Geophysical Research Abstracts
Vol. 20, EGU2018-13212, 2018
EGU General Assembly 2018

Crescent-shaped electron distributions within high-speed plasma jets deflected tangentially at the magnetopause: three-dimensional kinetic solutions

Gabriel Voitcu (1) and Marius Echim (2)

(1) Institute of Space Science, Magurele, Romania (gabi@spacescience.ro), (2) Belgian Institute for Space Aeronomy, Brussels, Belgium (marius.echim@oma.be)

The interaction of localized plasma clouds/jets with Earth's magnetopause is a fundamentally important issue for better understanding the transport of mass, momentum and energy towards the magnetosphere. In this paper we present particle-in-cell simulations of a three-dimensional plasma cloud interacting with a tangential discontinuity with no magnetic shear. The simulation setup corresponds to a magnetosheath high-speed jet impacting the frontside magnetopause during northward orientation of the interplanetary magnetic field. We discuss here the microphysics of a non-penetrating jet deflected tangentially by the discontinuity. Such plasma jets are split into two counterstreaming flows streaming tangential to the magnetopause surface. We focus on the kinetic structure of these plasma structures. Our numerical simulations reveal the formation of crescent-shaped (or non-gyrotropic) velocity distribution functions for electrons within the non-penetrating plasma jet deflected at the magnetopause. These electron distribution functions are similar to the ones measured by the Magnetospheric Multiscale (MMS) mission in the vicinity of Earth's magnetopause. We propose a physical mechanism that can explain their origin and emphasize non-MHD effects that demonstrates the important role of Larmor scale processes for the transport of plasma across the magnetopause.