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How Well Do Global Climate Models Simulate the Variability of Atlantic Tropical Cyclones Associated with ENSO?

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Abstract

The variability of Atlantic tropical cyclones (TCs) associated with ENSO in the U.S. CLIVAR Hurricane Working Group Interannual Experiments is assessed and compared with observations. The experiments are 28-year simulations driven by the observed time-varying sea surface temperature from 1982 to 2009 and conducted with four global climate models (FSU, GFDL, NASA GSFC, and NCEP GFS) with a total of 12 ensemble members. The performance of these climate models is evaluated based on both multi-model ensemble mean and individual model ensemble mean. Previous observational studies indicate a strong association between ENSO and Atlantic TC activity, as well as distinctions in the TC activities during eastern Pacific (EP) El Niño and central Pacific (CP) El Niño. The analysis of TC origin and TC track density suggests that most models simulate the variability of TCs well with stronger activities during La Niña and weaker activities during EP El Niño. However, some models do not capture the distinctions between the EP and CP El Niño. The patterns of large-scale circulation in response to the two types of El Niño, including vertical wind shear in the main development region, are analyzed and may account for the model bias.