Geophysical Research Abstracts, Vol. 9, 04659, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04659

Initial Results of a Systematic Analysis of Lion Roar Emissions Observed by Cluster

V. Krupar(1), O. Santolik (1,2), M. Maksimovic (3), N. Cornilleau-Wehrlin (4), and J.S. Pickett (5)

(1) Charles University, Praha, Czech Republic, (2) Institute of Atmospheric Physics / ASCR, Praha, Czech Republic, (3) DESPA, Observatoire de Paris, Meudon, France, (4) CETP/UVSQ, Velizy, France, (5) University of Iowa, Iowa City, IA, USA.

Lion roars are short-duration, narrow-band, intense wave emissions observed in the Earth's magnetosheath. We describe initial results obtained from a systematic analysis of more than one year of measurements obtained by the CLUSTER mission. We use cross spectral matrices of three magnetic and two electric field components from the STAFF-SA (Spatio-Temporal Analysis of Field - Spectral Analyser) instrument. Based on frequency-time power spectrograms we have manually selected time and frequency intervals when the Cluster satellites detected lion roar emissions. This large data set has been processed by the dedicated software (PRASSADCO) in order to statistically analyze selected time intervals. We then automatically exclude measurements with power spectral densities of magnetic field fluctuations lower that a predefined threshold from our data set. We also exclude measurements when the assumption of an almost circularly right-hand polarized plane wave is invalid. In the next step, statistical properties of this reduced data set are analyzed. The ratio of observed frequencies of lion roar emissions to corresponding values of the local electron cyclotron frequency forms a wide distribution of values below 0.5, with a peak at 0.1 and a median value of 0.16. The spatial distribution of lion roars is investigated in the entire range of magnetic local times and their localization between the model bow shock and magnetopause is determined. We also investigate the field-aligned component of the Poynting flux of these waves, which, together with the locally measured magnetic field directions, indicates possible source regions. The fine structure of lion roar emissions is demonstrated using case studies of high-resolution waveform measurements obtained from the WBD (Wideband Data) instrument.