Geophysical Research Abstracts,
Vol. 11, EGU2009-5595, 2009
EGU General Assembly 2009

ENSO variability in subtropical Pacific humidity: A last-saturation approach

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The goal of this study is to better understand the relative importance of extratropical and tropical processes in controlling subtropical humidity variability associated with ENSO. Tracers of last saturation were applied to NCEP reanalysis data and show that ENSO subtropical Pacific humidity variability can be explained in terms of changes in the temperature at which subtropical air parcels were last saturated in the Pacific storm tracks and that the observed humidity variability cannot be explained simply by changes in the local temperature of the subtropical troposphere. Specifically, during El Nino winters, more air is last saturated at high, poleward locations than during La Nina winters. During El Nino (La Nina) northern winter, about 61% (50%) of the driest subtropical air over the north Pacific is last saturated poleward of 20˚N and above 500 hPa. Averaged El Nino and La Nina tracers of last saturation can be used to accurately reconstruct the first-order characteristics of ENSO humidity variability. Interannual variability of high, poleward last saturation conditions co-varies with Nino 3.4 region sea surface temperature anomalies. Higher equatorial Pacific sea surface temperature anomalies correspond to more high, poleward last saturation and vice versa, suggesting previously unrecognized links between the tropical ocean, the extratropical atmosphere, and subtropical tropospheric humidity.