1. BACKGROUND
- In August 2011, Hurricane Irene’s intensity was over-predicted by several hurricane models and over-forecast by the National Hurricane Center.
- Governing factors of hurricane intensity include:
  - What is the impact of the upper ocean thermal evolution (SST) on Irene’s intensity, as compared to other model parameters, such as resolution, microphysics, & air-sea flux parameterizations?

2. HYPOTHESIS
We hypothesize that the models handled the track, vertical wind shear, and dry air intrusion well, but handled the upper ocean thermal structure (and evolution) poorly.
- Atmosphere tends to receive more attention in modeling
- Models resolve large-scale processes fairly well
- Models have improved considerably on predicting tracks

3. OBSERVATIONS & MODEL
RU16 Glider: at 40m isobath, right of eye track
Satellite: 1km AVHRR 3-day coldest dark pixel
SST composite (preserve cold wake); NASA SPoRT 2km SST for cloudy gaps
Model: 6km WRF-ARW, boundary conditions to get track correct (important because close to coast)

4. RESULTS
A. Glider data revealed that ocean mixing and subsequent surface cooling preceded the passing of the eye
B. Improved satellite SST product revealed that this surface ocean cooling was not captured by:
  - Basic satellite product
  - Ocean models used for forecasting hurricane intensity
C. Over 100 sensitivity tests showed that Hurricane Irene intensity is very sensitive to this “ahead-of-eye” SST cooling
- Improve model spinup issues
- Validate wind shear and dry air intrusion (see Background and Hypothesis sections)
- Evaluate storm size and structure
- Compare modeled to observed heat fluxes
- Move towards accurate fully coupled WRF-ROMS system
- WRF w/ hourly ROMS SST
- WRF coupled w/ 3D Price-Weller-Pinkel ocean model
- WRF-ROMS

5. CONCLUSIONS
- Large majority of SST cooling occurred ahead of Irene’s eye
- We determined max impact of this cooling on storm intensity (fixed cold vs. fixed warm SST)
- One of the largest among tested model parameters
- Some surface cooling occurred during/after eye passage
- Actual impact of SST cooling on storm intensity may be slightly lower
- A high res ocean model (e.g. ROMS) nested within a larger scale ocean model could add significant value to tropical cyclone prediction in the coastal ocean—the last several hours before landfall

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