

Resistivity structure around the earthquake swarm area in the southeastern region of Mt. Ontake

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We carried out magneto-telluric measurements in the southeastern region of Mt. Ontake, where the 1984 Western Nagano Prefecture earthquake occurred and earthquake swarms have been observed since 1976. Most of the earthquakes have focal depths shallower than 10 km. The purpose of this study is to delineate the resistivity structures around earthquake swarm area, because the resistivity structure is very sensitive to the free water in the crust.

In the beginning, Kasaya et al.(2002) carried out two-dimensional analysis over two profiles across the earthquake fault of the 1984 Western Nagano Prefecture earthquake: one is in the low seismicity region of the fault (A-A') and the other, in the high seismicity region (B-B'). The resistivity structure along the A-A' profile is reasonably homogeneous and shows a high resistivity of more than ohm-m. The resistivity structure along the B-B' profile has a clear boundary at the center of the profile. This boundary divides the structure along the B-B' profile into two resistivity blocks and its location coincides with that the earthquake fault. A conductor is detected at depths greater than 8 km to the northwest of the earthquake fault. The depth to the upper boundary of the conductor coincides with those of the seismic reflectors. This structure seems to be formed by the free water dehydrated from the magma.

Moreover, three-dimensional analysis was performed for the data set observed around the focal region of the earthquake swarms (Kasaya and Oshiman, EPS submitted). An initial three-dimensional image was constructed based on 2-D resistivity analysis results (Kasaya et al., 2002). This analysis can allow us to show the relationship between lateral resistivity image and hypocenter distribution. Lateral inhomogeneity of the resistivity structure is remarkable: a low resistivity zone is located at the shallow depth around the center of the study area and the low resistivity zone surrounded by the high resistive structure. This feature agrees well with the distribution of the degree of the water saturation deduced from seismic information. Hypocenters of recent seismicity are distributed around a portion between the resistivity boundary and the relatively high-resistance region. This fact strongly suggests that earthquakes in the study area are triggered by fluid (water) in the crust.