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Tectonic blocks in the Kamuikotan metamorphic rocks with distinct P-T paths, Etanbetsu-Horokanai district, Hokkaido

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The Kamuikotan metamorphic rocks are known as typical high-*P/T* type metamorphic rocks formed at a convergent boundary. One the other hand, in the study area, the Horokanai ?Etanbetsu district, while accretionary sediments suffered a high-*P/T* type metamorphism, amphibolites formed by an intermediate-*P/T* type metamorphism also occur as tectonic blocks, which later suffered the same high-*P/T* type metamorphism as the sediments did (Watanabe et al., 1986). In order to argue about the metamorphic history and tectonics of these amphibolites, it is important to estimate the temperature and pressure changes (*P-T* paths) during metamorphism strictly. Furthermore, it is necessary to analyze deformation structures, which recorded a motion of metamorphic rocks. Accordingly, in this research, we have analyzed mineral assemblages in these amphibolites, and conducted micro-chemical analyses of compositional zoning in amphiboles from these rocks with an EPMA. Further, we have analyzed the pressure and temperature conditions which the amphibolite experienced based on a thermodynamic calculation (i.e. pseudosection). As a result, amphiboles which constitute the amphibolites can be divided into 7 types in terms of compositional zoning in amphiboles. Type I amphibole is characterized by the compositional zoning from actinolite core to glaucophane rim. Therefore, it can be inferred that greenschist facies metamorphism was overprinted by blueschist facies metamorphism. Here, we inferred that no cooling was experienced in the amphibolites during the poly-metamorphism, because neither pumpellyite nor lawsonite which is expected to form at high pressure and low temperature conditions was not formed. Therefore, it is thought that this sample only experienced the pressure increase without cooling during the poly-metamorphism. Type II amphibole is characterized by the compositional zoning in amphiboles from magnesiohornblende core indicating amphibolite facies metamorphism through actinolite mantle indicating greenschist facies metamorphism to glaucophane rim indicating blueschist facies metamorphism. Therefore, a *P-T* path such as pressure increase after cooling is suggested. Type III is characterized by the compositional zoning in amphiboles from tschermakite core to glaucophane-magnesioriebeckite rim. It is inferred from compositional zoning in garnet that both temperature and pressure increased in the garnet amphibolite, which was followed by blueschist facies metamorphism inferred by the compositional zoning in amphibole. Therefore, in this area, there are at least three different types of amphibolites which show different *P-T* paths. Since these three types of amphibolites show different overall paleo-geothermal gradients based on the compositions of amphiboles, we inferred that the paleo-geothermal gradient decreased from low-*P/T* (or intermediate-*P/T*) type to high-*P/T* type during the poly-metamorphism, which is best represented by the compositional zoning of type II amphibole. These facts could indicate that the paleo-subduction zone was cooled, and three different types of amphibolites which may have been formed at different paleo-geothermal gradients in different ages, were later assembled as tectonic blocks with different temperature-pressure-time paths in the Horokanai-Etanbetsu district.

Keywords: the Kamuikotan metamorphic rocks, high-P/T metamorphism, tectonic blocks, pressure-temperature path, compositional zoning in amphiboles