Project Details

ROSES ID: NRA-03-OSS-01
Selection Year: 2004
Program Element: Independent Investigation: LWS

Project Title:
An Investigation of Magnetosphere-Ionosphere-Coupling Through the Subauroral Electric Field with the Development of a Parameterized Subauroral Electric Field Model

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Summary:
LWS seeks to better understand the coupling of the magnetosphere, ionosphere and thermosphere (MIT). Ideally, studies of the storm-time coupling would involve completely coupled models of these two systems. However, this coupling is often computationally prohibitive, and theoretical studies of one region typically employ a proxy model for the other region. The proposed work will investigate the role of the subauroral electric field in MIT coupling. In particular, this work will examine the how changes in the MIT system caused by the subauroral electric field feed back into the electric field. The Rice Convention Model (RCM) and the Thermosphere-Ionosphere-Mesosphere-Electrodynamics General Circulation Model (TIME-GCM) will be pseudo-coupled in order to investigate these feedback mechanisms. Pseudo-coupling is the process of using outputs from one model as inputs to the other model while running each model as a separate code. The RCM has successfully modeled subauroral polarization streams (SAPS), strong shielding electric fields, penetration electric fields, and overshielding. These electric fields will drive ionospheric motion and heat the thermosphere, which will significantly alter the ionospheric conductance. This is the main feedback mechanism to be studied in this proposal, but not the only one. The coupled inputs to be examined here are the global ionospheric conductance, the location of the auroral boundaries, the neutral wind-generated electric field, and the Region-2 generated electric field. By incrementally adding coupled inputs, the effect of each input will be determined independently. A series of test runs will be conducted to investigate the general behavior of the coupling. In addition, a parameterized subauroral electric field (PaSEF) model will be developed from the results of the pseudo-coupled runs. It is hoped that this PaSEF will replace the Volland-Stern model in general community usage.

Publication References:

Summary: "

Reference: Trevor Garner / Applied Research Laboratories, University of Texas at Austin - An Investigation of Magnetosphere-Ionosphere-Coupling Through the Subauroral Electric Field with the Development of a Parameterized Subauroral Electric Field Model

Summary: no summary

Reference: Garner, T. W.; Wolf, R. A.; Spiro, R. W.; Burke, W. J.; Fejer, B. G.; Sazykin, S.; Roeder, J. L.; Hairston, M. R.; (2004), Magnetospheric electric fields and plasma sheet injection to low L-shells during the 4-5 June 1991 magnetic storm: Comparison between the Rice Convection Model and observations, Journal of Geophysical Research: Space Physics, Volume 109, Issue A2, CiteID A02214, doi: 10.1029/2003JA010208