Geophysical Research Abstracts
Vol. 19, EGU2017-11181-2, 2017
EGU General Assembly 2017

Structure and evolution of flux transfer events near magnetic reconnection dissipation region

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We investigate a series three small scale flux transfer events (FTEs) associated with reconnected flux ropes (FR) recently generated by a nearby, dayside magnetic reconnection (MR) site. The data are provided by the Magnetospheric Multiscale (MMS) spacecraft near noon local time. Intense current density (>3 μA/m^2), a thin current layer (44km$\sim$0.5d$_i$), strong electron heating, a high-amplitude electric field (>100 mV/m), electron crescent-shaped distributions and the absence of an ion jet at the magnetopause indicate that MMS crossed the magnetic reconnection dissipation region [Burch and Phan, 2016]. Within one minute before MMS crossed this dissipation region, three evolving, small scale FTEs were observed one by one moving southward from the reconnection site located northward of MMS. The electric currents (calculated both using the curlometer technique and from particle moments) are mainly located in the center of the FTEs and parallel with the magnetic field. The large current in the center can reach 600 nA/m^{-2} and shows a bifurcated feature. We find that the associated FTEs are created by secondary magnetic reconnection and have different magnetic field topologies, which is a similar condition to that expected in the Multiple X-line MR model. The size of the FTEs become larger with the time elapsed since MR and the reconnection jets at the FTEs are all located on the trailing and outer edges. The above features indicate that these FTEs are still in the evolution stage after they are ejected from reconnection region ('active' FTEs). Our observation may suggest that mesoscale or typical size FTEs can be created from secondary MR, initially, and subsequently can evolve to a typical size in the process of spreading.