

ENA emission coming from the direction of the cusp for large IMF By: Observation and Modeling

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The ion injection in the high-altitude cusp can produce neutral atom emission through charge exchange with the Earth's hydrogen exosphere. Recent studies using the LENA imager on the IMAGE spacecraft have shown that the direction of the neutral atom emission responds to the increase and decrease of the southward component of IMF, and that for northward IMF the emission comes from the direction of the very high-latitude magnetopause. In the present study we refer to the importance of the IMF By component for the LENA cusp emission. Results of analyses show that strong emission tends to occur when the magnitude of the IMF clock angle is near 90 degree. Results also indicate that the emission sometimes shows a poleward motion at times of short-lived southward rotation of the dawnward/duskward IMF, which appears to contradict the characteristics of the emission in which the direction shifts to lower latitudes for larger southward component of IMF. We have developed a simple numerical model of cusp ion injection and ENA emission to fit these IMF By-related observations. The model includes ion dispersion signatures along the 3-dimensional magnetic field line geometry based on the Tsyganenko model. Taking reasonable values of the number flux of the ion injection, and of the spatial extent of the injection region, the general properties of the intensity and spatial distribution of the LENA emission has been reproduced. How the variations of these input values can explain the IMF By-related LENA observations is presented, and the characteristics of the ion injection will be discussed in terms of the response to the change of the IMF and of its own time constant.