

Testing Subduction Initiation and Ophiolite Models by Drilling the Bonin Forearc

Julian A. Pearce (Cardiff, UK), **Robert J. Stern** (UT Dallas, USA), **Mark K. Reagan** (Iowa, USA), **Osamu Ishizuka** (GSJ, Japan) et al.

We propose to drill a section through the volcanic stratigraphy of the outer forearc of the IBM system in order to trace the processes of magmatism, tectonics and crustal accretion associated with subduction initiation. This in turn has implications for understanding the origin of the many ophiolites that are now believed to form in this setting and so is a good opportunity to test this supra-subduction zone ophiolite model and involve the land-based geological community in IODP. We propose two sites in the Bonin forearc (BON-1 and BON-2) which form an offset-drilling pair that together should penetrate the full c. 1.25 ± 0.25 km lava section. The sites have been surveyed and surface-sampled by several diving and dredging cruises. Studies of the recovered samples have established a stratigraphy in which peridotites, gabbros and sheeted dykes are overlain by 'Forearc Basalts' (FAB) and then in turn by boninites. DSDP Site 459 in the Mariana Forearc provides a well-surveyed alternate site of similar age, stratigraphy and setting that will penetrate a similar lava sequence. Drilling BON-1 and BON-2 will contribute to our understanding of intra-oceanic convergent plate margins by providing:

- 1) a high-fidelity record of magmatic evolution during subduction initiation;
- 2) a test of the hypothesis that "Fore-arc Basalts" (FAB) tholeiites lie beneath boninites;
- 3) a record of the chemical gradients within these units and across their transitions;
- 4) information on how mantle melting processes evolve during subduction initiation from early decompression melting of fertile asthenosphere to late flux melting of depleted mantle, providing key empirical constraints for realistic subduction initiation geodynamic models;
- 5) a test of the hypothesis that forearc lithosphere created during subduction initiation is the birthplace of supra-subduction zone ophiolites.