Geophysical Research Abstracts
Vol. 20, EGU2018-17934, 2018
EGU General Assembly 2018


# ICME effects on Mercury's magnetospheric boundaries and northern cusp region

Carol Paty (1), Reka Winslow (2), Noé Lugaz (2), Lydia Philpott (3), Nathan Schwadron (2), Catherine Johnson (3,4), and Haje Korth (5)

(1) Georgia Institute of Technology, School of Earth and Atmospheric Sciences, United States (carol.paty@eas.gatech.edu), (2) Institute for the Study of Earth, Ocean, and Space, University of New Hampshire, Durham, New Hampshire, USA (reka.winslow@unh.edu, noe.lugaz@unh.edu, Nathan.Schwadron@unh.edu), (3) Department of Earth, Ocean, and Atmospheric Sciences, University of British Columbia, Vancouver, British Columbia, Canada (lphilpot@eos.ubc.ca, cjohnson@eos.ubc.ca) , (4) The Planetary Science Institute, Tucson, Arizona, USA (cjohnson@eos.ubc.ca), (5) The Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland, USA (Haje.Korth@jhuapl.edu)

Using observations from the MESSENGER spacecraft in orbit around Mercury, we conduct statistical analyses and detailed case studies of the large-scale processes in Mercury's magnetosphere during interplanetary coronal mass ejections (ICMEs). The dynamic nature of Mercury's small magnetosphere is pushed to its extremes during times of ICMEs. We study the motion of the bow shock and magnetopause boundaries, erosion of the dayside magnetosphere, the size, extent, and plasma pressure of the northern cusp region, and the plasma precipitation to the surface during extreme events. We find that the magnetopause is substantially compressed due to an increase in solar wind ram pressure at these times. On average during ICMEs, the subsolar stand-off distance from the center of the planet is reduced by $\sim$15% as compared with the value during nominal solar wind conditions, and the magnetopause reaches the surface of the planet $\sim$30% of the time. On the other hand, the bow shock under these conditions is located farther from the planet than for nominal solar wind conditions, because of a decrease in Alfvén Mach number during the ICME passage. The cusp is observed to extend $\sim$10 degrees further equatorward and 2 h wider in local time. In addition, the average plasma pressure in the cusp is more than double that determined under nominal conditions. For the most extreme cases, the particle precipitation to the surface is an order of magnitude higher than average. The solar wind ram pressure is found to be the dominant factor controlling these cusp characteristics, with the IMF Bz direction playing a small, but likely non-negligible role.