Seismic structure of middle-Jurassic oceanic crust in Western Pacific based on multi-channel seismic reflection experiment

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1. Introduction

Minami Tori Shima, it is located in easternmost Japanese territorial island, belongs to the Marcus-Wake Seamount chain. According to the previous paleomagnetic studies, the oceanic crust around the seamount chain was formed in Jurassic at a fast spreading rate (half spreading rate of 6.7 mm/year) and it is the oldest part of the Pacific Plate. Jurassic basalt from ODP site 801C located ˜150 km to the south of the seamount chain was dated at 167 Ma by using Ar^{40}/Ar^{39} age determination. To understand a detailed structure of and estimate a formation process of the oceanic crust in Jurassic we conducted a wide-angle seismic and multi-channel reflection experiment around Minami Tori Shima.

2. Survey

The survey line 'MTr5' is approximately 900 km in length, and cutting across the Marcus-Wake Seamount chain in the direction of NNE-SSW. As the seismic source, a tuned 8,040 cubic inch air-gun array was fired every 50 m (˜25 sec) for the reflection experiment. Seismic data were acquired using a 6,000 m long multi-channel streamer (480 ch) with a sampling rate of 2 msec and record length of 15 sec.

3. Results

We obtained a high resolution multi-channel profile of MTr5. The Moho reflections can be clearly identified beneath the flat seafloor. At the presentation, we especially focus on the deep sea floor of the southern part of MTr5, corresponding to the sea floor formed in Middle Jurassin, to understand the structure of the oldest oceanic crust of the Pacific Plate.

The Moho reflections can be identified at ˜10 sec two-way travel time. And many other striking reflections are observed beneath the acoustic basement.

In oceanic crust layer 3, strong unclear intermittent reflection lies parallel to the seafloor (we call it 'reflection A' in this summary). This reflection can be confirmed in multi-channel profiles, though no velocity gap is in the layer 3 of the velocity model obtained by the refracted wave analysis. Between the reflection A and the Moho reflections, and in the oceanic layer 2, many dipping reflections are observed. Some reflections reach to the acoustic basement and correspond to both edges of a small bump on the sea floor. So, they were probably caused by the fault.