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海域構造調査によるニュージーランド北島南端におけるヒクランギ沈み込み帯の速度構造と重力モデリング
Wide-angle OBS velocity structure and gravity modeling along the SAHKE transect, lower North Island, New Zealand

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As part of the Seismic Array HiKurangi Experiment (SAHKE) project, we acquired wide-angle reflection / refraction seismic data using ocean bottom seismometers (OBSs) along a transect across the southern North Island of New Zealand, where the Hikurangi Plateau, an early Cretaceous large igneous province, which subducts westward beneath Wellington, the capital city of New Zealand. The SAHKE project was designed to investigate the physical parameters controlling locking at the plate interface beneath the southern North Island and characterize slip processes in a major segment of the Hikurangi system. We deployed 16 OBSs with 5 km spacing off the east coast and 4 OBSs with 10 km spacing off the west coast. Controlled airgun sources were shot at every 100 m along a 350 km onshore-offshore transect. Although data from OBSs at shallow depths (˜100 m) contain large amplitude ambient noise, first arrivals from the airgun sources can be traced up to over 100 km offset on record sections of most OBSs. We applied first-arrival travel-time inversion in order to obtain P-wave velocity structure along the 80 km-long OBS profile off the east coast. Starting with a simple stratified velocity model including subduction structure, we iteratively revise the initial model and put more constraints on the first arrival picks. The velocity structure to ˜20 km depth was resolved, and the down going slab was clearly imaged. We picked travel times of reflected waves, and projected reflection points by applying a travel-time migration method using the first arrival velocity model. Reflection interfaces including the plate interface, a prominent phase that may represent the base of the Hikurangi Plateau and an interface between the upper and lower crusts are imaged. These interfaces can also be traced westward beneath the Wellington Region and consistent with observations from onshore active source data. We also observed P-wave arrivals with very fast apparent velocities (> 8.5 km/s) on the eastern-most OBSs, at offsets larger than ˜120 km. These arrivals are not reversed but can be explained as a refractions from the base of the Hikurangi Plateau crust beneath the Chatham Rise or as an eclogite layer within lower crust. We use gravity data and Vp-density relationships to test the hypothesis that the lower crust of the Hikurangi Plateau has transformed to eclogite.

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