MT法連続観測データの長期安定性について（２）

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Long-term stability of continuous MT monitoring, Part 2

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The magnetotelluric method has been recently applied to resistivity monitoring of a fault zone and volcano and geothermal reservoir. These studies expect to detect a time-dependent resistivity change of target structures. In order to detect such a small change, it is needed to remove any other variations, which are caused by variations of electromagnetic source, noise and contact conditions. This study aims to evaluate the long-term stability of MT data and to present a way for an application of resistivity monitoring. We analyzed the MT data continuously measured by GSI at Esashi (ESA) and Wakuya (WKY) observatories from June 2005 to June 2011. The 'BIRRP' time series processing code (Chave, and Thomson, 2003) estimated the MT responses by using 30-day-long data every 10 days. The 30-day-long data brought much better quality of the MT responses, which showed small error bars, compared to the ones from one-night data. The apparent resistivity, phase and magnetic transfer function at the ESA station obviously shows seasonal variations at a high frequency band above 1 Hz. The coherence between the electric field and predicted electric field shows poor quality in winter season (November to April). Large error bars of the magnetic transfer function in winter season imply that the variations are not caused by only the variation of the electric field noise. The phase tensor (Caldwell et al., 2004) can avoid an effect of the electric field distortions. Because the phase tensor parameters at the ESA vary with over 10 % range, the variation of the MT responses is not the effect due to the distortion. Additionally, because such variations of ESA are larger than of WKY, the data can reflect variations of instrumental characteristics and electromagnetic noise. These results show that an external factor can bring notable changes of the MT responses even if at the site where any structural temporary change is not expected. In order to apply the MT method to a detailed resistivity monitoring, it is required to previously know a background variation for the term without structural change, using continuous measuring at multiple stations.