EGU22-13170
https://doi.org/10.5194/egusphere-egu22-13170
EGU General Assembly 2022

Large-scale PIC Simulations of the Interaction of Solar Wind Discontinuities with the Dayside Magnetopause

Jean Berchem[1], Giovanni Lapenta[2], Robert L. Richard[1], C.-Philippe Escoubet[3], and Simon Wing[4]
[1]Department of Physics and Astronomy, UCLA, Los Angeles, California, USA (jberchem@ucla.edu)
[2]Centre for Plasma Astrophysics, Department of Mathematics, KU, Leuven, Belgium
[3]ESA ESTEC, Noordwijk, Netherlands
[4]APL, John Hopkins University, Maryland, USA

Developing an understanding of the effects of solar wind structures on the dayside magnetopause is a necessary first step for comprehending how they impact the magnetosphere. With this aim, we have used large-scale particle-in-cell (PIC) simulations to investigate the kinetic processes occurring at the magnetopause as solar wind structures impact the dayside magnetosphere. In this presentation, we report our progress in investigating the interaction of simple discontinuities with the magnetopause. Our procedure is to first run a global magnetohydrodynamic (MHD) simulation to predict the overall configuration of the solar wind-magnetosphere system before the impact of the discontinuity on the magnetopause. Then, fields and plasma moments within a large sub-domain of the global MHD simulation are used to set the initial conditions of the implicit PIC simulation of the impact. Preliminary results indicate that the interactions of solar wind discontinuities with the magnetopause are very likely to generate a succession of large magnetic flux ropes that move toward the cusps. The simulations reveal the development of a strong North-South asymmetry in the twisting of the ropes. This suggests that we should expect strong North-South asymmetries in particle precipitation when such discontinuities impact the magnetopause.