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


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

RUTGERS Center for Ocean Observing Leadership
Mid-Atlantic Bight HF Radar Network

17 Long-Range CODARs
7 Medium-Range CODARs
17 Short-Range CODARs
41 Total CODARs in Region
+5 CODARs outside Region
46 Total CODARs

Triple Nested, Multi-static, Multi-use

Industry Partner: CODAR Ocean Sensors
MARACOOS Weather Network

NDBC Backbone
> 50 sites

Regional Industry Enhancement
> 100 sites

WeatherFlow Station
Hurricane Network Station


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

Integrated Ocean Observing System
NSF
NOAA
Department of Commerce
Execution of the National Ocean Policy
NASA
Department of the Navy
CNR
MOORE

Rutgers Center for Ocean Observing Leadership
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

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
RU-WRF Wind Resource

The annual wind speed estimates for this map were produced by AWS Truepower using their MesoMap system and historical weather data.
RU-WRF Wind Resource

The annual wind speed estimates ... this map were produced by AWS Truepower using their MesoMap system and historical weather data.

Wind Speed at 90 m

<table>
<thead>
<tr>
<th>m/s</th>
<th>mph</th>
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<tr>
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<tr>
<td>0.0 - 6.0</td>
<td>0.0 - 13.4</td>
</tr>
</tbody>
</table>

Contours

- Water Depth (Meters)
- Distance from Shore (Nautical Miles)
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

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• Visit us at http://rucool.marine.rutgers.edu

Questions?