Calculating the motion and direction of Flux Transfer Events with Cluster

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Abstract

For many years now, the interactions of the solar wind plasma with the Earth's magnetosphere has been one of the most important problems for Space Physics. It is very important that we understand these processes because the high-energy particles and also the solar wind energy that cross the magnetosphere could be responsible for serious damage to our technological systems. The solar wind is inherently a dynamic medium, and the particles interaction with the Earth's magnetosphere can be steady or unsteady. Unsteady interaction include transient processes like bursty magnetic reconnection. Flux Transfer Events (FTEs) are magnetopause signatures that usually occur during transient times of reconnection. They exhibit bipolar signatures in the normal component of the magnetic field. We use multi-point timing analysis to determine the orientation and motion of flux transfer events (FTEs) detected by the four Cluster spacecraft on the high-latitude dayside and flank magnetopause during 2002 and 2003. During these years, the distances between the Cluster spacecraft were greater than 1000 km, providing the tetrahedral configuration needed to select events and determine velocities. Each velocity and location will be examined in detail and compared to the velocities and locations determined by the predictions of the component and antiparallel reconnection models for event formation, orientation, motion, and acceleration for a wide range of spacecraft locations and solar wind conditions.