Impact of Ocean Observations on Hurricane Irene and Hurricane Sandy Forecasts

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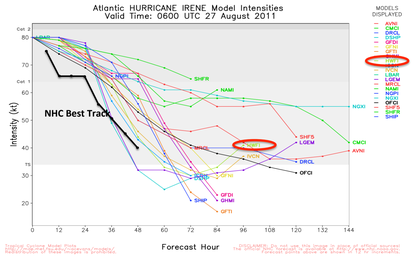
What We Learned

1. The coastal ocean can play a significant role in the **intensity and track of hurricanes.**
2. Unique ocean observations before, during, and after Hurricanes Irene and Sandy have led to **improved atmospheric forecasts.**
3. The same observations are currently being used to **validate ocean models** in simulation of coastal mixing during storms.

Background

- Rutgers University Coastal Ocean Observation Lab (RU-COOL) deployed **underwater gliders** in Hurricanes Irene (2011) and Sandy (2012)
- The data retrieved has informed researchers of the **complex coastal mixing** that occurs during intense storms and results in **lower sea surface temperatures** (SST) in the wake of the storms
- A **new declouded regional satellite SST product** developed at Rutgers captured post-Irene and post-Sandy cooling
- How can we use this new SST product **to improve intensity overpredictions** for Hurricane Irene, and **intensity underpredictions** as well as **speed/ timing** forecasts for Hurricane Sandy?

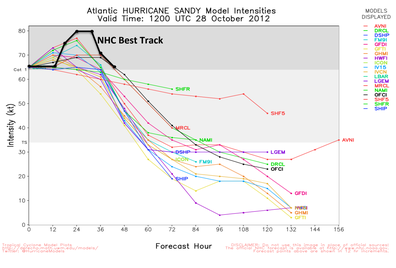
Even coupled models (e.g. HWRF) overpredicted Irene



Irene

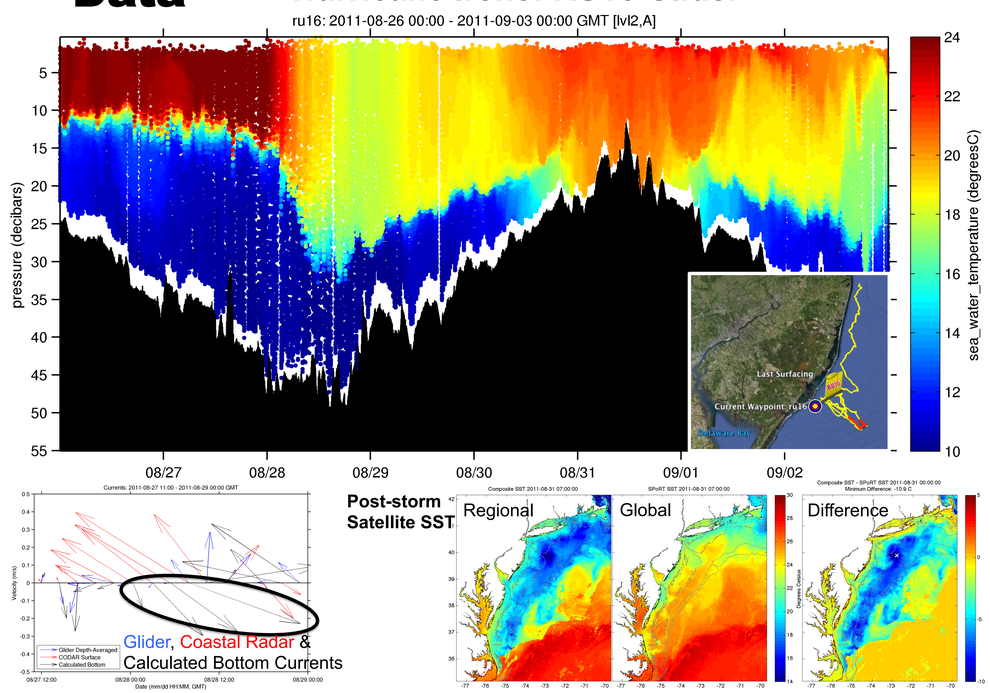
Sandy intensity predictions can be improved too…

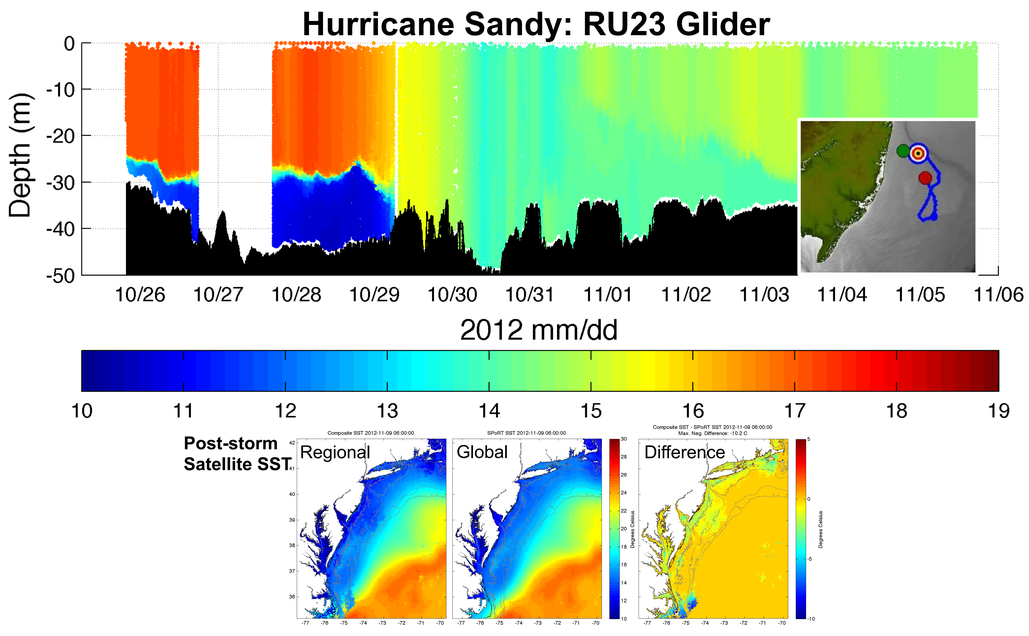
…as well as speed (see far bottom right of poster)



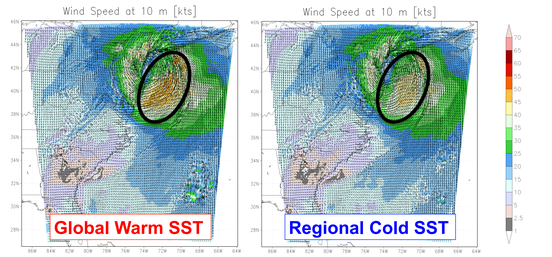
Sandy

Data





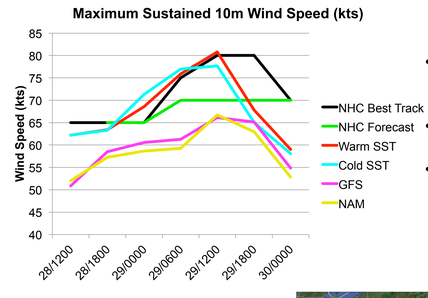
Results & Discussion



Irene

Maximum Wind Speed Skill Score	*Official Forecast*	*Warm SST Hindcast*	*Warm SST + OML Model Hindcast*	*Cold SST Hindcast*
RMS Error (knots)	9.43	7.13	7.09	3.61

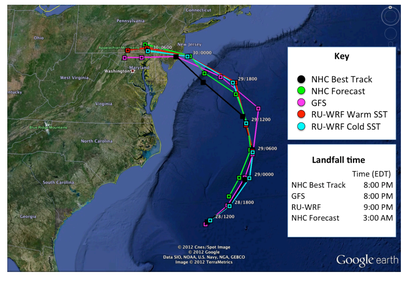
- Using observed variations in SST reduced modeled intensity of Irene—in some cases by 15 knots—to more closely match NHC best track and available obs.
- 1D ocean mixed-layer model in Advanced Hurricane WRF only slightly decreased errors
- Fully coupled atmosphere-ocean models even overpredicted intensity→ critical need for **correct ocean simulation of coastal mixing, esp. bottom boundary layer**



Sandy

- Persistent cloudiness post-Sandy prevented a clear view of SST via IR satellites
- Small sensitivity of intensity to SST
- Could other major factors be in play for Sandy? (e.g. mid-level atmospheric disturbance from Midwest injecting energy?)

- Acceleration of Sandy toward landfall is also being assessed
- Models underpredicted NYC sea level rise by 3 feet
- Correct predictions of speed for Sandy will be ingested into storm surge models to **improve sea level rise forecasts**



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