NTC Radiation reflected on Magnetopause Surface: Observations from Cluster Large Scale Configuration

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Non Thermal Continuum radiation (NTC) is an electromagnetic wave of weak intensity, steady in time. Observations of terrestrial NTC radiations, below $\sim$100 kHz, can be classified into two classes. A first class corresponds to wave frequencies above the magnetosheath plasma frequency, the radiation escaping in the interplanetary medium. Corresponding spectral characteristics are a series of narrow banded emissions. A second class corresponds to wave frequencies below the plasma frequency of the magnetosheath. The radiation bounces at the magnetopause and is trapped in the magnetospheric cavity. This class of NTC is often observed in frequency-time spectrograms as a wide and continuous frequency band. In this paper, we present an event of bounced radiation whose spectral characteristics are similar to those of escaping radiation.

The Cluster mission, which has been launched during the 2000 summer, is a constellation of four identical satellites. The tetrahedral disposition of the satellites allows a spatial-temporal study of the structures they cross. The two main purposes of the WHISPER experiment are to record the natural waves in the bandwidth 2-80 kHz and to make a diagnostic of the electron density using the sounding technique. The various working modes and the Fourier transforms calculated on board provide a good time and frequency resolution and allow us to: (i) detect the fine structure of NTC emissions, (ii) derive directivity properties, based on spin modulation of the received electric field.

On July, 16, 2005, the four Cluster satellites observed NTC radiation in the plasmapause vicinity. A series of distinct and parallel NTC narrow bands are observed in frequency-time spectrograms above the local plasma frequency. Despite the very large separation between the satellites (10 000 km), these bands and their variations in frequency appear at the same time on each satellite spectrogram. The phenomenon is also observed in data of IMAGE (nearby Cluster) and Geotail (placed downstream in the tail). By using two different methods, first, spin modulation properties and second ray tracing, we show that these observations can be explained by the following scenario: radiation emitted by a source region placed near equator in the dawn side of the outer

plasmasphere, bounced at the magnetopause, and can be observed in different points in the magnetosphere.