

Cusp ion precipitation for stably northward IMF and its relation to the magnetosheath flow

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Magnetic reconnection can occur at the high latitude of the cusp, where magnetosheath field lines and magnetospheric lobe field lines are antiparallel when the interplanetary magnetic field(IMF) is northward. Magnetosheath plasmas are injected into the cusp through this type of reconnection, i.e., lobe reconnection for northward IMF, and often produce localized aurora poleward of the usual auroral oval location. Previous studies have shown that the intensity of such proton auroras becomes greater as solar wind dynamic pressure increases, suggesting that the number flux of precipitating ions in the cusp increases as solar wind dynamic pressure increases. Since the quantity of solar wind dynamic pressure consists of solar wind density and solar wind velocity, the dynamic pressure dependence is due to the solar wind density dependence to a certain degree. For solar wind velocity, considering that lobe reconnection occurs in the presence of stronger shear flow as magnetosheath flow speed increases, it may be expected that solar wind velocity can also be a controlling parameter for the cusp ion injection. In this study, we examine how solar wind velocity is related to the cusp ion precipitation. We have analyzed precipitation particle data obtained by DMSP F16 and F17 in the low-altitude cusp for 5 years, and identified more than 500 cusp events that occurred during stably northward IMF periods, using our automated event identification method. The result of the analysis suggests that the ion outflow jet from reconnection tends to be strong as the sheath protons stream fast on lobe reconnection. We discuss how the streaming protons interact with the process in the lobe reconnection.

Keywords: cusp, northward IMF, lobe reconnection, ion precipitation, cold streaming protons