Impact of the Ocean–Atmosphere Background State in the Tropical Cyclones Cold Wake Magnitude Variability

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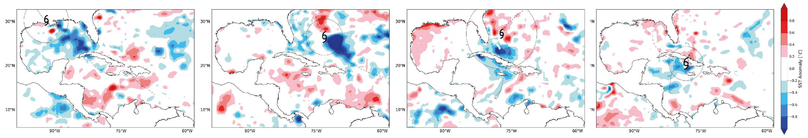
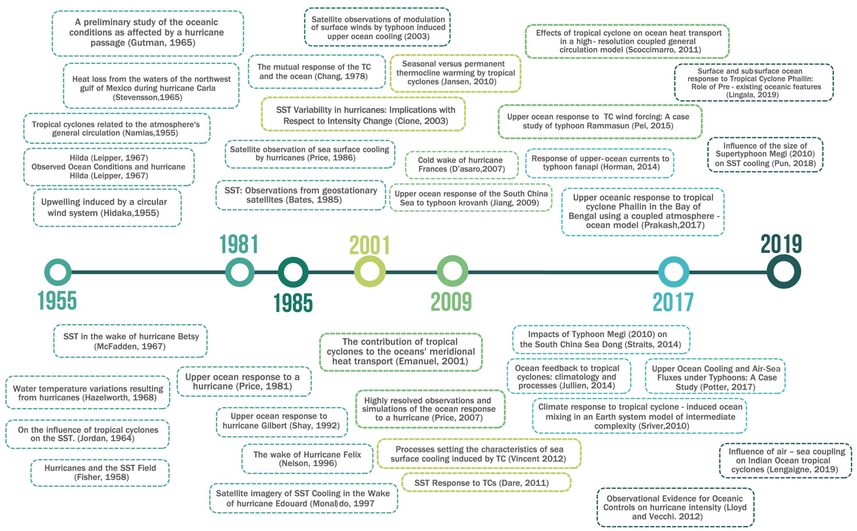
Introduction

The reduction of SST as a response of a TC passage is often referred to as TC cold wake. This SST anomaly is typically assessed as a function of TC intensity, analyzing the life cycle of a single TC, without considering the background state of the ocean-atmosphere system and the storm size.

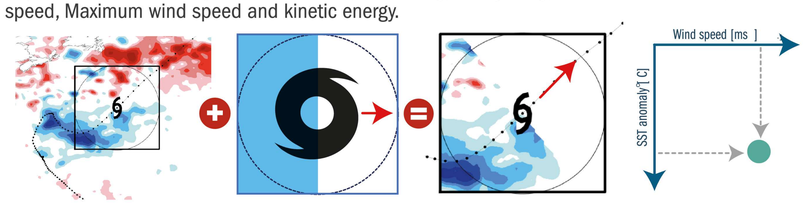


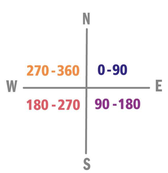
Earl, 2010 | Gustav, 2008 | Paloma, 2008 | Sandy, 2008



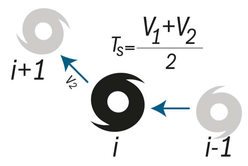
Data and methodology

For every Tropical Cyclone in each of the six ocean basins, we look for the value of 20 C isotherm depth, Sea surface temperature, Latitude, Julian day, Bathymetry, Movement direction, Translation speed, Maximum wind speed and kinetic energy.





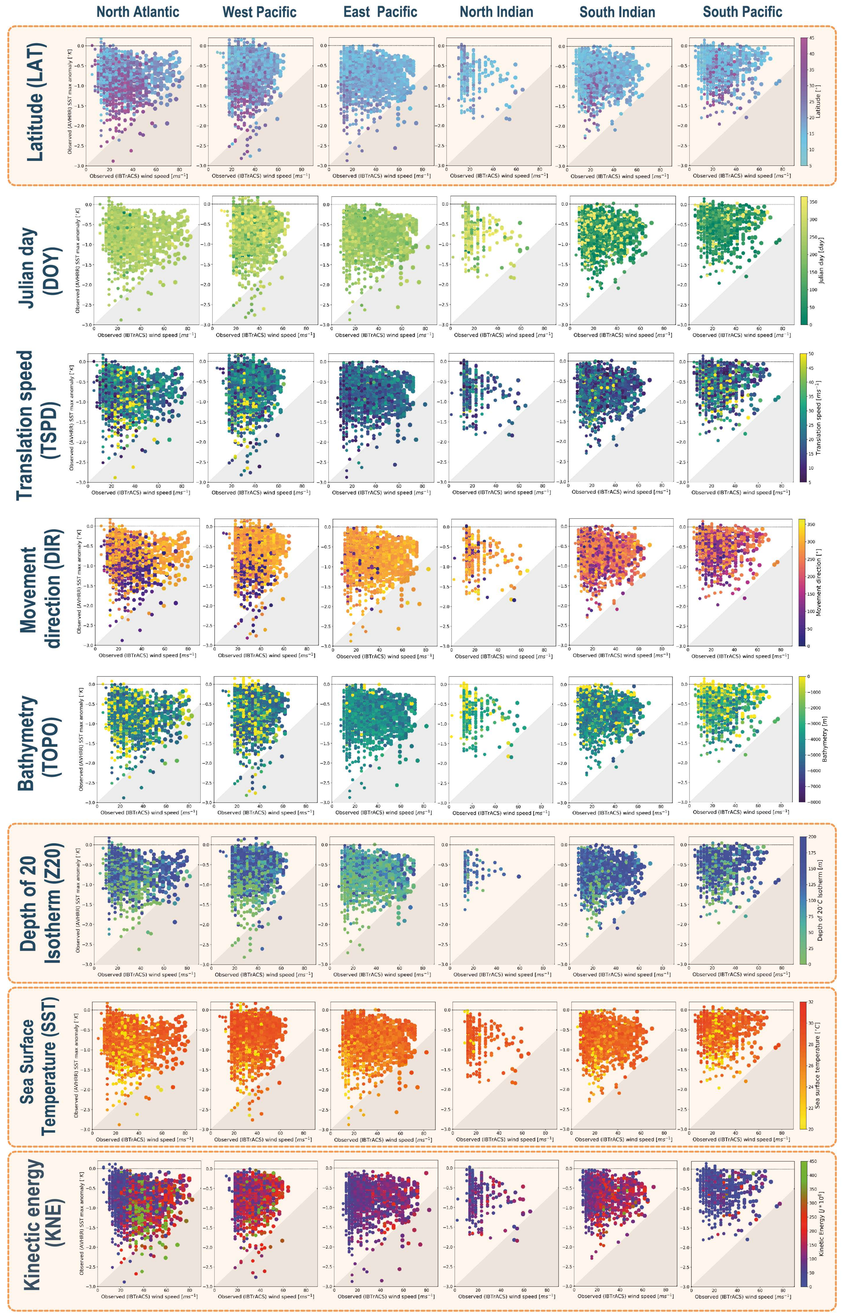
Movement direction



Translation speed

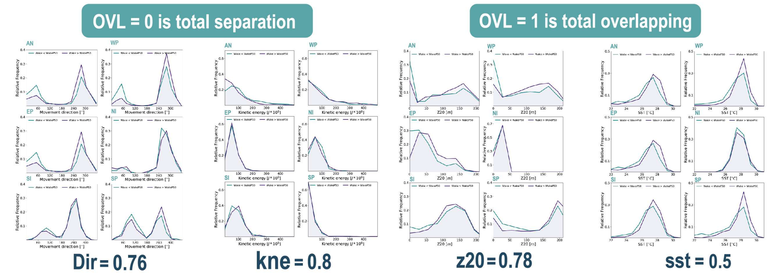
Depth of 20 Isotherm: GLORYS
Sea Surface Temperature: AVHRR
Maximum Wind Speed: IBTrACS
Bathymetry: ETOPO2
Latitude: IBTrACS
Julian day: IBTrACS
Translation speed: IBTrACS
Movement direction: IBTrACS
Kinetic energy: Satellite retrievals

Relationship between TC intensity - SST anomaly

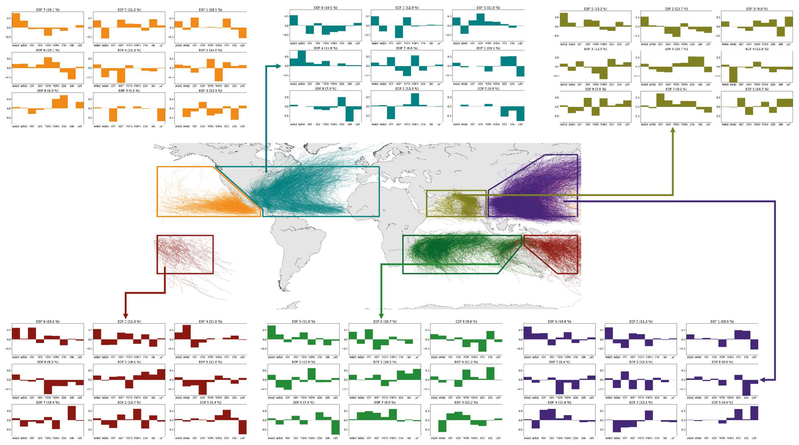


What is the most relevant variable in cold wake magnitude variability?

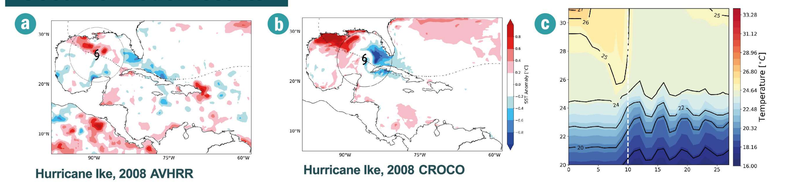
For every Tropical Cyclone in the six ocean basins, we looked for the values of 20 isotherm depth.



EOF of each ocean basin, oscillation modes are sorted according to the amount of correlation with the Cold wake magnitude.



Oceanic model results



SST anomalies during Hurricane Ike in 2008. (a) Satellite Retrievals, (b) Results from CROCO, and (c) ocean temperature profile from CROCO at the green star in Figure (b). Solid contours represent the 26, 24, 24, 22 and 20.

Conclusions

- TCs north (or south) of 25°are related to shallower thermoclines, therefore the pumping is more efficient.
- TC intensity is not the most relevant parameter in order to explain the cold wake magnitude variability.
- Thermocline depth and Kinetic energy have a significant role in the cold wake magnitude.
- The processes that drive the cold wake are different in each ocean basin due to its geographical and background dynamical differences.

Acknowledgments

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