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[S-IT04_28AM1]Fluid flow, deformation and physical properties of the subduction boundary and forearc mantle

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Subduction brings oceanic crustal material into direct contact with the overlying mantle wedge. The subduction boundary changes its slip behaviour from seismic to aseismic with increasing depth. The deep forearc region around the tip of mantle wedge shows a transitional nature with episodic tremor and slip which are probably strongly influenced by sustained fluid flow. The amount of fluid release in the forearc is not well constrained but is thought to depend on the thermal structure of the subduction zone. Fluid released into the forearc mantle will cause a transformation of mantle rock to serpentinite. This metamorphic transformation implies a major volume change and a change in physical properties of the mantle. Despite considerable recent advances in understanding these processes, there is no good consensus on how strong this forearc region is likely to be or how fluids are transported. Such information is vital in developing more complete tectonic models of these geologically and geophysically important regions. In this session we aim to contribute to our understanding of the deep forearc by bringing together the results of a variety of different approaches including field based observations, experimental work, theoretical modeling and geophysical observations on deformation, reaction and physical properties in fluid-rock systems.

10:20 ～ 10:35

[SIT04-P04_PG]アンチゴライト CPOの測定

ポスター講演3分口頭発表枠

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キーワード：アンチゴライト, CPO, シンクロトロンX線, 弾性波異方性

Foliated antigorite serpentinite with crystallographic preferred orientation (CPO) probably causes shear wave splitting observed at subduction zones (e.g., Katayama et al., 2009). Therefore, the study of type and intensity of antigorite CPO is an important to understand the detail of this phenomenon.
Soda and Wenk (2014) measured CPOs of antigorite serpentinite from the Sashu Fault at the Saganoseki Peninsula, Oita Prefecture, by three independent methods, U-stage (with optic microscope), EBSD and synchrotron X-rays. The obtained antigorite CPOs by three methods are almost same without the fabric strength, maxima of pole figures in multiples of random distribution. The fabric strength decreases in the following order, U-stage > EBSD > synchrotron X-rays, which is probably caused by the characteristics of three methods. Through U-stage measurement, we can obtain the fabric pattern of antigorite CPO mainly from coarser antigorite grains (> 30 μ m). In the case of EBSD measurement, we measure antigorite CPO within an area of ca. 0.8 mm × 0.8 mm. Measurement points of only ca. 30% can be used to make fabric patterns. Residual ca. 70% points are neglect, because the quality of Kikuchi lines from them is too low to identify the orientation. In the synchrotron X-rays method, the result represents the bulk fabric from a volume of ca. 0.5 mm × 0.5 mm × 1.0mm.
The serpentinite measured antigorite CPO develops mylonitic structures with a penetrative foliation and

lineation (Soda and Takagi, 2010). The antigorite grains show undulose extinction. And their grain boundary is unclear under the microscopy. Mg# (Mg/(Mg+Fe)) of antigorite grains is wide range 0.98-0.88. The BSE images indicate Fe-rich antigorite infilling the grain boundaries and fractures of Mg-rich antigorite.

The same serpentinite has already observed by TEM (Urata et al., 2009). The results indicate that the m-vales of antigorite grains, the number of octahedral along the [100] modulation wave, make two groups, high m-vale (16-18) and low m-vale (13-14). This result suggests that the antigorite are crystallized mainly two stages, which is supported by the variation of Fe contents of antigorite (Fe-rich and Mg-rich). The Mg-rich antigorite grains are main minerals composed of the serpentinite, Fe-rich antigorite grains occupy at the periphery of the others and within the vein. The TEM observation indicates that the Mg-rich antigorite grains are subdivided into sub-grain with 50-100 nm in size, which can be recognized as an undulose extinction under optic microscope.

These microstructures of antigorite grains potentially influence the outcome of CPO measurements. The weaker fabric patterns from the synchrotron X-rays are probably attributed to the fine-grained antigorite crystallized at the deferent stages and to sub-grain. And the U-stage and EBSD measurements focus only the selected grains, which may result in overestimation of elastic wave anisotropy of serpentinite.

References

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