



Magnetotail reconnection events observed by MMS

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We present two magnetotail reconnection events observed by MMS. Both events, occurring on 11 July and 17 July in 2017, respectively, represented mid-tail reconnection as indicated by reversals of the plasma outflow and magnetic field. The 11 July 2017 event exhibited no/little guide field. The 17 July 2017 event that was preceded by multiple magnetic field fluctuations due to flapping of the magnetotail featured a moderate guide field. Detailed field and particle observations indicated that MMS encountered the electron diffusion region during both events. EDR encounters were characterized by electron agyrotropy, i.e. multi-layered electron distributions, electron bulk motions decoupled from the magnetic field, and dissipative feature. In particular, we report MMS observations of enhanced electron vorticity in the vicinity of the electron diffusion region of magnetic reconnection with and without a guide field. We discuss the origin of the electron vorticity enhancement, the effect of the enhanced vorticity in modifying magnetic field topology, and how the electron vorticity enables us to delineate multi-scale reconnection boundaries using the two MMS events.