Seismic Velocity Structure around the Izu-Oshima Island revealed by using OBSs and controlled sources

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1.Introduction

The Izu-Oshima volcano erupted frequently in the past. In November 1986, the Izu-Oshima volcano erupted after an interval of 12 years since the last eruption. This phenomenon is caused by the sudden rise of the magma from deep region and it is important for understanding process of eruption, prediction of a volcanic eruption, and consideration of tectonics to obtain the crustal structure. Many geophysical studies have been performed in the Izu-Oshima, so that the shallow crustal structure has been revealed (e.g. Ito et al. 1981). However the deep crustal structure has not been revealed yet. The seismic survey using long profile to study deep structure was carried out in 1999. The profile was extended to marine area across the Izu-Oshima. We report the experiment of marine area that was carried out as a part of the experiment.

2.Experiment

From October 24 to November 5 in 1999, a seismic survey with ocean bottom seismometers (OBSs) was carried out around the Izu-Oshima. The profile has a trend of the direction of northwest-southeast across the Izu-Oshima. The length of the profile is about 18km in northwest side and about 10km in southeast side. Nine OBSs in northwest side and eight OBSs in southeast side were deployed. We used airguns and explosives as controlled sources. Two airguns were fired every 120m on the profile. The explosives of 200kg and 300kg were exploded. Each three explosives were used on both sides. During shooting of the airguns, reflection waves were recorded by single channel hydrophone streamer towed from the shooting ship. On the other hand, seismic stations were deployed along the northwest-southeast line in the island to records signal from sources.

3.Analysis and Conclusion

A structure beneath the profile is estimated by forward modeling using a two-dimensional ray tracing method. Beneath the profile of northwest side, the surface layer has thickness of 400-700m with P-wave velocities of 1.7-2.0km/s. The second layer has thickness of 1000-1600m with P-wave velocities of 2.5-3.2km/s and velocity becomes larger as close to the island. The third layer is 1400m thick with P-wave velocities of 3.7-4.5km/s. Velocity interfaces of each layer become shallower as close to the island. In addition, the estimated shallow velocity structure in marine area seems to correspond to the shallow structure in the island.