Project Details

ROSES ID: NRA-00-OSS-01
Selection Year: 2001
Program Element: Independent Investigation: LWS

Topic: Prediction of the Interplanetary Magnetic Field Vector Bz at 1 AU

Project Title:
Global Magnetosphere/Ionosphere Specification: Low Earth Orbit Constellation Observations and Global Model Intercomparison

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Summary:
Previous research, missions and computer models have demonstrated that the magnetosphere-ionosphere system is astonishingly dynamic and sensitive to the solar wind. The measurements required to fully characterize the system are therefore extraordinarily difficult to obtain and global simulations will be essential to Living With a Star missions. It is therefore crucial to validate the global models. The low altitude polar region provides a 2-D window on the system and the Iridium system of communication satellites provides a unique opportunity to measure the global distribution of field aligned currents (FACs). Each of the Iridium satellites carried an engineering magnetometer and we have developed procedures to derive global distributions of FACs in both hemispheres from these data. Data available for analysis cover the time from February 18, 1999 through the time of writing. Because current is a fundamental MHD variable the FAC distributions derived from the Iridium system provide an unprecedented opportunity to validate the global models. We propose to test the global magnetospheric simulations by comparing the results of the Lyon-Fedder MHD code coupled with the Rice Convection Model against FAC distributions determined from Iridium system data. This work will address two questions: (1) Do the simulations give the right systems of currents? and (2) How accurately does the model represent the intensity, distribution and physical dependencies of the currents, including the expansion and contraction of the polar cap? These validations serve as a litmus test of the model and its representation of the solar wind-magnetosphere interaction. This work will quantify the confidence to be placed in the simulation results and produce a data base against which other models, either existing or future, may also be tested.

Publication References:

Summary: no summary

Reference: Korth, H.; Anderson, B. J.; Wiltberger, M. J.; Lyon, J. G.; Anderson, P. C.; (2004), Intercomparison of ionospheric electrodynamics from the Iridium constellation with global MHD simulations, Journal of Geophysical Research: Space Physics, Volume 109, Issue A7, CiteID A07307, doi: 10.1029/2004JA010428