

## ULF geomagnetic changes possibility associated with large earthquake.

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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 large earthquake during the 2001 and the 2008 in Boso Peninsula based on spectrum density ratio analysis, fractal analysis (Detrended Fluctuation analysis : DFA ) and direction finding analysis. Geomagnetic data observed at Kiyosumi, Uchiura and Kakioka have been analyzed. Kiyosumi and Uchiura stations are set up within 5 km, so similar tendency results is expected to record at Kiyosumi, and Uchiura stations.

At 16:34(LT) on the Jul. 23, 2005, a large earthquake occurred in Boso Peninsula. The epicentral distance from Kiyosumi station is about 47 km. On the day, the variations of spectrum density ratio at Kiyosumi and Uchiura stations exhibit apparent changes from the average ones. On the same day, scaling index of vertical component decrease at the Kiyosumi and Uchiura stations based on DFA. On the contrary, there are no corresponding significant changes at a remote station of Kakioka. We only use the midnight time data (LT 01:30~03:30), so that signatures appear before the earthquake. And results of direction finding on that day indicate an increase of direction of arrive from the epicenter. These facts suggest the anomalous changes at the Kiyosumi, Uchiura station are a possible candidate of earthquake-related ULF geomagnetic signals.