

Three-dimensional deep electrical resistivity structure beneath the Kii Peninsula, Southwestern Japan

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SUMMARY

The Kii Peninsula in the forearc region of southwestern Japan has distinct structural and tectonic features due to the subducting Philippine Sea (PHS) slab. These include high-seismicity, deep low-frequency tremors (DLTs), and high-temperature hot springs. The Kii Peninsula is key to understanding the relationship between deep fluids and seismic activities. In this study, we analyzed the network-MT data acquired in the Kii Peninsula, including the data used in Yamaguchi et al. (2009), to estimate a 3-D regional deep resistivity model for the first time in this region. The resultant model seems to be the most reliable as for the deep subsurface structure, which has a complex 3-D nature. The result of the inversion shows a high-resistivity zone, considered as a Kumano acidic rock body (KAR), beneath the Kii Peninsula and corresponds well with the seismic high-velocity zone and the high-gravity anomaly zone. A low-resistivity region surrounds the high-resistivity region, and a prominent low-resistivity region extends from the top of the slab to the crustal surface. In the Kii Peninsula, high-temperature hot springs with high ³He/⁴He isotopic ratios gush out around the high-resistivity zone at the crustal surface, i.e., at the margin of the KAR, which is consistent with this finding in that this fluid is of deep origin. This correspondence between the resistivity structure and the spatial distribution of the hot springs may explain the fluid contribution in the subsurface of the Kii Peninsula. DLTs occur at the boundary between the high-resistivity zone and the top of the PHS slab, and the low-resistive area around the DLTs inferred by Yamaguchi et al. (2009) was not identified. The high-resistivity zone is interpreted to be part of the KAR, which may contribute to the occurrence of DLTs by preventing the upward flow of fluids from the slab.

Keywords: electrical resistivity structure, Kii Peninsula, Deep Low-Frequency tremor, high-temperature hot springs, Network-MT method
