



Equatorial Atlantic forcing of the El Niño Southern Oscillation

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Observations indicate a significant influence of the Atlantic zonal mode on the El Niño Southern Oscillation (ENSO), with variations in the Atlantic leading by around six months. Detailed analysis of observations and reanalysis show that a warm phase of the zonal mode during boreal summer favors the development of a La Niña event during the boreal winter. A warm SST anomaly in the Atlantic affects the Walker circulation with anomalous rising and subsiding motions in the tropical Atlantic and eastern tropical Pacific, respectively. This exerts an easterly anomaly to the west of subsiding region that is amplified by Bjerknes positive feedback, favoring the development of a La Niña event.

Here we reproduce the observed relationships, in terms of both strength and phase, using a complex Coupled General Circulation Model (ECHAM5/MPIOM). A five ensemble member simulation is performed with observed sea surface temperature (SST) specified in the tropical Atlantic and full coupling elsewhere. The simulations cover the period 1950 to 2005. The ensemble mean of the simulations reproduces the results from observations and reanalysis very well, and supports the mechanism outlined above. The impact of Atlantic on the mean state and statistics of the variability will also be discussed. The potential implication for ENSO prediction is investigated in seasonal hindcast experiments with the model.