respectively. In this study, we investigated the western part of the Kamuikotan gorge area, the western part of Asahikawa-city. The rocks in this area were characterized by a peculiar P-T path and mineral assemblages different from any other metamorphic rocks in the Kamuikotan metamorphic belt. First, we analyzed the tectonics of the Kamuikotan metamorphic rocks from geological and petrological approach (i.e., field work, chemical composition analyses of both minerals and whole rocks). Based on field work, it has been found that the protolith stratigraphy in this area is composed of a typical accretionary stratigraphy (basaltic rocks, limestone, chart and mudstone in ascending order), which was repeated by thrust. Further, three deformation stages (D1, D2 and D3) have been revealed by the overlapping relationships among folds. D1 is characterized by main schistosity (S1), D2 is characterized by east-vergent close folding (F2), and D3 is characterized by crenulation cleavages (S3). Next, we analyzed the P-T path from blueschist to greenschist facies, and further to the surface of the earth for a mafic schist that includes Na-amphibole surrounded by actinolite. We constrained the range of P and T by the pseudosection method. As a result, it has been found that the P-T range lies on the reaction line between pumpellyite and epidote on condition that pumpellyite, epidote and albite coexist. (P is 3.6-4.5 kbar, T is 280-29oC or P is 3.4-4.7 kbar, T is 275-30oC. This difference in P and T is from amphibole model.) Further, we estimated the formation temperature of epidote in equilibrium with pumpellyite from the pistacite component (0.27-0.31) (Nakajima et al., 1976), which yielded the temperature range of 296-31oC. In the same way, we estimated the formation temperature of chlorite from the chemical composition (Inoue et al., 2009), which yielded the temperature range of 121-24oC if all Fe is Fe2+, and that of 109-220oC if some Fe is Fe3+ (Vidal et al., 2005). In addition, we estimated isochore from homogenization temperatures of fluid inclusions in quartz (101-13oC) that coexisted with chlorite used for the estimate of formation temperature. Integrating all these results, we analyzed P-T path. First, from blueschist facies, temperature increased and pressure decreased to reach or pass through the reaction line between pumpellyite and epidote. Next, pressure decreased toward the isochore of fluid inclusions at constant temperature of c. 300 oC inferred from deformation microstructures in quartz indicating brittle-ductile transition. Furthermore, temperature and pressure decreased toward the formation temperature of chlorite. Finally, we have speculated that the increase of temperature from blueschist to greenschist facies could have been caused by fluid infiltration in the rocks.