

Can the GEOS CCM Simulate the Temperature Response to Warm Pool El Niño Events in the Antarctic Stratosphere?

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“Warm pool” (WP) El Niño events are characterized by positive sea surface temperature (SST) anomalies in the central equatorial Pacific. During austral spring, WP El Niño events are associated with an enhancement of convective activity in the South Pacific Convergence Zone, provoking a tropospheric planetary wave response and thus increasing planetary wave driving of the Southern Hemisphere stratosphere. These conditions lead to higher polar stratospheric temperatures and to a weaker polar jet during austral summer, as compared with neutral ENSO years. Furthermore, this response is sensitive to the phase of the quasi-biennial oscillation (QBO): a stronger warming is seen in WP El Niño events coincident with the easterly phase of the quasi-biennial oscillation (QBO) as compared with WP El Niño events coincident with a westerly or neutral QBO.

The Goddard Earth Observing System (GEOS) chemistry-climate model (CCM) is used to further explore the atmospheric response to ENSO. Time-slice simulations are forced by composited SSTs from observed WP El Niño and neutral ENSO events. The modeled eddy heat flux, temperature and wind responses to WP El Niño events are compared with observations.

A new gravity wave drag scheme has been implemented in the GEOS CCM, enabling the model to produce a realistic, internally generated QBO. By repeating the above time-slice simulations with this new model version, the sensitivity of

the WP El Niño response to the phase of the quasi-biennial oscillation QBO is estimated.