



On the relationship between Atlantic Niño variability and ocean dynamics

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The Atlantic Niño is the dominant mode of interannual sea surface temperature (SST) variability in the eastern equatorial Atlantic. Current coupled global climate models struggle to reproduce its variability, partly because they suffer from an equatorial SST bias that inhibits summer cold tongue growth. Here, we assess whether the equatorial SST bias affects the ability of a coupled global climate model to produce realistic dynamical SST variability by decomposing SST variability into dynamical and stochastic components. To compare our model results with observations, we employ an approach that is based on empirical linear models of dynamical SST using two predictors, sea surface height and zonal surface wind. We find that observed dynamical SST variance shows a pronounced seasonal cycle. It peaks during the active phase of the Atlantic Niño and is then roughly 4-7 times larger than stochastic SST variance. This suggests that the Atlantic Niño is a dynamical phenomenon and potentially predictable. In the coupled model, the SST bias suppresses the summer peak in dynamical SST variance. Bias reduction, however, improves the representation of the seasonal cold tongue and enhances dynamical SST variability by supplying a background state that allows key feedbacks of the tropical ocean-atmosphere system to operate in the model.