Resistivity structure around the Atotsugawa fault system revealed by inversion schemes combining Wideband- and Network-MT methods

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The Atotsugawa fault system (central Japan) in the Niigata-Kobe tectonic zone is one of the best field to research the physical mechanism of strain accumulation along earthquake faults because of its potential of causing large earthquakes (~M7.0), high deformation rate and existence of many geophysical studies.

In order to elucidate the strain accumulation mechanism around the Atotsugawa fault system, we investigated the resistivity structure around the fault system. To delineate a reliable resistivity structure from the upper crust to the uppermost mantle, we estimated the resistivity structure by combined inversion schemes of the wideband-magnetotelluric method and the Network-MT method. In the Network-MT method, metallic telephone cables several kilometers in length are used to measure electric potential differences.

By a two-dimensional combined inversion scheme, we revealed that, in the lower crust, there are localized conductive areas below the Atotsugawa fault, the Ushikubi fault and the Takayama-Oppara fault zone. We interpreted that the lower-crustal conductors are localized ductile shear zones with highly connected fluid, being responsible for the strain accumulation along the respective active faults just above the conductive areas. In addition, in the mantle wedge under the Atotsugawa fault system, a large conductive area was imaged, which may be attributed to the fluid dehydrated from the Philippine Sea slab and/or the Pacific slab.

In addition, so as to evaluate the effects of three-dimensional distortion to the resistivity structure, such as caused by the land-sea boundary at the north of the Atotsugawa fault system, we newly developed a three-dimensional inversion scheme combining the wideband-magnetotelluric method and the Network-MT method.

In this presentation, we review the results of the two-dimensional modeling and show an early result of the three-dimensional modeling.

Keywords: new inversion scheme, wideband and Network MT method, lower-crustal fluid, fault-zone conductor, ductile shear zone, upper mantle fluid

