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# 3D Seismic Velocity and Attenuation Structures in Kinki

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In southwestern Japan, the young Philippine Sea plate is subducting along the Nankai Trough beneath the Amurian plate and the old Pacific plate is descending from the east beneath them. Although no active and Quaternary volcanoes exist in the Kinki district, high $^{3}He/^{4}He$ are observed in the Kii peninsula (e.g., Sano and Wakita, 1985). High $^{3}He/^{4}He$ values suggest that some mechanisms of bringing primordial $^{3}He$ from the mantle are working there. The long-continuing Wakayama earthquake swarm activity is observed in the western part of the Kii peninsula along the south of the Median Tectonic Line. Beneath the Osaka bay, just located north of the Wakayama swarm, low-frequency earthquakes are observed around the Moho depth. To understand these characteristic crustal activities, we determined 3D seismic velocity and attenuation structures beneath the Kinki.
For the velocity structure, we applied the tomographic method by Zhao et al. (1992) to a large number of arrival-time data obtained from 15,984 earthquakes and 600 stations. Geometries of the Conrad, Moho and upper boundary of Pacific slab are considered in ray tracing. We set grid nodes in the model space with intervals of 0.1-0.2°in the horizontal direction and 10-50 km in the vertical direction. For the attenuation structure, we used waveforms from 654 earthquakes occurring in the crust of the overlying continental plate and the Philippine Sea slab. Amplitude spectrums are calculated, and $t^{*}$(whole path attenuation) are estimated from the decay of the spectrums at higher frequencies than the corner frequency, following the method of Eberhart-Phillips and Chadwick (2002). Using the obtained $t^{*}$, the 3D seismic attenuation (Q) structure is determined by the inversion. Total numbers of used $t^{*}$are 12,699(P) and 11,744(S).
High velocity zone is imaged for the mantle of the subducting Philippine Sea slab in eastern Shikoku and from the central part of the Kii peninsula to Tokai. However, in the southwestern part of the Kii peninsula, a low-velocity region is imaged in the slab mantle. Beneath the Philippine Sea slab, two large low-velocity regions are imaged, which extend upward from the upper boundary of Pacific slab at depths of 300 and 400 km. The two low-velocity regions appear to merge into one beneath the Philippine Sea slab at the southwestern part of the Kii peninsula. This low-velocity region cannot be explained by temperature anomaly alone, and fluids are likely to exist, which probably represents a hydrous mantle upwelling from the Pacific slab.
Beneath the Wakayama earthquake swarm, a low-velocity and high-attenuation region is imaged. Low-frequency earthquakes beneath the Osaka bay occur at its deeper end. Vp/Vs values are low in the upper crust and high around the low-frequency earthquakes. These features are also imaged beneath the volcanoes in Chubu and Chugoku district. Our results show the existence of a large volume of fluids in the crust beneath the Wakayama swarm and the Osaka bay, suggesting important roles of geofluids in generating characteristic seismic activity around the Kii peninsula.