

Project Details

ROSES ID: NNH07ZDA001N

Selection Year: 2008

Program Element: Independent Investigation

Project Title:

Investigating the impact of solar variability on weather and climate with the high-altitude NOGAPS-ALPHA global spectral forecast model

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Summary:

We propose to perform a detailed series of atmospheric model simulations to study the link between variations in solar ultraviolet (UV) irradiance and variations in the Earth's weather and climate. These simulations will test new theories on wave-induced stratospheric ozone heating feedbacks and their role in communicating solar-induced heating anomalies near 50 km altitude downward to the troposphere and upward to the mesosphere. This study will employ the NOGAPS-ALPHA global spectral forecast model extending from 0-100 km altitude with an interactive treatment of solar UV heating and ozone photochemistry. We will perform a large number of simulations over seasonal and interannual time scales to isolate interactions between solar-induced heating anomalies and planetary wave propagation. We will also carry out detailed comparisons between modeled and observed solar cycle variations in stratospheric ozone, temperature, and zonal winds. Differences in the atmospheric response from one solar cycle to the next will be explored using state-of-the-art reconstructions of solar UV irradiance variations over the past 150 years. This investigation will provide new information on how changes in the sun's UV output can affect global weather and climate, and provide important new information on the dynamical response of the mesosphere to solar UV variability to improve lower boundary conditions for space weather prediction models.

Publication References:

Summary: no summary

Reference: McCormack, J. P.; Nathan, T. R.; Cordero, E. C.; (2011), The effect of zonally asymmetric ozone heating on the Northern Hemisphere winter polar stratosphere, Geophysical Research Letters, Volume 38, Issue 3, CiteID L03802 , doi: 10.1029/2010GL045937