OFFICIAL ABSTRACT and CERTIFICATION

Associations between the Slowdown in North Atlantic Tropical Cyclone Translation Speed and Intensifying Storm Precipitation

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An analysis of the links between the decline in North Atlantic tropical cyclone (TC) translation speed and the intensification of precipitation accumulation associated with landfalling storms is central to an improved understanding of the behavior and impacts of North Atlantic TCs in a changing climate. This study elaborates on prior research by examining spatial and temporal trends in the translation speed of an expanded dataset of 1,857 storms during the period 1851-2016 and relating observed patterns to shifts in the intensity of rainfall associated with a smaller subset of landfalling storms within the dataset. A number of statistical analyses, including a linear regression analysis, k-means clustering algorithm, and k-nearest neighbor outlier detection test, are carried out to assess the modulation of North Atlantic TC translation speed over time. A multifaceted analysis of storm precipitation associated with a subset of 185 landfalling tropical cyclones from 1950-2011 is then undertaken through a linear regression analysis and hierarchal clustering assessment. A visual analysis of synoptic rain field maps and geopotential height anomalies across the contiguous United States on the dates preceding and following landfall accompanies the statistical analysis. The results reveal a decline in TC translation speed over time and an increase in the intensity of landfall precipitation. The claim that anthropogenic human-induced warming may be responsible for this trend is then explored and analyzed with respect to pre-existing studies.

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