Advent of Continent: New Hypothesis and Evidence from Nishinoshima Volcano in the Ogasawara Arc

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Magmas produced by partial melting of mantle peridotite are called primary magmas. Primary magmas in the Mariana arc are basaltic[1, 2] and basalts have been generally deemed to be parental to new crust in subduction zones. We present petrological evidence that points towards primary andesite magmas being derived from the mantle source when the crust and lithosphere in subduction zones are thin.

This evidence has been gathered from Nishinoshima, a submarine volcano in the Ogasawara arc, ~1,000 km south of Tokyo, Japan, which suddenly erupted in November 2013, after 40 years of dormancy. We propose that Nishinoshima represents the missing link between the mantle and the continental crust because: (1) it erupts andesitic lava, similar in composition to the continental crust, and (2) the underlying crust is only 21 km thick, making it one of the closest arc volcanoes to the mantle.

Here we report the scientific results of our endeavours to collect subaerial lavas from the current eruption and older submarine lavas from the flanks of Nishinoshima volcano. Using olivine-bearing phenocryst-poor andesite samples, we have developed a model for the genesis of the Nishinoshima andesitic lavas in which the andesites originate directly from the mantle. Melting of hydrous mantle at low pressures is necessary to produce primary andesite magmas, and thus it is achieved beneath Nishinoshima and other submarine volcanoes in the Ogasawara arc, where the crust is thin.

[1]Tamura, Y. et al. Two primary basalt magma types from Northwest Rota-1 volcano, Mariana arc and its mantle diapir or mantle wedge plume. *J. Petrol.* **52,** 1143-1183 (2011).
[2]Tamura, Y. et al. Mission Immiscible: Distinct subduction components generate two primary magmas of Pagan volcano, Mariana arc. *J. Petrol.* **55,** 63-101 (2014).