Deformation and growth of arc by collision of oceanic plateau at the Ogasawara region

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The fate of incoming oceanic plateaus at subduction zones will range from complete subduction of a plateau beneath an island arc to complete accretion/collision of a plateau to an island arc (e.g., Mann and Taira, 2004). If oceanic plateaus are preserved at subduction zones, they would be contributing to continent/arc growth process. Here we examine the mode of occurrence of an oceanic plateau reaching subduction zone in the Northwest Pacific, as well as that of the forearc landward slope.

The Ogasawara Plateau is a large volcanic feature on the incoming Pacific plate. The Ogasawara Plateau is likely a complex of several Cretaceous guyots in the so called West Pacific Seamount Province. The Hahajima Seamount is located at the junction between the Izu-Bonin (Ogasawara) and Mariana Trench forearc slopes, where a notable indentation of the trenches was possibly caused by the Ogasawara Plateau on the incoming Pacific plate. The Hahajima Seamount yields serpentinite peridotites, gabbros, volcanics including boninites, and limestones. Because of the presence of serpentinite peridotites, the seamount has long been interpreted as a serpentinite diapir seamount typically found along the forearc slopes of the Izu-Bonin-Mariana Trench. However, based on newly acquired bathymetry and additional bottom sampling data, Ishiwatari et al. (2005) and Fujioka et al. (2005) propose that the Hahajima Seamount is a tectonic block, not a serpentinite diapir seamount. These authors argue that tectonic emplacement of the Hahajima Seamount was caused by collision of the Ogasawara Plateau.

Here we show new seismic evidences that indicate accretion of the Ogasawara Plateau to the Izu-Bonin forearc. The WNW-ESE multi-channel seismic survey profile over the Hahajima Seamount/Ogasawara Plateau records multiple faults interpreted as thrusts in the inside of the Hahajima Seamount. Possible limestone layers likely derived from the Ogasawara Plateau can be identified at the base of the forearc slope, further suggesting that parts of the Ogasawara Plateau are now accreting to the Izu-Bonin forearc.

Many geological/geophysical evidences confirmed that parts of the Ontong Java Plateau are accreting to the Solomon forearc. Our new seismic evidences clearly demonstrate for the first time that, although the Ogasawara Plateau is much smaller in volume/area than the Ontong Java Plateau, the Ogasawara Plateau accretes to the Izu-Bonin forearc, contributing growth of the arc crust.