Magnetospheric Multiscale (MMS) Observations of ULF Waves and Correlated Low-Energy Ion Monoenergetic Acceleration

Bin Li
Polar Research Institute of China, upper atmospheric and space physics, China (libin@pric.org.cn)

Low-energy ions of ionospheric origin with energies below 10s of electron volt dominate most of the volume and mass of the terrestrial magnetosphere. However, sunlit spacecraft often become positively charged to several 10s of volts, which prevents low-energy ions from reaching the particle detectors on the spacecraft. Magnetospheric Multiscale spacecraft (MMS) observations show that ultralow-frequency (ULF) waves drive low-energy ions to drift in the $E \times B$ direction with a drift velocity equal to $V E \times B$, and low-energy ions were accelerated to sufficient total energy to be measured by the MMS/Fast Plasma Investigation Dual Ion Spectrometers. The maximum low-energy ion energy flux peak seen in MMS1’s dual ion spectrometer measurements agreed well with the theoretical calculation of H+ ion $E \times B$ drift energy. The density of ions in the energy range below minimum energy threshold was between 1 and 3 cm$^{-3}$ in the magnetosphere subsolar region in this event.