Project Details

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

Project Title:
LWS Proposal to Provide Scientific Guidance and Modeling Support for the Ionospheric Mapper Mission

PI Name: Tim Fuller-Rowell
PI Email: atn@g.ucla.edu
Affiliation: University of Colorado, Boulder
Summary:
One of the potential benefits of the LWS Ionospheric Mapper mission is to be able to take advantage of the availability of "dual-altitude" constellations. The lower altitude (~450-km) LWS component comprising, predominantly, in-situ plasma and neutral instruments, and the higher altitude (~850-km) POES segment providing additional remote sensing instruments. This proposal will explicitly evaluate the merits of such a combination by targeting a specific science question.
Specifically, we will address the question: can low-Earth-orbit measurements of the "direct" response of neutral temperature and density be used to quantify the spatial and temporal variations of the high latitude magnetospheric sources? For instance, neutral temperature changes, gravity wave surges and "holes" in neutral density, all reflect the strength, local time distribution, and temporal variability of the energy deposition. Utilizing these neutral response characteristics provides crucial information to adjust the output of the AMIE assimilative scheme, and so tune the specification of the sources.
The study has two parts. The first is an extensive upgrade of the AMIE procedure. The second is the development of data assimilation tools, to enable LWS satellite observations of low-altitude neutral atmosphere structure to be combined with physical models of the upper atmosphere, to further constrain the high latitude input. The ability of the schemes to accurately specify the magnetospheric momentum and energy injection will be tested by quantitative comparisons of the model predictions with the observed global ionospheric and dynamic response, to geomagnetic events. The data assimilation approach will include the development of an adjoint physical model of the thermospheric energy budget, and will include an evaluation of the "ensemble" Kalman filter technique.
In addition to providing the physical understanding and an improved AMIE assimilation tool, the outcome of the research will provide the rationale and guidance for the Ionospheric Mapper. The study will provide essential elements in the modeling requirements and data assimilation expertise, required for support of LWS.

Publication References:

no references