

Statistical analysis of ULF geomagnetic changes related to earthquake activity using transfer function around Kakioka, Japan, during 1997-2015

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Recently, ultra low frequency (ULF, less than 1 Hz) has been considered one of the most prospective bands to detect earthquake precursory signatures because of its larger skin depth. Han et al., 2014 have performed statistical studies at Kakioka (KAK) station, it is proved that ULF geomagnetic changes preceding earthquake at KAK station has statistical significances. However, we can use only the remote station as a reference which shows a high correlation with KAK station. Therefore, to study use any remote station for investigation the ULF geomagnetic changes related to earthquake, we have performed statistical studies using the geomagnetic transfer function approach using the KAK station, Japan, during 1997-2015. We investigated the energy of ULF geomagnetic signals of the frequency around 0.01 Hz using wavelet transform analysis. To minimize the influences of artificial noises and to remove global geomagnetic perturbations, we used only the geomagnetic data observed at nighttime (LT 01:30 A.M. to 04:30 A.M.) and utilized observations from a remote station, Memambetsu, as a reference. We have computed geomagnetic Z component at KAK station using transfer function, and defined P value (the ratio observed Z component and computed). We have determined threshold for geomagnetic anomaly from P value. Earthquake as $E_s > 10^8$ at KAK station have chosen for this study. Statistical results of superposed epoch analysis have indicated that significant correlation between ULF geomagnetic changes and earthquake 21-25 days before the events. Further, we have evaluated the precursory information of ULF geomagnetic changes related to earthquake using Molchan's error diagram. The probability Gain (PG) is around 1.3 against a Poisson model. The above results have indicated that it is possible to use any remote station using transfer function. Details will be given in the presentation.