



Statistical analysis and assessment of ULF seismomagnetic phenomena for a short-term earthquake forecast at Kanto area, Japan, during 2001-2010

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To clarify and verify ULF (ultra-low frequency) seismo-magnetic phenomena, we have performed statistical studies on the geomagnetic data observed at several stations, in Japan, during 2001-2010. They are Kiyosumi (KYS), Uchiura (UCU), Fudago (FDG), Seikoshi (SKS), Mochikoshi (MCK), Kamo (KAM), and Kakioka (KAK). KAK is a standard geomagnetic station operated by Japan Meteorological Agency and the others are operated by us. We investigated the energy of ULF geomagnetic signals at the frequency around 0.01 Hz using wavelet transform analysis. To minimize the influences of artificial noises and global geomagnetic perturbations, we used only the geomagnetic data observed at nighttime (LT 2:30 am-4:00 am). Here, we describe the results of KAK as an example. As for KAK data, we utilized observations from a remote station, Kanoya (KNY), as a reference. Statistical results of superposed epoch analysis have indicated that ULF magnetic anomalies are more likely to appear before sizeable earthquake events ($E_s > 108$) rather than after them, especially 6-15 days before the events. Further statistical investigations show clearly that the ULF geomagnetic anomalies at KAK are more sensitive to larger and closer events. Finally, we have evaluated the precursory information of ULF geomagnetic signals for local sizeable earthquakes using Molchan's error diagram. The probability gain is around 1.6 against a Poisson model. The above results have indicated that the ULF seismo-magnetic phenomena at KAK clearly contain precursory information and have a possibility of improving the forecasting of large earthquakes. The statistical results for the other stations also show similar tendency. These facts suggest that ULF magnetic anomalies have a significant correlation and precursory information on a sizeable earthquake.