

Ocean bottom seismic observation in the Hikurangi subduction zone offshore the North Island of New Zealand

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The Hikurangi Plateau which has ~12 km thick crust subducts under the Australian plate in the Hikurangi subduction zone offshore North Island, New Zealand. The plate interface is relatively shallow so that geometry of the plate interface has been revealed in detail by high quality seismic reflection data collected along dense profiles along the margin [Bell et al. 2010]. Distribution of interseismic plate-coupling has been estimated and series of slow slip events (SSEs) have been detected at around the lower limit of the coupling region due to recent installation of dense GPS network over the North Island. In the northern part, along-strike coupling region is narrow and the upper limit extends to near the trench axis and the lower limit is shallow at ~15 km depth. Most of the region of strong interplate coupling is under the sea. We need to conduct seismic observation using ocean bottom seismometers (OBSs) to understand seismicity and hypocentral distribution in detail. SSEs occur at much shallower depth than other subduction zones.

We conducted a passive seismic observation using OBSs for the first time offshore Gisborne to reveal seismicity and low-frequency events accompanying SSEs. We deployed four OBSs in April 2012 and recovered all instruments after 11 months of observation. The northern two instruments were a broadband type and the other southern two were equipped with 1Hz seismometers. Although the recorder of one of the broadband type OBSs recorded only intermittently, good data were obtained from the others. An earthquake swarm occurred to the north of the array in September to November 2012. A large SSE occurred around the Hawke's Bay to the south of the array from mid-February 2013. At first we apply STA/LTA algorithm to this data to detect seismicity. The result shows seismicity was activated accompanying both the earthquake swarm and the SSE. We tried to determine the hypocenters of these events using 4 OBSs and some GeoNet onshore seismometers. We could detect more offshore events than are listed in the GeoNet catalogue owing to higher Signal-to-Noise ratios of the OBS data while most events occurred beneath the seafloor.

Keywords: seismicity, Hikurangi, OBS