Resolving Ocean Surface Processes Across the Florida Straits Using WERA (WHARF)

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Goal: To improve our understanding of sea surface processes and their linkages to atmospheric and oceanic boundary layer processes.

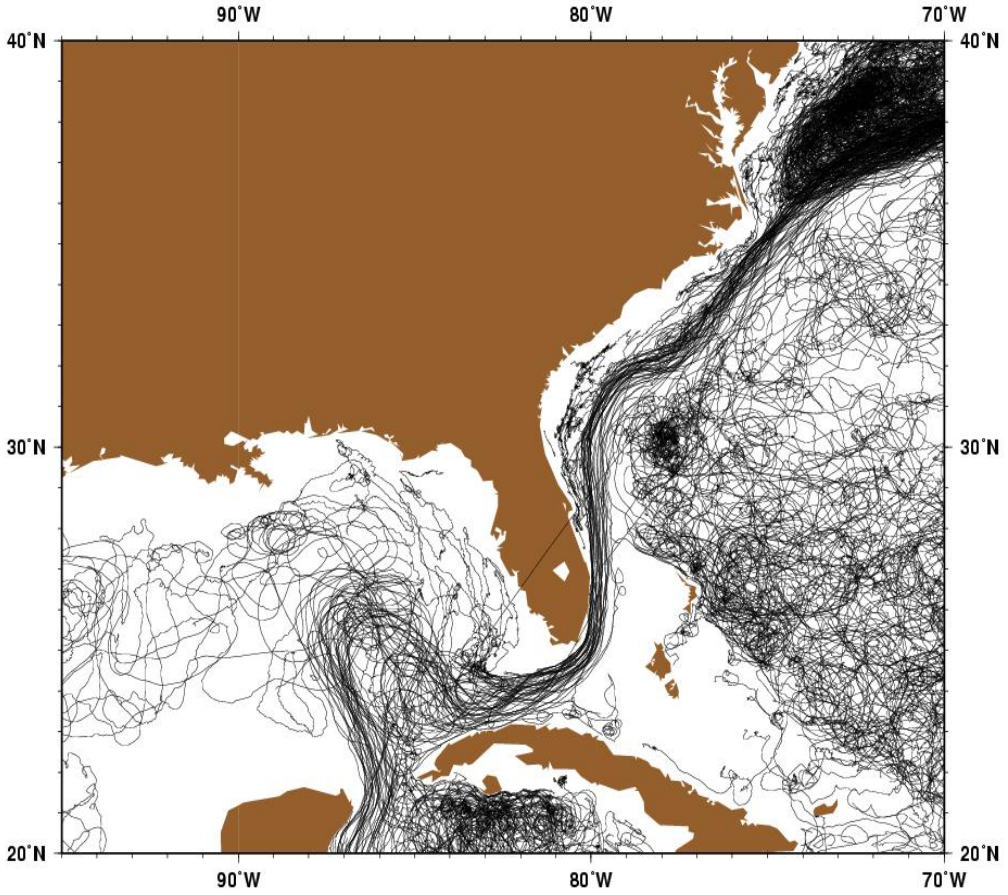
http://iwave.rsmas.miami.edu/~nick

SECOORA
Southeast Coastal Ocean Observing Regional Association

IOOS® INTEGRATED OCEAN OBSERVING SYSTEM

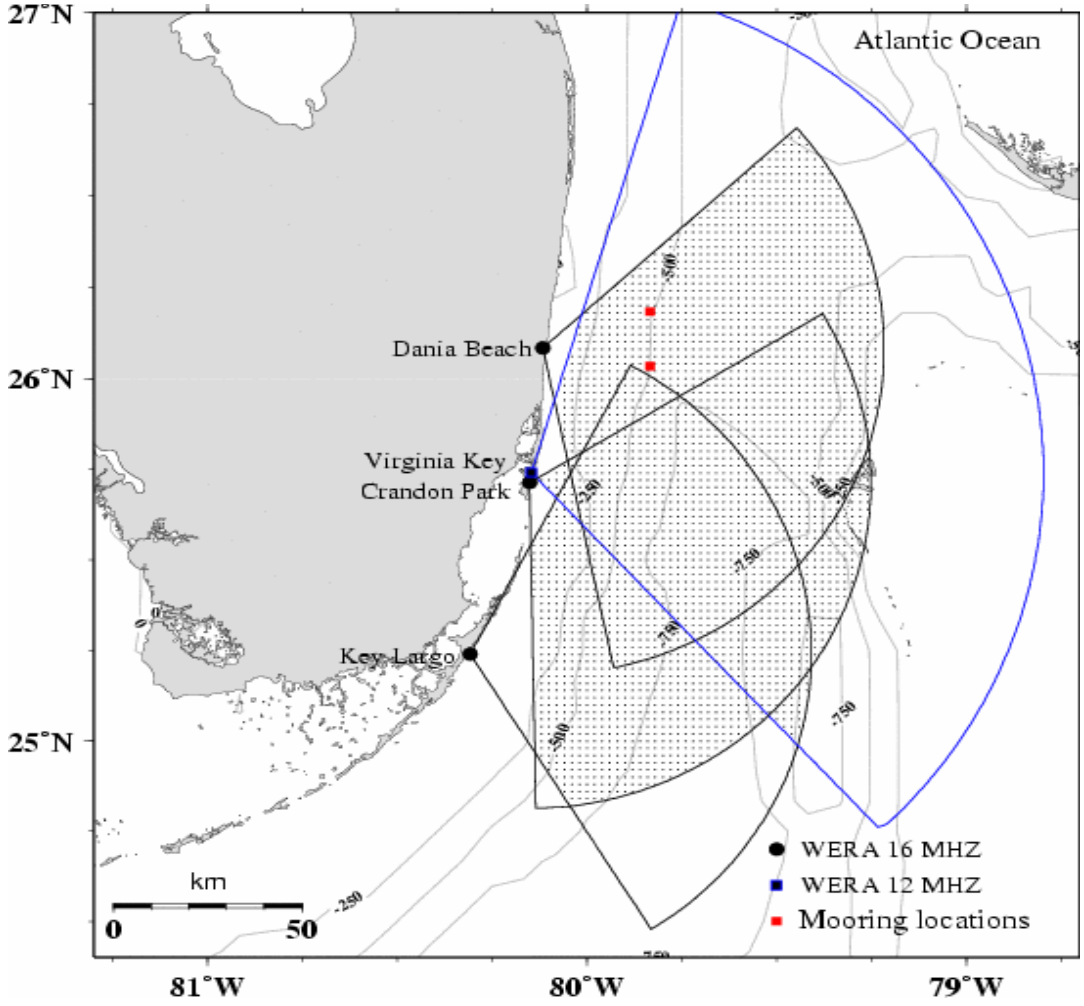
Florida Current Variability

- **Meanders**
- **Cyclonic eddies;**
  - ↘ Tortugas eddies (TE)
  - ↘ Frontal eddies (FE)
- **Anticyclonic eddies**



[*Source:* http://oceancurrents.rsmas.miami.edu]

WERA Deployments (Crandon Park)



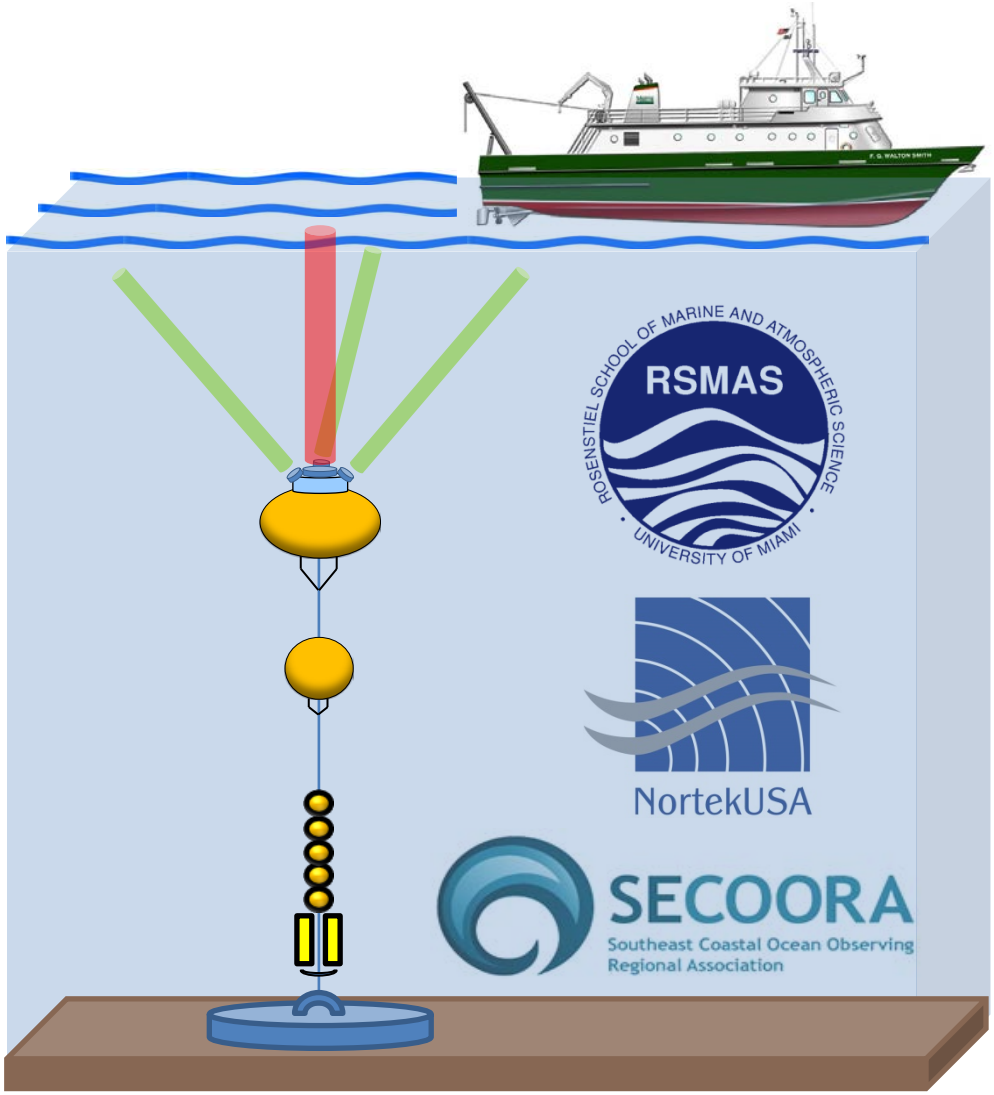
Goal and Objectives:

Evaluate remote high frequency (HF) radar measurements of surface currents and bulk wave parameters using an *in-situ* timeseries of data collected by a Nortek Acoustic Current and Wave Profiler (AWAC). Specific objectives are:

1. Survey pre-selected location for suitable mooring site of approx. 300-m water depth;
2. Take a CTD cast to measure the hydrographic structure at the mooring site;
3. Successfully deploy the AWAC fixed on the subsurface mooring; and,
4. Run ADCP transect across the Florida Current front.

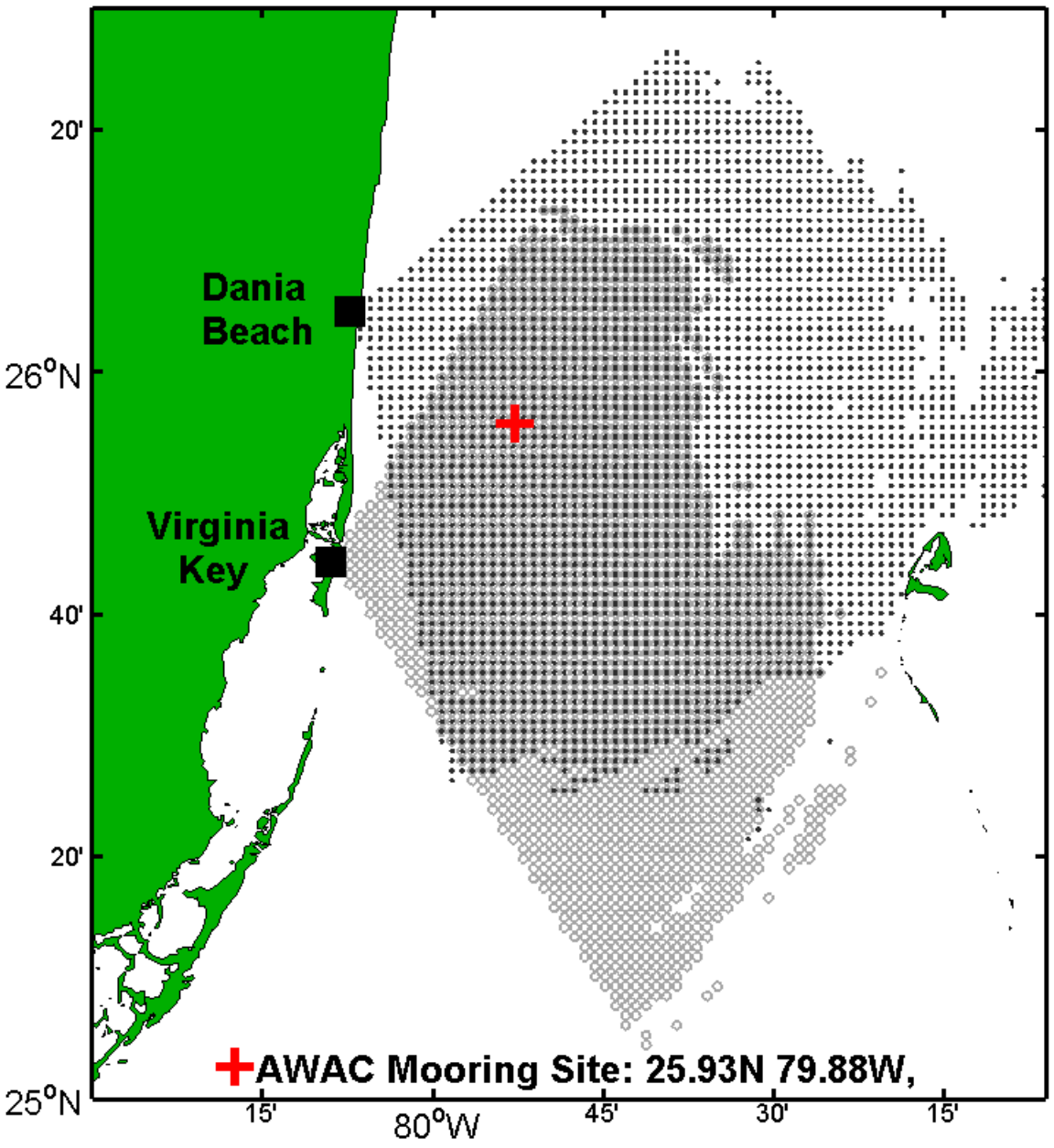
We are working with the **NWS Weather Forecast Office** (Pablo Santos) in Miami to assess their ocean (NCEP RTOFS; ADCIRC) and wave models using the HF radar data.

This models are aimed at marine forecasting across the Florida Straits.

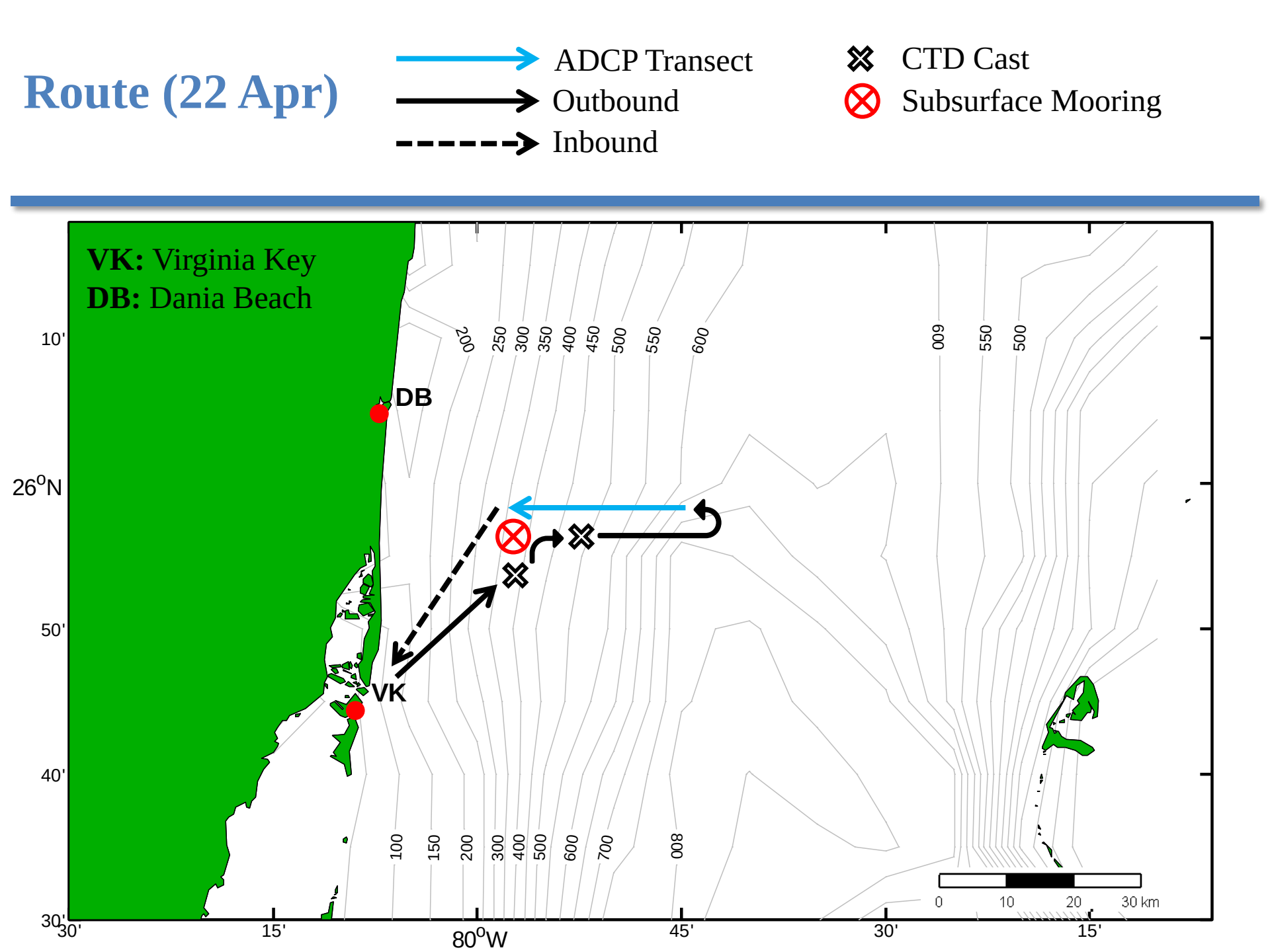


WHARF

WAVE HEIGHTS AND CURRENTS IN THE FLORIDA STRAITS ▪ MOORING DEPLOYMENT 2014


Dania
Beach
Virginia
Key
26°N
20'
40'
20'
25°N
15'
80°W
45'
30'
15'
AWAC Mooring Site: 25.93N 79.88W,

Route (22 Apr)

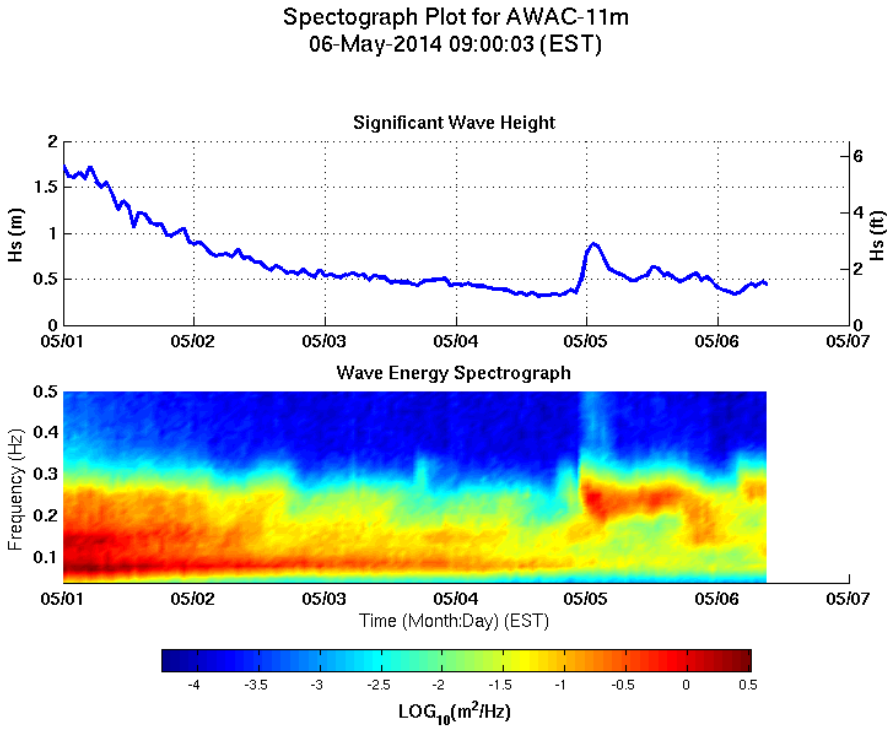

ADCP Transect
Outbound
Inbound
CTD Cast
Subsurface Mooring
VK: Virginia Key
DB: Dania Beach
DB
VK
10'
50'
40'
30'
26°N
30'
15'
80°W
45'
30'
15'
0
10
20
30 km

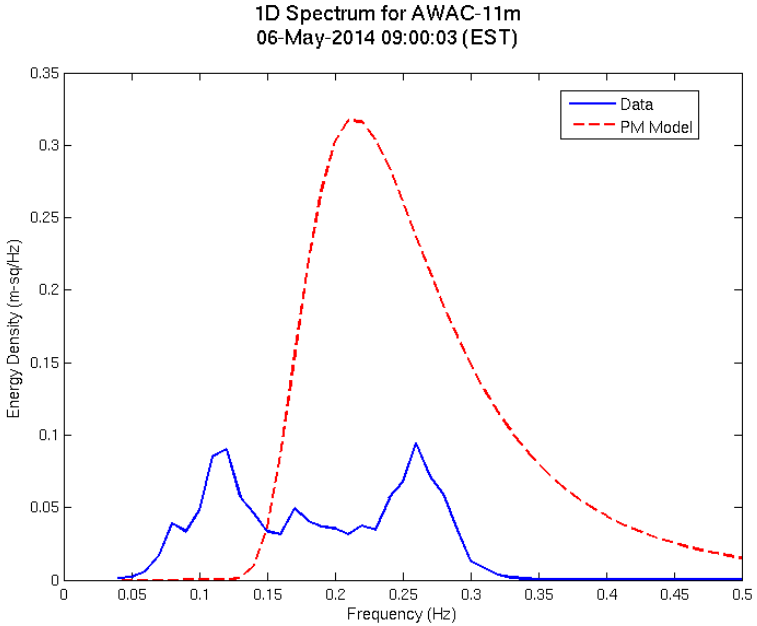
Nortek AWAC Data – Duck, NC

Nortek **A**coustic **W**ave **A**nd **C**urrent Profiler

11-m AWAC Wave Measurement

6th May 2014



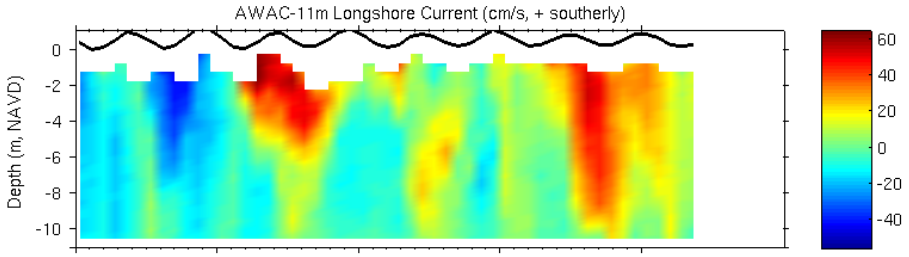


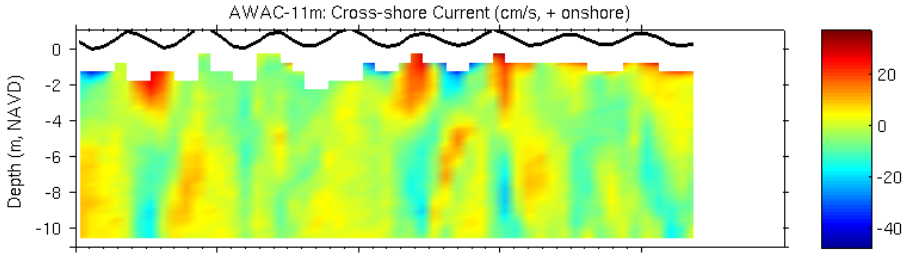
*** Data are provided by the Field Research Facility, Field Data Collections and Analysis Branch, US Army Corps of Engineers, Duck, North Carolina.**

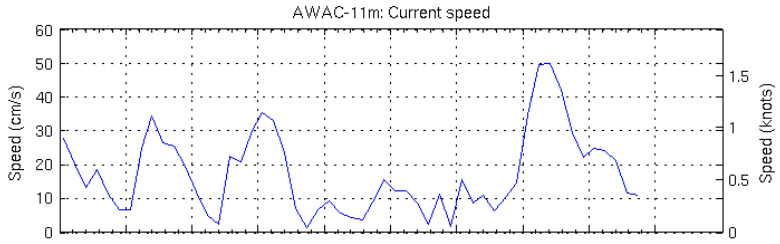
Nortek AWAC Data – Duck, NC

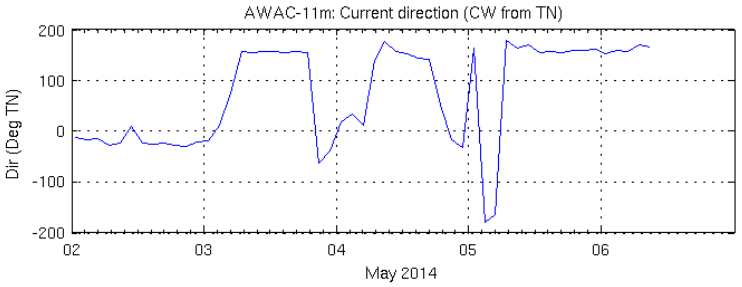
11-m AWAC Current Profile

6th May 2014









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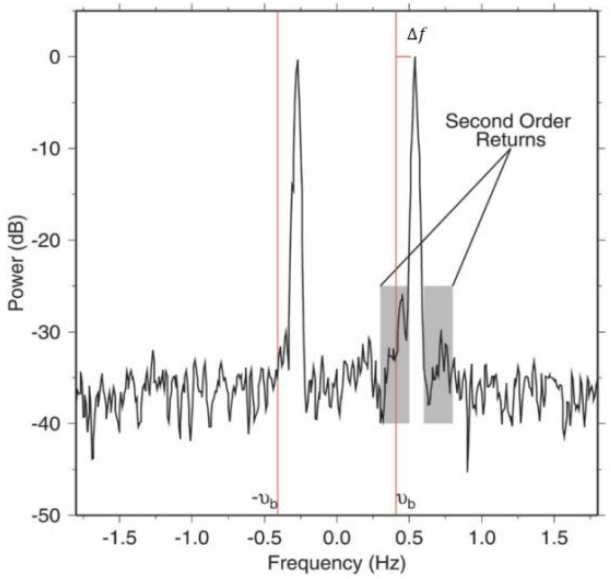
Significant Wave Height (SWH)

RMS wave height uses the ratio between the 2nd- and 1st- order returns:



$$\hat{H}^2_{\text{rms}} = \frac{2\int_{-\infty}^{\infty}[\sigma_2(\omega_d)W(f_d)\,df_d]}{k_0^2\int_{-\infty}^{\infty}\sigma_1(f_d)\,df_d}$$

$[\sigma_1, \sigma_2]$ is 1st and 2nd order backscattered energy
f_d is Doppler frequency
k_0 is the radar wavenumber
$W(f_d)$ is the weighting function

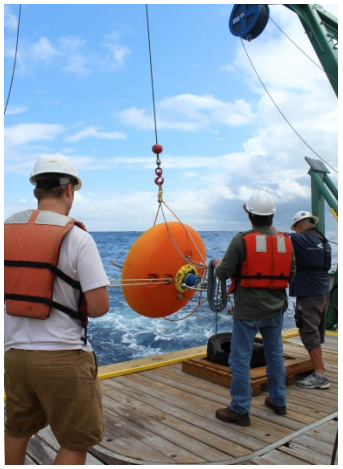
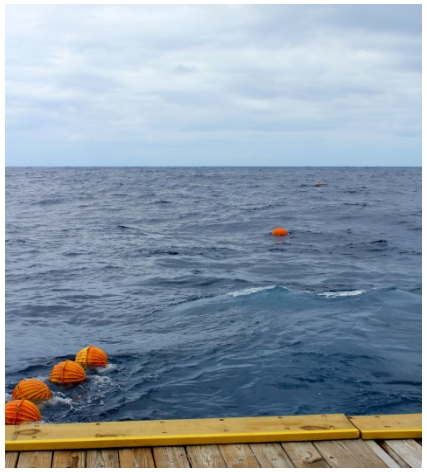
The weighting function is used to suppress energy received at zero Doppler shift, energy far removed from the Bragg peaks, and energy in regions of the Doppler frequency space that are particularly sensitive to direction [*Barrick*, 1977].

Summary:

Mooring time series will be about 85 days (22 Apr-12 Aug) to evaluate currents and waves (SWH only) from a *Nortek* Acoustic Current and Wave Profiler (AWAC) relative to WERA HF radar measurements between DB and VK radars.

We expect to get the Crandon site working within a month after the picnic area is completed. This will take a couple of days to recable (~$12K) and recalibrate.

We are in discussions with **Ocean Reef Club** to deploy the North Key Largo site using 8-12 channels at a frequency of 12.7 Mhz for extended range to ~120 km (App?)

Opportunity to work with sports fisherman using our data for outreach and education (they have three beautiful golf courses!)

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