

Energy conversion in the plasma sheet and its relationship to aurora as observed by Cluster and FAST

O. Marghitu (1, 2), M. Hamrin (3), B. Klecker (2), K. Rönmark (3), S. Buchert (4), L.M. Kistler (5), M. André (4) and H. Rème (6)

(1) Institute for Space Sciences, Bucharest, Romania

(2) Max-Planck-Institut für extraterrestrische Physik, Garching, Germany

(3) Physics Department, Umeå University, Sweden

(4) Swedish Institute of Space Physics, Uppsala, Sweden

(5) Space Science Center, University of New Hampshire, Durham, USA

(6) CESR-CNRS, Toulouse, France

(Contact: marghitu@venus.nipne.ro)

The four Cluster satellites provide a good platform for investigating the power density, $\mathbf{E} \cdot \mathbf{J}$, with \mathbf{E} the electric field and \mathbf{J} the current density. In the plasma sheet \mathbf{E} can be inferred by cross-checking data from two instruments, CIS and EFW, while \mathbf{J} can be derived from the magnetic field data. When $\mathbf{E} \cdot \mathbf{J} < 0$, mechanical energy is locally converted into electromagnetic energy, part of which can propagate as Poynting flux and dissipate in the auroral ionosphere. When $\mathbf{E} \cdot \mathbf{J} > 0$ the conversion sense is reversed and the mechanical energy of the plasma, for example the bulk flow energy, increases. We present energy conversion events identified by Cluster in the plasma sheet, at about $18R_E$, during the summer and fall of 2001. Conjugate FAST data, measured around $0.6R_E$, show good correlation with electron precipitation, for some of the $\mathbf{E} \cdot \mathbf{J} < 0$ events. One such event is examined in detail, by checking the mechanical energy equation and the Poynting theorem.