

Project Details

ROSES ID: NRA-NNH04ZSS001N

Selection Year: 2005

Program Element: Focused Science Topic

Topic: To determine the mechanisms responsible for the formation and loss of new radiation belts in the slot region in response to geo-effective solar wind structures.

Project Title:

A Physical Model of the Radiation Belt

PI Name: Mei-Ching Fok

PI Email: atn@g.ucla.edu

Affiliation: Goddard Space Flight Center

Project Member(s):

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Summary:

While there are existing physical models that specify and forecast the terrestrial radiation belt environment, hardly any of them covers the entire radiation belt region and energy range. We propose to formulate a comprehensive physical model of the radiation belt electrons, encompassing both diffusive and convective effects. This model is a data-driven bounce averaged model, which solves the plasma distribution functions in the ranges of 2-10 earth radii and 10 keV to 4 MeV energy. The solar wind and IMF data are the only inputs of the model. The model will set a new standard for quantitative predictive capability, after refinement based on testing against representative event observations and calibration through comparison with diverse applicable data sets. The results will lead directly to a physics-based model that links the radiation belt response quantitatively to its energy sources and the mechanisms that accelerate charged particles into the energy range known to have harmful effects on humans and human systems in space. The model will be made available in the form of open source software tools that permit ready evaluation of radiation belt conditions for specific events, which will find applications to aerospace technology, biological and materials research, human exploration and development of space, and space science in the Sun-Earth connection theme.

Publication References:

no references