

# Increasing tropical cyclone intensity and potential intensity in the subtropical Atlantic around Bermuda from an ocean heat content perspective 1955-2019

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## Aims

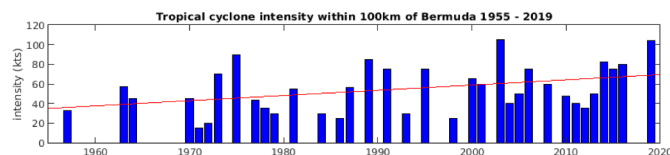
- How has tropical cyclone intensity changed near Bermuda from 1955-2019
- Can tropical cyclone potential intensity estimates be improved using ocean heat content compared to SST

## Method

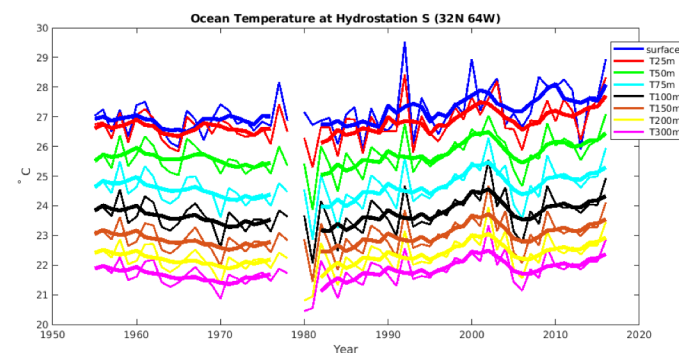
- Analysis of tropical cyclones within 100km of Bermuda using HURDAT2 data from 1955-2019, and ocean temperature profiles from the Hydrostation S time-series site (32N 64W), close to Bermuda.
- Tropical cyclone maximum potential intensity, which provides an estimate of the theoretical upper limit of maximum wind speed and minimum central pressure, was calculated based on the method developed by Emanuel (1999) and adapted to use  $\overline{T_{50m}}$  as opposed to SST.

## Results

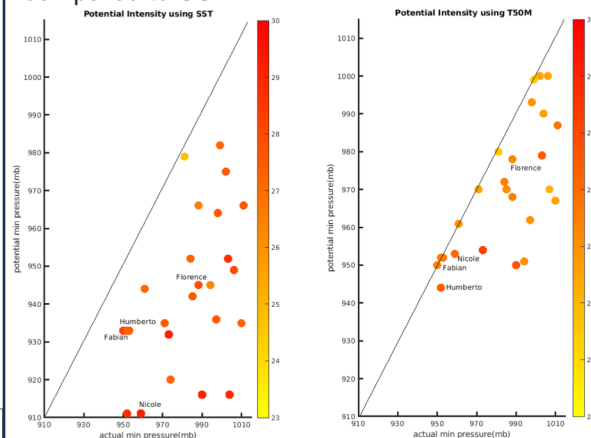
1. Tropical cyclone average intensity near Bermuda has increased from 33 to 63kts (5kts p/d) over the last 60 years linked to rising ocean temperatures in the region.



2. Strongest correlation is between TC intensity and ocean temperature averaged through the 50m layer ( $\overline{T_{50m}}$ ), ( $r=0.37$ ,  $p<0.01$ ). Rising SST of 1.1°C (0.2°C p/d) from 1955-2019.

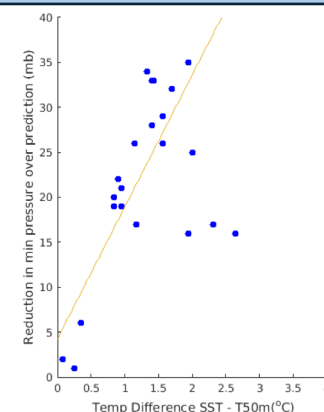


3. Closer prediction of hurricane intensity (nearer black line) using upper ocean heat ( $\overline{T_{50m}}$ ) compared to SST.

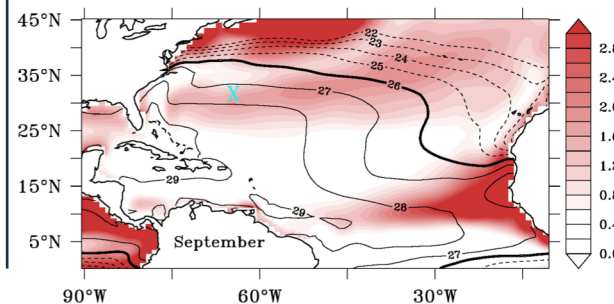


Plot shows tropical cyclone potential intensity (minimum pressure). Each dot represents a tropical cyclone and the colorbar indicates ocean temperature (°C). The nearer the dot to the black line indicates a closer estimate of actual tropical cyclone minimum pressure.

4. The average minimum pressure difference is reduced by 12mb using  $\overline{T_{50m}}$  compared to SST and is proportional to the  $SST - \overline{T_{50m}}$  temperature difference.



5. Tropical cyclone intensity prediction could be improved using  $\overline{T_{50m}}$  where the  $SST - \overline{T_{50m}}$  temperature difference (shading) is more than 1°C. X indicates Bermuda.



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