Evaluating the Impacts of ENSO Flavors on the ENSO-SAM Teleconnection to Antarctica Using CAM 4

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ABSTRACT

The discussion continues on ENSO flavors, namely whether the central Pacific ENSO Modoki represents a distinct pattern of SST anomalies in the Pacific or if it is part of a continuum with the canonical eastern Pacific ENSO. Despite this debate, several events during the 1990s and early 2000s where the Pacific SST anomalies were restricted to the central Pacific Ocean have occurred. These events have been shown to affect winter storm tracks in the Southern Hemisphere and alter the typical teleconnection impacts across the globe. Previous work has demonstrated that when ENSO and SAM anomalies are "in-phase" (La Niña/SAM+, El Niño/SAM-), the ENSO teleconnection to the high-southern latitudes is robust and enhanced. In contrast, when ENSO and SAM are “out-of-phase”, the teleconnection is weakened. Global numerical simulations using the National Center for Atmospheric Research Community Atmosphere Model (CAM 4) have also shown the ability to capture the important features of the observed teleconnection. Here, the effect of central versus eastern Pacific SST anomalies on the phasing between ENSO and SAM is investigated with CAM 4. Two separate methods are utilized to investigate this relationship. First, strong and weak SAM cases are encouraged in the model through a gentle nudging of the zonally-averaged circumpolar flow around Antarctica while the lower boundary SSTs, sea ice, ozone, and carbon dioxide based on observations from 1979-2005 are prescribed to the model. Second, 15-year simulations with repeated lower boundary conditions representing each phase of ENSO for each of the ENSO flavors (canonical and Modoki) are conducted. Both sets of anomaly experiments are compared to appropriate control simulations in order to detail changes to the teleconnection through position and strength of the subtropical and polar front jets as well as the strength of the ENSO-SAM phasing during the canonical ENSO and Modoki ENSO events.