Spatial distribution and b-values of earthquakes beneath Kii Peninsula, southwestern Japan

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Spatial distribution and b-values of seismicity beneath Kii Peninsula were examined using the JMA earthquake catalog and information discontinuities estimated by receiver function analysis and temporary seismic network data. Seismicity were classified into continental crust events, mantle wedge events, and intraslab events and examined the characteristics of them in detail. Moreover, intraslab seismicity were also divided into oceanic crust and oceanic mantle events. The b-value of intraslab events (0.82) were smaller than those of continental crust events (1.01) and mantle wedge (1.06). The b-value of oceanic crust events (1.01) is larger than that of oceanic mantle ones (0.74). The b-values of mantle wedge events, oceanic crust ones and oceanic mantle ones beneath "southwestern" Kii peninsula were clearly different those beneath "northeastern" Kii peninsula. At the boundary of the "southwestern" and "northeastern" Kii peninsula, two large previous intraslab earthquakes (the 1952 M6.7 Yoshino earthquake and the 1899 M7.0 Kii Yamato earthquake), one of segmentation boundaries of tremor and northern edge of the Kumano acid rocks were located.

Experimental results of the acoustic emissions (Ferrand et al. 2017; Kita and Ferrand, under review) indicated that the b-value of peridotite rocks increases with increase of hydration. Therefore, the oceanic mantle beneath southwestern Kii peninsula is more serpentinized than that beneath northeastern Kii peninsula. On the other hand, the mantle wedge beneath southwestern Kii peninsula is less serpentinized than that beneath northeastern Kii peninsula, which is consistent with the low attenuation structure of the mantle wedge there by Kita and Shibutani (2017). Theoretical simulation study for propagation of episodic tremor and slip by Ando et al. (2012) show that segmentations of slow-slip propagation (in the strike direction of the plate interfaces) occur depending on heterogeneous distribution of rheological strength on plate interfaces. The edges of the segments of slow slip correspond to points at which the rheological properties change and the spatial distribution of the seismic attentuation structure. As indicated by Kita and Matsubara (2016) beneath Shikoku region based on the atteuation structure imaging, the heterogeneity condition of the overlying plate and subducting plate could cause a formation of a segment of ETS.

Keywords: intraslab earthquake, b-value, tremor, Oceanic mantle, Acoustic emission, Kumano acid rocks

