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Ocean bottom geophysical observation on the seafloor near the Society hot spot, French Polynesia

Daisuke Suetsugu (1), Hajime Shiobara (2), Tatehi Isse (1), Hiroko Sugioka (1), Aki Ito (1), Kiyoshi Baba (2), Takafumi Kasaya (1), Noriko Tada (1), Dominique Reymond (3), and Jean-Pierre Barriot (4)

(1) Institute for Research on Earth Evolution, Japan Agency for Marine-Earth Science and Technology, Japan (dai@jamstec.go.jp), (2) Earthquake Research Institute, University of Tokyo, Japan, (3) Laboratoire de Géophysique, DAS/CEA, Tahiti, France, (4) Observatoire Godésique de Tahiti, UPF, Tahiti, France

The South Pacific region is characterized by a broadly elevated seafloor known as the South Pacific superswell, which suggests the presence of a large-scale mantle plume beneath the South Pacific, called the South Pacific superplume. The geometry, origin depth, temperature, and composition of the superplume remain controversial, however, mainly due to the lack of seismological data that documents the mantle structure beneath the South Pacific. To obtain a better seismic image of the superplume, we deployed temporary broadband seismographs on oceanic islands and the seafloor in the South Pacific since 2002. In the first experiment from 2002-2005, we deployed 10 broadband ocean-bottom seismographs (BBOBS) over the French Polynesian region. The seismic image obtained from the data indicates that large-scale low-velocity anomalies (on the order of 1000 km in diameter), indicative of the superplume, are located from the bottom of the mantle to a depth of 1000 km, and small-scale low-velocity anomalies (on the order of 100 km in diameter) are present above it. The small-scale anomalies may be narrow plumes generated from the top of the dome. Narrow plumes beneath the Society hot spot are best resolved by the data, although the spatial resolution is still not sufficient to understand how the narrow plumes reach from the top of the superplume to the hot spot. In the second experiment from Feb. 2009 to Dec. 2010, we deployed 9 BBOBS and 9 ocean-bottom electro-magnetometers (OBEM) neat the Society hot spot to obtain a clear image of the ascending narrow plumes beneath the hot spot. Simultaneous observation with seismic and electro-magnetic sensors should enable not only to determine geometry of the plumes, but also to investigate thermal and compositional heterogeneities associated with the plumes. The installation and recovery of the BBOBS and OBEM were carried out with the JAMSTEC research vessel “MIRAI” and the Tahitian tuna-fishing boat “Fetu Mana”, respectively. The observation was successfully completed and the 1.5 year-long data were recovered. In the session, we will present an overview of the observation and data and very initial results of the 2009-2010 data.