Movement of lifetime maximum intensity locations during the North Atlantic hurricane season

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Abstract

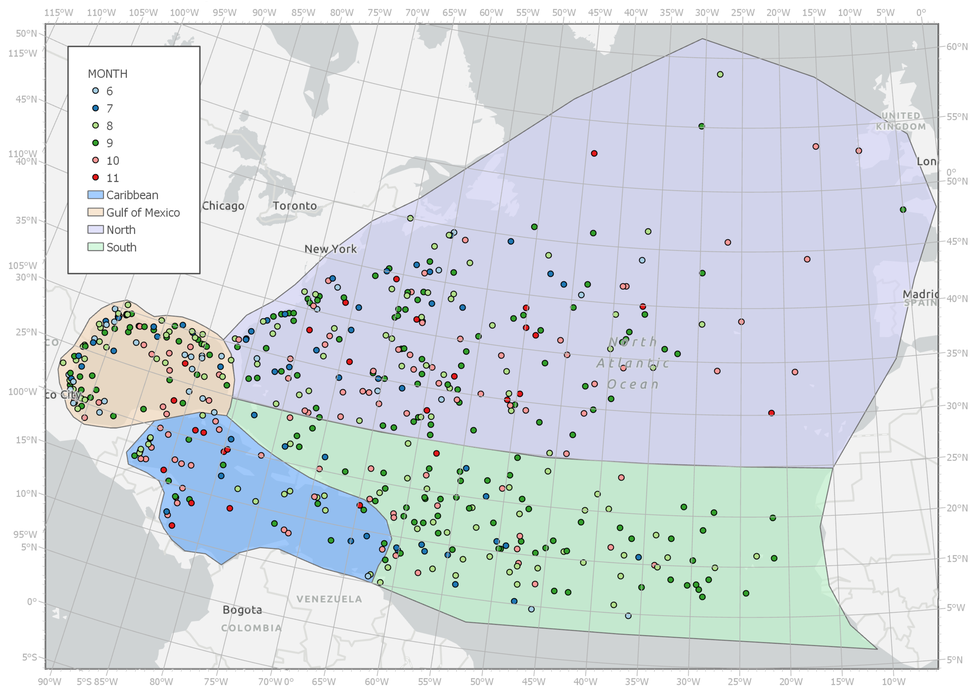
Where a storm reaches its lifetime maximum intensity (LMI) can be a powerful indicator of tropical cyclone intensification patterns. Any changes in this location may demonstrate how hurricanes are affected by climate change. Studies on the annual and decadal trends in LMI location have shown that the latitude where storms are reaching their LMI is shifting, but at different rates and in different directions depending on the ocean basin. In the North Atlantic, for example, LMI location seems to be moving slightly closer to the equator, especially for those storms with the greatest intensities. LMI location patterns have yet to be explored within the hurricane season. We assess how LMI location moves through a hurricane season based on climatological mean locations, showing how time of year affects where a storm reaches its greatest intensity. This work contributes to our growing knowledge on hurricane intensification patterns, which are one of the main ways that climate change affects tropical storms.

Methodology

1. Download data from NOAA's HURDAT
2. Limit data up to 1982 (well-developed satellite imagery)
3. Select LMI's within official hurricane season (May 1 to November 30)
4. If LMI's are repeated, select the last reported LMI
5. Define regions within the Atlantic Basin: Gulf, Caribbean, southern North Atlantic, northern North Atlantic. Based on underlying topography and latitude.

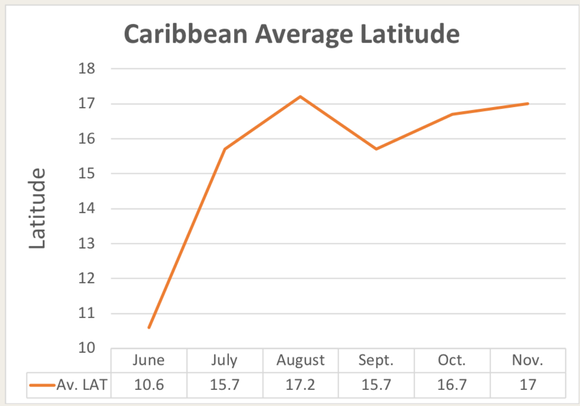
LMI by Month from 1982 to 2017

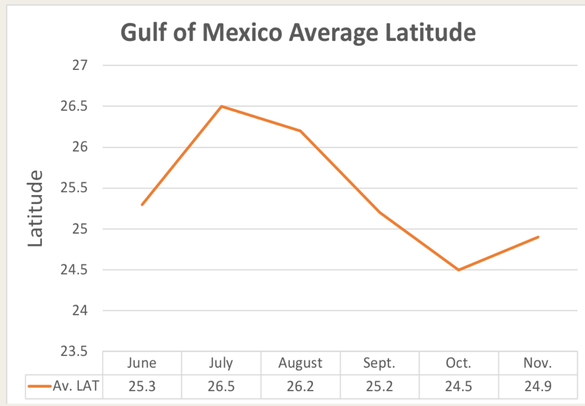
WGS 1984 Cape Verde Grid

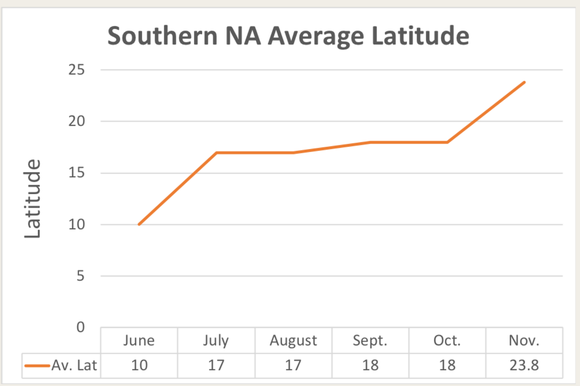


Analysis (preliminary)

Analysis is currently ongoing. We have started preliminary analyses using basic excel tables and graphs. Basic statistics were performed using the ArcGIS Pro feature. The preliminary results have been placed below and are mostly raw.







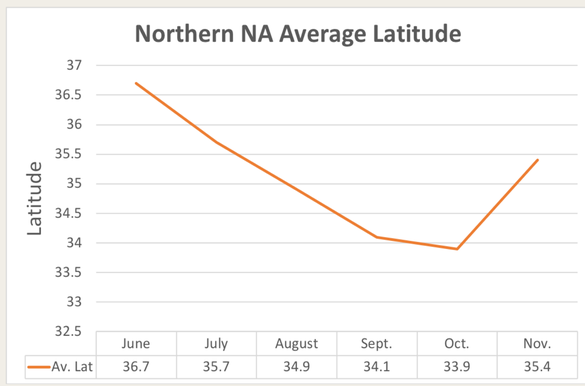


Image from Josh Stevens using GOES-16 | Michael

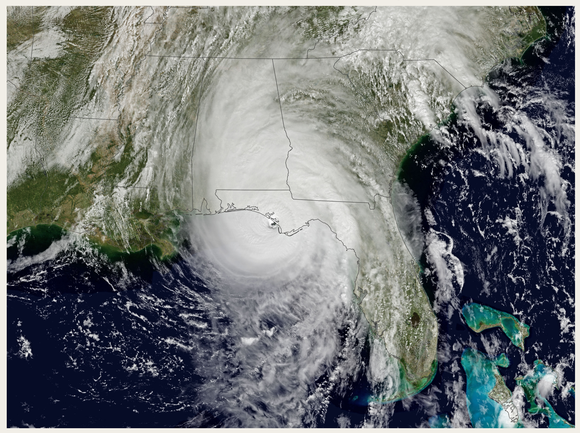


Image from Ricky Arnold aboard ISS | Florence

Sources:

1. Kossin, J.P., K.A. Emanual, and G.A. Vecchi, 2014: The poleward migration of the location of tropical cyclone maximum intensity. *Nature*, **509**, *349*–352.
2. Kossin, J.P, T.L. Olander, and K.R. Knapp, 2013: Trend Analysis with a New Global Record of Tropical Cyclone Intensity. *Journal of Climate*, **26**, 9960–9976.
3. Tennille, S.A., and K.N. Ellis, 2017: Spatial and temporal trends in the location of the lifetime maximum intensity of tropical cyclones. *Atmosphere*, **8**, 1–9.

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