

Across- and along-arc variations in arc magmas and their genesis in the Izu-Bonin arc

Yoshihiko Tamura[1]; Kenichiro Tani[1]; Hiroshi Shukuno[1]; Hiroshi Kawabata[2]; Qing Chang[1]

[1] IFREE, JAMSTEC; [2] JAMSTEC

Mantle melting along convergent plate boundaries ultimately results in the formation of continental crust. Knowledge of the three-dimensional evolution of arc systems can lead to far better understanding of the dynamic processes operating in the mantle wedge and the formation of continental crust. It has long been known that arcs, like mid-ocean ridges, are segmented into zones of discrete though perhaps transient crustal growth. One recent explanation of arc segmentation is the three-dimensional thermal and chemical structure in the mantle wedge called hot fingers by Tamura et al. (2002) and Tamura (2003). Tamura et al. (2002) suggested that mantle melting and the production of magmas beneath the NE Japan arc may be controlled by locally developed hot regions within the mantle wedge that have the form of inclined, 50 km wide fingers. Ten hot fingers in the mantle wedge are interpreted to underlie the Quaternary volcano groups in NE Japan, based on interrelationships between volcano spacing, topographic profiles, seismic tomography and Bouguer gravity anomalies.

Does any subduction zone have hot fingers in the mantle wedge? Back-arc seamount chains (Horeki, Genroku, Enpo, etc.) form seven distinct topographic features. Importantly, we can see the analogous seven topographic features, or seven Quaternary volcanoes, along the volcanic front. At the northern end of the Izu-Bonin arc, however, the correlation becomes less clear because of the collision of the arc with Honshu. In most parts of the arc, however, these features are well correlated, such as Torishima-Sumisu in the volcanic front with the Horeki-Genroku backarc seamounts, which have similarities in both magnitude and wavelength. We present here the magmatic variations between Sumisu and Torishima, between Torishima and Horeki, and among volcanoes, which extend westward from the frontal Sumisu volcano, which may represent a possible expression of hot fingers beneath the Izu arc.