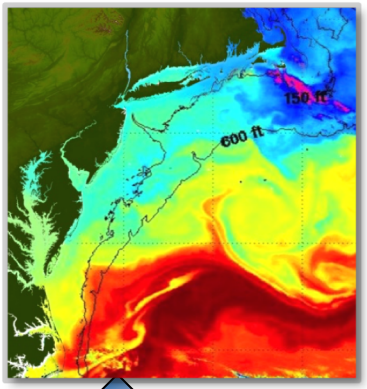
Utilization of a Regional Ocean Observing Network and Regional Atmospheric Modeling for Offshore Wind Resource Assessment

Joseph F. Brodie, Rich Dunk, Greg Seroka, Travis N. Miles, Joshua L. Coupe, Louis A. Bowers, Sage Lichtenwalner, Hugh Roarty, Michael Crowley, Laura Nazzaro, Josh Kohut, Scott Glenn

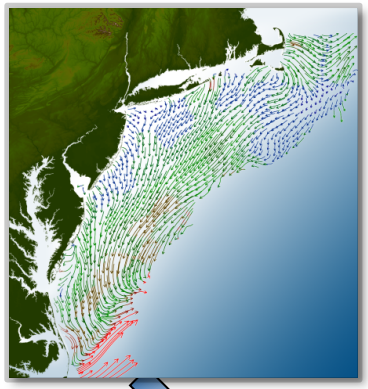
Center for Ocean Observing Leadership
Department of Marine and Coastal Sciences
School of Environmental and Biological Sciences

Regional Ocean Data Products

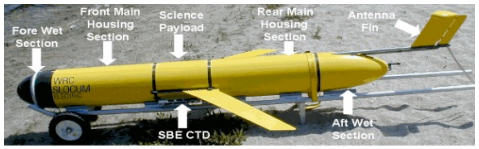
Satellites

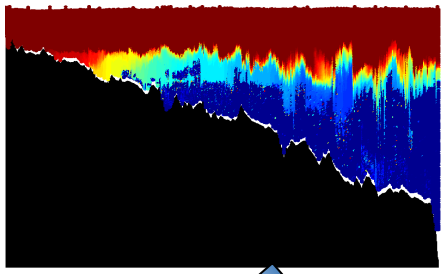


HF radar

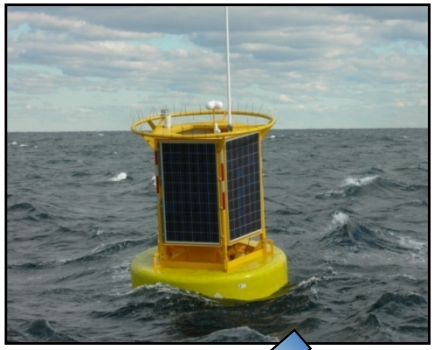


Gliders

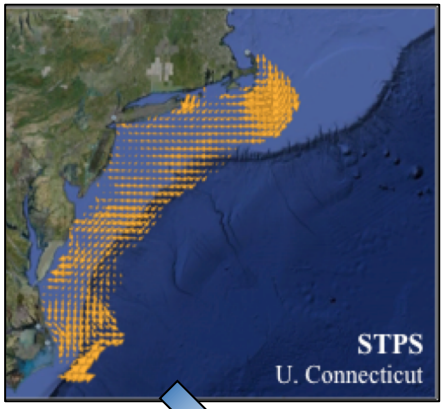


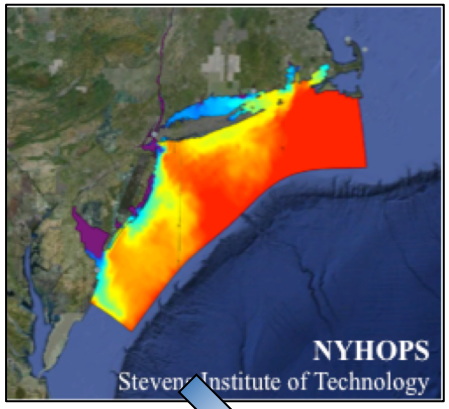


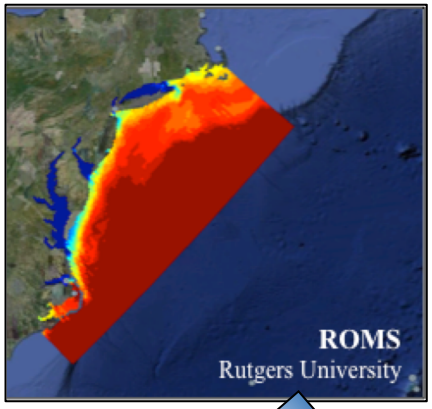
Fixed Platforms

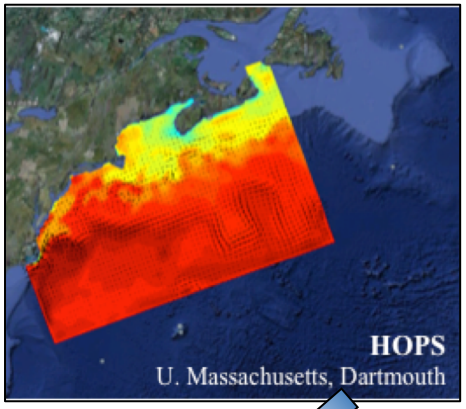


Assimilated by an Ensemble of Ocean Models



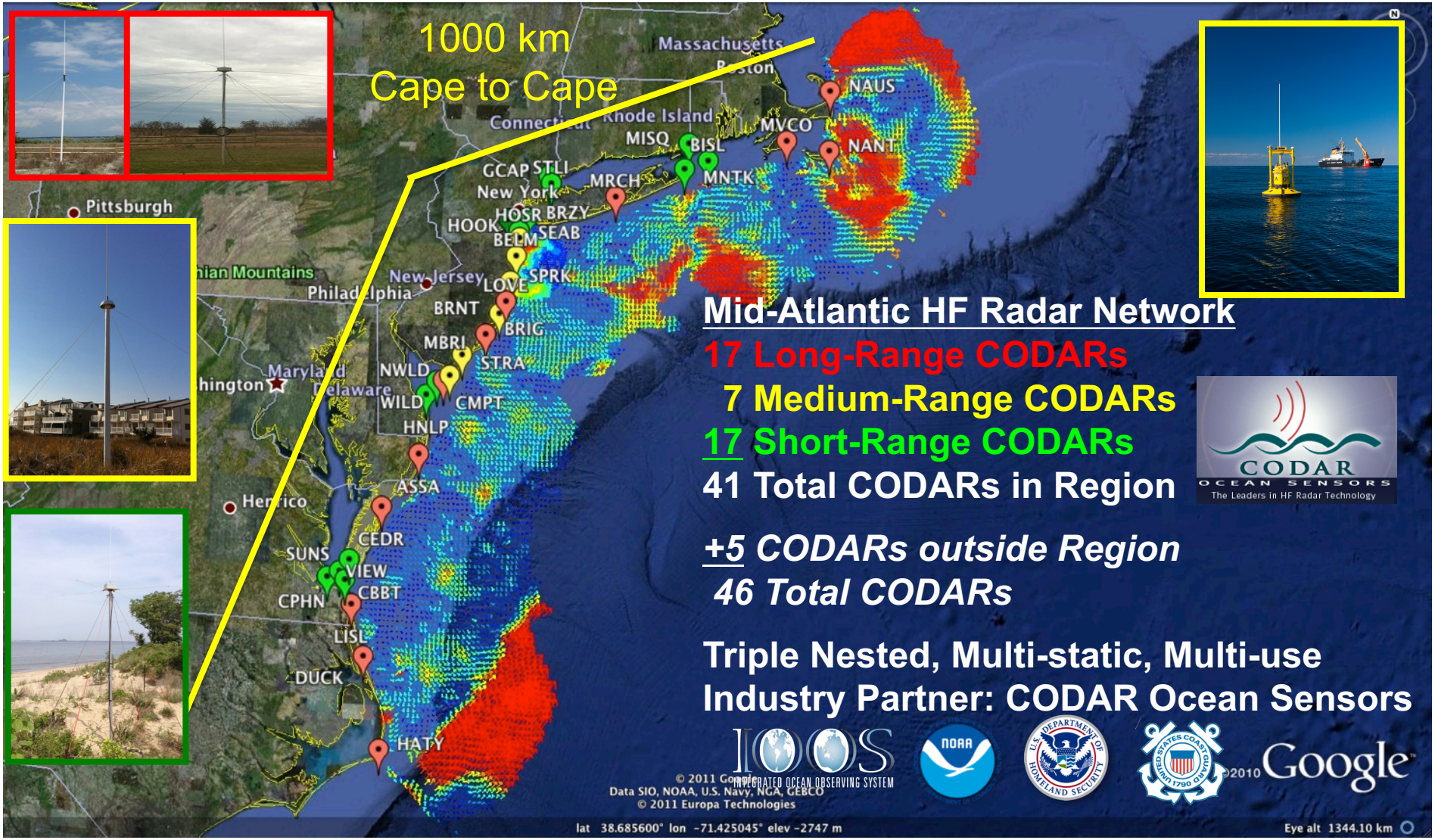






Connections to the Atmosphere

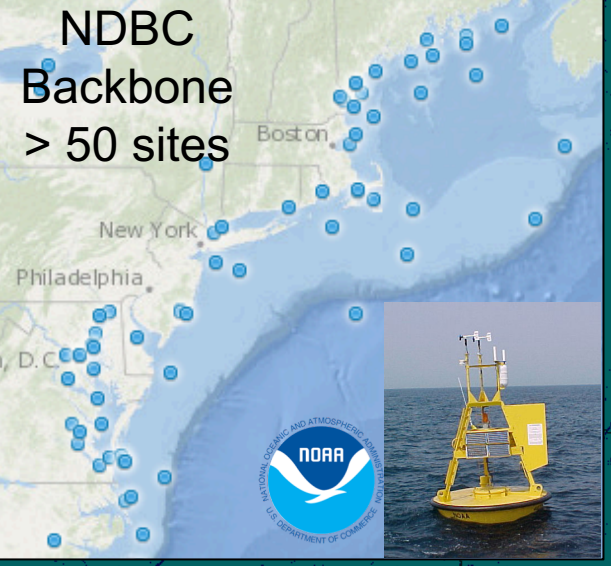
Mid-Atlantic Bight HF Radar Network



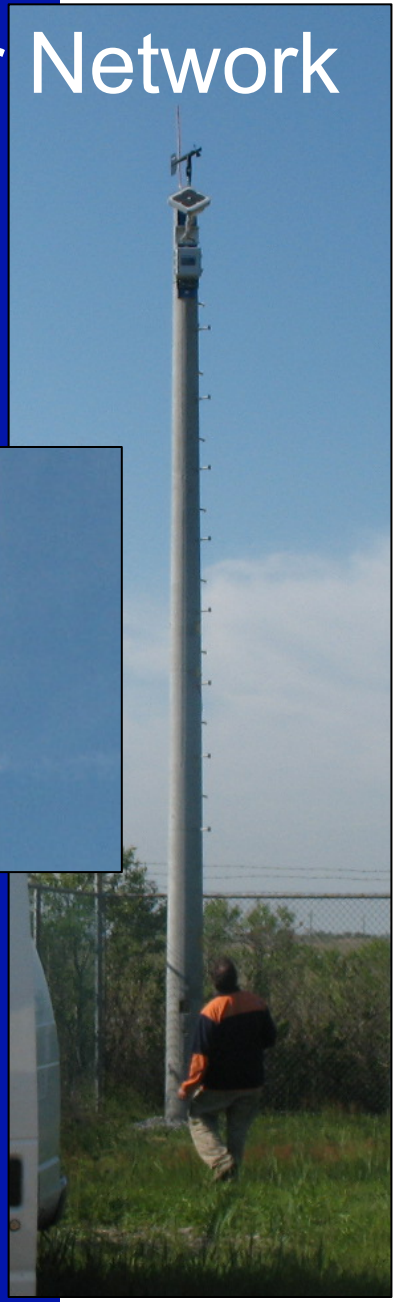
RUTGERS Center for Ocean Observing Leadership

MARACOOS Weather Network

NDBC
Backbone
> 50 sites



Regional Industry
Enhancement
> 100 sites



WeatherFlow Station

Hurricane Network Station

WeatherFlow
Better Data. Better Decisions.

RUTGERS Center for Ocean Observing Leadership

Coastal Met-Ocean Monitoring Station

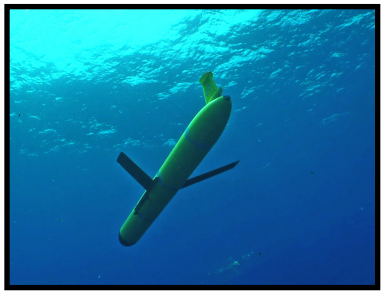
- Located at the RU Marine Field Station in Tuckerton, NJ
- 12 m meteorological tower
- Triton SODAR
- Lockheed WindTracer scanning lidar (coming soon)

Rutgers University - Coastal Ocean Observation Lab

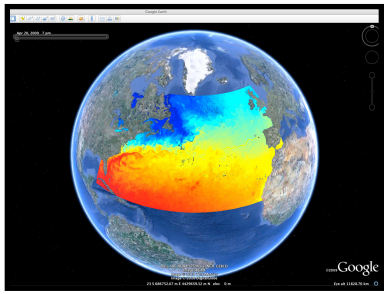
Observatory Operations, Data Fusion & Training Center

L-Band & X-Band Satellite Receivers

CODAR Network



Glider Fleet

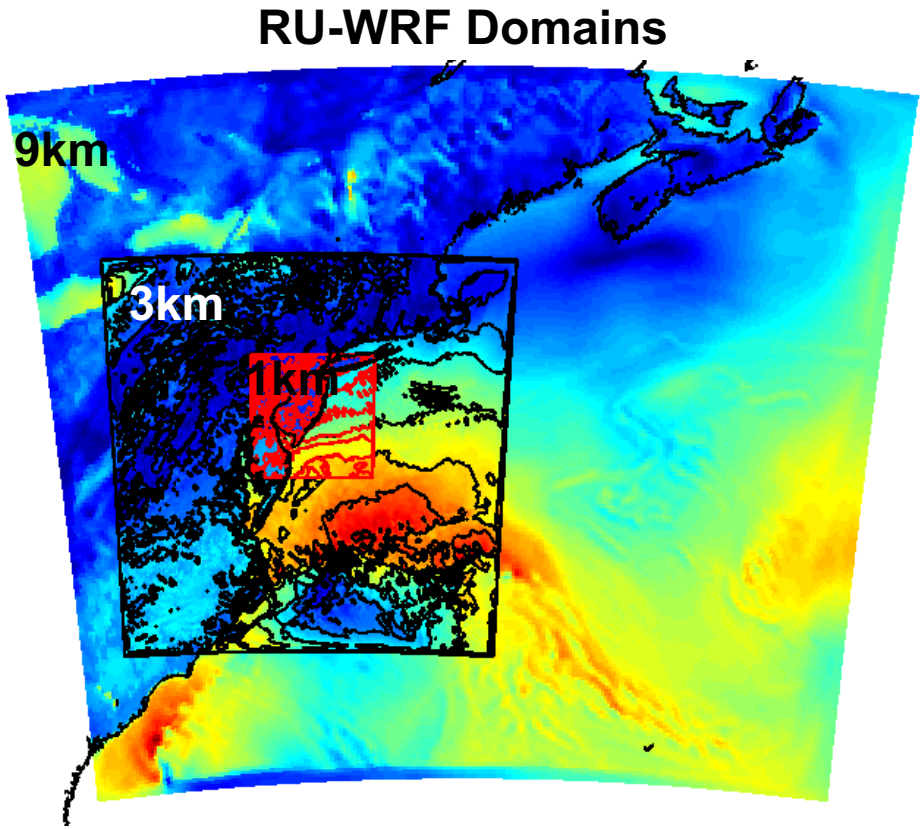


3-D Nowcasts & Forecasts

IOOS INTEGRATED OCEAN OBSERVING SYSTEM · NSF · NOAA · U.S. DEPARTMENT OF HOMELAND SECURITY · DEPARTMENT OF DEFENSE · NASA · DEPARTMENT OF THE NAVY ONR Science & Technology · BPU · NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION · DODGE FOUNDATION · NOPP · GORDON AND BETTY MOORE FOUNDATION

Real-Time Weather Modeling

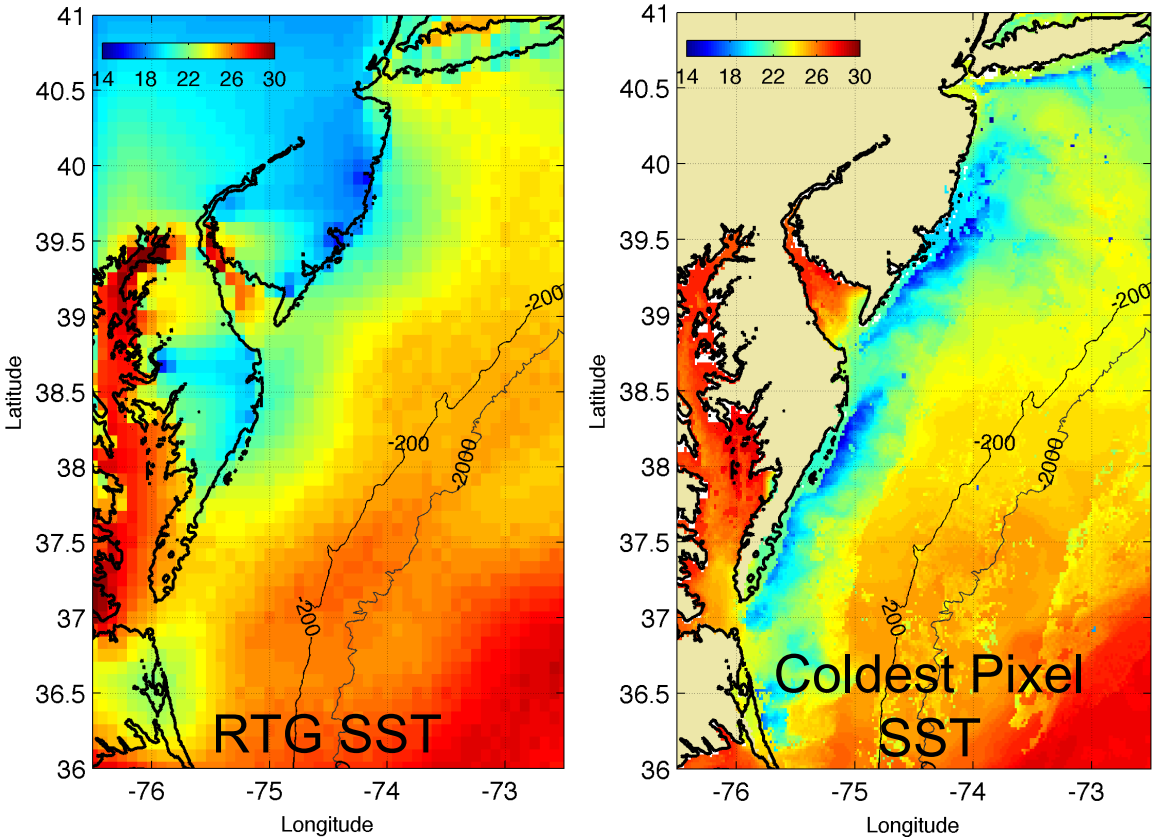
- Run Continuously 2011 – Present
- Triple nested: 9km-3km-1km
  - 9km: 0, 6, 12, 18Z cycles
  - 3km: 0, 12Z cycles
  - 1km: 0Z cycle (Research Mode)
- Hourly forecast:
  - 9km: out 5 days
  - 3km: out 2 days
  - 1km: out 1 days
- Lateral Boundary Conditions:
  - 9km: 0.25 degree Global Forecast System
  - 3km: RU-WRF 9km
  - 1km: RU-WRF 3km
- Vertical Levels:
  - 40 levels more tightly packed near the surface.
- Surface Boundary Condition:
  - RU Coldest Pixel Composite



Coldest-Pixel SST Captures Coastal Upwelling

Example:
8 July 2013 Upwelling

NOAA National Center for Environmental Prediction Satellite Product



Rutgers SST

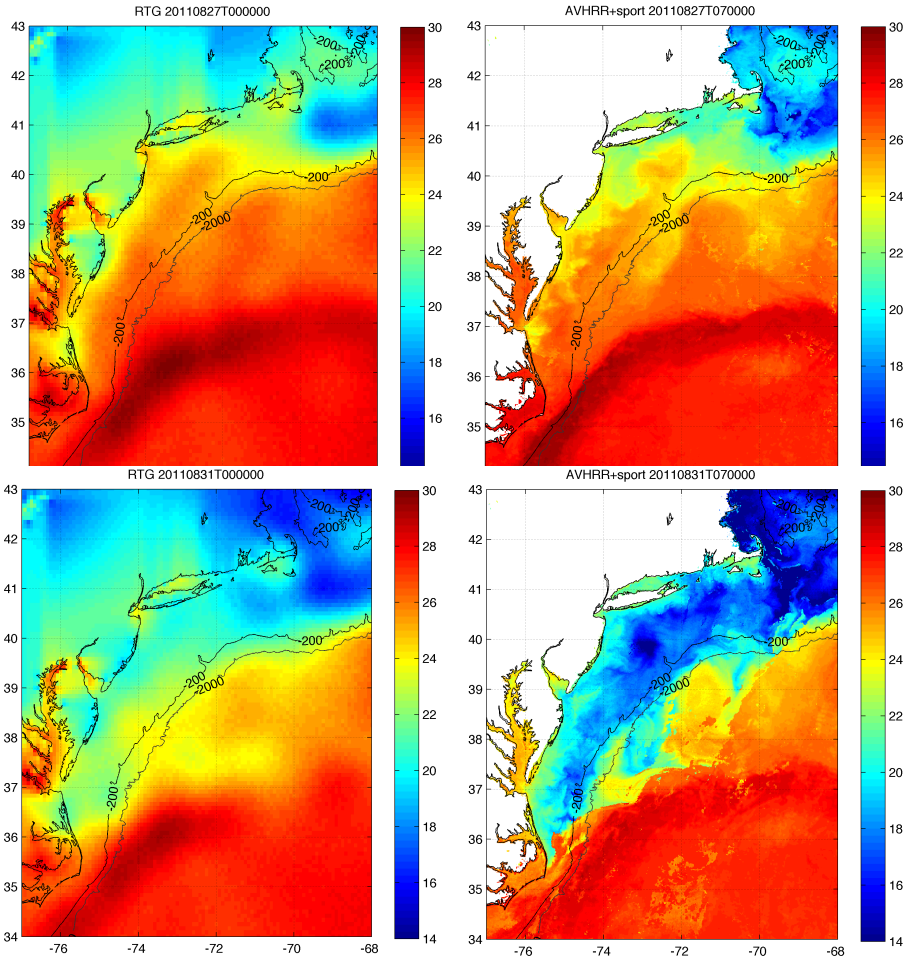
Coldest Pixel SST Also Captures Hurricane-Driven Cooling

NOAA RTG HR SST

Rutgers SST

BEFORE IRENE

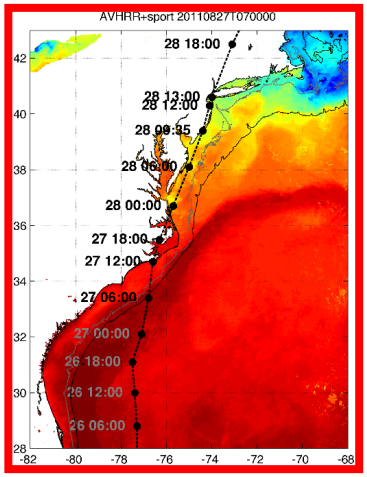
AFTER IRENE



Example: Hurricane Irene August 2011

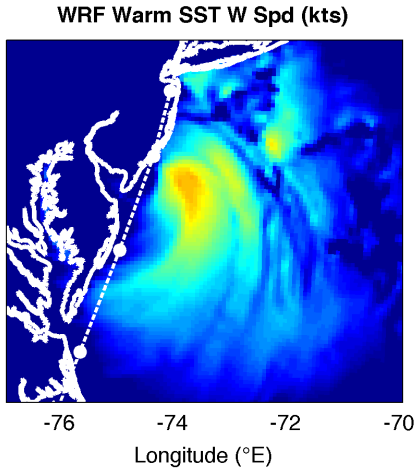
Cold Water Influences Coastal Storms

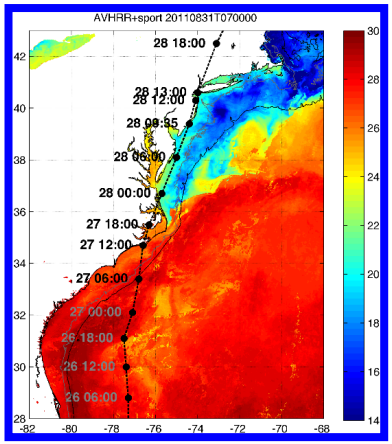
Hurricane Irene – Aug 2011



Warm Ocean

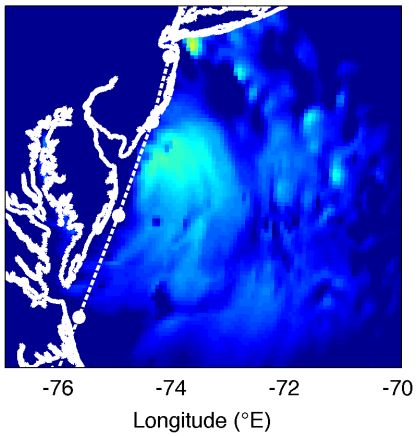
Cat I Hurricane



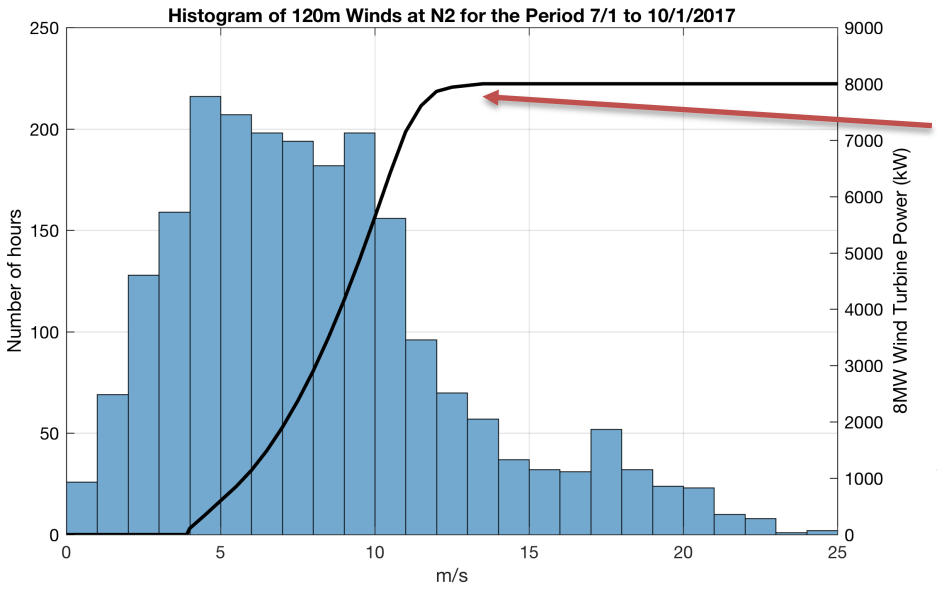


Cold Ocean

Trop Storm

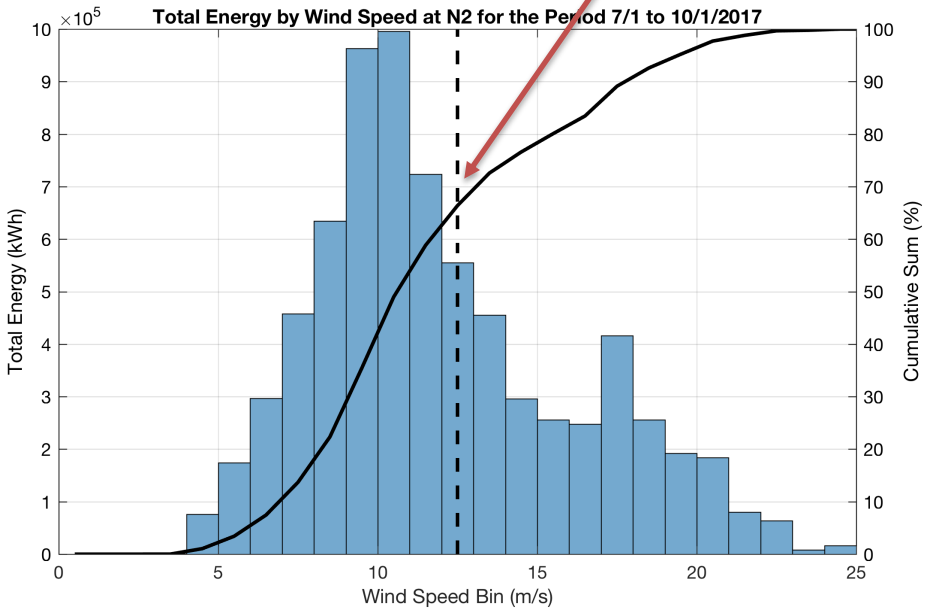


NJ WEA Wind Resource

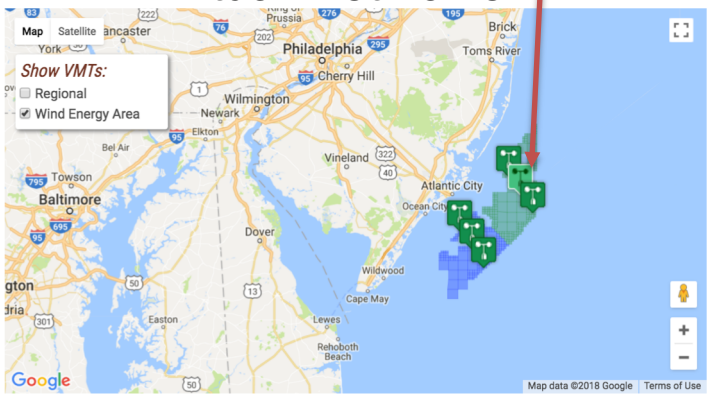


8 MW wind turbine
12.5 m/s rated speed

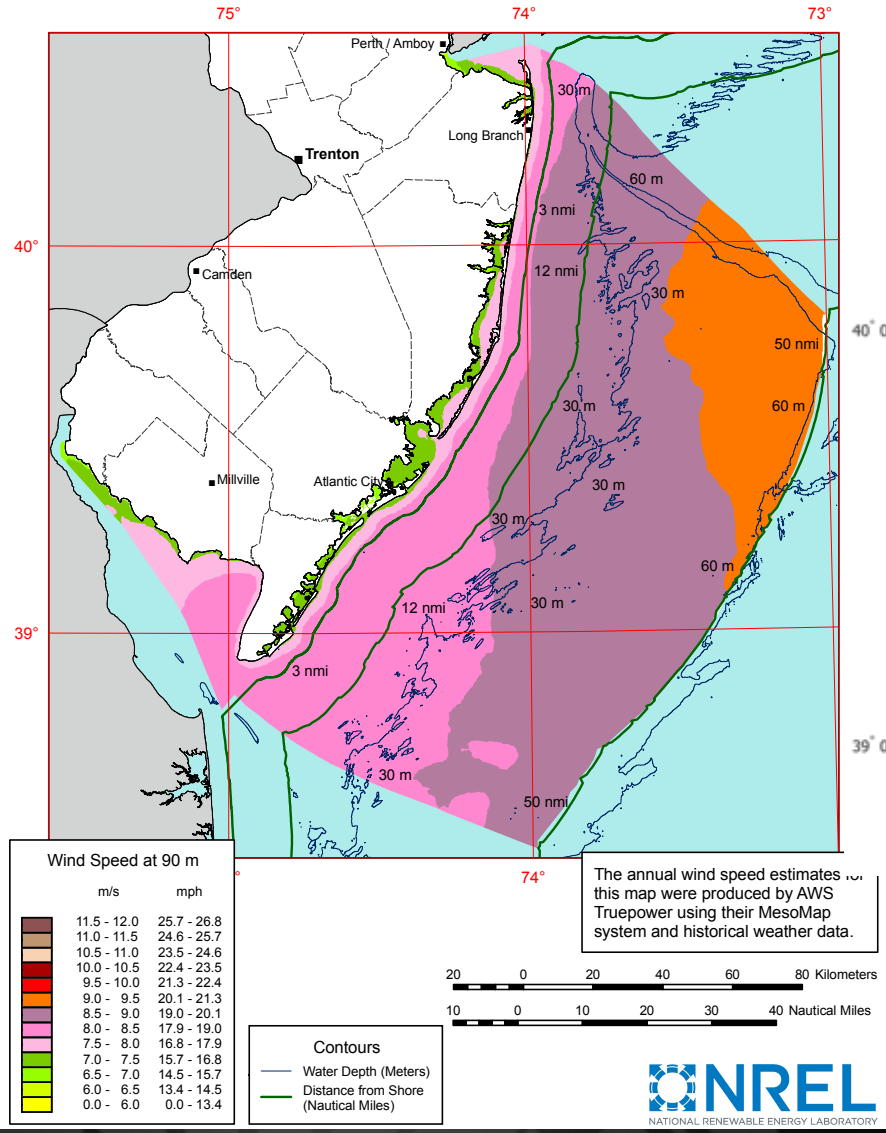
2/3 of energy extracted below turbine rated speed

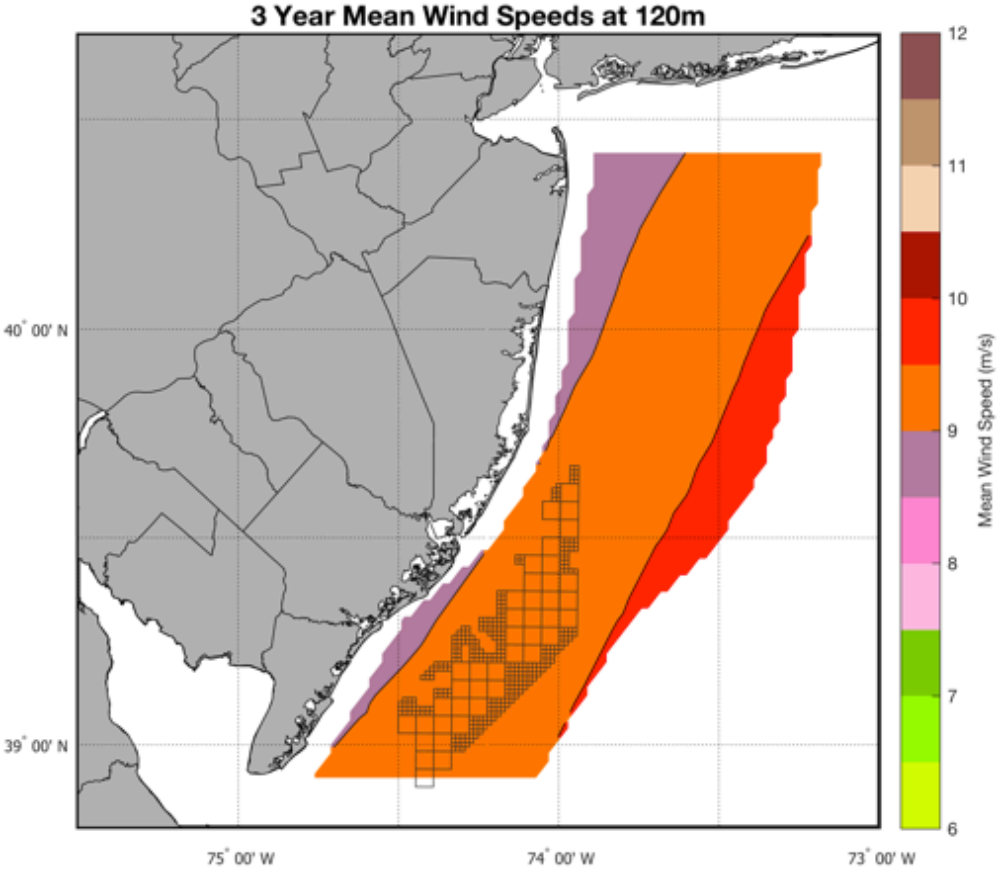


Virtual Met Tower

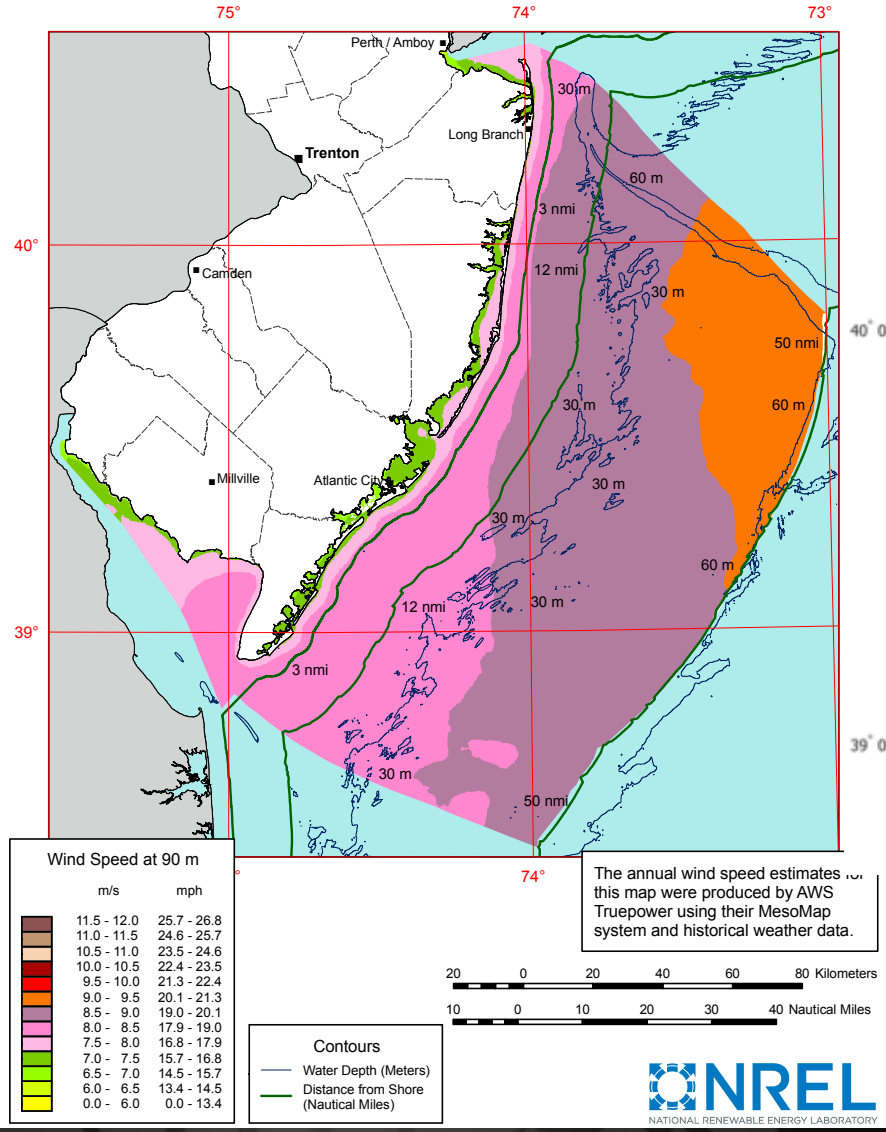


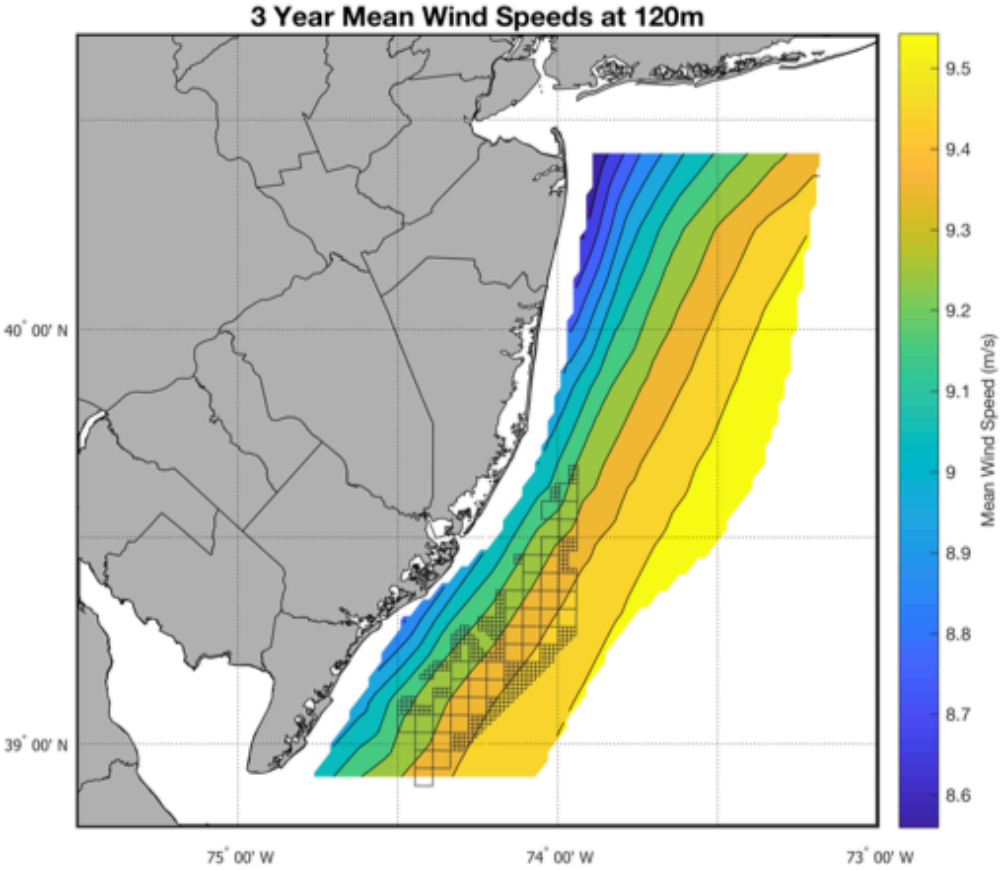
RU-WRF Wind Resource





RU-WRF Wind Resource





Summary and Future Work

Current

- Comprehensive observation network
- Coldest-pixel SST captures coastal upwelling
- Real-time RU-WRF modeling for wind resource and other activities

In Development & Future

- Coupled WRF/ROMS with data assimilation
- NREL validation study
- Online data portal for NJ BPU and other stakeholders

Contact Us

- Email me: jbrodie@marine.rutgers.edu
- Visit us at **http://rucool.marine.rutgers.edu**

Questions?