

Seismic velocity structure and seismicity at the Hahajima Seamount in the Izu-Bonin Subduction zone

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Introduction

The Izu-Bonin subduction zone has unique characteristics such as very few shallow large earthquakes and existence of serpentine seamounts along the trench axis. The serpentine seamounts are generally located at 30-50km landward from the trench axis and are conical shape. These unique characteristics may result from upwelling of serpentinized mantle wedge peridotites along the plate boundary (e.g. Kamimura et al., 2002; Kasahara et al., 2003). The low-temperature phase of serpentine has velocity-strengthening. Hence, the existence of low-temperature serpentine between the plate boundary results in no interplate earthquakes.

The Hahajima Seamount is located at 26N, and serpentinized harzburgites were dredged. The Hahajima Seamount is different from the other serpentine seamounts in respect that the Seamount is rectangular shape and located just beside the trench axis. To investigate whether the Hahajima Seamount is a serpentine seamount or not, we conducted a seismic refraction/reflection survey and observed seismicity around the Seamount.

Observation

Ten pop-up type ocean bottom seismometers (OBSs) were deployed using the R/V Hakuho-maru in November 2003. We set 2 refraction/reflection lines, one crossed the Seamount, the other was through the foot of the Seamount. After the structure survey, we observed seismicity during 10 days.

Results

From the paste-up of each OBS, the signals from air-guns are only recognized within 10km from OBSs. This means that the Hahajima Seamount consists of very high attenuating media. Since we can not determine the seamount structure from these records, we try to estimate the structure from travel time residuals of teleseismic records. Using 6 teleseismic records, we calculated the velocity of the basement of the Seamount to be about 3.6 km/s. This velocity is consistent with the velocities of the other serpentine seamounts.

No seismic events were observed during 10 days at and around the Seamount. In general, observations using similar OBS systems have been detected at least few tens of seismic events during 10 days. Therefore, this result means that the seismicity at and around the Hahajima Seamount is extremely low.

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