

Discovery of a plutonic seamount in Izu-Bonin arc: Dive reports of the Daisan-West Sumisu knoll

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Obtaining deep crustal materials such as plutonic rocks is crucial in understanding the crustal evolution of intra-oceanic arcs. However, exposures of plutonic rocks are rare in such tectonic settings, since denudation is minimal and most of outcrops are limited to submarine environments.

During the R/V Natsushima NT07-15 cruise in July - August 2007, we conducted ROV Hyper-Dolphin surveys of flat-topped seamounts in the Manji and Enpo seamount chains, which are part of a series of southwest-trending cross-arc seamount chains in the Izu-Bonin rear arc. The chief objective was to locate outcrops of plutonic rock. In a previous survey of the flat-topped Manji seamount, a member the Manji seamount chain, tonalitic clasts had been collected and were interpreted as originating from a shallow intrusion that had been exposed by wave planation (Ishizuka et al. 2002).

ROV Hyper-Dolphin Dives #728 and #729 visited the Daisan-West Sumisu knoll, located in the northeastern part of the Enpo seamount chain. Dive #728 traversed the southern flank of the knoll from the base (~1277 mbsl) to the summit (~462 mbsl), while Dive #729 traversed the northern flank from mid-slope (~655 mbsl) to the summit (~428 mbsl). Most of the observed outcrops were massive or vertically-jointed surfaces of plutonic rock, lacking any volcanic or sedimentary deposits. All twenty-eight rock samples collected from these two dives were granodiorite and granodioritic porphyry, with SiO₂ contents of 61 - 71 wt.% and K₂O contents of 1.1 - 2.7 wt.%. Single channel seismic (SCS) surveys show only poor reflectors, and no bedded aprons around the knoll, consistent with a plutonic origin for the seamount. This is the first discovery of a plutonic seamount in the modern Izu-Bonin arc.

We will present our latest zircon U-Pb geochronology and geochemical data for these samples, combined with studies of their petrology, which together are advancing our understanding of silicic magmatism in intra-oceanic arcs.