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

[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 AM - 10:35 AM

[SIT04-P01_PG]Saline fluids recorded in jadeitites in subduction-zone melanges of southwest Japan

3-min talk in an oral session

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Slab-derived fluids play essential roles in mass transfer along subduction-zone channels between the subducting slab and mantle wedge (e.g., Bebout 2013 Metasomatism and the chemical transformation of rocks; Spandler and Pirard 2013 Lithos). Salinity of such slab-fluids probably affects solubility and fluid-rock partitioning of elements; therefore, it remains to be investigated in various rocks. Jadeitite is a rock composed mainly of jadeite (sodium pyroxene, $NaAlSi_2O_6$) and occurs typically in serpentinite mé langes intercalated to high-pressure and low-temperature metamorphic belts. This curious rock is thought to be the product of direct precipitation from aqueous fluids and/or of fluid-induced metasomatism of a protolith (Harlow *et al*. 2007 Geology of gem deposits, Tsujimori and Harlow 2012 Eur J Mineral, and references therein). Fluid inclusions are commonly observed in jadeitites, and they may provide information about the fluid composition in subduction-zone mé langes. We determined major components and salinity of fluid inclusions in the jadeitites collected from eight localities in Japan: Omi-Itoigawa (Omi-Renge belt), Oya and Osa (Suo belt), Kochi (Kurosegawa belt), Mie and Tone (Nishisonogi

metamorphic rocks), and Shimonita and Yorii (the origin unclear). In all of the studied rocks, primary fluid inclusions consist of a liquid phase and a gas bubble. Raman spectra show the presence of H_2O liquid and vapor with or without minor CH_4 gas. The freezing point of the liquid phase indicates high-salinity (up to 8 wt% NaCl equivalent) of the primary fluid inclusions. The salinity varies among the localities of the jadeitite. For example, the salinity of the primary fluid inclusions is about 7.1 ± 0.1 wt% NaCl equivalent in the albite jadeitite from Oya and about 4.6 ± 1.2 wt% NaCl equivalent in quartz inclusions bearing jadeitite from Tone. Some jadeitite samples contain secondary CH_4-rich fluid inclusions along healed microcracks. The presence of minor CH_4 is also reported in the saline fluids inclusions with 5.1 ± 1.9 wt% NaCl equivalent from the Myanmar jadeitite (Shi *et al.*, 2005 Geochem J). The present findings suggest that saline fluids with or without CH_4 are common in subduction-zone mé langes in Japan as well as in Myanmar. The reduced conditions can be caused by serpentinization processes. This is contrast to the CO_2-bearing saline fluids in the peridotite xenoliths from fore-arc mantle wedge (Kawamoto *et al.*, 2013 PNAS). The high-salinity of the slab-fluids probably enhances the mobility of elements such as Pb in subduction-zone channels (Keppler, 1996 Nature, Shigeno *et al.*, 2012 Eur J Mineral).