Geophysical Research Abstracts
Vol. 18, EGU2016-8151, 2016
EGU General Assembly 2016

Seasonal predictions of equatorial Atlantic SST in a low-resolution CGCM with surface heat flux correction

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The dominant mode of interannual variability in tropical Atlantic sea surface temperatures (SSTs) is the Atlantic Niño or Zonal Mode. Akin to the El Niño-Southern Oscillation in the Pacific sector, it is able to impact the climate both of the adjacent equatorial African continent and remote regions. Due to heavy biases in the mean state climate of the equatorial-to-subtropical Atlantic, however, most state-of-the-art coupled global climate models (CGCMs) are unable to realistically simulate equatorial Atlantic variability.

In this study, the Kiel Climate Model (KCM) is used to investigate the impact of a simple bias alleviation technique on the predictability of equatorial Atlantic SSTs. Two sets of seasonal forecasting experiments are performed: An experiment using the standard KCM (STD), and an experiment with additional surface heat flux correction (FLX) that efficiently removes the SST bias from simulations. Initial conditions for both experiments are generated by the KCM run in partially coupled mode, a simple assimilation technique that forces the KCM with observed wind stress anomalies and preserves SST as a fully prognostic variable. Seasonal predictions for both sets of experiments are run four times yearly for 1981-2012.

Results: Heat flux correction substantially improves the simulated variability in the initialization runs for boreal summer and fall (June-October). In boreal spring (March-May), however, neither the initialization runs of the STD or FLX-experiments are able to capture the observed variability.

FLX-predictions show no consistent enhancement of skill relative to the predictions of the STD experiment over the course of the year. The skill of persistence forecasts is hardly beat by either of the two experiments in any season, limiting the usefulness of the few forecasts that show significant skill. However, FLX-forecasts initialized in May recover skill in July and August, the peak season of the Atlantic Niño (anomaly correlation coefficients of about 0.3). Further study is necessary to determine the mechanism that drives this potentially useful recovery.