

# Sensitivity of the Strongest Hurricanes to Ocean Surface Warmth

## Observations versus a global climate model

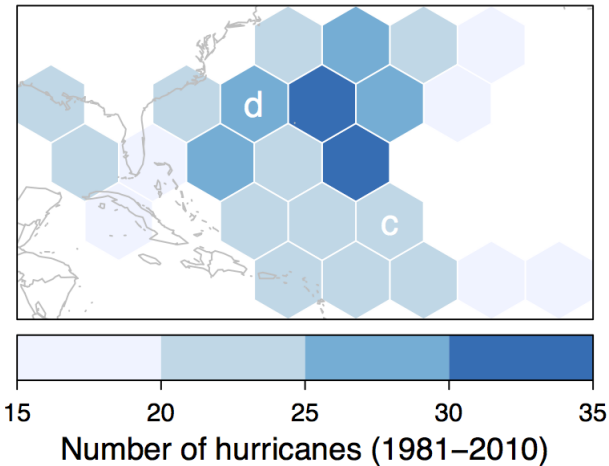
James B. Elsner

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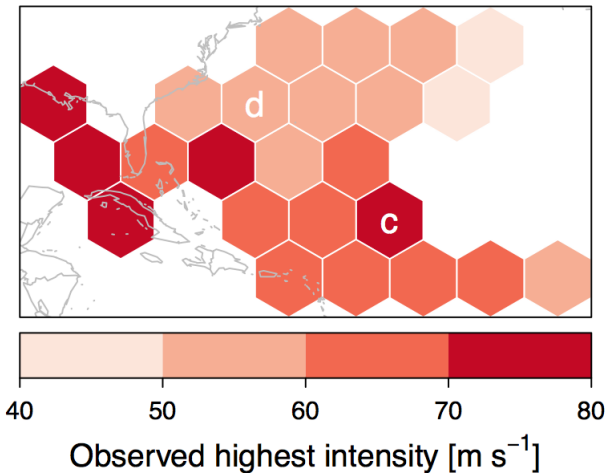
In collaboration with Jill Trepanier, Thomas Jagger, & Sarah Strazzo.

- Estimates of the **sensitivity of hurricane strength to ocean heat** are needed to better understand how fierce hurricanes might become in the future.
- Maximum intensities are increasing especially over the warming Atlantic, but good estimates of the sensitivity to ocean warmth are not possible with time-series data.
- Studies using paired values of intensity and SST are limited since most pairs represent hurricanes in an environment less than thermodynamically optimal.
- Here we overcome these limitations and show a sensitivity of **8.2 [ $\pm$  1.19 (s.e.)] m s<sup>-1</sup>/°C** from observations but only **1.5 [ $\pm$  0.60 (s.e.)] m s<sup>-1</sup>/°C** from a dynamical model.

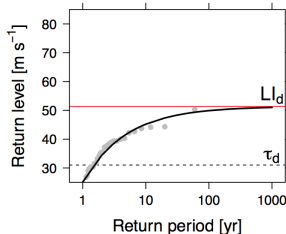
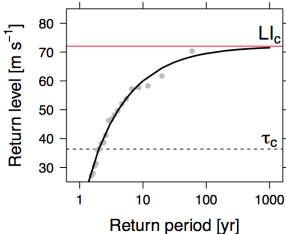
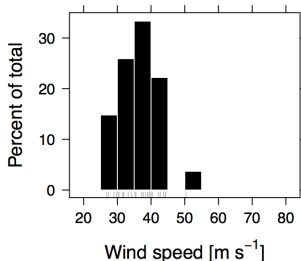
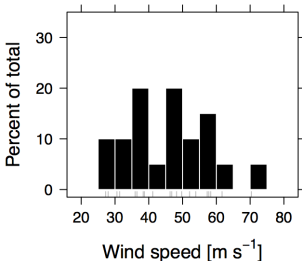
# Frequency



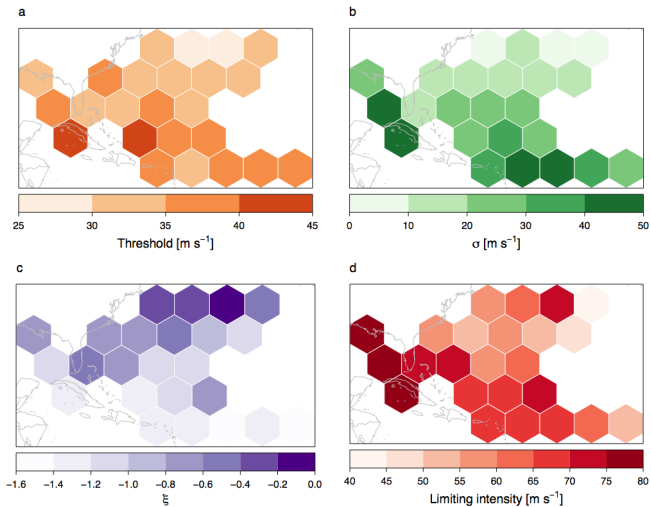
# Intensity



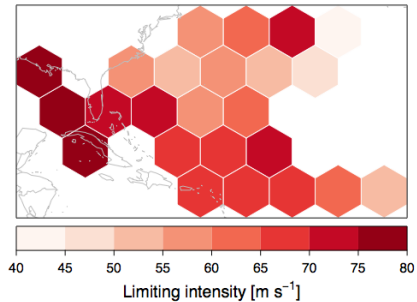
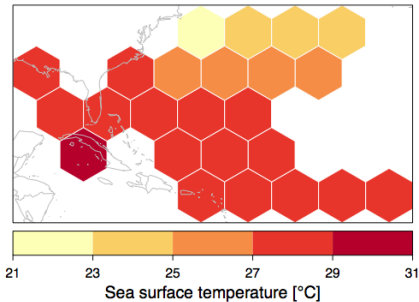
# What is limiting intensity?



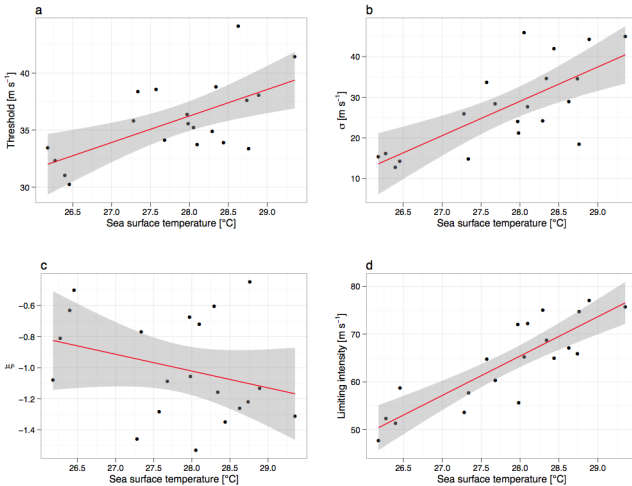
# Statistical parameters



# Sea-surface temperature (Aug-Oct) & limiting intensity [1981-2010]

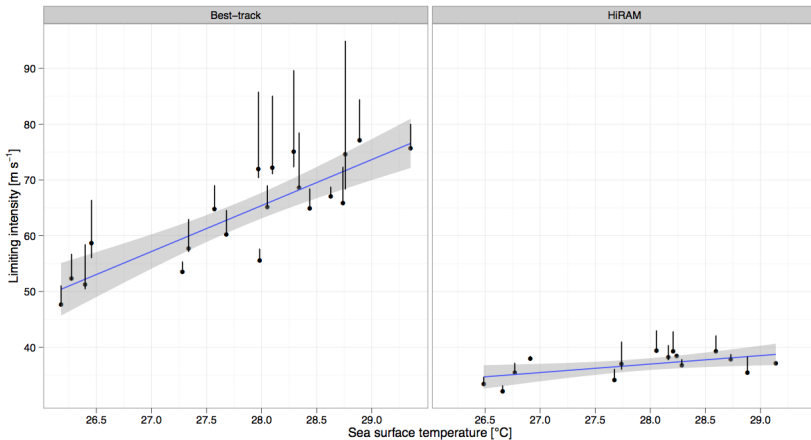


# Sensitivity of model parameters to SST





# Comparison with HiRAM



## Summary

Sensitivity of hurricane intensity to ocean heat is a key statistic for assessing what hurricanes might be like in the future, but estimates of this value are missing in the literature. Here we estimate the sensitivity to be  $8.2 \pm 1.19 \text{ m s}^{-1}/^{\circ}\text{C}$  (s.e.) for hurricanes over oceans hotter than  $25^{\circ}\text{C}$ .

Sensitivity is found to be significantly lower at  $1.5 \pm 0.60 \text{ m s}^{-1}/^{\circ}\text{C}$  (s.e.) for hurricanes in a high-resolution dynamical model. Results indicate the likelihood of more powerful hurricanes during the 21st century as oceans continue to warm, but call into question the usefulness of current models for assessing future activity.

Observed frequency & intensity  
Sensitivity to ocean warmth  
Observed sensitivity not matched in a GCM

# Questions?

