

A recipe of serpentinite melange in Mitsuishi Horaisan, Hokkaido.

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Serpentinite melanges are thought to originate from interfaces between wedge mantle and subducting oceanic slab. However, it is still not clear whether the observed fabrics represent original structures or significantly modified during later exhumation stages. We discuss on structural evolution of the Horaisan serpentinite melange, one of the typical in Kamuikotan Zone of Hokkaido.

The Horaisan melange contains numerous blocks of amphibolites, antigorite rocks, and massive serpentinitized peridotite. Peak metamorphic conditions (~650 degC, 1.1 GPa) of garnet amphibolite blocks suggest high-temperature subduction. Since the melange structurally underlies an ophiolite accompanied with boninite, amphibolites may represent fragments of subducted slab under hot wedge mantle (i.e. dismembered metamorphic sole). We reconstruct how the melange developed based on field and microscopic observations as follows.

Stage 1 (Ep-amphibolite facies): Amphibolitized oceanic slab subducted beneath wedge mantle. High strain concentrated inside the slab resulted in strong schistosity, whereas the hanging wall peridotite scarcely deformed.

Stage 2 (Ep-Ab amphibolite facies): Amphibolites partially underwent retrograde recrystallization. Antigorite crystallized in peridotite to varying extent. Amphibolites were dissected by anastomosing shear bands and thus became blocks. Peridotites in contact with amphibolite blocks are altered to be actinolite rinds. Peridotites were also dissected by shear zones consisting of tremolite and/or antigorite schist. Slab and block interiors of amphibolite and peridotite were not deformed in this stage.

Stage 3 (blueschist facies): Trace Na-amphiboles crystallized at interstices of amphibolites and actinolite rinds without any deformation. No information specifically of this stage were identified in peridotites. Since coherent blueschist units underplated, the melange might have already detached from the subduction interface.

Stage 4 (very low grade): Peridotites pervasively underwent low-temperature serpentinitization. Heterogeneous cataclastic shear differentiated foliated and massive serpentinite. Low-temperature reaction rims wrapped amphibolite blocks without significant deformation.

Summary: The sites of major strain shifted from amphibolite in stage 1, reaction rims (actinolite rinds) in stage 2, and low-temperature serpentinite in stage 4. Originally, the melange might have been a stack of blocks and slabs of peridotite and amphibolite separated by thin and anastomosing shear zones in early stages 1 to 2. Block-in matrix fabric with foliated serpentinite matrix is a feature not of plate interface but of later reorganization after exhumation and cooling.

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