An electrical resistivity profile along Murakami –Soma city, across the NE Japan arc

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Mount. St. Helens locates at obviously fore-arc side from the volcanic front. Moreover, it is well known that the crustal seismicity have turned active around the Iwaki city and the northern Ibaraki prefecture since the 2011 off the Pacific coast of Tohoku Earthquake (the 2011 Tohoku earthquake), which is considered to be caused by transport of crustal fluids. These results indicate geofluids rise up to the crust beneath some areas of fore-arc from uppermost mantle. The crust beneath the fore-arc around the border of Miyagi and Fukushima prefecture could store geofluids transported from uppermost mantle.

Ohzono et al. (2012) estimated the coseismic strain response of the 2011 Tohoku Earthquake, and found the extension deficit region (EDR) along Ou-Backbone Range (OBR). They interpreted the EDR was ascribed to low viscosity in the lower crust induced by fluid-flow upwelled from uppermost mantle. The EDR runs towards fore-arc side around the border of Miyagi and Fukushima prefecture, and, therefore, we could expect fluid presence in the lower crust beneath the fore-arc side around Miyagi-Fukushima border. On the other hand, Miura et al. (2004) estimated the strain rate during an interseismic period between 1997-2001, and found strain concentration (shortening) around OBR, but relatively extension around the fore-arc of Miyagi-Fukushima border.

In this study, we model two-dimensional electrical resistivity profile along Murakami –Soma city, where passes the Miyagi-Fukushima border, to investigate fluid presence in the lower crust beneath the fore-arc region of NE Japan arc.

Magnetotelluric (MT) method is used to model the electrical resistivity profile. The electrical time variation data were acquired at 26 observation site along Murakami –Souma in Sep. 12th to Nov. 30th, 2010. Typical observation duration was 10 to 23 days per site. We got 32 Hz (all time) and 1024 Hz (2:00-2:45 JST) sampling data..

The MT response function was estimated using Bounded Influence, Remote Reference Processing (BIRRP, e.g. Chave & Thomson., 2004). The 0.01~1.5 s, 2~100 s and over 100 s period range of the response function was calculated from 1024 Hz, 32 Hz and 1 Hz sampling data, respectively. Obtained the response function, we calculated phase tensor (Caldwell et al., 2004) and its determinant Φ_2. The pseudo section of Φ_2 represents almost 45° beneath fore-arc in all period range. The result indicates no obvious conductor in the crust and uppermost mantle beneath the fore-arc region around the border of Miyagi-Fukushima prefedture. On the other hand, the Φ_2 is much larger than 45° in the 10~1000 s period range beneath around OBR, where an obvious conductor presence is expected in the deepe crust to uppermost mantle.

We found that the MT response data were affected by galvanic distortion, and will apply Groom-Bailey (G-B; Groom & Bailey, 1989) decomposition to the response data. In this presentation, we will show a two-dimensional electrical resistivity profile calculated from the MT response to which the G-B decomposition applies.

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