

Project Details

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Project Title:

Spatial Footprint of Solar Direct and Indirect Radiative Forcing during the Past 400 Years

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Summary:

This proposal builds on time-dependent simulations already conducted of the response to forcing by the full solar spectrum for the past 500 years with a coarse grid troposphere-stratosphere model. We propose to make a detailed comparison of three different times that include both pre and post-industrial environments (circa 1670, with estimated low solar irradiance; 1890, with moderate solar forcing but prior to large trace gas increases and availability of some instrumental record; and 1990, with high solar irradiance and increased trace gases - but prior to Pinatubo). New simulations of the climatic response to the varying solar spectrum (0.1 to 100 microns in 190 wavelength bands) will make use of initial and boundary conditions generated from the appropriate time of the full 500 year run, but employ (1) a finer resolution atmospheric GCM (including the middle atmosphere), (2) calculated ozone response, and (3) a dynamical ocean model. Comparisons will be made between the temperature footprint associated with direct solar irradiance variations, and also the indirect effect of planetary wave response to ozone-induced heating. The relationship of these results to observed temperature changes will be examined. In this way we hope to gain a detailed understanding of the importance of natural solar-induced climate change on regional scales corresponding to the adopted level of irradiance change (0.2% total from the Maunder Minimum) and allow it to be separated from anthropogenic effects.

Publication References:

Summary: no summary

Reference: Rind, D.; (2002), The Sun's Role in Climate Variations, (2002), Science, Volume 296, Issue 5568, pp. 673-678 (2002), doi: 10.1126/science.1069562