Project Details

ROSES ID: NNH08ZDA001N
Selection Year: 2009
Program Element: Strategic Capability

Project Title:
Integrated Modeling of the Atmosphere-Ionosphere System

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Summary:
We propose to advance the strategic capability for numerical simulation of the coupled atmosphere-ionosphere system for the NASA Living With a Star Targeted Research and Technology program by providing advanced space weather and climate models to the research community.

Integrated modeling of the atmosphere and ionosphere is crucial for understanding the upward coupling via wave and tidal forcing from the lower atmosphere, which produces daily and seasonal variations in the structure and composition of the upper atmosphere and ionosphere; and for the quantification of downward coupling of solar and geomagnetic forcing to the middle and possibly the lower atmosphere. These two fundamental needs are categorized as space weather and climate capabilities. We will exploit the common resources and expertise of our team to address these objectives using two mature modeling activities: the Whole Atmosphere Community Climate Model (WACCM) and the model of Integrated Dynamics through Earth's Atmosphere (IDEA). WACCM has a comprehensive chemical/dynamical scheme, enabling the study of climate change throughout the atmosphere; IDEA is based on an operational weather forecasting model, which facilitates space weather modeling. We will develop a common ionosphere module to enhance ionospheric simulation capabilities in both models using an existing interface; we will also improve the parameterization of particle precipitation effects and tropical dynamics. Co-development, intercomparison, and validation of these models will improve both, and will allow the proposal team and the research community to address critical questions concerning the interaction of solar variability and anthropogenic climate change, the role of the atmosphere in determining ionospheric structure, and the effects of geomagnetic activity and energetic particle precipitation throughout the atmosphere and ionosphere.

Improvements and extensions of the numerical models will be implemented using standardized software interfaces, thoroughly tested and documented, and evaluated using a suite of data sources. Model code will be provided to NASA and to scientific researchers on an open-source basis. Models will be made available on NASA supercomputers and transitioned to the Community Coordinated Modeling Center (CCMC) runs-on-request facility.

Publication References:

no references