Geochemical variation of the Pacific crust subducting beneath the Izu-Bonin arc and its implications for the generation of arc magmas

KATHRYN DURKIN[1], PATERNO R. CASTILLO[1*], SUSANNE STRAUB[2], NATSUE ABE[3], EMMANUEL GARCIA[1], QUANSHU YAN[4], RYU KANEKO[5] AND YOSHIHIKO TAMURA[3]

[1]Scripps Institution of Oceanography, UCSD, USA (*correspondence: pcastillo@ucsd.edu)
[2]Lamont-Doherty Earth Observatory, Columbia Univ., USA
[3]Mantle and Continental Crust Drilling Res. Group, R&D Center for Ocean Drilling Science, JAMSTEC, Japan
[4]Key Laboratory of Marine Sedimentary and Environmental Geology, FIO-SOA, China
[5]Graduate School of Science and Technology, Niigata Univ., Japan

The bulk of subduction zone magmas are produced by partial melting of the mantle wedge metasomatized by the slab component. The latter is enriched in volatiles and other fluid-mobile elements and mainly comes from subducted sediment and underlying altered oceanic crust (AOC). Many studies have shown a strong link between subduction input and arc output, particularly in sedimented arc-trench systems. The Izu-Bonin system is basically sediment-poor and, thus, the latitudinal compositional variation of its arc magmas, particularly that of Pb isotopes, is coming from AOC. This is because Pb is one of the foremost tracers of recycled AOC, estimated to make up about 50% or more of the Pb in arc magmas. However, whereas the Izu-Bonin arc chemistry requires influx of Pb from a subducted Indian-type basaltic crust, the spot sample of the incoming basaltic basement at ODP Site 1149 is Pacific-type. The apparent discrepancy of Pb input and output in the Izu-Bonin system thus puts into question the concept of the AOC being an important source of Pb for arc magmas and our understanding of slab input in general. To resolve these issues, we dredged basaltic samples from the active, vertical fault scarps along a ~700 km long section of the Pacific Plate subducting into the Izu-Bonin Trench during the RR1412 cruise aboard R/V Revelle in late 2014. Our sampling transect encompasses a significant range of crustal ages that includes the purported compositional change of the Mesozoic Pacific crust at ~125 Ma. We plan to analyze these samples in order to perform detailed mass balance calculations of slab input vs. arc output that, in turn, will allow us to better constrain whether the AOC is indeed a significant source of the Izu-Bonin arc magma chemistry.