

P-Wave Velocity Structure and Local Seismicity of Hikurangi Subduction Zone, New Zealand, as Revealed by the 2001 OBS Experiment

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The North Island Geophysical Transect (NIGHT) was undertaken in 2001 to study the subduction process beneath the North Island, New Zealand. As a part of the project, 14 ocean bottom seismometers (OBSs) were deployed along a NW-SE offshore profile with spacing about 15 km. The OBS's recorded about 2000 airgun shots.

We performed ray-tracing by forward modelling to analyse the P-wave velocity structure across Hikurangi subduction zone. As the result, we found two seamounts along the profile. One of them is located near the trench on subducting oceanic crust. And the other one is located at ca. 40 km landward from the trench and is subducting at the depth of ca. 8 km. The size of this subducting seamount is 4 km high and 30 km wide. It seems that the subducting seamount is steeper than normal seamounts which were reported for the other subduction zones. The thickness of subducting oceanic crust is 10-13 km, and P-wave velocity gradient of oceanic layer 2 is lower than normal oceanic layer 2. There is also a low velocity layer close to the land. The crustal model shows that subducting oceanic crust is gently dipping beneath accretionary prism and fore-arc basin.

The OBS experiment gave us an opportunity to study, for the first time, the local offshore seismicity associated with the Hikurangi subduction zone. We could detect and locate more than 100 shallow earthquakes which occurred along the East Coast margin and east and west of the trench axis. Many events tend to occur in some small clusters within an area less than 10 km*km. The most active seismic swarm is located on the subducting oceanic crust of the Hikurangi Plateau, 200 km east of Hawke Bay, and produced more than 30 events during our observation period.