Impact of the IMF Rotation on the depolarization front and Alfven Transition Layer

DongSheng Cai[1]
[1] ISIS, U Tsukuba

3D three-dimensional global PIC simulations are performed in order to analyze the dynamics of the magnetotail as the interplanetary magnetic field (IMF) rotates from north to south. This IMF rotation has quite different impacts within meridan/equatorial planes which can be analyzed over two successive temporal phases. First, as IMF rotates from North to Dawn-Dusk direction, the X-point (magnetic reconnection) evidenced in the magnetotail (meridian plane) is moving earthward (from x=-35 Re to x=-17.5) distance at which it stabilizes. This motion is associated to the formation of "Crosstail-S" patterns (within the plane perpendicular to the Sun-Earth line) through the neutral sheet in the nearby magnetotail. Second, as IMF rotates from dawn-dusk to South, the minimum B field region is expanding within the equatorial plane and forms a ring. This two-steps scenario is analyzed in strong association with the cross-field magnetotail current Jy, in order to recover the pre-signatures of substorms triggering. The second step dynamics (IMF rotation from Dawn-Dusk to South) is very complex and requires to be classified into two sub-phases (A and B) because the full penetration of the IMF into the magnetotail takes a certain delay. In the first phase A, Jy in the magnetotail disappears. After the dipolarization, IMF penetrates the magnetotail region, Jy appears again in the second phase B, and a thinning of the current sheet occurs. In these two sub-phases, we will investigate how current thinning, recovery of Jy are associated to the dynamics of the dipolarization front by visualizing the so called Alfven transition layer.