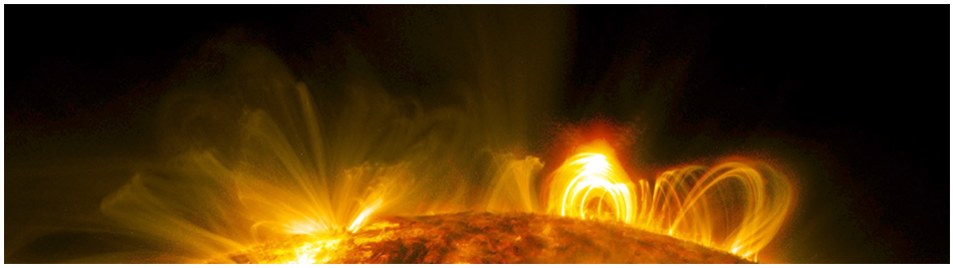

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Particle Acceleration in Magnetic Reconnection Events Observed by MMS

Tuesday, 16 November 2021 11:30 (30 minutes)

The NASA Magnetospheric Multiscale (MMS) mission uses four closely-spaced spacecraft to investigate magnetic reconnection in the boundary regions of the Earth's magnetosphere by measuring charged particles and electric and magnetic fields at the electron scale for the first time in space. Magnetic reconnection involves the conversion of magnetic energy to heat and charged particle kinetic energy. Particle energization is manifested in several different ways including jets of ions streaming away from X lines, electron jets streaming both toward and away from X lines, out-of-plane flows of electrons accelerated by the reconnection electric field, and high-energy ions and electrons produced by induced electric fields and Fermi acceleration. MMS encounters both asymmetric reconnection at the dayside magnetopause and symmetric reconnection in the magnetotail. Particle densities are much lower in the tail so that the available magnetic energy per particle is much higher than on the day side. The sources of accelerated electrons are also different being primarily magnetosheath electrons on the day side and neutral-sheet electrons on the night side. Meandering trajectories are important in both regions, which allows for cross-field acceleration by the reconnection electric field. The long-term puzzle of the acceleration of particles to energies of hundreds of keV during magnetic reconnection events in the geomagnetic tail has been solved by MMS, which observes acceleration by turbulent electric fields in the region surrounding the X line.

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