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The mantle discontinuity depths in the stagnant Pacific slab beneath the Philippine Sea

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We determined depths of the mantle discontinuities (the 410-km and 660-km discontinuities) in the Pacific slab stagnant in the mantle transition zone beneath the Philippine Sea using data from a broadband ocean bottom seismograph (BBOBS) network. As a part of the Stagnant Slab Project (2004-2008), twelve BBOBSs were deployed on the seafloor in the northern Philippine Sea. We analyzed nine-twelve months long data recovered by the cruise (KR06-14) with the JAMSTEC research vessel KAIREI to determine the mantle discontinuity depths beneath the northern Philippine Sea and westernmost Pacific. Among them, eight stations have continuous records longer than nine months, which were used in the further analysis. We employed the Velocity Spectrum Stacking of receiver functions (Gurrola et al., 1994). We stacked receiver functions at three stations located above the stagnant Pacific slab imaged by a seismic tomography to determine the discontinuity depths in and around the stagnant slab. The 410-km and 660-km discontinuity depths and the thickness of the mantle transition zone are 384 km, 692 km, and 308 km, respectively, assuming the iasp91 model for a velocity correction. As a comparison, we estimated the discontinuity depths beneath a 'normal' Pacific region from three BBOBS stations in the westernmost Pacific Ocean, giving 392 km and 651 km for the 410-km and 660-km discontinuity depths, respectively. The 660-km discontinuity is significantly deep in the stagnant Pacific slab. Assuming that the deep 660-km discontinuity is solely caused by a cold temperature environment of the stagnant slab, the thick mantle transition zone around the stagnant slab is estimated to be 300 K colder than beneath the 'normal' Pacific Ocean.