



A statistical study of the current sheet structure associated with fast flows in the magnetotail

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This presentation consist of two parts. In part I a new method to study current sheet structures is described. Part II focuses on statistical results from this method. Magnetic field and ion data from the tail season 2002 of Cluster have been used both in the development of the method and analysis of the results. The method can briefly be described as follows: By using a standard Harris sheet model it is possible to estimate the location of a spacecraft in a current sheet. During a given time interval the spacecraft distance from the current sheet centre (Z) is found for each magnetic field sample. In this study we have searched for events where Cluster obtain magnetic field samples from “all” locations between the centre of the current sheet and the lobe. For such time intervals the magnetic field and ion data are plotted against the distance (Z) and empirical relations between Z and the different data types are found for each event. Since the main objective behind this study is to investigate structures in the current sheet, several additional criteria have been used to exclude events which show rapid time changes. These criteria will be explained in the presentation. In part II a superposed event analysis of the empirical dependence between the magnetic field and Z in the magnetotail during fast flows are presented. The statistics clearly indicate a tailward current in the centre of the current sheet and an earthward current closer to the lobe for earthward flows. For tailward flows the pattern is opposite. These kind of currents may be explained as field aligned currents closing with Hall currents in the reconnection region.