Geochemical features of subduction-zone fluids based on in-situ observation of fluids and melts under high-pressure and high-temperature conditions

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Dr. Tatsuhiko Kawamoto of the Institute for Geothermal Sciences of Kyoto Univ (Japan) is world famous for his excellent research on the effect of water on mantle melting, the role of water in deep subducting process, and the nature of fluids in subduction magmatism. With K. Mibe and other colleagues, Kawamoto determined critical end-points between various magmas and aqueous fluids by using synchrotron based X-ray radiography, and he suggested a new hypothesis for subduction zone magmatism. Kawamoto found seawater-like saline fluid inclusions in mantle xenoliths beneath Pinatubo and others, proposing the importance of saline fluids in subduction zone process.

Abstract

Slab-derived supercritical fluids are likely to separate into melt and fluid in the mantle wedge (Kawamoto et al., 2012, PNAS). Findings of saline fluids from sub-arc mantle peridotite indicate that aqueous fluids in mantle wedge can contain 3.7 wt% NaCl in Ichinomageta, Northeast Japan arc (Kumagai et al., 2014, CMP) to 5.1 wt% NaCl in Pinatubo, Luzon arc (Kawamoto et al., 2013, PNAS). Synchrotron radiation XRF analysis is conducted to study Rb, Sr, and Pb partitioning between aqueous fluids and melts (Kawamoto et al., 2014, EPS). We suggest that slab-derived components have compositional features consistent with a saline fluid and a melt, which can be formed through a separation of a slab-derived supercritical fluid (Kawamoto et al., 2012).