

Long-term spectral analysis on ULF geomagnetic field observed at South Boso Peninsula

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Electromagnetic phenomena preceding large earthquakes have been reported in DC-VHF frequency range. ULF electromagnetic phenomena are the most promising among them because of the deeper skin depth. In order to study the earthquake-related ULF electromagnetic phenomena, discrimination of the signals is very important. In order to separate the anomaly change related to crustal activities from the geomagnetic variations more clearly, the ratio of vertical and horizontal components of spectral density has been investigated. The spectral analysis based on the wavelet method has been applied to the observed data instead of FFT because FFT analysis is not suitable for transient signals such as impulse.

In this paper, we would like to show you the relationship between the crustal activities and ULF geomagnetic activity observed at South Boso Peninsula, Japan in the period from 2000 to 2008.

We used two crustal activity indexes; the characteristics of these indexes are as follows;

(1) The regional seismicity of a daily integrated value of E_s that has been calculated using earthquakes with hypocentral distance of r less than 100km has been collected from JMA catalog, and (2) the seismic data satisfies the empirical relation for appearance of the anomalous ULF signals preceding large earthquakes(M-D relation).

We detect anomalous spectral density ratio change exceeds $+\sigma$, $+1.5\sigma$ and $+2\sigma$ using standard deviation of all the analysis period. We used the regional seismicity data of E_s more than 9 and 10.

As a result, the case which capture E_s more than 10 after 30 days that anomalous spectral density ratio change exceeds $+1.5\sigma$ has high relationship between the anomalous spectral density ratio change and crustal activities. Then, the case which capture seismic data satisfies M-D relation after 30 days that anomalous spectral density ratio change exceeds $+1.5\sigma$ has similar result.

Anomalous spectral density ratio change exceeds $+1.5\sigma$ is related to the crustal activities. However, we indicates that anomalous spectral density ratio change also contains aseismic activities.