

Magnetotelluric investigations in the Chugoku and Shikoku regions, southwestern Japan: close relationships between resistivity structure and seismic activities

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SUMMARY

The purpose of this study is to investigate the spatial and structural heterogeneity of the crust and upper mantle beneath the Chugoku and Shikoku regions, southwestern Japan, by conducting magnetotelluric (MT) investigations to contribute to the reduction of disasters due to earthquakes and volcanic eruptions.

Our research group revealed a clear relationship between resistivity structure and seismic activity in these regions by the 2D MT analysis. In the northern part of the Chugoku region, a zone of microearthquake activity parallel to the coastline exists in the upper crust, where several large inland earthquakes have occurred in the past 100 years. This seismic zone is resistive and low resistivity areas are identified under this zone. In the Shikoku region, remarkable conductive zones exist within the upper crust south of the Median Tectonic Line, and these are related to the low seismic activity in the central and western parts of Shikoku.

If an inland earthquake is caused by local stress concentration resulting from an inhomogeneous structure directly under the seismic activity zone (Iio, 2009), it is important to carefully examine the inhomogeneous structure and consider the relation of seismic activity and stress concentration / relaxation.

For this purpose, we have started 3D MT inversion analyses. The results show the following structural features. First, the above-mentioned relationship between resistivity structure and seismic activity found in the previous 2D analysis is confirmed also in the 3D structure. Secondly, the spatial extent of the lower crustal conductors beneath the northern Chugoku region, which is related to the low-frequency earthquake region, has been identified. Thirdly, the conductive regions were confirmed to be widely distributed at a depth of around 10 km south of the Median Tectonic Line. Fourth, resistivity structures related to the Philippine Sea Plate and deep low-frequency seismic tremors areas were identified.

Keywords: 3D MT inversion, in-land activities, seismicity, low-frequency earthquake, subduction zone
