Effect of thesubstorm onset to the plasma behavior in the dayside magnetosheath-cusp region

Shigeru Fujita[1,2], Takashi Tanaka[3], Ryuho Kataoka[2], and Masakazu Watanabe[2]
[1]*Meteorological College*
[2]*National Institute of Polar Research*
[2]*Kyushu Univetsity*

We have discussed formation of a transient shock in the magnetosheath during the growth phase of a substorm, and its disappearance after the growth phase by using a global MHD simulation as wellas its relation to the substorm sequence. A bulge of high pressure plasmas (the pressure bulge) extended from the cusp into the magnetosheath is formed after southward turn of the interplanetary magnetic field (IMF). The plasma bulk flow in the magnetosheath becomes super-magnetosonic by both the Lorentz force and the perpendicular pressure-gradient forces during its passage from the low-latitude magnetosheath to the upstream region of the pressure bulge. When this super-magnetosonic flow collides with the pressure bulge, the shock in the magnetosheath is formed. After the formation of the shock, the simulation indicates disappearance of this shock about 20 minutes after the auroral breakup associated with the onset of the substorm. We find that high-pressure plasmas are transported from the nightside magnetosphere to the cusp region through the cleft and arrives at the cusp at about 10 minutes after the onset. Behind this high-pressure plasmas, low-pressure plasmas are followed. When this low-pressure plasmas arrive at cusp, the cusp pressure is reduced. Then the magnetosheath shock disappears. Thus, formation and collapse of the shock in the magnetosheath-cusp region is related to the sequence of the substorm.

We did not elucidate formation of the low-pressure plasmas yet. The detailed analysis of the simulated results reveals that the low-pressure plasmas are generated by the interchange instability in the plasmas in the plasma sheet inner boundary in the expansion phase of the substorm. In the talk, after explaining briefly the relation between the plasma behavior in the dayside magetosheath region and that in the nightside plasma sheet, we present the detailed analysis of the plasma behaviour in the plasma sheet inner boundary.