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The Magnetospheric Multiscale Mission: New Data on Magnetic Reconnection

JAMES BURCH, Southwest Research Institute

The Magnetospheric Multiscale (MMS) mission was launched on March 12, 2015 into its Phase 1 elliptical orbit with apogee at 12 Earth radii (R_E). The baseline science goal for MMS is to *Understand the microphysics of magnetic reconnection by determining the kinetic processes occurring in the electron diffusion region that are responsible for collisionless magnetic reconnection, especially how reconnection is initiated.* In priority order, MMS will address three specific objectives: (1) Determine the role played by electron inertial effects and turbulent dissipation in driving magnetic reconnection in the electron diffusion region; (2) Determine the rate of magnetic reconnection and the parameters that control it. (3) Determine the role played by ion inertial effects in the physics of magnetic reconnection. During the six months of commissioning following launch, all of the instruments on the four spacecraft were made fully operational. Beginning on September 1, 2015 the spacecraft began their first scan of the dayside magnetopause in a tetrahedral formation with separations of 160 km. During Phase 1 the separation will be reduced in steps to 10 km and then adjusted to the separation that is judged to be optimum for reconnection studies. A second scan of the dayside magnetopause will be conducted at this optimum separation. Then apogee will be raised to 25 R_E for a scan of the magnetotail with separations variable from 30 km to 400 km. Throughout the mission the payload will be operated at its maximum data rate, which is sufficient to investigate reconnection down to approximately the electron diffusion length scale with full 3D plasma electron distributions obtained in 30 ms, ion distributions at 150 ms, and magnetic and electric fields at 1 ms resolution. 3D plasma and energetic ion composition an energetic electron measurements along with plasma waves will also be made. The spacecraft potential is maintained below +4V by an ion emitter. Because of the large amount of data and the downlink limitations, only a few per cent of data at the highest rates can be sent to the ground. An on-board data selection system, supplemented by a Scientist-in-the Loop (SITL) system will be used to obtain the best segments of high-rate data for reconnection studies. Results from the first three months of Phase 1 will be presented in this paper.