

Project Details

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Program Element: Independent Investigation

Project Title:

Solar Proton Events and their Atmospheric Dynamical Influence

PI Name: Charles Jackman

PI Email: atn@g.ucla.edu

Affiliation: Goddard Space Flight Center

Project Member(s):

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Summary:

This investigation will be directed towards two aspects of atmospheric dynamics and solar proton events. The first part will focus on the influence of solar proton events on atmospheric dynamics, including the temperature and wind changes caused by the events. Several very large solar proton events in the past thirty-five years have created significant perturbations in the polar mesosphere due to substantial ozone decreases and Joule heating over a couple of days. A few of these events also caused polar upper stratospheric ozone decreases of over 10% for a period of several weeks. The dynamical changes resulting from these short-term (days) and long-term (weeks) influences from solar protons will be investigated with two different models, the TIME-GCM (Thermosphere Ionosphere Mesosphere Electrodynamics - General Circulation Model) whose domain is from 30 to 500 km and the WACCM (Whole Atmosphere Community Climate Model) whose domain is from the ground to 140 km. The second part of the investigation will focus on the transport of the perturbed atmospheric constituents, caused by solar protons, for weeks to months past the events. The transport for the specific time periods of study will be generated from meteorological data sets and will be used in the GSFC Two-dimensional Photochemistry and Transport Model whose domain is from the ground up to 90 km. A third part of the investigation will focus on some of the uncertainties in the model computations that are particularly relevant to the solar proton-induced atmospheric perturbation. Model results from all parts of the investigation will be compared to satellite and ground-based measurements, whenever possible.

Publication References:

no references