Estimation of P-T history of amphibolite tectonic blocks in serpentinite mélange of Kamuikotan metamorphic rocks

*Yuto Kimura[1], Toru Takeshita[1]

1. Department of Natural History Sciences, Graduate School of Science, Hokkaido University

Serpentinite mélange is a geological body which contains fragments(these are called tectonic blocks)of metamorphosed oceanic crust and sedimentary rocks.The tectonic blocks in serpentinite mélange have experienced various pressure and temperature conditions in the subduction channel.Serpentinite mé lange of the Kamuikotan metamorphic belt which is distributed in the central part of Hokkaido.According to Ishizuka and Imaizumi(1983),the estimated P-T histories are such ones where prograde metamorphism at intermediate-pressure conditions occur first,which are followed by retrograde metamorphism at high-pressure conditions based on the compositional zoning of minerals.However,Okamoto(2016)and Ando(2018)reported that many types of amphibolites are distributed in the area and compositional zoning of these minerals were found to be varied.This presentation describes new findings about tectonics and thermal evolution in the subduction zonebased on the P-T histories of the amphibolite blocks.The study area,Dainuppu river is located at c.30km northwest of Asahikawa city.Many types of amphibolite blocks occur in this area.Garnet-epidote-amphibolite show the mineral assemblage,Grt+Ep+Ca-Amp+Na-Amp+Ttn+Rt±Chl±Ms± Op,epidote-amphibolite,Ep+Ca-Amp+Na-Amp+Ttn±Rt±Chl+Ms+Qtz±Op and Chlorite rich epidote amphibolie,Ep+Ca-Amp+Ttn+Chl+Ms+Qtz±Op.The protolith of these samples is thought to derive from mafic rocks.P-T history of these samples were estimated by compositional zoning of minerals.In particular,P-T conditions of garnet-epidote-amphibolites are estimated by THERIAK-DOMINO(de Capitani and Petrakakis, 2010).As a result of these analysis,garnets recorded incleasing temperature path as shown by decresing Mn content from core to rim.Peak metamorphism of garnet-epidote-amphibolites were predicted from THERIAK-DOMINO,T=650℃,P=9.5kbar.Pistacite content($Ps=Fe^{3+}/(Fe^{3+}+Al)\times 100$)indicates decreasing temperature path as shown by increasing the ratio from core to rim(Ps=9.5 to~ 30)for all of matrix epidote.In particular, pistacite content of garnet-epidote-amphibolites recorded greater decreasing temperature than other samples.Almost all amphiboles indicate retrograde metamorphism from core to rim.Except chlorite rich epidote amphibolite,the Na-amphiboles overgrew hornblende~barroisite,shown by the drastic increases of the $^{(B)}Na$(~0.5p.f.u in core to 1.5-2.0p.f.u in rim).On the other hand,$Al^{(IV)}$ decrease 1.8-1.0 p.f.u.This retrograde metamorphism can be divided into two stages:the first where $^{(B)}Na$ remains almost unchanged at 0.55p.f.u and $Al^{(IV)}$ gradually decreases from 1.9 to 1.0-1.5p.f.u from core to rim,second which is characterized by drastic decreasing $Al^{(IV)}$ and increasing $^{(B)}Na$ (0.4-0.6p.f.u to 1.4-1.8p.f.u)in outer rim.Garnet-epidote-amphibolites and epidote amphibolite recorded both of the retrograde stages.The tectonics infered from estimated P-T history from tectonic blocks in Dainuppu river area are summerized as followed(1)Garnet-epidote amphibolites subducted at relatively warmer geotherm about 25-30℃/km(2)Subducted garnet-epidote amphibolites and epidote amphibolite were stagnated and subduction channel cooled down at least 15℃/km(3)Garnet-epidote amphibolites and epidote amphibolite were inferred to further experience retrograde metamorphism leading to the overgrowth of Na-amphiboles.The scheme of P-T history can be explain by the model of Gerya(2002) that the tectonic blocks showing clock wise and counter clock wiseP-T path which subduct earlier and later respectively, are juxtaposed at a deeper part and exhumed together,which Okamoto(2016)observed for tectonic blocks in Kamuikotan metamorphic belt.Similar P-T histories of the tectonic schemehave been inferred in eclogite from western-Iratsu body in Sambagawa belt Endo et al,(2012) and amphibolite from Nagal ophiolite complex in India Bhowmik and Ao,(2016).

Keywords: Serpentinite mélange, Metamorphic P-T history, Tectonic blocks

