

Project Details

ROSES ID: NNH11ZDA001N

Selection Year: 2012

Program Element: Focused Science Topic

Topic: Atmosphere-Ionosphere Coupling During Stratospheric Sudden Warmings

Project Title:

Communication of solar variability to the Earth's surface via the stratosphere

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Project Member(s):

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Summary:

Of the several pathways that have been proposed by which solar variability can influence climate, the best documented, and arguably the most credible, is via its direct impact on the tropical upper stratosphere. Accordingly, the research in this proposal is aimed at the identification of mechanisms and pathways by which perturbations to the tropical upper stratosphere, induced by variations in solar UV output, modify the stratospheric circulation, and thence influence the troposphere, and surface climate. The emphasis is on the middle and high latitude stratospheric and tropospheric response to tropical anomalies induced by solar variability, in particular the impact on stratospheric sudden warmings, since prior work indicates that it is these events that are sensitive to tropical perturbations, and that it is during such events that linkage with the troposphere is strongest. The approach to be taken is experimentation with a global dynamical model of the troposphere-stratosphere-mesosphere system with simplified physics, used as a mechanistic tool to classify the response of the deep atmosphere to range of upper stratospheric perturbations, under a range of meteorological conditions (in particular, different planetary wave regimes, and different phases of quasi-biennial oscillation in the tropical stratosphere). Emphasis will be on the climate response, i.e., the long-term response to sustained solar-induced anomalies, rather than short-term responses, under

perpetual solstice conditions and under a full seasonal cycle.

Publication References:

Summary: no summary

Reference: Goncharenko, L. P.; Coster, A. J.; Plumb, R. A.; Domeisen, D. I. V.; (2012), The potential role of stratospheric ozone in the stratosphere-ionosphere coupling during stratospheric warmings, Geophysical Research Letters, Volume 39, Issue 8, doi: 10.1029/2012GL051261

Summary: no summary

Reference: Domeisen, Daniela I. V.; Plumb, R. Alan; (2012), Traveling planetary-scale Rossby waves in the winter stratosphere: The role of tropospheric baroclinic instability, Geophysical Research Letters, Volume 39, Issue 20, doi: 10.1029/2012GL053684