

Climate Responses to Spectral Solar Forcing in GISS GCMAM

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We examine modeled climate responses to two types of spectral solar forcing of 11-year activity and centennial and longer time scale. We apply the reconstructed in-phase and SIM based out-of-phase spectral solar variation scenarios for the same variations in total solar irradiance (TSI) to the GISS (Goddard Institute for Space Studies) GCMAM (Global Climate Middle Atmosphere Model). We find that atmospheric temperature have very different responses to the two spectral solar forcing throughout the atmosphere. On centennial and longer time scales for the in-phase solar forcing, the global average surface temperature increases at a statistically significant rate of 0.005 °C/decade, contributing a warming of ~0.06 since 1880 to 2005, less than 7% of observed global temperature anomaly. For the out-of-phase solar forcing, the global average surface temperature increases with a statistical insignificantly trend of 0.002 °C/decade, contributing less than 3% of observed global temperature anomaly. We will present detailed analyses of temperature trends to the two spectral solar forcing. We also examine atmospheric responses to 11-year solar activity for the two spectral solar forcing scenarios for the past 23 solar cycles. We find atmospheric ozone, temperature, zonal wind, EP flux and EP flux divergence have very different responses to the two scenarios of solar forcing.