Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01458, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01458
EGU General Assembly 2008

Ground- and satellite-based LF transmitter signal observations of ionospheric perturbations for the Miyagi-ken oki earthquake (2005 August 16).

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The Japanese LF transmitter (located at Fukushima prefecture, frequency =40 kHz) has been used to detect its whistler-mode signals in the ionosphere by the satellite, Demeter, and it is found that there was observed convincing evidence of signal intensity depletion before the 2005 Miyagi-ken oki earthquake (August 16, 2005; M=7.3). In order to have sufficient spatial resolution, we have used the long-averaging time of 3 weeks in the satellite data analysis. While, we can have the sufficient temporal resolution when using the ground-based data (JJY-Kochi, JJY-Moshiri (Hokkaido) and JJY-Kamchatka (Russia)). The nighttime fluctuations at these three propagation paths have exhibited significant anomalies just around the earthquake, with exceeding the mean + 3 standard deviations. We can conclude that the lower ionosphere is definitely disturbed around this earthquake.