Advances in Magnetic Reconnection with Magnetospheric Multiscale

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Magnetospheric Multiscale (MMS) has completed its exploration of magnetic reconnection at the Earth's dayside magnetopause. It has now begun the complementary exploration of reconnection in the magnetotail. At the dayside magnetopause MMS has demonstrated the central role played by electron kinetic-scale physics. Mixing of magnetosheath and magnetospheric electrons leads to non-gyrotropic distributions that produce the reconnection current and electric field. Dissipation caused by these phenomena (J dot E > 0) absorbs magnetic energy causing build-up of heat and particle kinetic energy mainly through wave-particle interactions. Reconnection was also observed to occur within Kelvin-Helmholtz vortices and within flux-transfer events. Numerous bow-shock crossings have revealed electron acceleration by whistler waves and localized J dot E dissipation. This paper provides highlights of the accomplishments of MMS to date and describes how reconnection proceeds through intense and highly localized events within the larger electron dissipation region.

Keywords: Magnetic Reconnection, Earth's Magnetopause, Wave-particle Interactions

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