Project Details

ROSES ID: NRA-00-OSS-01
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Program Element: Independent Investigation: LWS

Project Title:
The Analysis of the Predictive Capability of Solar Wind Parameters on Cleft Energization

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Summary:
Observations and simulations show that the largest portion of the cleft ion outflow, an important source of plasma to the magnetosphere, originates from a narrow (less than 2) latitudinal interval termed the cleft-heating wall. The cleft-heating wall lies just poleward of the closed field line region in the dayside sector. Furthermore, cleft ion heating and subsequent outflow have been shown to be sensitive to solar wind dynamics-particularly to the variability in solar wind dynamic pressure. This proposal addresses the direct coupling of solar wind energy to the cleft-heating wall region by quantifying ion energization as a function of solar wind conditions and thus determining its predictive capability. Observational analysis and an existing semi-kinetic model will be used to achieve this objective. Local wave power spectral densities and derived ionospheric parameters (i.e. temperatures, densities, and velocities) will be obtained from measurements from polar orbiting satellites such as FAST, Polar, and Interball-Aurora. These data will be combined with geophysical and solar wind parameters and used in a statistical study to determine relevant influences. The knowledge gained from analysis of this observational database will be broadened with the use of an existing semi-kinetic model that simulates ion heating through particle-wave interactions. The power spectral density (PSD) obtained from the observations will be used as an input to this model and will provide a strong connection to the solar wind influences. Our proposed objectives meet the following primary tasks of the Living with a Star (LWS) initiative; 1) Determine space weather predictive capability by providing an in-depth understanding and specification of how solar-dynamics drive ionospheric properties; 2) Enable improved space weather specification models by providing a database for model inputs to be used for forecasting.

Publication References:

Summary: no summary

Reference:
Stevenson, B. A.; Horwitz, J. L.; Germany, G.; Moore, T. E.; Giles, B. L.; Craven, P. D.; Chandler, M. O.; Su, Y.-J.; Parks, G. K.; (2001), Polar observations of topside field-aligned O+ flows and auroral forms, Journal of Geophysical Research, Volume 106, Issue A9, p. 18969-18980, doi: 10.1029/2000JA003042

Summary: no summary

Reference: Huddleston, M. M.; Chappell, C. R.; Delcourt, D. C.; Moore, T. E.; Giles, B. L.; Chandler, M. O.; (2005), An examination of the process and magnitude of ionospheric plasma supply to the magnetosphere, Journal of Geophysical Research: Space Physics, Volume 110, Issue A12, CiteID A12202, doi: 10.1029/2004JA010401