R006-10
A 会場 ：9/25　PM2 （15:45-18:15）
16:30〜16:45

北向き IMF での磁気圏電離圏対流と null-separator 構造

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The magnetosphere-ionosphere convection in the northward IMF condition and the null-separator structure

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The magnetosphere-ionosphere convection in the northward IMF condition has three modes; one is the round cell convection confined in the polar cap (the lobe cell), the next is round cell convection crossing the open-closed boundary (the merging cell), the last is the crescent cell convection in the nightside polar cap [Tanaka, 1999]. The crescent cell convection crosses the open-close boundary. Tanaka [1999] and Watanabe et al. [2005] revealed that crescent cell convection belongs to the exchange cell convection. We reconsidered how these convections occur under the null separator structure of the magnetic field lines when IMFBz is positive and IMFBy is negative.

The main findings of this research are as follows;
1) The cylinders of the null-separator structure form the lobes. The cylinders have slots open to the solar wind. Solar wind plasma can enter the lobe through this slot. The plasma pressure increases in this slot region in the lobe. This structure is the plasma bulge [Tanaka et al., 2017]. Furthermore, when IMFBy is negative, the plasma entering the lobe, when viewed from the tail, convects in two vortex modes: clockwise on the equator near the plasma sheet and counterclockwise on the opposite side.

2) We examined the streamlines of plasma convection originating from the solar wind. There are two modes of convection streamlines. We consider the streamlines starting the solar wind in the northern hemisphere.
First, the convection streamlines starting from the pole side of the separator line and penetrating the cusp traverse a segment of magnetic field lines extending from the northern ionosphere to the null point of the overdraping field.
Second, among the convection streamlines generated from the opposite side of the separator line, those that cross the field line segment from the null point of the overdraping magnetic field line to the solar wind in the northern hemisphere enter the lobe of the southern hemisphere at first and reach the lobe of the northern hemisphere.

3) The solar-wind magnetic field lines carried by the convection starting from the pole side of the separator line (the first case of #2) first cause reconnection with the open magnetic field lines passing through the northern hemisphere null point. After that, the magnetic field lines ride on the counterclockwise convection in the lobe mentioned in 1). This results in round cell convection in the ionosphere. When the starting point of convection in the solar wind is close to the separator line, the convection crosses the open/close boundary. At this time, whenever convection crosses an open-close field line boundary, reconnection occurs at the northern hemisphere null point. Conversely, the convection that started from a slightly distant place causes reconnection only once at a null point in the northern hemisphere and then becomes lobe cell convection that convects only within the lobe.

4) The convection from the solar wind on the equator side of the separator line (the second case of #2) first causes reconnection at the null point in the southern hemisphere. After that, it crosses the closed magnetic field line region of the plasma sheet and enters the northern hemisphere. In the northern hemisphere, it enters the lobe's clockwise convection region. This creates crescent cell convection in the ionosphere.

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Watanabe, M., K. Kabin, G. J. Sofko, R. Rankin, T. I. Gombosi, A. J. Ridley, and C. R. Clauer (2005), Internal reconnection for northward interplanetary magnetic field, J. Geophys. Res., 110, A06210, doi:10.1029/2004JA010832.