

Analysis of geomagnetic diurnal variations at Esashi station from 1997~2012

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There have been many reports on ultra-low-frequency (ULF) electromagnetic phenomena associated with earthquakes in a very wide frequency range. In this study, unusual behaviors of geomagnetic diurnal variations prior to the 2011 off the Pacific coast of Tohoku earthquake (Mw9.0) have been reported. Ratios of diurnal variation range between the target station Esashi (ESA) which is about 135 km from the epicenter and the remote reference station Kakioka (KAK) have been computed. The results showed that there had been clear anomalies exceeding the statistical threshold in the vertical component about 2 months before the mega event. These anomalies are unique over a 16 years background. The original records of geomagnetic fields of the ESA station also exhibited continuous anomalous behaviors for about 10 days in the vertical component from Jan.3, 2011-Jan.13, 2011, about two months prior to the Mw 9.0 earthquake. During the same period, other independent geophysical parameters such as seismicity and crustal deformation also show clear unusual changes, which suggests these anomalies might be related with the mega event.

Keywords: ULF seismo-magnetic phenomena, earthquake, geomagnetic diurnal variations