R006-60
Zoom meeting B ：11/4 AM2 (10:45-12:30)
12:15-12:30

Observational study on preferential energization of low-charge-state heavy ions in the near-Earth magnetotail

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The ion pressure in the Earth's inner magnetosphere is generally dominated by a few to a few 100s keV protons. Oxygen ions of ionospheric origin, O+, can make a significant contribution to the ion pressure during geomagnetically active periods. Our previous study showed clear oxygen-proton differences in energy spectra in the outer part (L>5) of the ring current region. The results indicate the occurrence of mass-dependent acceleration in the inner magnetosphere and/or near-Earth magnetotail. The present study extends analysis toward ions with different mass and/or charge states, for example, He+ and O++ of ionospheric origin and He++ of solar wind origin. We primarily use data from the MEP-i (Medium-Energy Particle experiments - ion mass analyzer), which measures ions with energies of ~10 to 180 keV/q and determines both mass and charge, on board the Arase spacecraft.
We examine characteristics of energy spectra of energetic ions during magnetic storms that occurred when the Arase apogee was positioned on the night side. Energy spectra of singly-charged ions (H+, He+, O+) show mass dependence, with He+ and O+ having harder spectra than H+. The spectral slope of doubly-charged ions (He++, O++) is steeper for He++ than O++. For ions with the same mass, singly-charged ions show harder spectra than doubly-charged ones. The energization occurs more effectively in the direction perpendicular to the magnetic field rather than the parallel direction. The results suggest preferential energization of low-charge-state heavy ions caused by the dawn-dusk electric field in the near-Earth magnetotail. The preferential energization is likely associated with narrow flow channels during magnetic field reconfiguration (dipolarization), which are reportedly generated on the spatial scale comparable to the gyro-radius of low-charge-state heavy ions.