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MMS observations of Hall currents at the borders of a crater flux transfer event

Lorenzo Trenchi (1), John Coxon (2), and Robert Fear (2)

(1) ESA – ESRIN, Directorate of Earth Observation Programmes, Largo Galileo Galilei 1, 00044 Frascati (Roma), Italy (lorenzo.trenchi@esa.int), (2) Department of Physics and Astronomy, University of Southampton, Southampton, UK

We present MMS observations of a Flux Transfer Event (FTE) detected on 27 October 2015, during a period of stable southward interplanetary magnetic field. Several reconnection jets were also observed during this period. The FTE is characterized by a clear signature in the magnetic field magnitude, with a maximum of the magnetic field intensity at the FTE centre, flanked by two local minima. This class of FTEs are called 'crater' FTEs, and have been suggested to be connected with an active reconnection X line. The MMS burst mode data allowed for the identification of intense fluctuations in the components of electric field and electron velocity parallel to the magnetic field at the borders of the FTE. We interpret these as signatures of the magnetic separatrix, and we infer that this FTE is connected with an active reconnection X line. This has important consequences for the FTE generation mechanism: in the original Russell and Elphic (1978) model, the FTE is not connected with an active reconnection site, and only in the extended X line models are the separatrices expected at the borders of the FTE. Our observations suggest a stratification of the particles inside the reconnection layer, in which electrons are flowing toward the X line along the separatrix, and flowing away from the X line along the adjacent reconnected field lines. More internally, ions and electrons are flowing away from the X line with comparable velocities, forming the observed reconnection jets.