

Weakening of tropical cyclone activity over the North Atlantic in near-future decades

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The seasonal tropical cyclone (TC) activities over the North Atlantic (NA) are anticipated to decrease in the near-future decades of 2016–2030. A track-pattern-based model has been applied in this study to predict TC genesis and occurrences over the entire NA basin. For the atmospheric and oceanic input data, three long-term simulations of the National Centers for Environmental Prediction Climate Forecast System (CFS) initialized in 1988, 1996, and 2002 are used. The CFSs predicted increased vertical wind shear and decreased sea surface temperature (SST) over the tropical NA in the near-future decades. To understand the predicted decreases in TC activities combined with large-scale environments, we examine the changes in the North Atlantic SST (NASST) variability and El Niño–Southern Oscillation (ENSO), the two dominant modes that control NA TC activity. The mechanisms behind the weakening of the NA TC activities in near-future period vary among regions: A phase shift in the NASST from positive to neutral weakens TC activities over the open ocean; more frequent El Niño episodes also notably suppress TC activities throughout the NA basin. Consistent NASST warming trend in Coupled Model Intercomparison Project 5 projections suggests that natural variability is still dominant than anthropogenic forcing at least in the near-future period over the NA basin. This study suggests how the TC activity will be changed in near future which is different from the centurial projection, and its related possible mechanisms.