

**Decadal variability of Asian-Australian monsoon-ENSO-TBO relationships**Gerald Meehl<sup>†</sup>; Julie Arblaster<sup>†</sup> NCAR, USALeading author: [meehl@ucar.edu](mailto:meehl@ucar.edu)

A set of dynamically coupled ocean-atmosphere mechanisms previously has been proposed for the Asia-Pacific tropics to produce a dominant biennial component of interannual variability (the Tropospheric Biennial Oscillation or TBO). Namely, a strong Asian-Australian monsoon is often associated with negative SST anomalies in the equatorial eastern Pacific and a negative Indian Ocean Dipole in northern fall between the strong Indian monsoon and strong Australian monsoon, and tends to be followed by a weak monsoon and positive SST anomalies in the Pacific the following year and so on. These connections are communicated through the large-scale east-west (Walker) circulation that involves the full depth of the troposphere. However, the Asia-Pacific climate system is characterized by intermittent decadal fluctuations whereby the TBO during some time periods is more pronounced than others. Observations and models are analyzed to identify processes that make the system either more or less biennial at certain times due to one or some combination of: 1. increased latitudinal extent of Pacific trade winds and wider cold tongue; 2. warmer tropical Pacific compared to tropical Indian Ocean that weakens trade winds and reduces coupling strength; 3. eastward shift of the Walker circulation; 4. reduced interannual variability of Pacific and/or Indian Ocean SST. Decadal timescale SST variability associated with the Interdecadal Pacific Oscillation (IPO) has been shown to alter the TBO over the Indo-Pacific region by contributing changes in either some or all of the four factors listed above. Analysis of a multi-century control run of CCSM4 shows that this decadal modulation of interannual variability is transferred via the Walker Circulation to the Asian-Australian monsoon region, thus affecting the TBO and monsoon-Pacific connections. Understanding these processes is important to be able to evaluate decadal predictions and longer term climate change in the Asia-Pacific region.