

Surface Temperature and Planetary Albedo Responses to Total and Spectral Solar Forcing on Multi Decadal Time Scales in GISS GCMAM

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We examine climate responses to solar variations, focusing on possible roles of cloud feedback on Sun-climate interactions. We apply two reconstructed spectral solar forcing scenarios, one based on SIM (Spectral Irradiance Monitor) observations, the other based on the SATIRE (Spectral And Total Irradiance REconstruction) model, as inputs to the GISS (Goddard Institute for Space Studies) GCMAM (Global Climate Middle Atmosphere Model) to examine the climate responses on multi decadal time scales. There are no clear 11-year solar forcing signals in surface temperature. However, both solar forcing scenarios induce large multi-decadal surface temperature responses. We examine planetary albedo responses to global surface temperature variations for both control run and the run with solar variations. We found that the planetary albedo is negatively correlated with the surface temperature for both experiments. The correlation coefficient between the planetary albedo and surface temperature for SIM based solar forcing is -0.38 compared to -0.50 for SATIRE solar forcing. Those correlation coefficients are about 1.5 times larger than those for control runs. This supports and reinforces earlier studies showing how cloud feedback plays an important role in Sun-climate interactions.