Finding the source of the latitudinal compositional variation in the Izu-Bonin arc system

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

[1]Scripps Institution of Oceanography, UCSD, USA (contact: kdurkin@ucsd.edu)
[2]R & D Center for Ocean Drilling Science (ODS), Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka 237-0061, Japan.
[5]Graduate School of Science and Technology, Niigata Univ., Japan
[4]Lamont-Doherty Earth Observatory, Columbia Univ., USA
[5]Key Laboratory of Marine Sedimentary and Environmental Geology, FIO, China

Volatiles released from the hydrated sediments and altered oceanic crust (AOC) on top of a subducting oceanic plate flux melt the mantle wedge in the majority of island arc systems. Studies have shown these volatiles also carry a chemical signature of the subducted slab which is imparted into the resultant volcanic output in many subduction zones, particularly in sediment-rich arc systems. However, the Izu-Bonin system is sediment-poor, therefore the documented latitudinal compositional variations, especially in Pb isotopes, in its arc lavas must be sourced from the AOC. Izu-Bonin arc lava geochemistry suggests an influx of Indian-type MORB, but the spot sample of the subducting basaltic basement at ODP site 1149 is Pacific-type. To solve the apparent discrepancy of Pb isotope input and output in this arc system, we dredged samples of the AOC from vertical fault scarps along a transect from 27.5°N to 34.5°N during the R/V Roger Revelle 1412 cruise in 2014, successfully collecting basalt at 11 sites. Major element data for these samples show an alkali enrichment in the northern region of the study area compared to the more tholeiitic compositions in the south. Trace element data appear to support this latitudinal enrichment trend. Detailed mass balance calculations supported by Sr, Nd, Hf and especially Pb isotope analyses will be performed to further constrain the compositional variation of the subduction input. These analyses will help evaluate whether the geochemical variation of the AOC of the subducting Pacific plate matches that of the Izu-Bonin arc geochemistry.