



The representation of the South Tropical Atlantic teleconnection to the Indian Ocean in the AR4 coupled models

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A series of recent papers showed that sea surface temperature (SST) anomalies in the south equatorial tropical Atlantic modulate the internannual variability of the African and Indian monsoon rainfall. Physically such a teleconnection can be explained by a simple Gill-Matsuno mechanism.

In this work, the output from five different models chosen within the CMIP3 (Coupled Model Intercomparison Project version 3) ensemble of coupled general circulation models (CGCMs) are analyzed to investigate how state-of-the-art CGCMs represent the impact of the South Tropical Atlantic (STA) SSTs on the Indian and African region.

Using a correlation-regression technique, it is found that four out of the five models display a teleconnection between STA and Indian region which is in agreement with the observations in the rainfall field. This teleconnection is also noticed in the ensemble mean of the five models. Over Africa, however, the significant changes in rainfall displayed in the observation are properly caught by only one of the CGCMs. Additionally, none of the model reproduces the symmetric upper-level wind response around the Equator seen over the Indian Ocean in the observations. All models have significant biases also in the surface pressure field response to the tropical Atlantic SSTs. Nonetheless the overall response found over the southern hemisphere in this study is indicative of the Gill-Matsuno-type mechanism identified in previous studies using idealized experiments with atmospheric GCMs and observational data.

Overall the amplitude of the coupled model responses to the south tropical Atlantic anomalies is weaker than in the observations. It is shown that the difference in amplitude is not only due to the strong bias of the CGCMs over the tropical Atlantic but it is also caused by the different physical parameterizations used in models.