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Geomagnetic transfer function analysis and fractal analysis using Esashi's MT data

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There are many reports on earthquake-related electromagnetic phenomena. Anomalous ULF geomagnetic field changes associated with earthquake is one of the most convincing and promising phenomena due to deeper skin depth. Since ULF signals associated with large earthquakes are weak, effective signal discrimination methods should be required. Several methods for the signal discrimination have been developed so far. In this study, we investigate ULF geomagnetic changes possibly associated with the 2008 Iwate-Miyagi Nairiku earthquake based on normalized spectrum density ratio analysis, geomagnetic transfer function analysis, and fractal analysis (Detrended Fluctuation analysis : DFA). Geomagnetic data observed at Esashi and Kakioka have been analyzed. Their epicentral distances from Esashi and Kakioka are about 47 km and 317 km, respectively. 25 days before the earthquake, the variations of normalized spectrum density ratio and geomagnetic transfer function at the Esashi station exhibits an apparent changes from the trend. On the contrary, there are no corresponding significant changes at a remote station of Kakioka. On the same day, scaling index of vertical component decrease at the Esashi station based on DFA. On the other hand, there is no significant change at the Kakioka station.

These facts suggest the anomalous changes at the Esashi station are a possible candidate of earthquake-related ULF geomagnetic signals.

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Keywords: Geomagnetic transfer function, fractal, the 2008 Iwate-Miyagi Nairiku earthquake, ULF