Preliminary report on multi-channel seismic reflection survey in the northern Shichito-Iojima ridge

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1.Introduction:

The Shichito-Iojima ridge is located on the volcanic front of Izu-Ogasawara arc, being characterized by a variety of volcanic topography formed by the volcanic activity in Quaternary. Because the influence of the erosion is smaller in ocean than in land, the oceanic area is appropriate for seismic imaging study to reveal tectonic history. In the northern Shichito-Iojima ridge, there are many submarine calderas, detailed structures of which are still unknown.

In October 2004, JAMSTEC conducted a multi-channel seismic (MCS) reflection survey in the northern Shichito-Iojima ridge using R/V KAIREI. This survey was carried out as a part of the seismic investigation of continental shelf around Japan.

2. Data acquisition:

During the survey, we collected 384.7km of MCS data along the volcanic front of the ridge. Two typhoons and an earthquake brought noises to the MCS records. Near the islands, the survey line was crooked for safety reasons and then the feathering angle became to be large. However, there is no strong water current and no large shipping traffic in this region.

The data acquisition was conducted by using a total of 12000 cu. in. airgun array (eight 1500 cu. in. airguns) with shot spacing of 50 m, air pressure of 2000 psi and towing depth of 10 m. The receiver was a 204-channel hydrophone streamer cable with group interval of 25 m. The range of offset was 110 to 5200 m. The record length and sampling interval were 15 s and 4 ms, respectively.

3. Data processing and discussion:

We applied a standard 2D seismic data processing sequence: trace edit, geometry set, bandpass filter, wavelet processing, amplitude recovery, deconvolution, velocity analysis, multiple suppression, NMO correction, mute, CMP stack, poststack time migration, and so on, using FOCUS and ProMAX software. In this study, we selectively conducted the geometry setting and the multiple suppression. For the former, we applied so-called the Crooked line binning method, which is often used in land-data-processing. For the latter, we carefully chose the parameters considering influence from uneven seafloor topography and the crooked-line geometry.

We will present the preliminary interpretations from the processing result. The acoustic basement basically corresponds to the basement rocks of the present volcanoes, showing complex structures and regional characteristics. Thick sediments cover the basement around the volcanoes, without relation to water depth. The thickness of sediments is 1 to 2 s in two-way-traveltime. These observations may have some relationship with the bimodal volcanism and the existence of many composite volcanoes in the study area. The sediments are considered to be composed of the volcano-clastics according to the distribution. Furthermore, we can see the difference in internal structures of submarine calderas along the survey line.

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