

Crustal structure over a seismically active region off Ibaragi prefecture deduced from a refraction-reflection seismic survey

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Along the Japan Trench where the Pacific Plate subducts beneath the Japanese islands, in spite of a constant rate of its subduction, the seismicity and manner of occurrences show large variations. There has been recognized a cluster of earthquakes off Ibaragi prefecture beneath the 2000 ~ 3000 m deep seafloor of the landward slope of the Japan Trench, which has an area of approximately 30 deg. x 30 deg. The present seismicity remains high, and earthquakes having magnitudes ~7 repeatedly occurred with a fairly constant interval of 20 years. No earthquakes having magnitudes ~8 have occurred. The last such earthquake occurred in July, 1982, and the one previous to it occurred in January, 1961. It has been reported that these earthquakes were accompanied by smaller foreshocks. As an example of such occurrences, the 1982 earthquake was accompanied by 4 M~5 earthquakes that started to occur 2 days before the main shock. It has already been more than 20 years since the last 1982 earthquake, and swarm earthquakes including one M5.4 earthquake started to be observed since June, 2002. Earthquake Research Institute, the University of Tokyo is conducting one-year-long repeating seismic observations using five long-term Ocean Bottom Seismometers (OBSs) in the region to observe a series of foreshocks, the main shock and aftershocks.

In this study, in order to understand the relation between the crustal structure around the plate interface and the manner of earthquake occurrences, we conducted a refraction-reflection seismic survey using airguns as seismic sources and 27 OBSs and a 24-channel hydrophone streamer as receivers during KH04-4 cruise of the R/V Hakuho-Maru from November 3rd through 15th, 2004. The depth to the plate interface is supposed to be 25 km deep, and in order to probe such depths, the survey was conducted along a 150 km-long North-South along-trench, and a 140 km-long East-West perpendicular-to-the-trench profiles. Fifteen and 13 OBSs were deployed with ~10 km interval, respectively. Two 25-l, and one 20-l airguns were used, and were fired every 40 seconds that corresponds to 100 m. In order to improve the shot density, each profile was shot twice. All OBSs were recovered and fine data were collected. In this presentation, we will introduce preliminary results of this refraction-reflection seismic survey.