

Seismic wave velocity in the asthenosphere beneath Petit-spot

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Recently, a new type of volcanism is found on the 135 million years old Pacific plate [Hirano et al. 2001; Hirano et al. 2006]. The small alkalic submarine volcanoes are named as Petit-spot. The origin of the volcanism is unknown. Hirano et al. [2006] propose that the volcanoes erupt along lithospheric fractures formed in plate bending near outer-rise. However, the mechanism of the melt generation and eruption are still controversial.

Seismic velocity in the asthenosphere beneath Petit-spot may place strong constraints on the mechanism of the melt generation. In a previous study [Obayashi et al., 2006], a large low velocity anomaly (-1.5 %) of P wave around the 410 km discontinuity beneath Petit-spot is reported. The temperature anomaly estimated from the low velocity anomaly is +200 K and suggests the presence of fractional melt of less than 1% [Obayashi et al., 2006]. However, the low velocity anomaly does not seem to extend to the surface volcanoes in the tomographic image. The relation between the low velocity anomaly and Petit-spot is not obvious.

In this study, we investigate seismic velocity in the shallow asthenosphere beneath Petit-spot.

We measure Rayleigh wave (0.01-0.02 Hz) velocity which has the highest sensitivity in the depths range shallower than 150 km. We compare the velocity of Rayleigh wave which sample off Tohoku coast (Petit-spot region) and off Shikoku coast. In a preliminary result, we do not found any distinct difference between the tow regions. This result suggests that the asthenosphere beneath the Petit-spot is under normal condition. Alternative possibilities are that (if any) velocity anomaly is too small to be resolved by surface wave study or largely extends over the two regions. In order to provide further constraints on the velocity stricture in the asthenosphere beneath Petit-spot, OBS data may be indispensable.

Waveform data used in this study were corded by broad band seismograph network (F-net). The network is operated by National Research Institute for Earth Science and Disaster Prevention (NIED).