MT data analysis with Multi-channel Spectrum Analysis (MSSA)

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Near the Boso Peninsula, there are triple junctions where the Pacific Plate, the Philippine Sea Plate, and the North American Plate gather, and crustal deformation is very active. Off the coast of Boso is the epicenter of the Enpo earthquake, and the southern Boso area is the epicenters of the 1702 Genroku Kanto earthquake and the 1923 Taisho Kanto earthquake. Recently, slow slip events have been confirmed off Katsuura every 5-6 years. In 2014-2016, Chiba University conducted a wide-area MT survey in the Boso Peninsula to investigate the source structure of the past major earthquake and the resistivity structure of the plate boundary. The observations were made at 12 long-term observation points at 1 Hz sampling using U43 and 41 short-term observation points at 2400, 150 and 15 Hz using MTU-5 and MTU-5A. However, in the Boso Peninsula, the influence of artificial noise included in the acquired MT data is extremely large due to leakage current from a DC train, factories, or power lines running around/in the peninsula. A conventional remote reference method using geomagnetic 1 Hz data at Memambetsu station operated by Japan Meteorological Agency was applied to the Boso MT data, but the effect of noise reduction was insufficient. Therefore, in this study, we applied the noise removal of time series data using Multi-channel Singular Spectrum Analysis (MSSA) as preprocessing of MT analysis. MSSA parameters include window length, data length, and principal component grouping. By changing these parameters, the effect of noise removal on Boso MT data was investigated in detail. This time, we report the effect of noise reduction by parameters and the results of MT analysis.

Keywords: noise reduction, Multi-channel Singular Spectrum Analysis, MT method, Boso peninsula

