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The Impact of Warm Pool El Niño Events on Antarctic Ozone

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Warm pool El Niño (WPEN) events are characterized by positive sea surface temperature (SST) anomalies in the central equatorial Pacific in austral spring and summer. Previous work found an enhancement in planetary wave activity in the South Pacific in austral spring, and a warming of 3-5 K in the Antarctic lower stratosphere during austral summer, in WPEN events as compared with ENSO neutral. In this presentation, we show that weakening of the Antarctic vortex during WPEN affects the structure and magnitude of high-latitude total ozone. We use total ozone data from TOMS and OMI, as well as station data from Argentina and Antarctica, to identify shifts in the longitudinal location of the springtime ozone minimum from its climatological position. In addition, we examine the sensitivity of the WPEN-related ozone response to the phase of the quasi-biennial oscillation (QBO).

We then compare the observed response to WPEN events with Goddard Earth Observing System chemistry-climate model, version 2 (GEOS V2 CCM) simulations. Two, 50-year time-slice simulations are forced by annually repeating SST and sea ice climatologies, one set representing observed WPEN events and the second set representing neutral ENSO events, in a present-day climate. By comparing the two simulations, we isolate the impact of WPEN events on lower stratospheric ozone, and furthermore, examine the sensitivity of the WPEN ozone response to the phase of the QBO.