

Marine magnetotelluric experiment across the central Mariana subduction-arc-back arc system

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This project is a Japan, US, and Australia collaborative research effort. We carry out a marine magnetotelluric transect across the central Mariana subduction-arc-back arc system using ocean bottom electro-magnetometers (OBEMs), ocean bottom electrometers (OBEs), and ocean bottom magnetometers (OBMs) to provide a comprehensive image of the electrical conductivity structure of the Mariana island-arc system extending from the Pacific ocean to the West Mariana Ridge (remnant arc) through the Marina Trough. Subduction zones are fundamental to Earth recycling, controlling the return of crustal materials into the mantle and the partitioning of some fraction back to the surface. The Mariana subduction system is the classic example of an intra-oceanic arc, trench, and back-arc system. Our transect across the central Mariana subduction system, which includes three upwellings of serpentine diapirs, arc volcanism, and back-arc spreading, will address issues of hydration of the mantle wedge resulting from subduction and the nature and distribution of subsequent melting through estimation of the electrical conductivity structure.

We successfully deployed 33 OBEMs, 7 OBMs, and 7 OBEs at 40 sites. Positioning of the instruments on the ocean floor at 29 sites was performed, which allows us to determine the positions precisely. All the instruments measure geomagnetic and/or electric fields continuously until we will recover them in September 2006. After the recovery, these data will provide a comprehensive image of the electrical conductivity structure for the central Mariana subduction-arc-back arc system. These results will make a breakthrough for understanding mantle dynamics related to plate subduction.