Main Talking Points

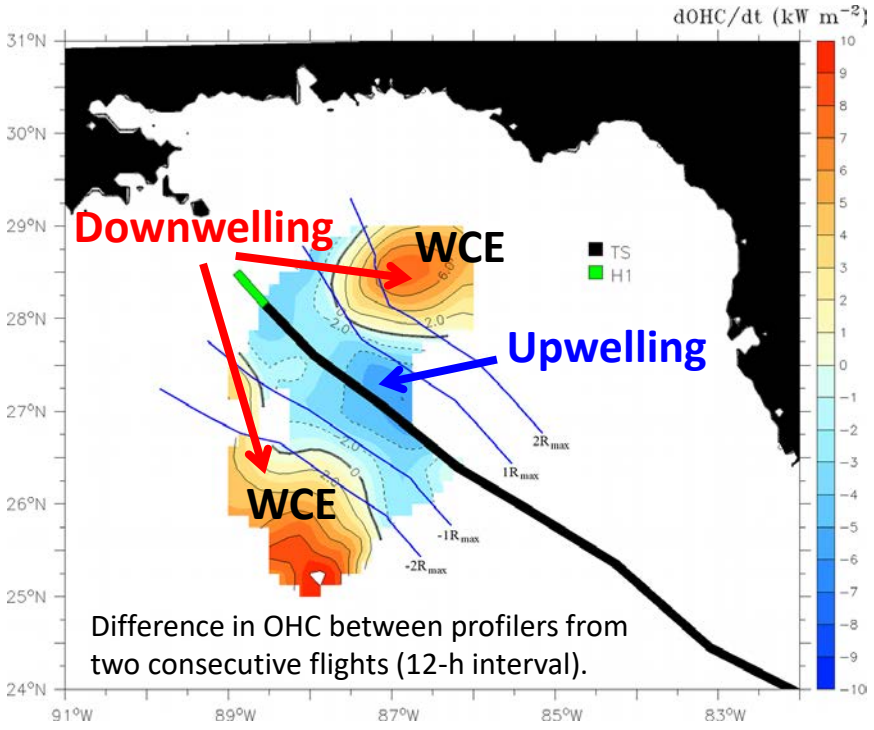
- Upwelling responses over ocean eddies are non-linear.
- SST responses are a function of the strength and vorticity of ocean eddies.
- The variability in h_{26} and OHC over ocean eddies impacts the negative feedback.

Take Home Messages

- **Numerical models must correctly represent ocean eddies to correctly simulate upwelling and downwelling responses, sea surface cooling, and ensuing air-sea moisture disequilibrium, enthalpy fluxes, and tropical cyclone intensity.**
- **This is largely a problem of model initialization, for which direct measurements of the pre- and in-storm ocean states (T, S, V) are critical.**

Upwelling Responses over Ocean Eddies are Non-Linear

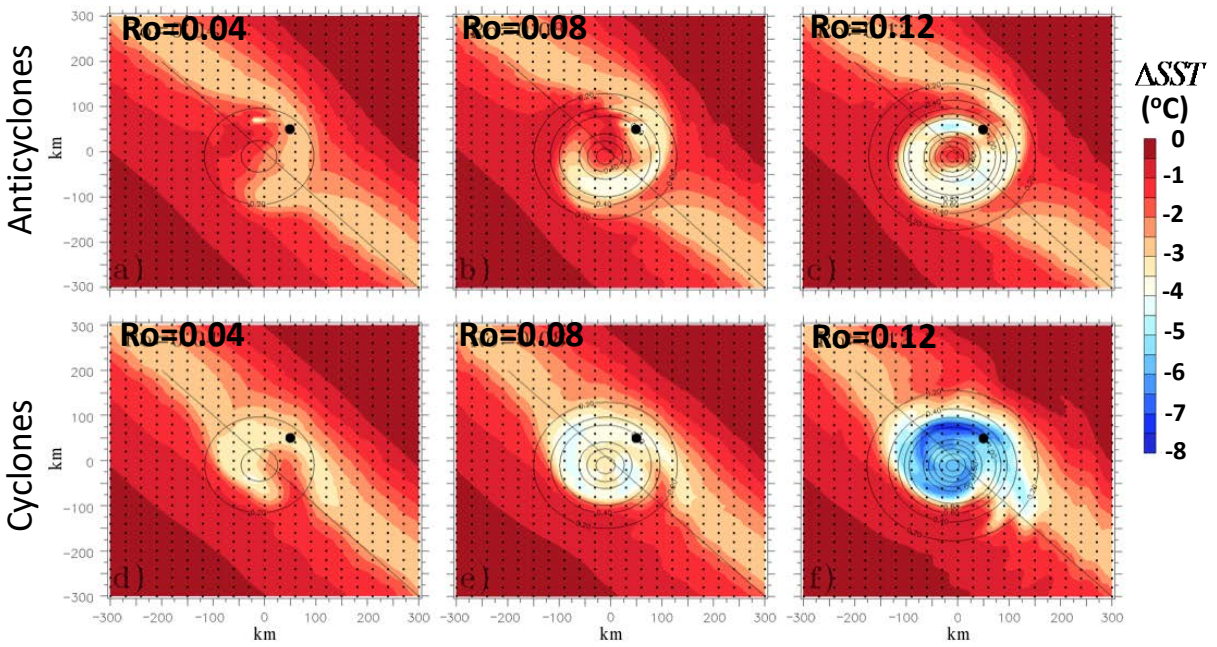
- Maximum cooling underneath Hurricane Isaac's center: **-3 kW m^{-2}** over a 12-h interval.
- Maximum warming underneath Isaac's left and right sides: **8 kW m^{-2}** over a 12-h interval.
- Isaac (2012) became a Hurricane over this region of upper-ocean warming (SSTs were above 28^{o}C).



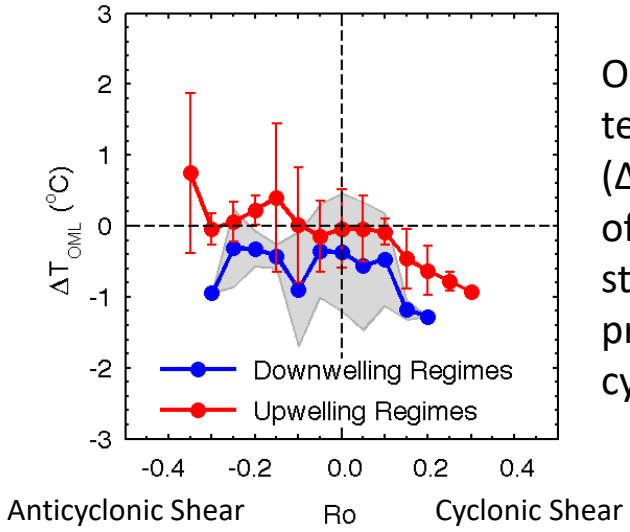
Numerical models must correctly represent ocean eddies to correctly simulate upwelling and downwelling responses.

SST Responses are a Function of the Strength and Vorticity of Ocean Eddies

- Numerical simulation of the response of oceanic geostrophic eddies to tropical cyclone forcing.
- The wind forcing is the same in all experiments (Hurricane Katrina at peak category 5 hurricane).



The correct representation of ocean eddies in numerical models is critical to correctly simulate sea surface cooling.



Ocean Mixed Layer (OML) temperature response (ΔT_{OML}), based on 79 pairs of collocated pre- and in-storm ABXT temperature profiles from eight tropical cyclones.

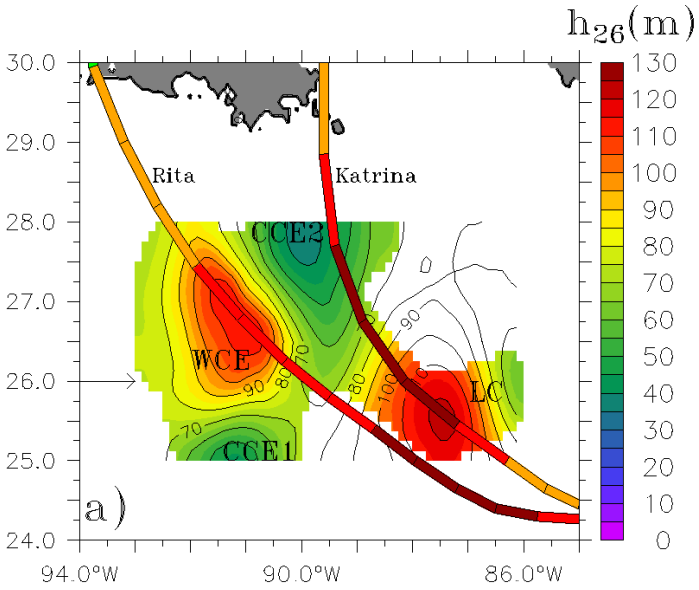
The Variability in h_{26} and OHC over Ocean Eddies Impacts the Negative Feedback

- h_{26} is the depth of the 26°C isotherm;
- We use h_{26} for estimating the Ocean Heat Content (OHC).

Initiation of the negative feedback (h)

$$\Delta T_{nf} = \frac{PE_{h26}}{H_W} = \frac{h_{26}\ \text{Potential Energy}}{\text{Hurricane Work}}$$

- Fast initiation of the negative feedback over cool ocean eddies (cyclones: CCE2).
- Delayed initiation of the negative feedback over warm ocean eddies (anticyclones: LC and WCE).



- **Numerical models must correctly represent ocean eddies to accurately simulate the timing and extent of the SST negative feedback on storm intensity.**
- **This is largely a problem of model initialization, for which direct measurements of the pre- and in-storm ocean states (T, S, V) are critical.**