Resistivity Monitoring in Erimo and Nijibetsu, Hokkaido

Tomonori Watanabe[1]; Toru Mogi[2]; Masamitsu Takada[3]; Minoru Kasahara[4]

[1] Natural History Sci., Hokkaido Univ; [2] ISV, Hokkaido Univ.; [3] Inst. Seismology and Volvanology, Hokkaido Univ.; [4] ISV, Hokkaido Univ

Introduction: Resistivity changes might be expected to accompany with rock failure or fluid flow related to earthquakes. For the purpose of predicting great earthquakes in Eastern Hokkaido, we had installed resistivity monitoring arrays in Erimo and Nijibetsu areas in 1996, which have been continuously operated to date. The array simultaneously measures variation of both electric and geomagnetic fields. We obtained changes in apparent resistivity derived from changes in magnetotelluric(MT) transfer functions.

Observations: Electric fields were recorded on ˜100 meter long short dipoles and on long dipoles using telephon line ranging from 4 to 12 km long. These dipoles were constructed electronically from signals relayed via cables or telephone lines from electrodes. Geomagnetic fields were measured using flux-gate magnetometer. Both telluric voltages and geomagnetic variations were sampled at every 10 sec with a digital data acquisition system.

Analysis and Result: We calculated apparent resistivitis at some periods from 64 to 2048 sec using MT response function between 1996 and 2003. We used robust MT response function estimates based on the BIRRP method [Chave and Thomson, 2004], which described to simultaneous limit on the influence of both outliers and leverage points. Missing data or large noises generated by instrumental noise, cultural noise, and rainfall are excluded in the estimations. As a result, range of changes in apparent resistivity (xy and yx component) during the 8 years are 17˜47%, 11˜17% on short dipoles in Erimo, 12˜13%, 34˜42% on short dipoles in Nijibetsu, and 5˜9%, 25˜37% on long dipoles in Nijibetsu.

Discussion: We considered reasons apparent resistivity were so fluctuated. Annual variations were found in the apparent resistivity of short dipole in Erimo. Unusual fluctuations in 2001 were seen in Nijibetsu. Most of the extraordinary estimates maybe caused by noises such as huge geomagnetic activity or heavy rain, etc. But, they may include fluctuations caused by the crustal activities.