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Zoom meeting B ：11/1 PM1 (13:45-15:30)
13:45〜14:00

Field-aligned low-energy O+ (FALEO) ion flux enhancements in the inner magnetosphere: A possible source of warm plasma cloak

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Recent satellite observations in the inner magnetosphere have shown that unidirectional/bidirectional energy-dispersed O+ flux appears a few minutes after substorms in the inner magnetosphere and lasts for >10 min with a decrease in its energy from ˜5 keV to 10-100 eV [Chaston et al., 2015; Kistler et al., 2016; Nose et al., 2016, 2018, 2021; Gkioulidou et al., 2019; Hull et al., 2019]. From the Van Allen Probes observations, Nose et al. [2016] revealed that the unidirectional energy-dispersed O+ flux is observed in 80% of the total events and that its direction is parallel (antiparallel) to the magnetic field when the satellites are located below (above) the geomagnetic equator. This strongly implies that these O+ ions are extracted from the ionosphere at the onset of substorms and flow along the magnetic field toward the geomagnetic equator. The similar features of the O+ flux enhancements were also observed by the Arase satellite in the more inner magnetosphere and at the higher geomagnetic latitudes [Nose et al., 2018, 2021]. These field-aligned low-energy O+ (FALEO) ions experience pitch angle scattering near the geomagnetic equator and remain bouncing between both hemispheres. They drift eastward because of their low energy (<1 keV) and can contribute to the O+ content of the inner magnetospheric plasma such as the warm plasma cloak and the oxygen torus. A resultant increase in the O+ density may provide a precondition for the O+-rich ring current.

In the present study, we examine FALEO flux enhancements simultaneously observed by multiple satellites, Arase, Van Allen Probe A and B satellite, on September 22, 2018. The O+ fluxes are enhanced after the substorm onset at 05:24 UT, at which three satellites are located in the nightside inner magnetosphere (Arase at MLT=0.3 hr, L=6.2, GMLAT=— 9.6 deg; Probe A at MLT=0.7 hr, L=5.5, GMLAT=14.7 deg; Probe B at MLT=0.0 hr, L=5.3, GMLAT=10.6 deg). Arase observes FALEO only in the parallel direction to the magnetic field in the energy range from a few keV to 100 eV. Probes A and B, however, identify FALEO in both parallel and antiparallel directions at a few keV to 10 eV. The antiparallel fluxes appear earlier than the parallel fluxes. Multiband flux structure is clearly observed by Probe A. We perform a numerical calculation of O+ ion trajectories to reproduce the observed E-t spectrograms at three satellites. In the presentation, we will show the results of data analysis and numerical simulation in more detail, and discuss the contribution of FALEO to the O+ content of the inner magnetospheric background plasma.