

Nightside Ultra-Low-Frequency waves observed in the topside ionosphere by the DEMETER satellite

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We study Ultra-Low-Frequency waves (ULF) at frequencies 17-100 mHz observed in the topside ionosphere by the DEMETER satellite in a ~5-year period from January 2006 to November 2010. Our results show that two types of ULF oscillations occur on the nightside in the $L < 2$ region. These two kinds of ULF oscillations are separated based on cross-covariance analysis between electric field in the DC/ULF range and electron density. Type I ULF oscillations, accompanied by electron density perturbations (average $|\delta N_e/N_{e0}| > 5\%$), are found to lag behind density variations; and the longitudinal distribution of type I ULF oscillations is quite similar to the distribution of plasma irregularities at solar minimum. These signatures suggest that type I ULF oscillations are related to plasma irregularities that are common phenomena in the nightside F region ionosphere. The characteristics of type II ULF oscillations (without significant electron density perturbations) agree well with those features of mid-latitude ionospheric electric field fluctuations, which are not thought to be related to magnetospheric origins.

Keywords: topside ionosphere, ultra-low-frequency oscillations, electron density perturbations