Past and Future Hurricane Intensity Change along the U.S. East Coast

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The ocean and atmosphere in the North Atlantic are coupled through a feedback mechanism that excites a dipole pattern in vertical wind shear (VWS), a metric that strongly controls Atlantic hurricanes. In particular, when tropical VWS is low and favorable for an active hurricane season, a protective barrier of high VWS inhibits hurricane intensification along the U.S. East Coast. Here we show that this pattern is driven mostly by natural decadal variability, but that greenhouse gas (GHG) forcing erodes the pattern and degrades the natural barrier along the U.S. coast. Twenty-first century climate model projections using both the CMIP5 multimodel and CESM large ensemble show that the increased VWS along the U.S. East Coast during decadal periods of enhanced hurricane activity is substantially reduced by GHG forcing, which allows hurricanes approaching the U.S. coast to intensify more rapidly. The erosion of this natural intensification barrier is especially large following the Representative Concentration Pathway 8.5 (rcp8.5) emission scenario. We also illustrate the large uncertainties in the future projection of VWS change using CMIP5 multimodel and the NCAR large ensemble.