

Magnetospheric Multiscale observations of ULF waves and correlated low-energy ion monoenergetic acceleration

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Low-energy ions of ionospheric origin with energies below tens of eV dominate most of the volume and mass of the terrestrial magnetosphere. However, sunlit spacecraft often become positively charged to several tens 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 a higher energy level to reach the detection range of the MMS/Fast Plasma Investigation (FPI). The maximum ion flux energy level detected by MMS1 DIS agreed perfectly with the theoretical calculation of H^+ ion $E \times B$ drift energy. The density of ions in the energy range below 2 eV was between 1 cm^{-3} and 3 cm^{-3} in the magnetosphere subsolar region in this event.

Keywords: low-energy ion monoenergetic acceleration, ultralow-frequency wave, $E \times B$ drift

