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Tectono-metamorphic evolution of the upper sequence of Hidaka Metamorphic rocks in Satsunai-gawa River, Hokkaido, Japan

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Hidaka Metamorphic Belt (HMB) is one of the youngest *HT-LP* metamorphic belts, that provide an opportunity to investigate the low-grade metamorphism in the upper to lower cross-section of magmatic arc. The previous studies have mainly considered the lower sequence of metamorphic rocks from the various viewpoints of magmatism, metamorphism and deformation (e.g. Osanai et al. 1991; Toyoshima et al. 1994). Most of such studies on metamorphic and structural evolution of HMB are based on the data from high-grade metamorphic rocks and associated igneous rocks. Here, we propose new constraints on the tectono-metamorphic evolution of upper sequence of Hidaka Metamorphic rocks based on a comprehensive field mapping and structural analysis of upper sequence of HMB in the upper reach of Satsunai-gawa River, Hokkaido, Japan combined with Raman Spectra of Carbonaceous Material (RSCM) thermometry and Illite Crystallinity.

The study area is mainly grouped into two metamorphic zones, which are composed of muscovite-chlorite (Zone I), muscovite-biotite+/-chlorite assemblages and muscovite-biotite (Zone II), respectively. The muscovite-chlorite metasediments are metamorphosed at the peak condition of 200-400 degree C based on the RSCM thermometry and IC data, and the muscovite-biotite metasediments, schist and gneiss are metamorphosed at about 400 to 650 degree C. Peak metamorphic pattern and mineral assemblages are progressively changed from the eastern to the western area, suggesting the geothermal gradient of 39-47 degree C / km (R2 = 0.8 to 0.9). In addition to the understanding of thermal gradients, we also attempted a detailed structural analysis of metasedimentary rocks based on the data of Koyasu et al. (2007). In the study area, the structural evolution can be mainly grouped into three tectonic events; Stage I to Stage III. Stage I is characterized by the tectonic thickening of fore arc sediments (D0 stage), shearing (D1 stage), large-scale folding (B2) and sinistral and normal sense of shear (D2 stage), and layer-normal shortening of D3 quartz veins and metamorphic rocks (D4 stage) during prograde metamorphism. After these deformations, S-type tonalites intruded in these metamorphic rocks during stage II. The biotite-muscovite gneisses are mainly deformed by dextral and normal sense of shear before (D5 stage) and after the intrusion of D6 tonalites (D7 stage). Some metasedimentary layers were deformed by the sinistral and normal sense of shear (D8 stage) during retrograde metamorphism. Finally, brittle deformations are observed within the metasediments and tonalites during stage III. That D9 deformation involved the N-S to NW-SE shearing and cut the regional schistosities, B2 folding and peak metamorphic pattern (M1 thermal gradient).

At the B2 axial area, the S1 schistosity is cut by the S2 schistosity at high angle, and the syn- or post-D2 cordierite porphyroblasts are observed along to the S2 schistosity. In addition, the peak metamorphic pattern based on RSCM thermometry shows slightly oblique to the regional S1 schistosity, D0 bedding plane, and map-scale folding. These data suggest that the peak metamorphic event (M1) involved between B2 folding and the intrusion of the tonalities, and these events in the upper sequence contradict with the tectonic, metamorphic and geochronological evolutions of lower sequence. Detailed relationship between peak metamorphism and tectonic evolution of upper sequence of HMB is going to discuss in poster session.

Reference: Osanai et al., 1991. J. Metamorph. Geol. 9, 111-124. Toyoshima et al., 1994. Isl. Arc 3, 182-198. Koyasu et al. 2007. JPGU meeting, abstract.

Keywords: RSCM thermometry, Illite crystallinity, graphite, Structural evolution