



Lion roar emissions observed by Cluster spacecraft

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Lion roars are intense, narrow-band, short-duration whistler-mode emissions occurring in the Earth's magnetosheath. We present a statistical study based on the CLUSTER data (the STAFF-SA experiment) obtained during years 2001 (high solar activity) and 2006 (low solar activity). We have manually selected about 5000 time-frequency intervals containing lion roar emissions. This large dataset has been processed in order to exclude other emissions (thresholds on intensity, ellipticity and planarity). More than one million spectral matrices have been obtained. We have studied a frequency distribution, a wave power distribution and a spatial distribution. We have found that lion roars are observed on the dawnside and on the dayside of the magnetosheath more often than we expected. We have investigated the relation between the Z_{MFA} (magnetic field aligned) component of the Poynting vector normalized by its standard deviation and the local direction of the magnetic field. Our results show that lion roars are generally propagating from the bow shock toward the Earth. We have compared our results with positions of a model bow shock and solar wind conditions. We present case studies from the waveform analyzer WBD onboard CLUSTER in which we have investigated the fine structure of lion roar emissions. Propagation characteristics of selected events are given considering local plasma conditions.