Genesis of tholeiitic and calcalcaline series of Zao volcano, NE Japan arc, Japan

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Genesis of co-existing tholeiitic series (TH) and calcalkaline series (CA) in island arc and their relationship has been a focus of attention because it is critical to understanding magma genesis in island arc. The Zao is Quaternary volcano situated on the Tohoku Backbone Ranges, Northeastern Japan arc, and both of TH and CA co-exist in continuous volcanic activity (Sakayori, 1991). We investigated the Sr, Nd, Pb isotope and trace element compositions to discuses genesis of TH and CA from Zao volcano.

The trace element compositions of the studied samples show the typical characteristics of island arc magma in the diagram of MORB normalized pattern, such as enrichment of LILEs and negative Nb spike. Positive Pb and Sr spikes are also apparent. The LILEs enrichment and negative spikes of Nb are relatively larger in CA than TH. Although abundance ratios of Cs/Nb of TH are restricted to 0.09 - 0.20, those of CA can be divided into two ranges, such as 0.20 – 0.25 and 0.42 – 0.57.

The isotopic compositions of TH are more enriched compared to CA. In all the diagrams presenting the relationship of the isotope compositions, TH and CA make different liner trends, which indicate the mixing relation. Furthermore, Pb isotopic compositions suggest that two depleted endmember is necessary to explain the trend of TH and CA. The depleted endmember of TH is relatively enriched than that of CA. On the other hand, tow enriched endmembers are required from the relationships between parent/daughter and the isotope ratios, because TH and CA show different linier trends in those relation and the liner trends are diverse in the direction of isotopically enriched side. The both of the enriched direction of TH and CA is differ from the mixing trend of mantle wedge and recycled materials form subducting slab observed from Northeastern Japan (Shibata and Nakamura, 1997). From the observations in the above, it can be concluded that four components are necessary to explain the chemical characteristics of TH and CA from Zao volcano and the different two enriched components are derived from different crustal materials, although the sources of those are not obvious yet.

References

Sakayori A., (1991), *Bull. Volcanol. Soc. Japan,* **36**, 79-92.
Shibata T. and Nakamura E., (1997), *J. Geophys. Res.*, **102**, 8051-8064.

Anthropogenic contamination of bivalves revealed by Cd isotopes

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We are studying Cd isotopic compositions in bivalves to assess their natural and anthropogenic variability and sources. Oysters (*Crassostrea gigas*) from BC were collected from Desolation Sound (BC coast) and Barkley Sound (west coast of Vancouver Island). For comparison, we analyzed bivalves collected off the coasts of France, oysters (*C. gigas*) from the Gironde estuary and northern Brittany and mussels (*Mytilus galloprovincialis*) from the Gulf of Lion.

Cd isotopes were measured by dynamic multi-collection using a Nu Plasma MC-ICPMS and sample-standard bracketing technique together with external normalization to correct for instrumental mass bias. Results are reported in del notation (δ), normalized to a mass difference of one atomic mass unit. Our reference Cd standard (High Purity Standards, Inc., lot 291012) has the same Cd isotopic signature as JMC Cd [1,2]. Reproducibility is estimated from repeat analysis of a secondary Cd standard (High Purity Standards, Inc., lot 502624), 0.37 ± 0.03 permil/amu (2SD; n=31).

BC oysters have Cd isotopic signatures consistent with those reported for seawater from the N Pacific [3,4] suggesting that the high Cd concentrations (4.8-15.8 ppm tissue dw) found in bivalves along this coast result from natural coastal upwelling. Oysters from the BC coast have a slightly lighter signature than those from the west coast of Vancouver Island, potentially resulting from a larger anthropogenic contribution consistent with this geographical location. Mediterranean mussels have Cd isotopic signatures within the range of NW Mediterranean seawater values [3]. Oysters from northern Brittany and the Gironde estuary have signatures significantly lighter than the literature value for the Atlantic [4]. The Gironde oysters have the lightest signatures consistent with pollution resulting from industrial evaporation-condensation processes, as documented by the shift to δ = –0.16 permil/amu for two dust samples from a Pb-Zn refinery plant in northern France [2]. These results demonstrate the ability of Cd isotopes to trace anthropogenic pollution.

References

[1] Wombacher F. *et al.*, (2003), *GCA* **67**, 4639-4654.
[2] Cloquet C. *et al.*, (2006), *Environ. Sci. Technol.* **40**, 2525-2530.
[3] Lacan F. *et al.*, (2006), *GCA* **70**, 5104-5118.
[4] Ripperger S. and Rehkämper M., (2007), *GCA* **71**, 631-642.