Geophysical Research Abstracts
Vol. 19, EGU2017-17138-1, 2017
EGU General Assembly 2017

Impact of the Interplanetary Magnetic Field rotation from North to South on the Alfven Transition Layer: 3D Global PIC Simulation

DongSheng Cai (1), Bertrand Lembege (2), and Ken-ichi Nishikawa (3)

(1) University of Tsukuba, CS, Tsukuba, Japan (cai@cs.tsukuba.ac.jp), (2) LATMOS-UVSQ, (3) University of Alabama in Huntsville

Using a global 3D PIC simulation, the solar-terrestrial magnetosphere interaction has been analyzed focusing on the 3D magnetic cusp region. Our recent global simulation results (Cai et al., JGR 2015) have reproduced the main features of the magnetic cusp under a northward IMF configuration comparing with the three-year statistical observations of Cluster satellites (Lavraud et al., JGR, 2005). One of the most important features found in our simulation is the existence of the Alfven Transition Layer (ATL) where Alfven Mach number is nearly zero almost adjacent to the upper stagnant exterior cusp (SEC). Its width measured near the SEC within the meridian plane varies from 1 to 4 Re. From the magnetosheath to SEC, the plasma flows transit from super to sub-Alfvenic regime. Striking features observed in the simulation is the unique depleted funnel shape ATL starting from the high altitude dusk to low altitude dawn above the magnetic cusp in a northward IMF. Both the ion and electron flux enter and spiral into the cups region through this depleted ATL with possibly a curvature drift. Varying IMF from north to south through dusk-dawn direction, this ATL persists although it drastically shrinks. Especially, in the southward IMF, the ion flux enters into the cusp region through the complicated ATL and bounce back to the magnetosheath. ATL can help us to investigate the complex structures of the magnetic cusp.