Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG14-07 Room:303 Time:May 25 15:30-15:45

Behavior of water, major and trace elements in subduction zone magmatism

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I present a forward model perspective on the behavior of water mixed with major and trace elements in the slab fluxes and in the magmas from subduction zones. Arc Basalt Simulator version 4 (ABS4: Kimura J.-I. et al. (2014) Diverse magmatic effects of subducting a hot slab in SW Japan: results from forward modeling. G3, doi:10.1002/2013GC005132) is a forward model calculating element mass balance in the slab dehydration/melting and melting of the wedge mantle peridotite by fluxing of the slab fluid/melt to estimate element abundances in the primary arc magmas, such as basalt, high-Mg andesite, and adakite. Mass balance of water is considered together with major and trace elements, and Sr-Nd-Hf-Pb isotopes in the numerical model. Once element mass balance between the source materials (slab sediment, altered oceanic crust, and peridotite, and mantle wedge peridotite) and a primary arc magma is established, source conditions including (1) depth of the slab dehydration/melting, (2) contributions of slab fluxes, (3) slab flux fraction in the mantle, (4) depth and temperature of mantle melting, and (5) degree of melting of mantle, and (6) element abundance including water in the primary basalt can be estimated. I will present the results of ABS4 analyses on the SW Japan and the NE Japan subduction zone magmas representing hot-young and old-cold subduction cases, respectively, with the special emphasis in water contents in the primary magmas.

Keywords: subduction zone, magma, water, major element, trace element, numerical model