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The disappearing of the magnetic barrier at Venus

T.L. Zhang (1), J. Du (2), Y.J. Ma (3), C. Wang (2), W. Baumjohann (1), and C.T. Russell (3)

(1) Space Research Institute, Austrian Academy of Sciences, Graz, Austria (tielong.zhang@oeaw.ac.at), (2) State Key Laboratory of Space Weather, Chinese Academy of Sciences, China, (3) University of California, Los Angeles, Institute of Geophysics and Planetary Physics, Los Angeles, USA

Although there is no intrinsic magnetic field at Venus, the convected interplanetary magnetic field piles up to form a magnetic barrier in the dayside inner magnetosheath. In analogy to the Earth's magnetosphere, the magnetic barrier acts as an induced magnetosphere on the dayside and hence as the obstacle to the solar wind. It transfers the solar wind dynamic pressure to ionospheric thermal pressure via the magnetic pressure. It is widely believed that the magnetic barrier exists both at Venus and Mars as a "permanent" feature of the solar wind interaction with an unmagnetized planet with atmosphere. Here we report Venus Express observation of the absence of a magnetic barrier when the interplanetary magnetic field (IMF) is nearly aligned with the solar wind flow. It is evident that the magnetic barrier strength is controlled by the IMF orientation. Using MHD simulation under extreme IMF orientation, we examine the feature of the solar wind interaction with Venus under the condition of the disappearing of the magnetic barrier. The impact on the atmospheric loss is to be evaluated.