中性粒子エミッションのIMF依存性：磁気圏カスプにおける対流の道筋の同定

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IMF dependence of neutral atom emission: Identification of the convection path in the magnetospheric cusp

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Recent studies using the Low Energy Neutral Atom (LENA) imager on the IMAGE spacecraft has shown that the ion injection in the high-altitude cusp can produce neutral atom emissions through charge exchange with the Earth's hydrogen exosphere. This suggests that the position of the reconnected field lines on which the ion injection is operative can be identified using LENA. Although many observations in the ionosphere and in the magnetotail demonstrated how the convection path of the reconnected field lines depends on IMF By and Bz, detailed knowledge about the path in the high-altitude cusp is still lacking. In this study we apply LENA for this identification. We took 13 periods of time for significant LENA cusp emission from the IMAGE near-noon orbits (March-April 2001) by requiring that the magnitude of the IMF clock angle is more than 60 degree, i.e., except for the interval when the IMF northward component dominates. ACE solar wind data for the identified 13 periods show that the LENA emissions occur during periods of a relatively large (more than 7 nT) IMF in the Y-Z plane. The comparison between LENA emission and ACE solar wind also shows that the direction of the LENA emission in some cases shifts equatorward (or poleward) responding to the increase (or decrease) of the magnitude of the clock angle, i.e., increase (or decrease) of the southward IMF component, as is expected, but that short-lived (several minutes) events appear in other cases in which the direction of the LENA emission shifts in a reversed manner, i.e., poleward in response to the increase of the clock angle. In a few events of the latter cases, SuperDARN HF radar also observed the poleward shift of the anti-sunward convection region simultaneously in the ionospheric cusp. This suggests that the poleward shift of the LENA emission is associated with the change of the convection path in the magnetosphere. We interpret the difference in the LENA response to the clock angle as depending on which part of the convection path LENA looks into. By combining both LENA responses, we will show clock angle dependent convection path in the magnetospheric cusp.