SCIPP RESEARCH BRIEF - STALLING NORTH ATLANTIC TROPICAL CYCLONES

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OVERVIEW

Tropical cyclones (TCs) are one of the costliest weather phenomena to impact the U.S. Stalling TCs, specifically, exacerbate impacts by increasing communities' exposure to the storm. This increased duration allows for more rain to fall, increased storm surge, etc. Hurricane Harvey, for example, produced over 50 inches of rain in select areas of Greater Houston after stalling offshore. With population growth occurring along the coast and the potential for more intense tropical storms in a changing climate, it becomes vital to understand when and where stalls occur.

METHODS AND RESULTS

Stalling Tropical Cyclone: A TC with a storm center that is constrained to a circle with a radius of less than or equal to 200 km over 72 hr.

Time Periods Analyzed: 1900-2020 and 1966-2020

Using the above definition and the HURDAT2 data set, statistical analysis was performed for both time periods to determine trends in frequency and location.

15% of the analyzed TCs met the stall definition, with 10 storms experiencing more than one stall. Stalls were found to be more common in September and October and were most often located near the Texas, Louisiana, and western Florida regions of the Gulf Coast. The eastern Florida coast and the region near the Carolinas also experienced increased stalls compared to other regions of the Gulf of Mexico. Stalls were also found to impact the duration of TCs, with stalling storms having longer life cycles than non-stalling TCs. Furthermore, the proportion of storms experiencing stalls has increased since 1966.

QUICK INFO

STUDY LOCATIONS

- Gulf Coast
- North Atlantic Ocean

OBJECTIVES

- Determine when/where storms tend to stall
- Examine potential annual trends in stalling tropical cyclone frequency

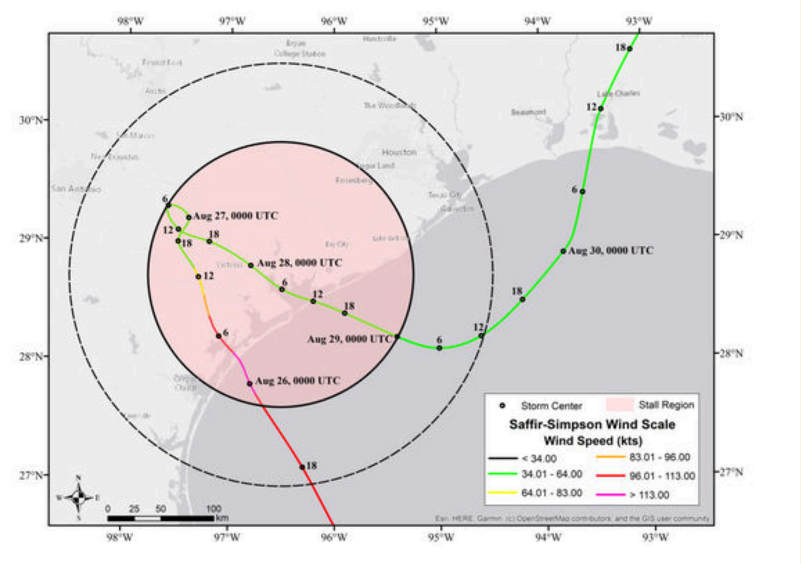

Figure 1. Hurricane Harvey's Track and Corral Method (Trepanier et al., 2024)

IMPLICATIONS

1. The Importance of Stalling TCs

Tropical cyclones are associated with high winds, extreme precipitation, storm surge, and the threat of tornadoes. Stalls extend the amount of time a geographic region is exposed to tropical cyclone impacts. This increased exposure threatens lives and may increase recovery costs.

Rapid intensification, defined as a 35 mph or more wind increase over 24 hours, also exacerbates impacts by decreasing the window of preparation for those in the storm's path. Slightly less than half of the analyzed storms experienced both a stall and rapid intensification, with an even smaller subset experiencing both at the same time. The combined impacts of rapid intensification and stalls, produce even more dangerous conditions. This research attempted to develop a better understanding of when and where stalls are likely to occur, ultimately contributing to improved response and preparation.

2. Looking Forward

Potential work to be completed in the future includes an analysis of the synoptic patterns contributing to stalls, a comparison of coastal and open-water stalling TCs, a calculation of rainfall recurrence intervals, and additional research on rapid intensification.

Access the full report: Trepanier, J. C., J. Nielsen-Gammon, V. M. Brown, D. T. Thompson, and B. D. Keim, 2024: Stalling North Atlantic Tropical Cyclones. *J. Appl. Meteor. Climatol.*, **63**, 1409-1426, https://doi.org/10.1175/JAMC-D-23-0229.1.

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