

## **Project IBM: Towards a Comprehensive Understanding of Arc Evolution and Continental Crust Formation**

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This complex drilling project proposal (Project IBM) describes the rationale and scientific objectives for an integrated project including non-riser/riser IODP expeditions and petrological/geochemical/geophysical studies designed to achieve one major goal of the IODP Initial Science Plan, i.e., a comprehensive understanding of intra-oceanic arc evolution and continental crust formation. We focus on the Izu-Bonin-Mariana (IBM) arc-trench system, which is undoubtedly one of the best-surveyed intra-oceanic arcs and, more importantly, is characterized by the presence of 6.0-6.3 km/s Vp middle crust possibly having intermediate compositions similar to the average continental crust.

We propose four linked thematic operations of IBM complex drilling to sample volcanoclastic sediments and upper and middle crustal rocks: Expedition 1 -Characterization of pre-arc crust and mantle, decoding the nature of pre-existing crust/mantle and understanding the tectonic setting of IBM arc formation by drilling at the Amami Sankaku Basin, the eastern margin of the West Philippine Basin; Expedition 2 -Characterization of initial IBM magmatism, extending our understanding of the nature and tectonic setting of initial IBM arc magmatism and crust formation by deepening ODP Site 786B; Expedition 3 -Documentation of temporal variation of rear-arc magmatism, investigating volcanoclastic sediments for a temporal record of rear-arc magmatism, which may be distinct from that along the volcanic front, by drilling at the site located between two rear-arc volcanic chains; and Expedition 4 -Ultra-deep drilling to the middle crust, documenting the characteristics of the entire IBM upper and middle crust and understanding the formation process of distinctive middle crust and its role in continental crust formation and solid Earth evolution by riser-drilling at ODP Site 792. These drilling experiments, together with non-drilling elements including extensive geophysical and petrological efforts, should provide a landmark not only in IODP research, but also in the study on Earth evolution.