Appraisal of the tectonics of the Kamuikotan metamorphic rocks around the Asahikawa City, central Hokkaido: Zircon U-Pb ages and contact metamorphism by fluid migration

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The Cretaceous high-P/T type Kamuikotan metamorphic rocks (KMRs) are distributed in central Hokkaido, northern Japan which extend to the north as far as Sakhalin, Russia. Sakakibara and Ota (1994) divided the KMRs into the six units on the basis of lithology, metamorphic grade, and metamorphic age. The six units also were classified into the following three types based on metamorphic mineral assemblages: high-pressure 1 (HP1; geothermal gradient G = ~10℃/km), high-pressure 2 (HP2; G = ~13℃/km), and high-pressure intermediate (HI; G = ~20℃/km) types. According to Sakakibara and Ota (1994), the K-Ar and ^{40}Ar-^{39}Ar ages of phengitic mica from the KMRs are divided into three groups: 108-145 Ma for HP1, 91-107 Ma for HP2 and 50-84 Ma for HI types. Some questions, however, arise concerning these classifications around the Asahikawa City. First, their age distribution seems not unidirectional but random, although each unit appears to occur originally as a thrust sheet. Second, the K-Ar ages of the HI-type Pankehoronai (Pk) unit and younger ones of the HP2-type Harushinai (Hr) unit (after Sakakibara and Ota, 1994) overlap at 70-85 Ma (Okamoto et al., 2015). Third, the age difference between adjacent localities is large and sometimes exceeds a few tens of millions of year. Furthermore, recently reported U-Pb zircon ages (Okamoto et al., 2014) show that the depositional age for the Pk unit (115-120 Ma) along the Ishikari River is slightly older than that for the Hr unit (100 Ma). On the other hand, along the branch of the Ishikari River, 80 Ma of U-Pb age for the Pk unit is also reported (Nagata et al., 2015). Therefore, the Pk unit defined by Sakakibara and Ota (1994) can be divided into two units, older and younger units. This younger unit may be correlated with the Oboke area (i.e. Shimanto belt) in the central Shikoku, which also yielded detrital zircon ages of 80 Ma (Aoki et al., 2007). In this study, we have analyzed lithology and metamorphic minerals from metapelites and metabasites in the Pk unit. The older unit consists of pelitic and mafic schists, calcareous rocks and cherts along the Ishikari River, but in contrast, the younger unit consists of pelitic and mafic schists. For metamorphic minerals, while lawsonite occurs in the older unit, it does not exist in the younger one. These facts support the idea that the previously defined Pk unit can be divied into the older and younger units. In the younger unit, while pumpellyite occurs along the branch of the Ishikari River, epidote occurs along the Pankehoronai and Orowen Rivers from metamorphosed mafic rocks, indicating that the metamorphic temperature is higher in the latter than the former area. This fact together with the spatially heterogeneous distribution of white mica K-Ar ages could be attributed to contact metamorphism caused by fluid migration in the Pk unit.

Keywords: Kamuikotan metamorphic rocks, tectonics, fluid migration, zircon U-Pb ages, white mica K-Ar ages, metamorphic mineral assemblages

