[EE] Evening Poster | S (Solid Earth Sciences) | S-GC Geochemistry

[S-GC45]Volatile Cycles in the Deep Earth - from Subduction Zone to Hot Spot

convener:Yuji Sano(Division of Ocean and Earth Systems, Atmosphere and Ocean Research Institute, University of Tokyo), Takeshi Hanyu(Japan Agency for Marine-Earth Science and Technology, Department of Solid Earth Geochemistry), Hirochika Sumino(東京大学大学院総合文化研究科広域科学専攻相関基礎科学系)
Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
Volatile geodynamics and chemical differentiation in the mantle and crust by drastically changing mineral stability and rheological behavior. Fractionation-processes such as partial melting, hydration, and dehydration are all controlled by volatiles in the rocks. A significant portion of the volatiles in the Earth has been thought to be present in the atmosphere and oceans as a consequence of extensive degassing during accretion and subsequent mantle degassing. On the other hand, it has been recently recognized that substantial amounts of volatiles are recycled back into the mantle at subduction zones, where intensive devolatilization of descended materials during arc magma generation was once thought to act as an effective "subduction barrier". However, fundamental questions still remain, such as: how are volatiles species distributed throughout the early and present Earth? What are the mechanisms for, and rate at which, volatiles are fluxed between the atmosphere, crust, and mantle? And what role have volatiles played in driving the evolution of the Earth? The possible role of the core in storing primordial volatiles is also poorly constrained. We therefore welcome contributions from experimental, observational, and modeling studies that help shed light on the deep cycles of volatiles, such as hydrogen, carbon, nitrogen, noble gases, halogens and sulfur. We particularly encourage studies linking the behavior of multiple volatile elements and their isotopic compositions. Studies investigating the linkage between volatile and solid geochemical tracers, the phase equilibria of volatile-bearing mantle assemblages, and the effect of volatiles on the physical properties of the mantle are also welcome.

[SGC45-P01]Hydrogen isotope study of serpentinite from the Happo-O'ne area: Implications for the water cycle in subduction zone

*Wataru Ouchi[1], Shinnosuke Aoyama[1], Tomokazu Murai[2], Yuichiro Ueno[2], Madhusoodhan Satish-Kumar[1]
(1.Department of Geology, Niigata University, Japan, 2.Department of Earth and Planetary Sciences, Tokyo Institute of Technology, Japan)
Keywords:Serpentinite, Hydrogen isotopes, Happo-O'ne

Dehydration, hydration and melting processes in subduction zones and mantle wedge are critical in understanding the movement of water into the mantle and the arc-related magmatic activity. Tracing the movement of water is a tough task, however hydrous minerals help in this matter. In order to understand the water circulation systematics in the mantle wedge, hydrogen (dD) and oxygen ($d^{18}O$) isotopic compositions of serpentinite rocks from Happo- O’ne area, Nagano Prefecture was studied. Happo-O’ne serpentinite is one of the largest serpentinite bodies belonging to the Omi-Renge Belt of the Hida Gaien Zone, which was associated with Paleozoic subduction zone. Based on thin section observations and XRD analysis, serpentinite occurrences were subdivided into several zones based on mineralogical association, consistent with previous study (Nozaka, 2005). Rock samples were crushed and serpentine minerals were separated by isodynamic separator and heavy liquid methods. Hydrogen and oxygen isotopes of the separated minerals and whole rocks were analyzed by

TCEA–IRMS at Tokyo Institute of Technology.

The dD values of serpentinite ranges between −135‰ and −47‰. Considering equilibrium isotopic fractionation between serpentine and water (Saccocia et al., 2009), at the formation temperature of Antigorite, these serpentinite rocks are clearly not originated from modern seawater (0‰). Serpentinites having lower dD (c. −125‰) is rather derived from meteoric water in this area (dD = −90‰; Suda et al., 2014). This is consistent with the geology: serpentinite having lower dD is mainly associated with talc, which was contact metamorphosed by intrusive granite. On the other hand, dD value of the water which was equilibrated with serpentinite having higher dD values, intermediate between seawater and present day meteoric water. These serpentinite rocks are relatively away from the granite intrusion and may still preserve pristine information of water in the mantle wedge. If so, our results imply intensive dehydration from subduction slab.

References

Nozaka, T. 2005, Journal of Metamorphic Geology, 23, 711–723.

Saccocia, P. J., Seewald, J. S., &Shanks, W. C. 2009, Geochimica et Cosmochimica Acta, 73, 6789–6804.

Suda, K., Ueno, Y., Yoshizaki, M., Nakamura, H., Kurokawa, K., Nishiyama, E., Maruyama, S. 2014, Earth and Planetary Science Letters, 386, 112–125.