ホースカラーオーロラとシータオーロラ：シミュレーションと観測の比較

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Hose-collar Aurora and Moving Theta Aurora: Simulation and Observation

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Hose-collar aurora is one of the manifestation of the sun-aligned polar car arcs for constant IMF By and positive Bz. The narrowed polar cap is associated with bordered morning and evening sides sun-aligned arcs. The horse collar region and the void will be relatively steady phenomenon on a global scale. We have examined the results of MHD simulation for the case of constant IMF By during northward IMF condition. Results demonstrate that plasma sheet has been inclined due to the IMF By, which leads to the expansion of morning side auroral oval into the northern polar cap for IMF By <0. In the simulation, we have newly found the bulge structure, which is the expansion of evening side auroral oval in the northern polar cap region. We further found i) vertical closed magnetic field lines, connecting the both hemisphere in the evening sector and ii) field aligned current structure, elongated sun-aligned direction.

On the contrary there appears an arc forming a single large-scale bar in the central polar cap. This aurora is known as the theta aurora. The theta aurora is a phenomenon associated with a switch of the IMF By during northward IMF condition. The theta aurora is non-stationary, although the appearance of the arc itself is similar to sun-aligned arcs. We have examined the results of MHD simulation for the case of IMF By polarity change. The trans polar arc appears in the morning sector in the northern polar cap and it moves dusk ward as time goes on. In this stage, the polar cap and tail lobes are continuously encroached by the new open field lines connected to the new IMF. Whereas magnetic field lines accumulated in new lobes tend to rotate the outer plasma sheet in the opposite direction, the old merging-cell convection still continues to generate closed field lines that must return to dayside against the new-lobe formation. The growth of new lobes results in the blocking of the return path toward dayside of closed field lines generated in the old merging cell to form the kink structure in the plasma sheet. Losing their return path, these closed field lines generated from old lobes accumulated on the night side and leads to the formation of theta aurora.

In the talk, we will compare simulation results with observations for the hose-collar aurora as well as the theta aurora.