

Physical properties of the materials near the top of the subducting Philippine Sea plate beneath the SW Japan arc by AVO analysis

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Large earthquakes occur along the Nankai trough, SW Japan, where the Philippine Sea plate is subducting beneath southwestern Japan arc. To understand tectonics related to the occurrence of these large earthquakes, we need to elucidate crustal and upper mantle structures of the subducting Philippine Sea plate and the overlying southwestern Japan arc. In the summer of 1999, we conducted a highly dense onshore-offshore integrated seismic experiment in the eastern part of Shikoku Island and the adjacent Nankai trough, SW Japan. Three explosives were fired as controlled seismic sources. We obtained high signal-to-noise ratio data along the entire length of the land profile. The most remarkable feature of the record sections is that extremely high amplitude reflections (bright reflections) can be recognized. This reflection phase is observed from almost zero offset to large offsets(160km). This phase was interpreted as a reflected wave from the top of the subducting Philippine Sea plate [Kurashimo et al., 2002].

Physical properties across the reflecting interface control amplitude versus offset (AVO) response. To obtain properties of the material between the subducting Philippine Sea plate and island arc crust, we investigated AVO response on this bright reflections. Analyzing this bright reflections, we could obtain the reflection coefficient (R_{pp}) as a function of the incident angle. R_{pp} tends to increase beyond about 45 degrees. To discuss about this characteristic, we calculated reflection coefficient for different velocity models. The single interface models (positive velocity contrast exists between the interface. negative velocity gradient exists upper side of the reflector) can not explain the characteristic of the R_{pp} . Thin layer model (about 200 m) with a P-wave velocity of 4.0 km/s (a thin layer with a negative reflection coefficient at its upper boundary and a much larger, but positive reflection coefficient at its base exists) explains the characteristic of the R_{pp} . The P-wave velocity of the sediments shows 2.0-4.2km/s off Shikoku Island (Kodaira et al., 2001). These results suggests that sedimentary material subducts beneath the southern part of Shikoku Island with the oceanic crust.