Arc Basalt Simulator (ABS) a simulation for slab dehydration and fluid-fluxed mantle melting for arc basalts

J.-I. KIMURA[1], B.R. HACKER[2], P.E. VAN KEKEN[3], H. KAWABATA[4], T. YOSHIDA[5] AND R.J. STERN[6]

[1]Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka 237-0061, Japan (jkimura@jamstec.go.jp)
[2]University of California, Santa Barbara, CA 93106-9630, USA (hacker@geol.ucsb.edu)
[3]University of Michigan, 1100 North University Avenue, Ann Arbor, MI 48109-1005, USA (keken@umich.edu)
[4]Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka 237-0061, Japan (hiroshik@jamstec.go.jp)
[5]Tohoku University, Japan (tyoshida@mail.tains.tohoku.ac.jp)
[6]University of Texas at Dallas, Richardson TX 75083-0688 U.S.A. (rjstern@utdallas.edu)

The origin of subduction zone magma characteristics has been attributed to the melting of depleted mantle peridotite by the fluxing of fluids or melts derived from subducting oceanic crust. High-Mg# basalts and high-Mg# andesites make up the bulk of subduction-related primary magmas and may be generated by fluid-fluxing or melt-fluxing of mantle peridotite, respectively. These different slab components appear to reflect control by thermal structure, with a cold slab producing slab fluids and hot slab producing slab melts. Recent experimental studies and thermodynamic models better constrain the phase petrology of slab components during prograde metamorphism and melting, mantle-wedge melting, and mantle-slab melt reaction. Experimental results also constrain the behavior of many elements in these processes. Geodynamic models allow quantitative P-T models for subducted slabs and mantle wedges. These developments together enable generation of forward models to explain arc magma geochemistry. The Arc Basalt Simulator Version 2 (ABS2) uses an Excel® spreadsheet-based calculator to predict the partitioning of incompatible element and Sr-Nd-Pb isotopic compositions in slab-derived fluid and in arc-basalt magma generated by open-system fluid-fluxed melting of mantle-wedge peridotite. ABS2 is specifically developed for simulating high-Mg# basalt geochemistry in cold subduction zones; any descrepancies in element/isotope behaviors between ABS2 results and natural or experimental observations likely targets for further re-evaluation of the magma genesis model. We present the modeling scheme of ABS2 and its application to arc basalts.

Radiogenic and stable isotope systematics of strontium within a single granitic pluton

Y. KIMURA[1]*, M. TSUBOI[1], S. WAKAKI[2,3], D. KATOH[2], Y. ASAHARA[2] AND T. TANAKA[2]

[1]Sci. Tech., Kwansei Gakuin Univ., Sanda, Hyogo, 669-1337, Japan (*correspondence: kimurayumiko@kwansei.ac.jp)
[2]Earth and Environmental Sci., Nagoya Univ., Nagoya, 464-8601, Japan
[3]Natural History Sci., Hokkaido Univ., Sapporo, 060-0810, Japan

Radiogenic ($^{87}Sr/^{86}Sr$) and stable ($^{88}Sr/^{86}Sr$) isotopic ratios of Sr were measured on ten whole-rock samples within a single granitic pluton, Kembi granite, southwestern Japan. The Kembi granite, 11.5 km (E-W) × 5.5 km (N-S) in extent, is situated in the northern part of Osaka area, southwestern Japan. The Kembi granite is classified as the Sanyo-type garanitoids of Ishihara [1], however, the characteristics of Rb-Sr isotopic system of the pluton is unclear. The pluton intrudes into the Jurassic accretionary complex of the Tamba Belt and Cretaceous volcanic clasts and sedimentary rocks of the Arima Group with the contact aureole. The Kembi Granite is medium-grained hornblende-biotite granite characterized by pinkwish potassium feldspar. Imoto *et al*. [2] reported the K-Ar biotite age of 72.7±3.6 Ma. Whole-rock chemistry shows a straight trend for every major and trace elements on the Harker's diagram. SiO_2 contents range from 72.5 to 76.9 wt.%, and SiO_2-rich rocks tend to be concentrated in the northern part of the pluton. Strontium isotopes were measured by TIMS at Nagoya University. Radiogenic Sr isotopic ratio was measured in a conventional manner. Intrinsic Sr isotope fractionation was determined by double-spike technique. The Rb-Sr whole-rock isochron yeilds the age of 78.7 Ma with an initial $^{87}Sr/^{86}Sr$ ratio of 0.7089. Variations in the major and trace elements, and Rb-Sr whole-rock isochron suggest that the Kembi Granite was generated by fractional crystallization of a single parental magma. Concordance between Rb-Sr whole-rock isochron age and K-Ar biotite age indicates no thermal disturbance after the emplacement. $^{88}Sr/^{86}Sr$ ratios of the Kembi Granite showed light isotope enrichment compared to the basalts measured by Ohno and Hirata [3], although variation within the pluton is smaller than the analytical uncertainty.

[1] Ishihara (1971) *J. Geol. Soc. Japan* **77**, 441-452. [2] Imoto *et al*. (1991) *Geology of the Sonobe district,* Geol. Surv. Japan 68 p. [3] Ohno and Hirata (2007) *Anal. Sci.* **23**, 1275-1280.