MMS Observations of FTE-Type Structures with Internal Magnetic Reconnection

Rungployhan Kieokaew, Benoit Lavraud, and Nais Fargette

Institut de Recherche en Astrophysique et Planétologie (IRAP), UPS, CNRS, France (rkieokaew@irap.omp.eu)

A bipolar magnetic variation $B_{n}$ with enhanced core and total fields in spacecraft data are recognized as a Flux Transfer Event (FTE) signature, which corresponds to the passage of a magnetic flux rope structure. Recent literature reported Magnetospheric Multiscale (MMS) observations of FTE signatures with magnetic reconnection signatures at the central current sheet. Among reported cases, electron pitch angle distributions (ePAD) in the suprathermal energy range show different features on either side of the reconnecting current sheet, indicating different magnetic connectivities. This structure is interpreted as interlinked/interlaced flux tubes, possibly formed by converging jets toward the central current sheet that in turn enhance magnetic flux pile-up and facilitate reconnection at the current sheet separating the two flux tubes. By surveying similar events using MMS data, we found some FTE-type structures with reconnection signatures at the central current sheet but with homogeneous ePAD of suprathermal electrons across the structures. Thus, these structures are inconsistent with interlinked flux tubes, but rather a regular flux rope. This leads to a question of how reconnection can occur in those single flux ropes, and their relation with interlinked flux tubes. In this work, we investigate properties of these structures and their related upstream solar-wind conditions. Formation mechanisms of such structures and how reconnection can occur will be discussed.