



Generator and load regions in the plasma sheet as detected by Cluster

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The local conversion of mechanical energy into electromagnetic energy takes place in generator regions where $\mathbf{E} \cdot \mathbf{J} < 0$, with \mathbf{E} the electric field and \mathbf{J} the current density. Inside load regions the transformation is reversed, $\mathbf{E} \cdot \mathbf{J} > 0$, and electromagnetic energy is converted into mechanical energy by reversible and/or irreversible processes. In this paper we concentrate on the plasma sheet, known to host both generator and load regions. Cluster offers appropriate conditions for a systematic investigation of $\mathbf{E} \cdot \mathbf{J}$ in the plasma sheet. The electric field can be inferred by using data from two instruments, CIS and EFW, which improves on the reliability of the estimates. One can also fully derive the current density vector, by using magnetic field data from the four Cluster satellites. We have scanned several plasma sheet Cluster crossings in the summer and fall of 2001 for clear $\mathbf{E} \cdot \mathbf{J} \leq 0$ signatures. The location of the identified generator and load regions within the plasma sheet is inferred by computing the plasma β parameter. The findings are discussed in terms of recent simulation results published in the literature and compared to previous data analysis work of the authors.