

Detected Climatic Change in Global Distribution of Tropical Cyclones

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Although previous studies have reported that global mean temperature has been rising since the mid 20th century and is attributable to increases in emissions of greenhouse gasses, the annual number of global tropical cyclones has been unchanged at around 86 since 1980. Owing to the limited length of observed tropical cyclone data and the effect of multi-decadal internal variability, it has been a challenging issue to detect the trends in tropical cyclone activity at a global scale. However, there is a distinct spatial pattern of the trends in tropical cyclone frequency of occurrence at the global scale since 1980, such as significant decreases in frequency of occurrence in the South Indian Ocean, western North Pacific, and increases in the North Atlantic and Central Pacific. Here, using a suite of high-resolution dynamical model experiments, we show for the first time that the observed spatial pattern of trends cannot be explained only by the underlying multi-decadal internal variability; rather, external forcing such as greenhouse gasses, aerosols, and volcanic eruptions likely played an important role. This study demonstrates that a climatic change in terms of global spatial distribution of tropical cyclones has already emerged in observations, and may in part be attributable to the increase in greenhouse gas emissions.

Keywords: Tropical Cyclone, Detection and Attribution, Trend in Spatial Pattern