International Session (Oral) | Symbol S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Techtonophysics

[S-IT02_29PM2]Aqueous fluids and melts in subduction zones: Experiment, modeling, and geophysical observations

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Characterization of the geophysical and geochemical interaction between minerals, fluid and magmatic liquid in subduction zone processes is central to our understanding of this environment. To this end, integrated observational, experimental, and theoretical studies are needed. Solubility and solution mechanisms of fluids in minerals and melts, and of silicate in fluids and linkages between solubility, solution mechanisms, chemical and physical properties of these materials under appropriate temperature, pressure, and redox conditions are needed. This session will bring together scientists with focus on current experimental, theoretical, and observational understanding of ?how to model physicochemical properties of subducting slabs including?spatial relation between intraslab seismicity such as slow-slip events and fluids pore pressure of fluids and their role in the weakening of shear strength of rocks?accumulation and transfer of fluids and melts ?solubility measurements of minor elements, trace elements, and stable isotopes in aqueous fluids and melts, ?how water and oxide components in aqueous fluids govern element and isotope partitioning between fluid, melt, and crystalline materials, and?linkages between solubility, partitioning, and rheological properties and solution mechanisms of water and silicate in minerals, melts, and fluids

4:45 PM - 5:00 PM

[SIT02-P01_PG]Later phase observations and seismic velocity structure in the subducting crust of the Pacific slab beneath Hokkaido

3-min talk in an oral session

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The subducting crust at the uppermost part of the oceanic lithosphere is considered to play important roles for generation of intraslab earthquakes (e.g., Kirby et al., 1996) and arc-magmatism in the mantle wedge (e.g., Nakajima et al., 2013), because the crust involves a large amount of water in form of hydrous minerals and these hydrous minerals affect seismic velocities in the crust (e.g., Hacker et al., 2003). Therefore, to understand water circulation in the subduction zones and genesis of intermediate-depth earthquakes, it is important to reveal where dehydration reaction of hydrous minerals occurs in the crust. However, it is generally difficult to obtain the detailed velocity variation in the crust because the thickness of the crust is ~7 km.Later phases, such as mode-converted wave and guided wave, are sensitive to heterogeneous structure in the crust because of their longer propagation paths in the crust, and hence they are very useful to resolve small-scale seismic velocity structure in the crust (e.g., Matsuzawa et al., 1986; Abers, 2005).At the Hidaka mountain range, middle of Hokkaido, northern Japan,

some later phases are reported from earthquakes that occurred in the Pacific slab (e.g., Shimizu and Maeda, 1980). A later phase (Xp phase) recorded in this region has some characteristics: 1) amplitudes of Xp phase are similar to or larger than those of the P wave, 2) Xp-P time lies in a range of 2-10 s and increases with epicentral distances. Shiina et al. (2013, SSJ) discussed the origin of the Xp phase with numerical modeling and interpreted the Xp phase as guided P-wave that propagated in the crust. Moreover, we identified a later phase (Xs phase) that arrives several second after the theoretical initial S waves, and such a phase usually appears in seismograms with guided P-wave. We interpreted the Xs phase as guided S-wave by comparison characteristics of guided P-wave and results of numerical modeling.In this study, based on these interpretations for later phases that observed in the western part of Hidaka mountain range, we estimated P- and S-wave velocity distributions in the subducting crust beneath the eastern part of Hokkaido. The number of arrival times of guided P- and S-waves picked in this study is 117 records and 56 records, respectively. Then, we obtained Vp of 6.8-7.7 km/s and Vs of 3.5-4.0 km/s at depths of 50-100 km in the crust. The obtained Vp in the crust is similar to that observed beneath Tohoku (Shiina et al., 2013) and lower than that expected for fully-hydrated MORB materials (e.g., Hacker et a., 2003). This result suggests that aqueous fluids may co-exist with hydrous minerals in the crust beneath the eastern part of Hokkaido.