The behavior of the cusp in various solar wind conditions

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The cusp is not just a window of the magnetosphere open to the solar wind. From the viewpoint of the magnetospheric the cusp is the place where energy conversion occurs for the dynamo of the magnetosphere-ionosphere coupling convection (Tanaka, 2007). Thus, it is important to investigate the behavior of the cusp corresponding to the various solar wind conditions.

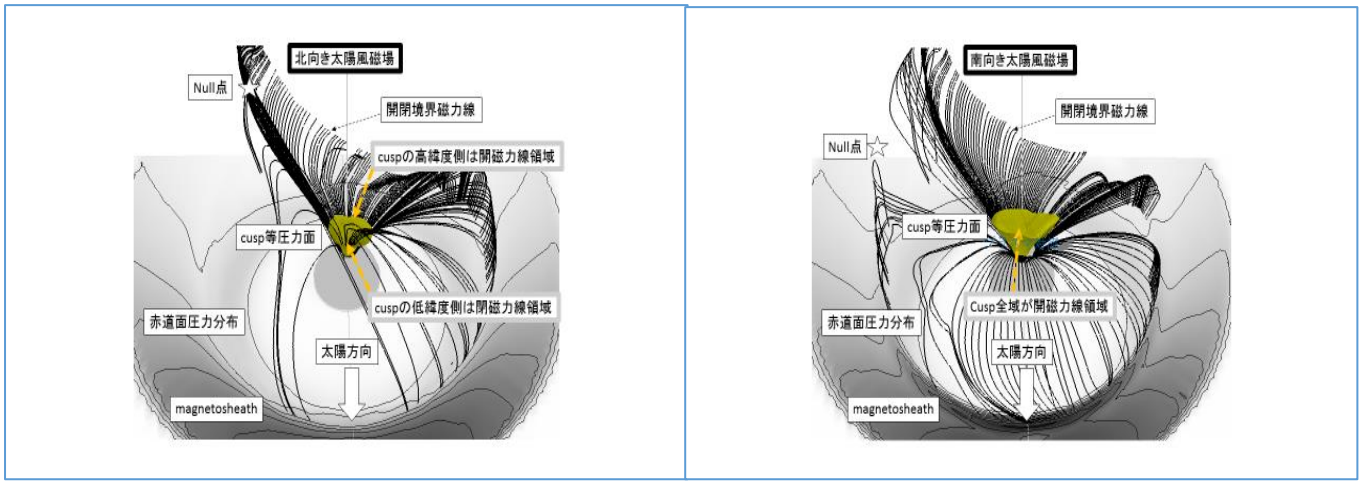

Fig. 1 The relation between the open-closed magnetic field boundary and cusp (left) in the conditions of northward IMF condition, and (right) that in the southward IMF condition. The right panel shows that the whole cusp exists in the open-field line region in the southward IMF condition. Whereas, in the left panel, the lower- and higher-latitude side of the cusp is in the closed field line region and the open field line region, respectively, for the northward IMF condition. The open-closed field boundary shown in these panels reflects the null-separator structure.

Besides, Ezoe (2018) plans to launch a small satellite for an imaging study of the cusp. This imaging study is the first satellite observation of the magnetosphere that offers the products comparable to the global MHD simulation. Therefore, we investigate the behavior of the cusp for various solar wind conditions. Fig. 1 shows the relation between the location of the cusp and the boundary of the open field lines and the closed ones for the northward IMF condition and the southward IMF condition. It is noted that the whole cusp exits in the open field line region for the southward IMF condition, whereas, in the northward IMF condition, the lower- and higher-latitude side of the cusp is in the closed and open field line region. Therefore, we expect that the density in the lower-latitude side of the cusp is higher than that in the higher-latitude side when IMF is northward. The imaging observation should check these simulation results. If the imaging observation confirms this simulation result, this observation indirectly confirms the null-separator structure of the magnetic field topology in the solar wind-magnetosphere boundary.

References

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