Geophysical Research Abstracts
Vol. 13, EGU2011-1129, 2011
EGU General Assembly 2011

Stratospheric Response to La Niña in the GEOS CCM

Margaret Hurwitz (1), Chaim Garfinkel (2), Paul Newman (3), Luke Oman (4), and In-Sun Song (5)

(1) NASA Postdoctoral Program, NASA Goddard Space Flight Center, Greenbelt, MD, USA (margaret.m.hurwitz@nasa.gov), (2) Johns Hopkins University, Baltimore, MD, USA (cig4@jhu.edu), (3) NASA Goddard Space Flight Center, Greenbelt, MD, USA (paul.a.newman@nasa.gov), (4) NASA Goddard Space Flight Center, Greenbelt, MD, USA (luke.d.oman@nasa.gov), (5) Goddard Earth Sciences and Technology Center, University of Maryland, Baltimore County, Baltimore, MD, USA (in-sun.song-1@nasa.gov),

La Niña events represent the opposite phase of El Niño/Southern Oscillation (ENSO) as do El Niño events. La Niña events are characterised by negative sea surface temperature (SST) anomalies in the central and eastern equatorial Pacific region between September and February.

In this presentation, we explore the extra-tropical response to La Niña events using a new formulation of the Goddard Earth Observing System (GEOS) chemistry-climate model (CCM), version 2 (GEOS V2 CCM). Two, 50-year time-slice simulations are forced by annually repeating SST and sea ice climatologies, one set representing observed La Niña events and the second set representing neutral ENSO events, in a present-day climate. By comparing the La Niña and ENSO neutral simulations, we show that the modelled tropospheric planetary wave response to La Niña is comparable to that found in the MERRA reanalysis. Next, we estimate the polar stratospheric response to La Niña using a variety of diagnostics: eddy heat flux at 100 hPa, lower stratospheric temperature, total ozone and the strength of the residual circulation. We contrast the polar vortex response to La Niña with the vortex weakening associated with both cold tongue El Niño events (in the Northern Hemisphere) and warm pool El Niño events (in the Southern Hemisphere). A new gravity wave drag scheme has been implemented in the GEOS V2 CCM, allowing the model to generate a realistic, internal quasi-biennial oscillation (QBO). We use this new model capability to examine the sensitivity of the stratospheric response to La Niña to the phase of the QBO.