Geophysical Research Abstracts, Vol. 7, 04664, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04664

Observations of HF emissions by ICE, the electric field experiment on the Demeter satellite

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The ICE electric field instrument on the DEMETER satellite allows to measure AC electric fields up to 3.175 MHz. In the HF range, average spectra are available in all modes of operation of the satellite and snapshot measurements of the waveforms are available in the burst modes. The main objective of the DEMETER mission being to investigate the electromagnetic perturbations in the ionosphere that are associated with the Earth's seismic activity, the operation of the satellite has been restricted since the launch at latitudes below about 65° invariant latitude, which most of the time dismisses the possibility of observing intense HF wave activity related to the auroral zone. Nevertheless, a number of events with HF emissions have been detected with several typical characteristic spectra, especially on the evening side at subauroral latitudes just poleward of the mid-latitude trough and near the equatorial edge of the auroral oval. An overview of typical events is presented, including broadband hiss emissions in the whistler mode often coincident with enhanced ionization and intense Z-mode waves near the upper hybrid frequency. We also report on an unexpected effect observed on dayside orbits and likely linked to the solar panels and their associated electronics and leading to the possibility of using them with the double probe electric antennae as a sounder for plasma diagnosis. The converter electronics generates harmonics distant of ∼90 kHz that are filtered up to ∼1MHz, i.e a value most often lower than the electron plasma frequency fpe and also than the electron gyrofrequency fce at subauroral latitudes. The condition fpe>fce is satisfied on dayside orbits and HF frequency-time spectrograms derived from wave measurements show that the harmonics fn above 1 MHz are strongly enhanced in a time interval limited by the conditions fn = fpe for the

upper harmonics or by the conditions fn = max (fce, 1 MHz) for the lower harmonics. The agreement between the upper cut-off frequency and the electron plasma frequency inferred from the IAP (plasma analyser instrument) and ISL (Langmuir probe) data is very good and leads to conclude that the upper envelope of harmonics can be used for plasma density diagnosis. An explanation is proposed.