Processes of subduction initiation revealed by P-T paths of amphibolite and blueschist tectonic blocks in serpentinite mélange: An example from the Kamuikotan high-P/T metamorphic rocks in Hokkaido, northern Japan

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It has been recently noted that serpentinite mélange which contains tectonic blocks of high-*P/T* type metamorphic rocks such as blueschist and eclogite and their counterclockwise P-T paths could indicate the subduction initiation (e.g. Willner et al., 2004; Escuder-Viruete et al., 2011; Agard et al., 2016; Bhowmik and Ao, 2016; Hunziker et al., 2017). We investigated tectonics in amphibolite and blueschist tectonic blocks in mélange, which are distributed at the highest structural level of the high-*P/T* type Kamuikotan metamorphic rocks in Hokkaido, northern Japan. We reconstructed their individual pressure-temperature (*P-T*) paths based on petrography, mineral chemistry and phase equilibria modeling. As a result, tectonic blocks in this study area are divided into six rock types: garnet-epidote amphibolite, epidote amphibolite, amphibolite, plagioclase-poor amphibolite, blueschist and quartz-rich blueschist. From the reconstruction of *P-T* paths, it is found that most of the tectonic blocks experienced blueschist facies metamorphism probably at the maximum depth, while the initial paths vary from a counterclockwise *P-T* path shown by different kinds of amphibolite to a prograde *P-T* path shown by blueschist and quartz-rich blueschist. We have concluded that these *P-T* paths, on the whole, could have reflected the cooling history of subduction channel from the beginning to steady state of subduction. The geothermal gradient could have been changed from ~25 ˚C/km to ~10 ˚C/km within *c.* 25 myr estimated by previously reported radiometric ages. These tectonic blocks could have started to subduct at a different timing to show the different *P-T* paths, and juxtaposed against each other at a certain depth in the subduction channel. Since these tectonic blocks show little deformation structures formed during exhumation stage, they might have behaved as a rigid body in serpentinite (i.e. mélange matrix) after they were incorporated in it during subduction stage.

Keywords: Kamuikotan high-P/T type metamorrphic rocks, amphibolite and blueschist tectonic blocks in serpentinite mélange, counterclockwise P-T paths, subduction initiation

