

Japan Geoscience Union Meeting 2011

(May 22-27 2011 at Makuhari, Chiba, Japan)

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MIS036-P02

Room:Convention Hall

Time:May 26 14:15-16:15

Is there any relationship between the 2011 Tohoku mega Earthquake and the geomagnetic field variations in Japan?

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On 11 March 2011 at 05:46:23 UTC, a mega earthquake (EQ) with magnitude 9.0 [The 2011 Tohoku Earthquake] has occurred near the east coast of Honshu, Japan, as a result of thrust faulting on or near the subduction plate boundary between the Pacific and North American plates. Generally, anomalous geomagnetic variations observed by ground-based measurements in association with the earthquakes are generally accepted and many studies have reported precursory phenomena (a few nT's) associated with some earthquakes. Geomagnetic data from MAGDAS network, Geospatial Information Authority of Japan (GSI) and other geomagnetic observatories in Japan stations have been analyzed to examine the occurrence of any anomalous signature related to this massive earthquake.

Our results indicate an increase in the total magnetic field intensity (F) in the vicinity of the epicenter of the Tohoku EQ (38.322 N, 142.369 E), compared with other reference stations inside and outside the epicentral region. Moreover, the annual range of the daily Z-component variations tends to decrease near the epicenter. In addition, the polarization ratio of Pc3 [Z/H] at Onagawa (ONW) station (about 80 km from the epicenter) shows a decrease a few weeks before the occurrence of the Tohoku EQ.

Keywords: total magnetic field intensity(F), daily Z-component variations, polarization ratio of Pc3 [Z/H]