Project Details

ROSES ID: NNH15ZDA001N
Selection Year: 2015
Program Element: Focused Science Topic

Topic: Space Weather at Terrestrial Planets

Project Title:
Space Weather at Mercury and its Effect on the Exosphere

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Summary:
In this proposal, space weather at Mercury and its effects on the exosphere will be studied. It is now well established that Mercury has an intrinsic magnetic field and as such joins the Earth as the other inner planet in our solar system to have a magnetosphere. Because the strength of Mercury , " s magnetic dipole is relatively weak, its magnetosphere is considered in some sense to be like a miniature version of Earth , " s magnetosphere. There are, however, some important differences between the two magnetospheres. One is that at Mercury the planet occupies a much larger volume of the inner magnetosphere compared to the Earth, and another is that Mercury has a much weaker atmosphere and ionosphere. Also, due to its proximity to the Sun, Mercury is buffeted by a much stronger, highly variable solar wind and by virtue of its relatively small magnetic moment, it has a much more dynamic magnetosphere with global reconfigurations occurring on the time scales of a few minutes or less, compared to 10 , " s of minutes to hours at the Earth. Thus space weather at Mercury is likely to be more extreme and volatile than at Earth, which can strongly affect its thin atmosphere. Understanding Mercury , " s atmosphere, strictly speaking a surface-bounded exosphere, is vitally important for understanding the composition of the surface, the loading of the magnetosphere with heavy ions, and the identification of the putative volatile substances that may be sequestered in partially permanently shadowed craters near the poles. Mercury , " s tenuous, collisionless, neutral exosphere with Na, K, and Ca was originally observed spectroscopically and this has been confirmed by direct measurements made by instruments mounted onboard the MESSENGER spacecraft, which has been in orbit around Mercury since March 2011. MESSENGER has also shown that ionized versions of these and other heavy atoms are also present around Mercury.

Publication References:

Summary: no summary

Reference: Her?ík, David; Trávní?ek, Pavel M.; Å tverák, Å. t?pán.; Hellinger, Petr; (2016), Properties of Hermean plasma belt: Numerical simulations and comparison with MESSENGER data, Journal of Geophysical Research: Space Physics, Volume 121, Issue 1, pp. 413-431, doi: 10.1002/2015JA021938