Along axis variation in electrical resistivity distribution around the 2011 Tohoku-oki earthquake

*Hiroshi Ichihara[1,2], Takafumi Kasaya[2], Kiyoshi Baba[3], Makoto Yamano[3]

1.Kobe University, 2.Japan Agency for Marine-Earth Science and Technology, 3.Earthquake Research Institute, the University of Tokyo

The 2011 Tohoku-oki earthquake (M9.0) was associated with huge fault slip over 80 m in the shallowest part of the plate interface where aseismic slip behavior was widely believed (e.g. Iinuma et al., 2012; Fujiwara et al., 2011). A key factor to understand the “anomalous” fault behavior is pore fluid around the plate interface because it controls shear strength of fault.
In order to discuss fluid distribution around the rupture zone, we acquired marine magnetotelluric data between 2009 and 2012 based on ocean bottom electro-magnetometers (OBEM) at 22 sites along three parallel survey lines; one line crosses the center of fault ruptured zone including the shallowest huge slip area (line C, along latitude 38N); another line crosses the north end of ruptured zone where tsunami origin was estimated (Ichihara et al., 2013) despite the significant fault slip is not estimated (line B, along latitude 39N); and the other line crosses the south part of fault ruptured zone where azimuth of trench axis is significantly different with the north lines (line D, along latitude 37.5N).
We estimated resistivity distribution beneath the line C using the 2-D inversion code based on Ogawa and Uchida (1996). The estimated resistivity profile shows a low resistivity zone in the shallowest part of plate interface. On the other hand, resistivity is relatively high in the deeper plate interface. They indicate that the huge fault slip occurred in the pore fluid rich area whereas the fault slip is small in the dehydrated area. In the presentation, resistivity distribution beneath the line B and line C will be shown to discuss variations of resistivity structures in along-axis direction.

Keywords: 2011 Tohoku-oki earthquake, Electrical conductivity, Resistivity, magnetotelluric, northeastern Japan arc

