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Temporal Resistivity Change of Crustal Resistivity Structure Before and After the 2011 Tohoku Earthquake

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The NE Japan was under the EW compression and localized strain distributions were observed along the Ou backbone ranges, which were responsible for generating the large inland earthquakes. The coseismic displacement of the 2011 off the Pacific Coast of Tohoku Earthquake (M9) released EW compressional strain and generated EW extension over the region. This earthquake had a great influence crustal dynamics in NE Japan. In particular, the seismicity around the Naruko area has sharply decreased. The GPS displacement show extension deficit (Ohzono et al, 2012), i.e. the Ou backbone rage shows less EW extension compared to the surroundings, because of the anomalous viscosity under the Ou backbone range. InSAR detected the subsidence of the geothermal regions around the Naruko area (Takada and Fukushima,a 2013). These suggest existence and migration of crustal fluids after the M9 earthquake.

MT is suitable to detect the fluid migration in the crust, as the resistivity is sensitive to the existence an connectivity of fluids, although they are minor components in the fluid bearing rocks. The previous profile MT dataset over Naruko volcano were obtained in 2003 (Asamori et al., 2010) and we tried to repeat MT measurements at the same places in 2013. Altough we tried to measure at the same spots, the locations are not exactly the same. In particular, we worry about the difference in the near surface local structures of the 2003 and 2013 sites. To overcome this difficulty, we used phase tensor (Caldwell et al, 2004) as response functions, which are insensitive to galvanic distortions of the near-surface local structure. To evaluate the temporal changes, it is important to show the errors of the phase tensors. For this, we used boot-strap method with 1000 realizations. We compiled the difference of α, β, ϕmax, ϕmin with error bars for all the period range. We found some consistent differences in the phase tensor parameters.

Keywords: resistivity, temporal variation, magnetotellurics, phase tensor, fluid