MT Survey and its preliminary result at Boso Peninsula, Japan (3)

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A magnetotelluric (MT) survey is one of the methods to understand the underground electric properties. In Boso area, Japan, there are three main topics to perform the MT survey; (1) to estimate underground resistivity structures related to the plate boundaries, seamount, asperities, and slow slip events; (2) to obtain a regional realistic resistivity structure for the numerical simulation in generation and propagation mechanisms of electromagnetic precursors, and (3) to develop a new MT technique to reduce the cultivated noises such as DC-driven train system and factories. For challenges to solve them, we decided to carry out the MT survey in Boso area, Japan during 2014 - 2016. Due to sensing down to 100 km depth, we used induction and fluxgate magnetometers. We set 41 and 12 sites for induction and fluxgate type magnetometers, respectively.

To remove noises from MT data, we attempted remote reference method that is conventional MT method in frequency domain. Hereupon, MT impedance at southern Boso area is improved to a certain degree. In other hand, the one at northern Boso are is not very improved. Therefore, we attempted MSSA (Multi-channel Singular Spectrum Analysis) for MT data in time domain to improve MT impedance. We performed SVD (Singular Value Decomposition) of original time series in MSSA, and reconstructed time series by using the principal components that indicate relatively high correlation in horizontal geomagnetic field between observation site and remote reference site. Then, unexpected MT impedance seen after remote reference method is tend to be restrained. It supposedly indicates that preprocessing MT data in time domain is effective and promise.

We calculated underground resistivity structure from southwest to northeast by using long period sites' data, there is low resistivity region (0.1 −10 ohm-m) around 1 - 2 km depth. This region possibly indicates fluid in sediment layers overlying large amount of surface at Boso area. There is low resistivity region (0.1 −10 ohm-m) under about 3 −10 km depth at southwest site, which possibly indicates ultramafic rock or accretionary prism pushed up by subducting seamount.

