EPSC Abstracts
Vol. 13, EPSC-DPS2019-487-1, 2019
EPSC-DPS Joint Meeting 2019

EPSC
EPSC-DPS Joint Meeting 2019
15–20 September 2019 | Geneva, Switzerland

Ion foreshock and dynamics of the induced magnetosphere of Venus in a global hybrid simulation

R. Jarvinen (1,2), M. Alho (1), E. Kallio (1) and T.I. Pulkkinen (3,1)
(1) Department of Electronics and Nanoengineering, School of Electrical Engineering, Aalto University, Espoo, Finland
(2) Finnish Meteorological Institute, Helsinki, Finland
(3) Department of Climate and Space Sciences and Engineering, University of Michigan, Ann Arbor, Michigan, USA
(riku.jarvinen@aalto.fi)

Abstract

We study the solar wind interaction with Venus in a 3-dimensional global hybrid model. We concentrate especially on large-scale, coherent ultra-low frequency (ULF) waves in the ion foreshock of Venus, and how the dynamics of the magnetosheath downstream of the quasi-parallel bow shock is correlated to the ULF waves convecting downstream with the solar wind flow. In the model, ions of solar wind and planetary origin are treated as macroscopic particle clouds moving under the Lorentz force, while electrons form a charge-neutralizing fluid. Ion velocity distributions evolve self-consistently according to the model calculation coupled with the evolution of the magnetic field by Faraday's law. In this work, we concentrate on the formation of an ion foreshock and its effect on the Venusian induced magnetosphere. The ion foreshock forms in the upstream region ahead of the quasi-parallel bow shock, where the angle between the shock normal and the magnetic field is smaller than about 45 degrees. The magnetic connection with the bow shock allows backstreaming of the solar wind ions leading to the formation of the ion foreshock. This kind of beam-plasma configuration is a source of free energy for the excitation of plasma waves.