

ULF geomagnetic variation at Tarumizu station, Kagoshima prefecture, Japan

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Anomalous ULF geomagnetic field changes associated with the 1997 Kagoshima-ken Hokuseibu Earthquake at Tarumizu has been reported by Hattori et al.,2002. In order to evaluate the significance of the ULF geomagnetic field variation by means of for the 1997 Kagoshima earthquake, the long term analysis have been reported for Tarumizu data in this paper.

In this paper, we use 3 component geomagnetic data with 1 Hz sampling at Tarumizu and Kakioka stations from January 1, 1995 to September 30, 2008.

The observed ULF signals on the ground are divided into 3 types: (1) global and intense variations originated from upper atmosphere (2) local artificial noises, and (3) ULF emissions from lithosphere. Since the earthquake-related ULF emissions are weak, effective signal discrimination methods are important. In this paper, we use spectral density ratio analysis. The variation of spectral density ratio (S_z/S_x) exhibits an apparent increase 2-3weeks before large earthquakes just like the previous result. But the variation has season variation or enhancement, so we have to standardize the ratio for evaluation of the relation between the enhancements and some large earthquakes. The normalization is given by the following equation, $S_z/S_x^* = [S_z/S_x - AV\{S_z/S_x\}] / SD$, where $AV\{S_z/S_x\}$ is the variation of 15 days before and after running means of the daily value, SD is the standard deviation of $AV\{S_z/S_x\}$. As a result, we confirmed the enhancements of the ratio 2-3weeks before the earthquakes, but these enhancements did not beyond the 3 SD. However, the normalized spectral density ratio tends to increase before the seismically active day. Therefore, Superposed Epoch Analysis has been performed between the normalized spectrum density ratio and enhancement of seismic activity. It is revealed that the SEA result show the significant increase 18 days before seismically active day. These facts suggest the relation between ULF geomagnetic activity and seismic activity.