Large Domain and High Resolution Storm Surge /Inundation Simulation in the Chesapeake Bay – A CIP Project Update

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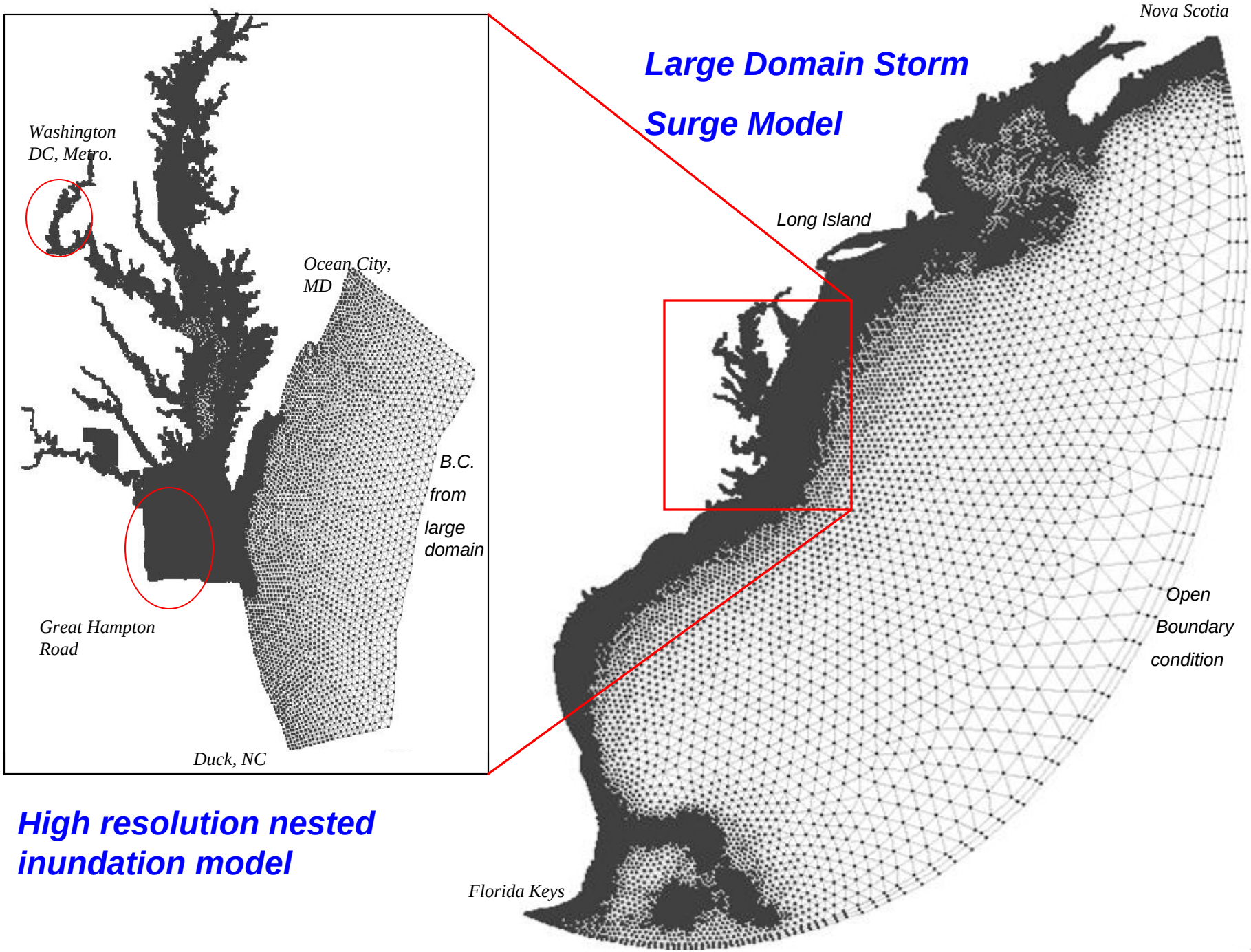
Department of Physical Sciences,
Virginia Institute of Marine Science
College of William and Mary

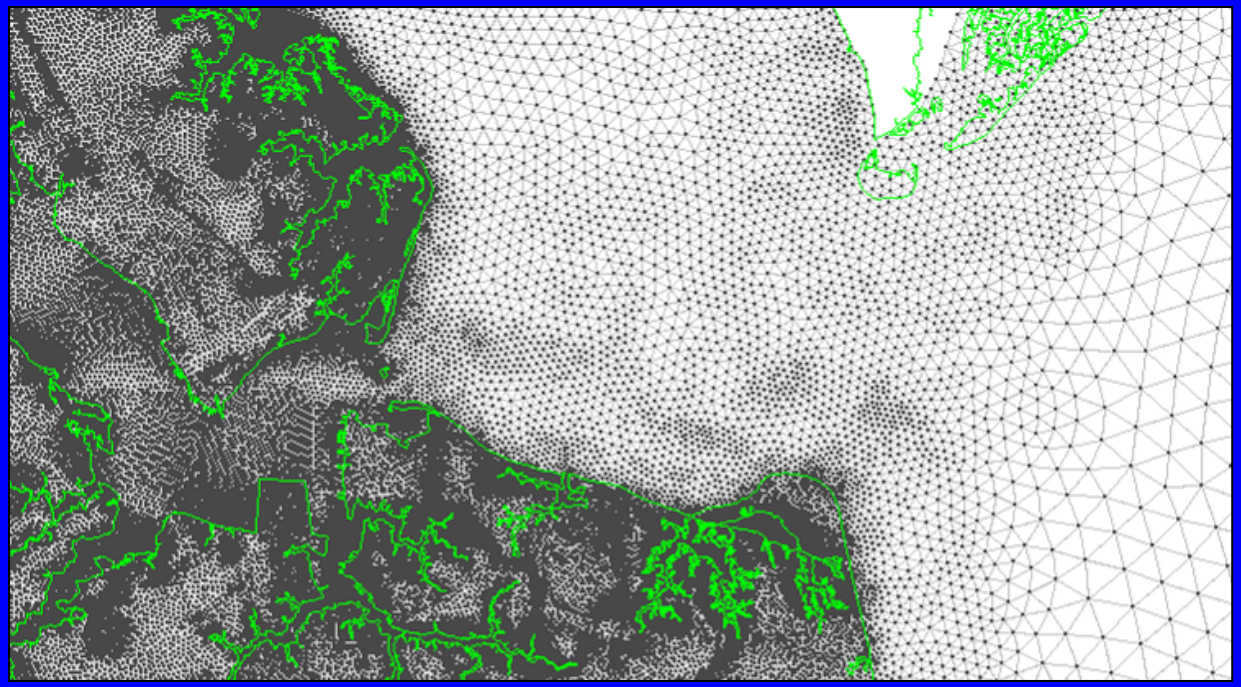
Norfolk Flood initiative and studies Meeting

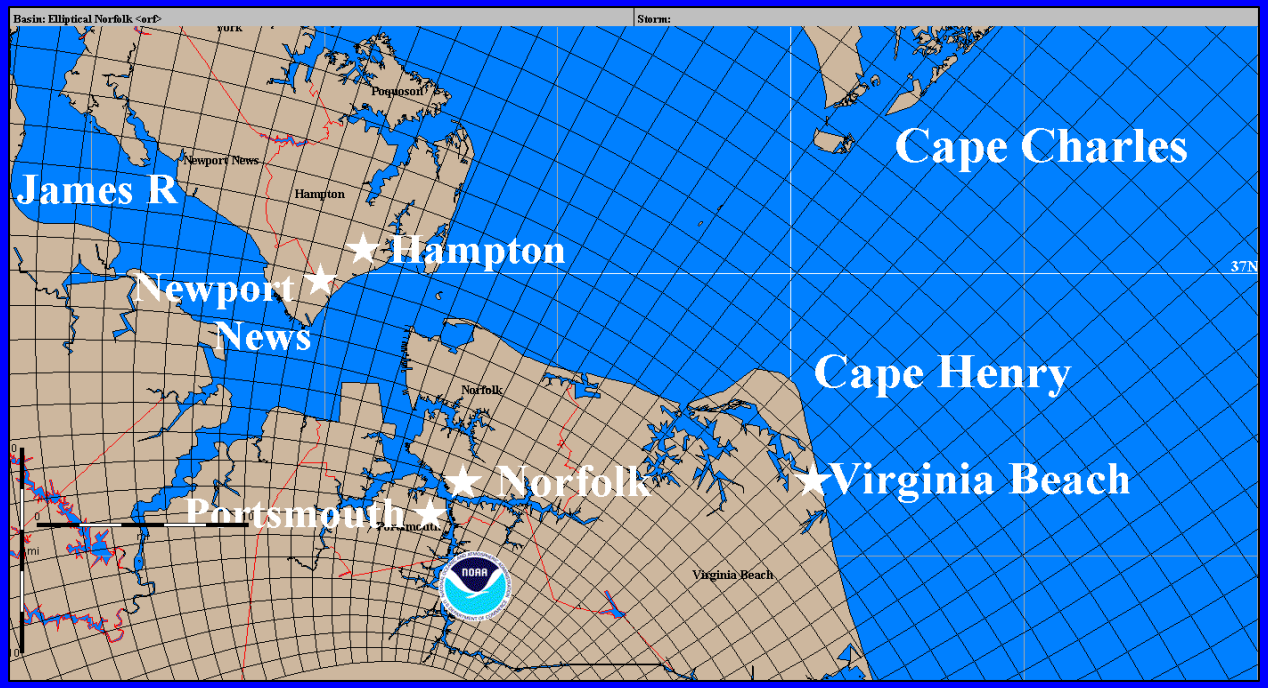
February 16, 2012



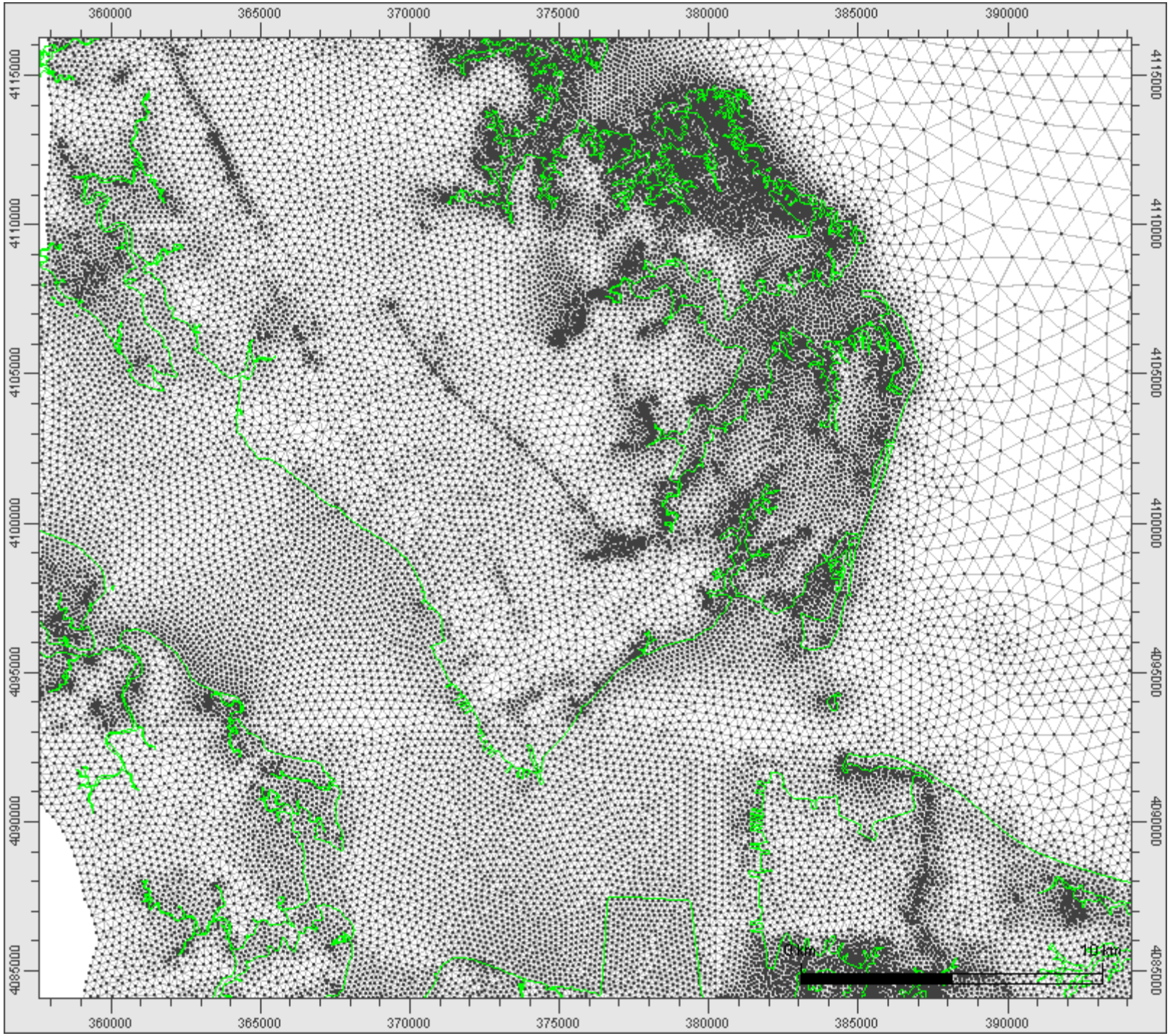
High resolution nested inundation model

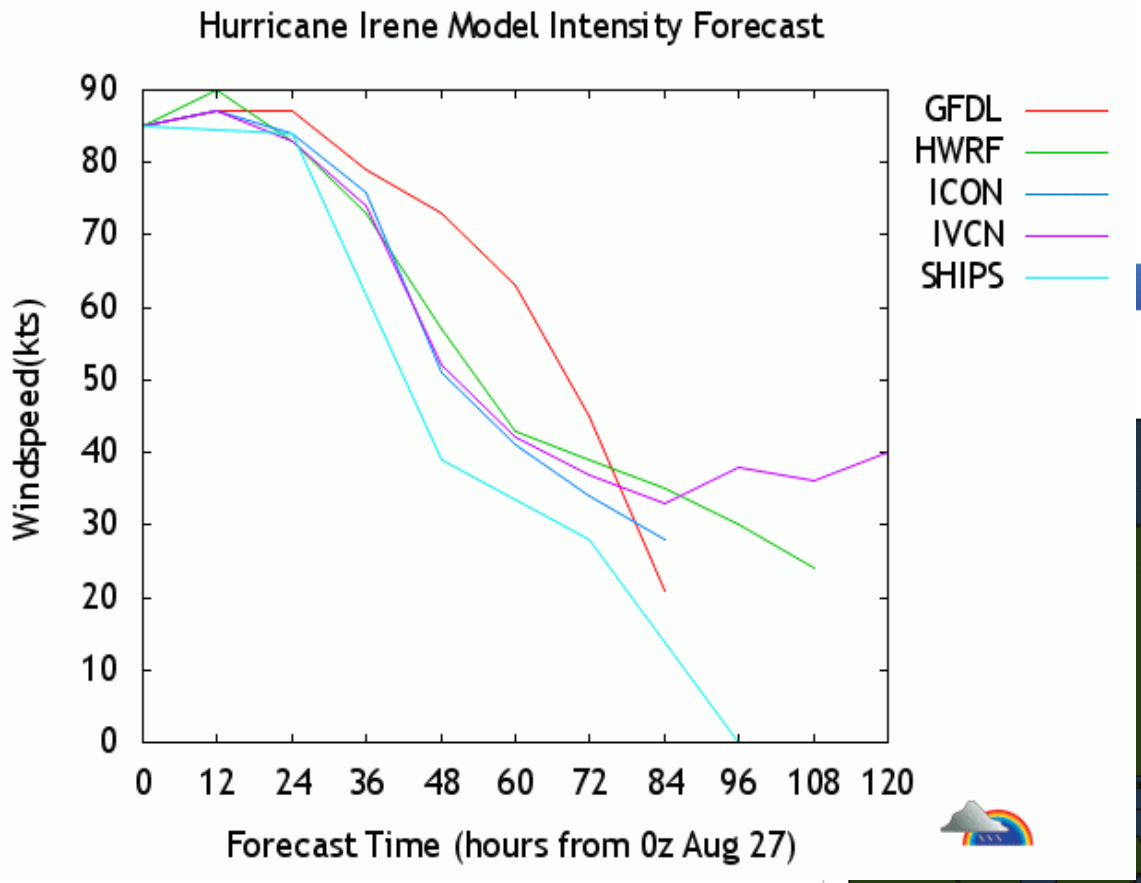
SLOSH Model Grid

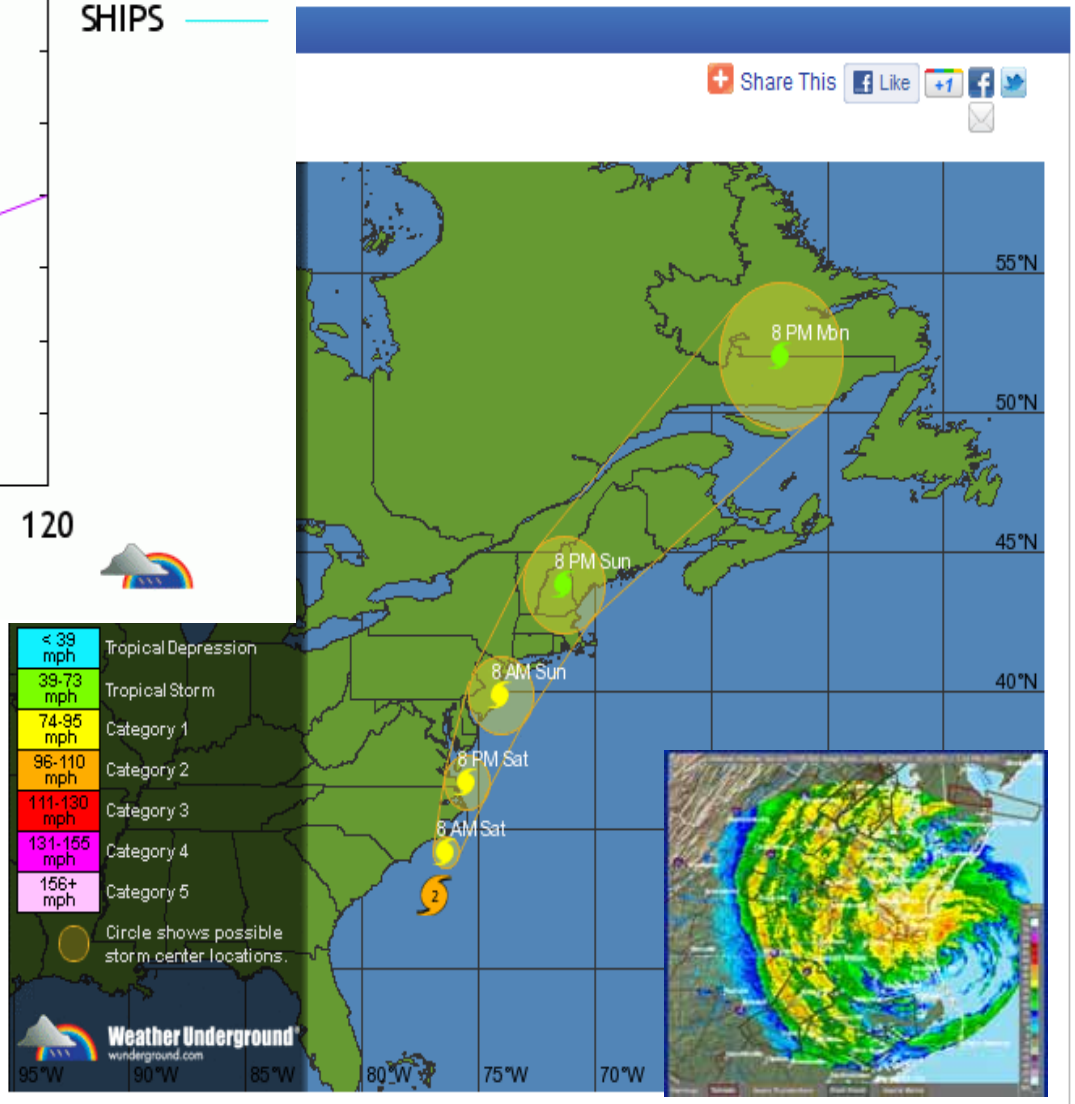




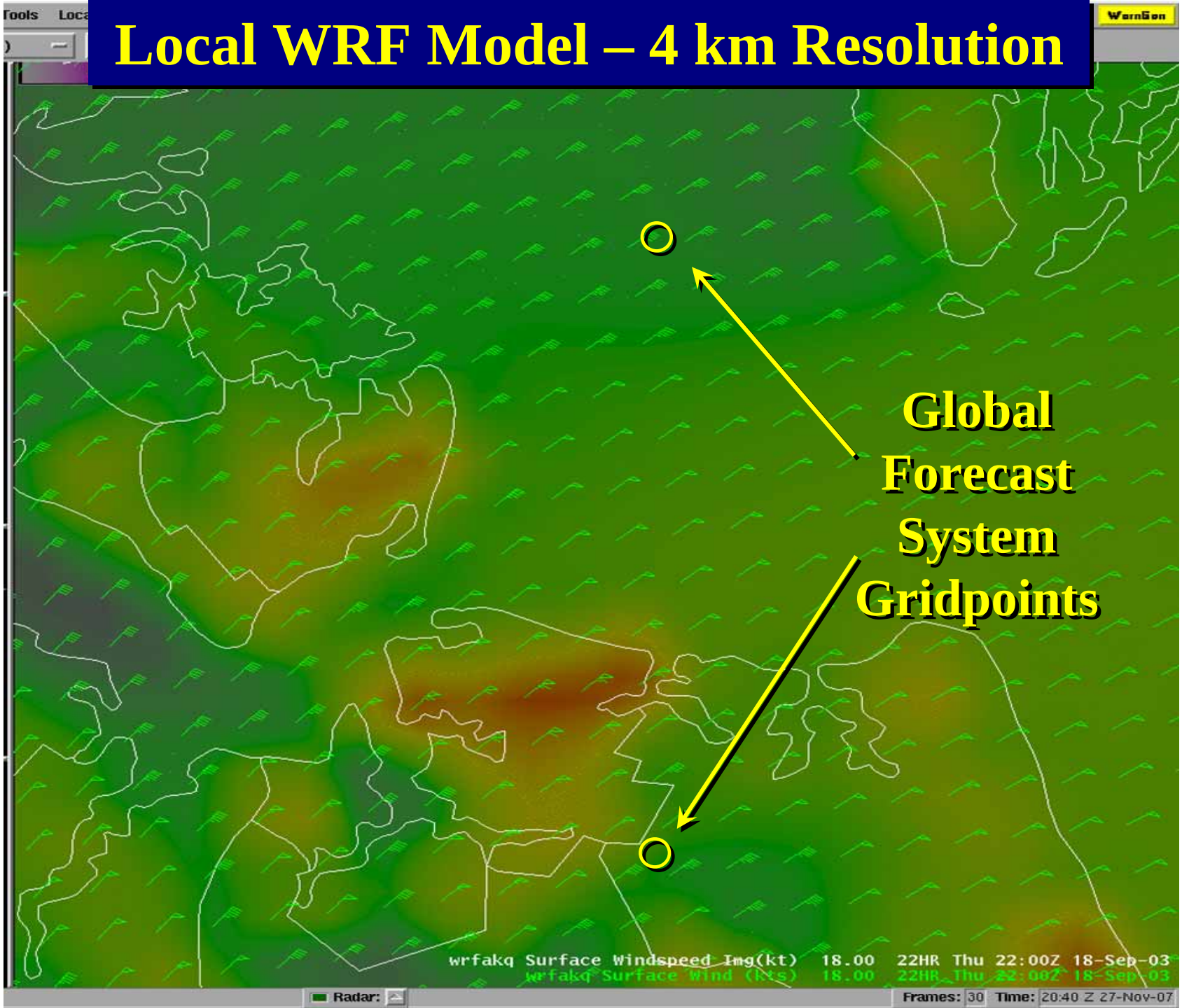
VIMS Model Grid

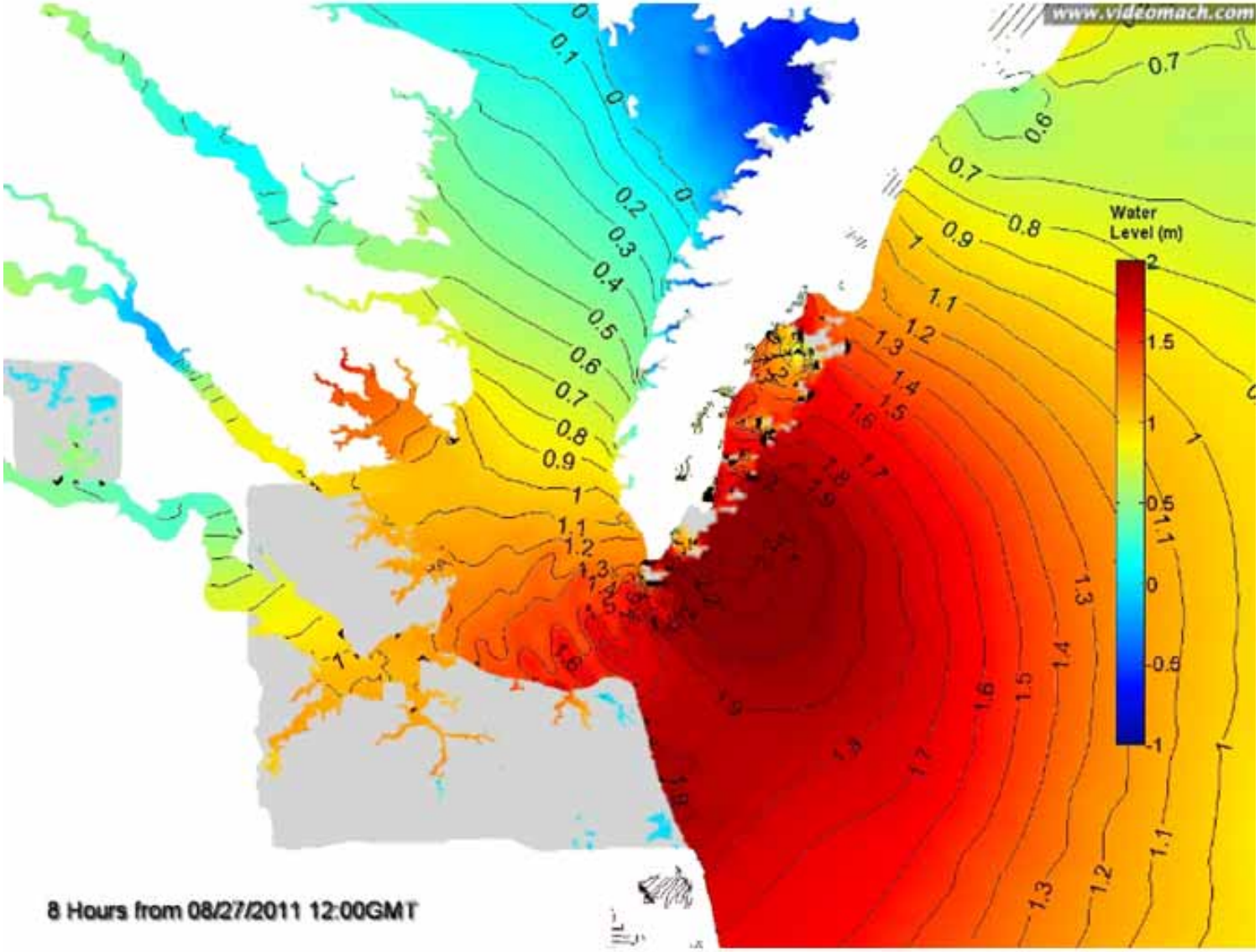

360000
365000
370000
375000
380000
385000
390000
4115000
4110000
4105000
4100000
4095000
4090000
4085000
5 km
10 km


Hurricane Irene Model Intensity Forecast
Windspeed(kts)
90
80
70
60
50
40
30
20
10
0
0 12 24 36 48 60 72 84 96 108 120
Forecast Time (hours from 0z Aug 27)
GFDL
HWRF
ICON
IVCN
SHIPS

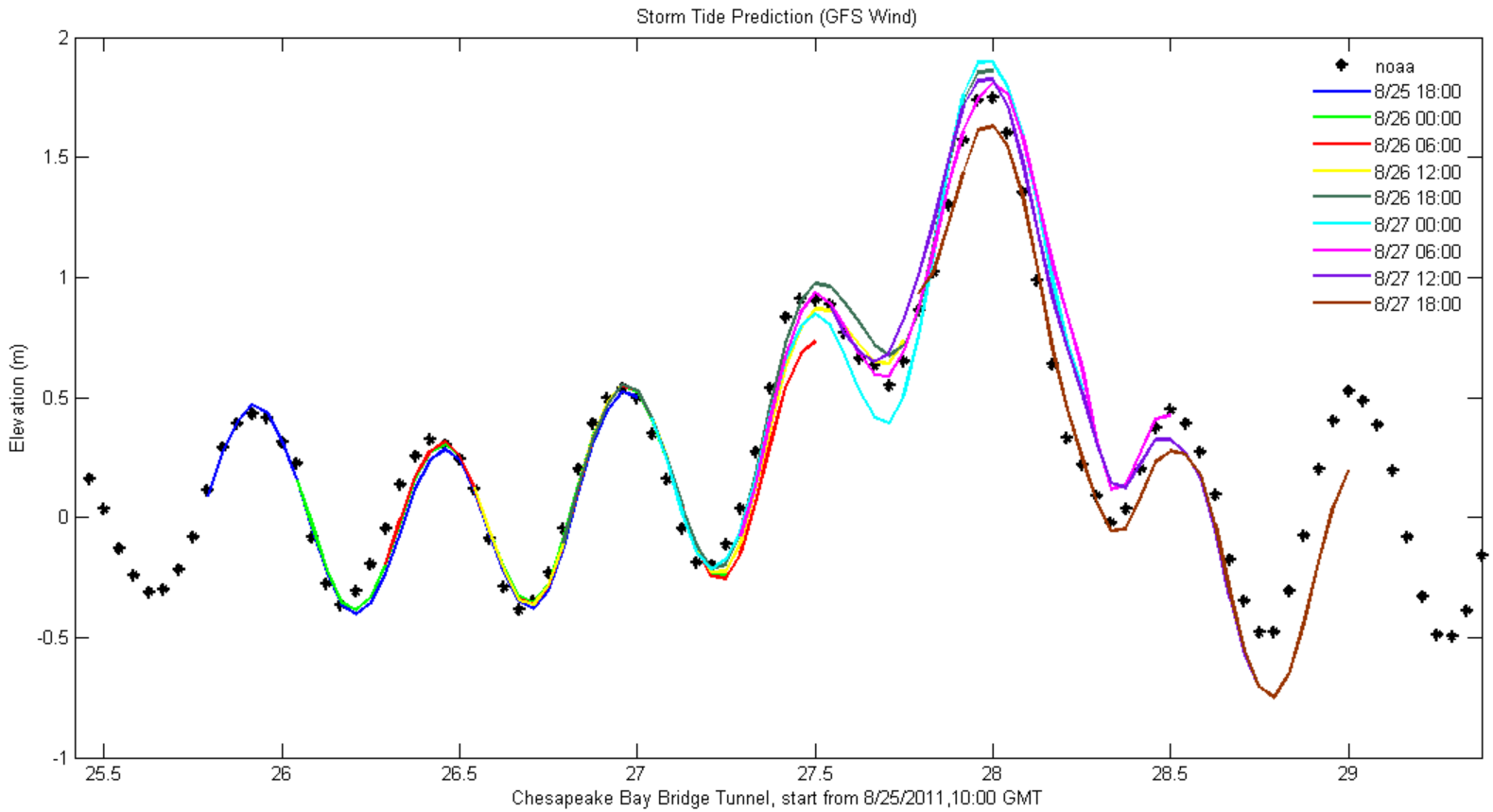

Share This
Like
+1
8 PM Mon
8 PM Sun
8 AM Sun
8 PM Sat
8 AM Sat
55°N
50°N
45°N
40°N
95°W
90°W
85°W
80°W
75°W
70°W
< 39 mph Tropical Depression
39-73 mph Tropical Storm
74-95 mph Category 1
96-110 mph Category 2
111-130 mph Category 3
131-155 mph Category 4
156+ mph Category 5
Circle shows possible storm center locations.
Weather Underground
wunderground.com
View All Tropical Weather

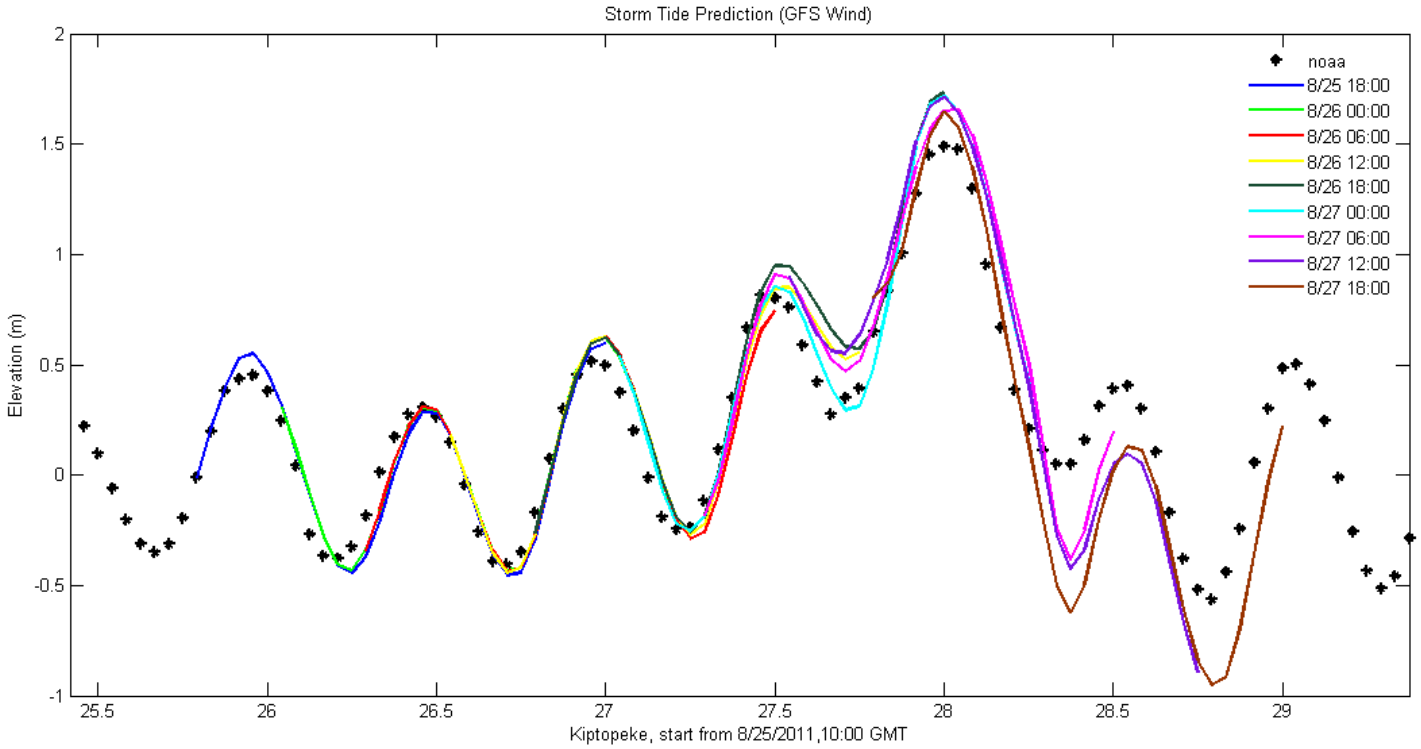
Local WRF Model – 4 km Resolution

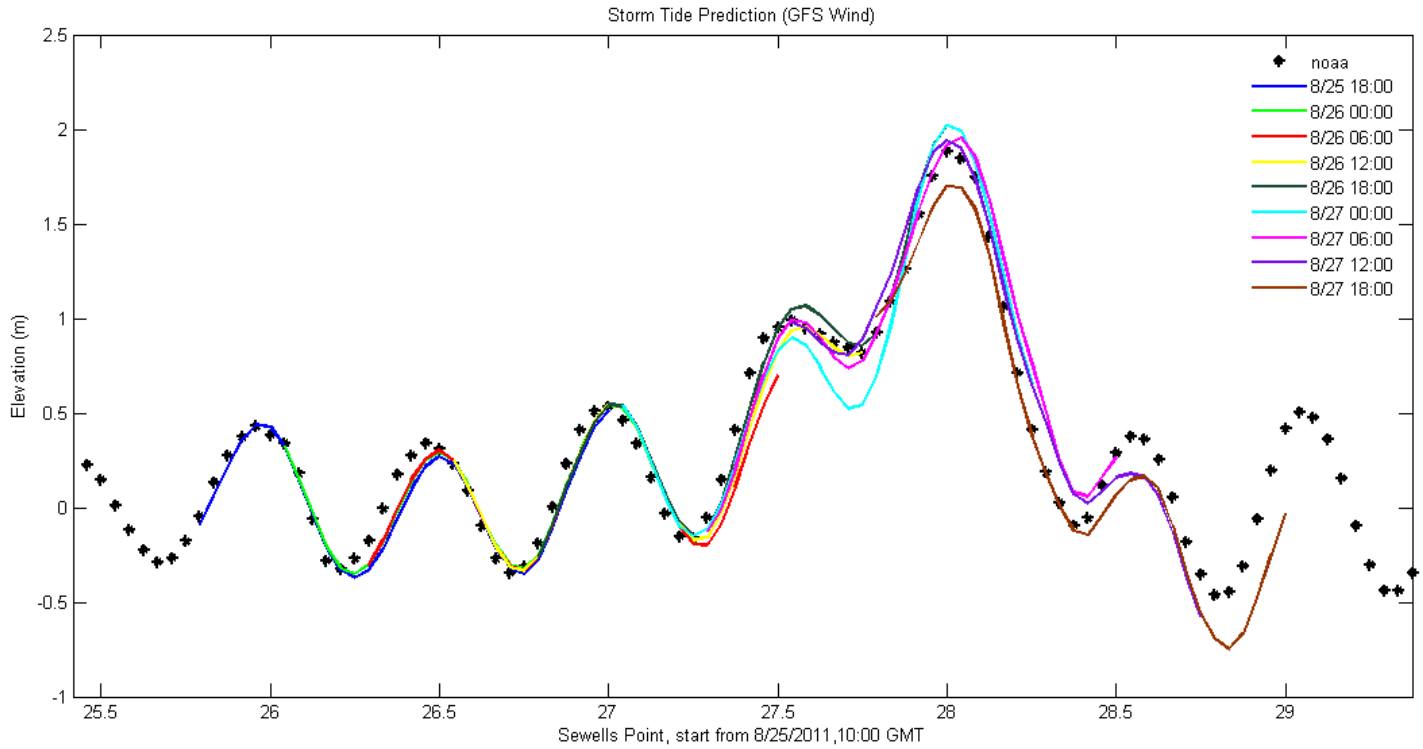


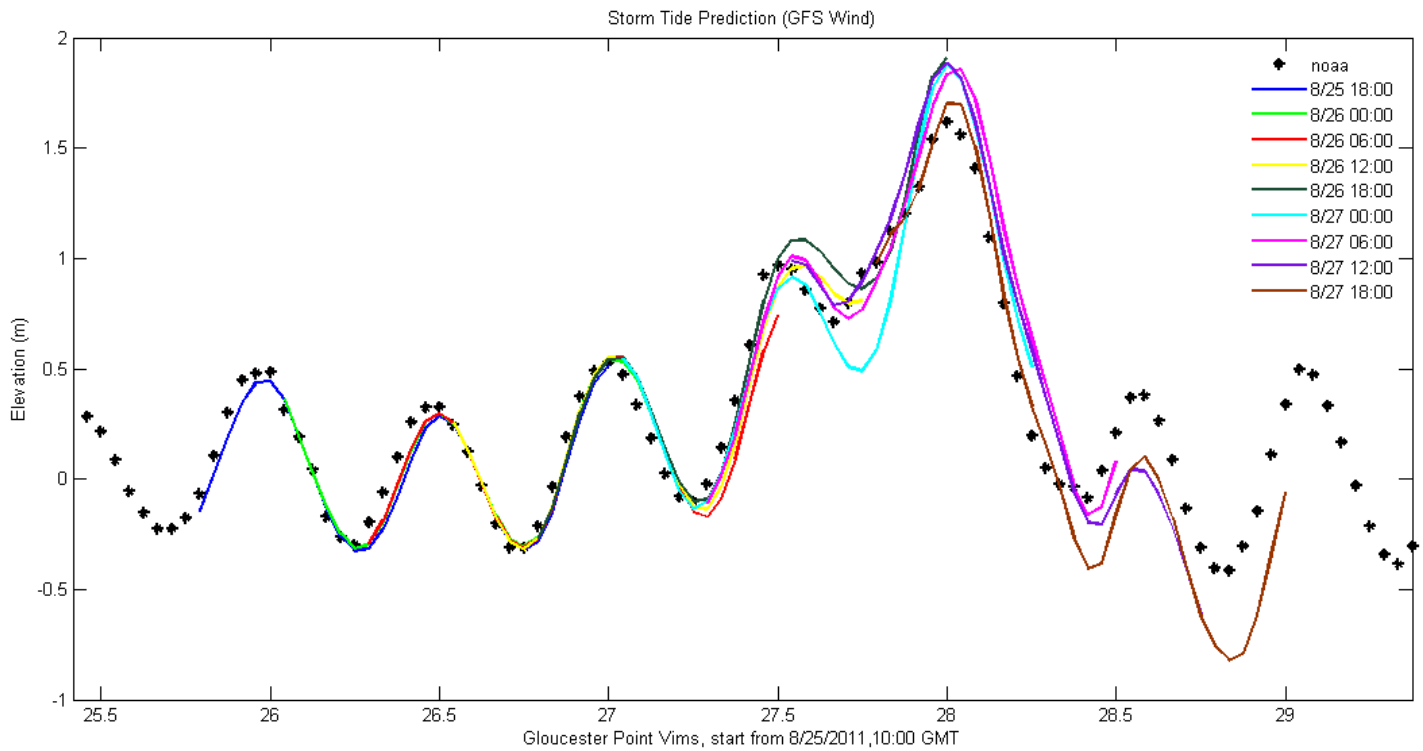


A snapshot of an animation for water level prediction including the wind-wave signature.


Storm Tide Prediction (GFS Wind)
Elevation (m)
Chesapeake Bay Bridge Tunnel, start from 8/25/2011,10:00 GMT
noaa
8/25 18:00
8/26 00:00
8/26 06:00
8/26 12:00
8/26 18:00
8/27 00:00
8/27 06:00
8/27 12:00
8/27 18:00
2
1.5
1
0.5
0
-0.5
-1
25.5
26
26.5
27
27.5
28
28.5
29


Storm Tide Prediction (GFS Wind)
Elevation (m)
Kiptopeke, start from 8/25/2011,10:00 GMT
noaa
8/25 18:00
8/26 00:00
8/26 06:00
8/26 12:00
8/26 18:00
8/27 00:00
8/27 06:00
8/27 12:00
8/27 18:00
2
1.5
1
0.5
0
-0.5
-1
25.5
26
26.5
27
27.5
28
28.5
29


Storm Tide Prediction (GFS Wind)
noaa
8/25 18:00
8/26 00:00
8/26 06:00
8/26 12:00
8/26 18:00
8/27 00:00
8/27 06:00
8/27 12:00
8/27 18:00
Elevation (m)
2.5
2
1.5
1
0.5
0
-0.5
-1
25.5
26
26.5
27
27.5
28
28.5
29
Sewells Point, start from 8/25/2011,10:00 GMT


Storm Tide Prediction (GFS Wind)
Elevation (m)
Gloucester Point Vims, start from 8/25/2011,10:00 GMT
noaa
8/25 18:00
8/26 00:00
8/26 06:00
8/26 12:00
8/26 18:00
8/27 00:00
8/27 06:00
8/27 12:00
8/27 18:00
2
1.5
1
0.5
0
-0.5
-1
25.5
26
26.5
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27.5
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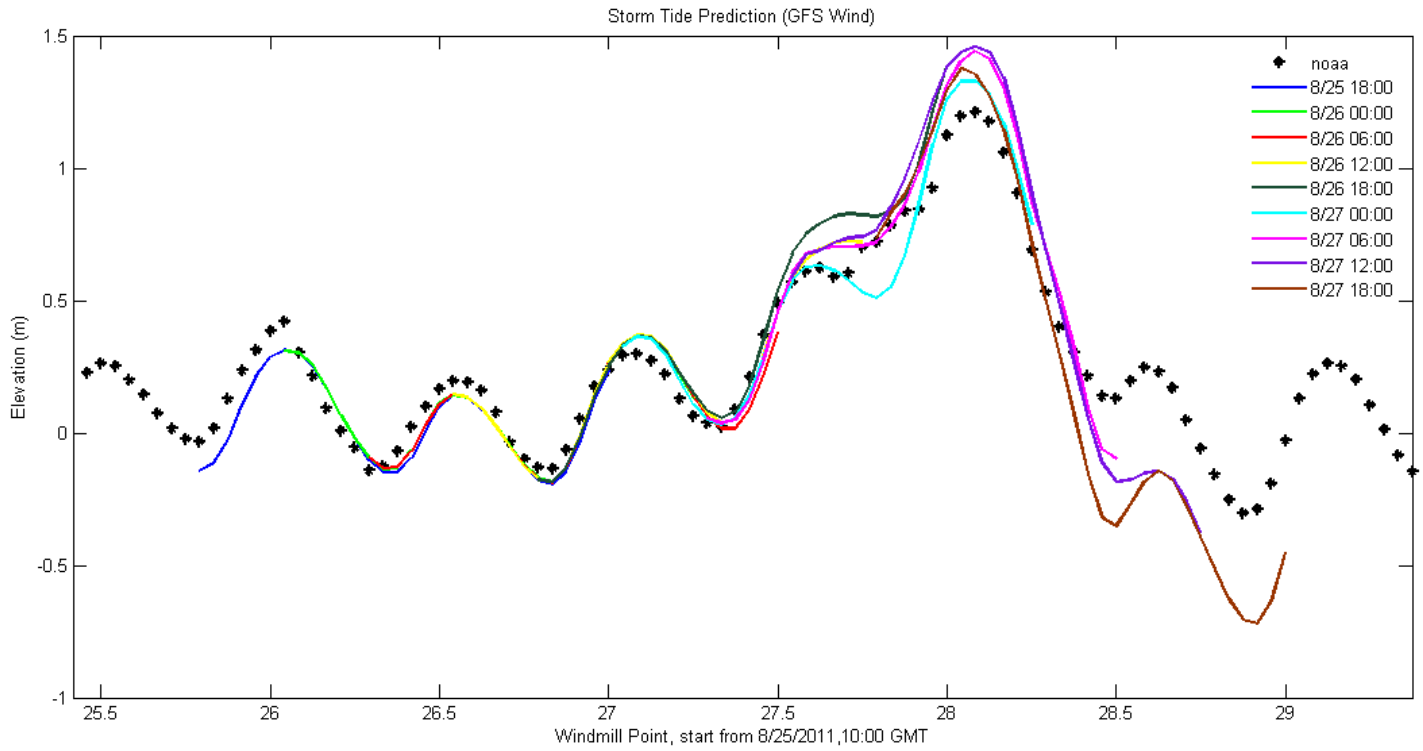
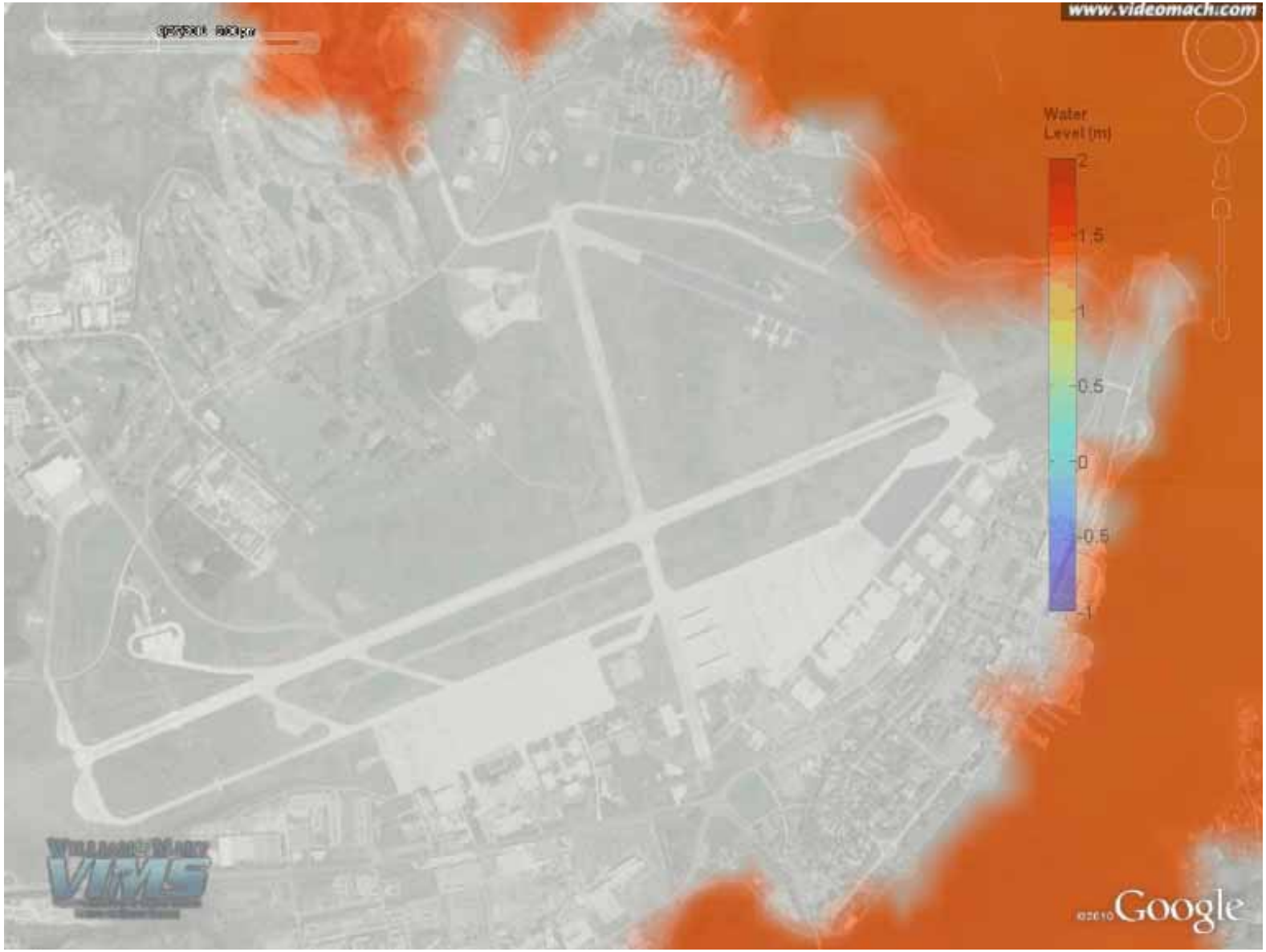
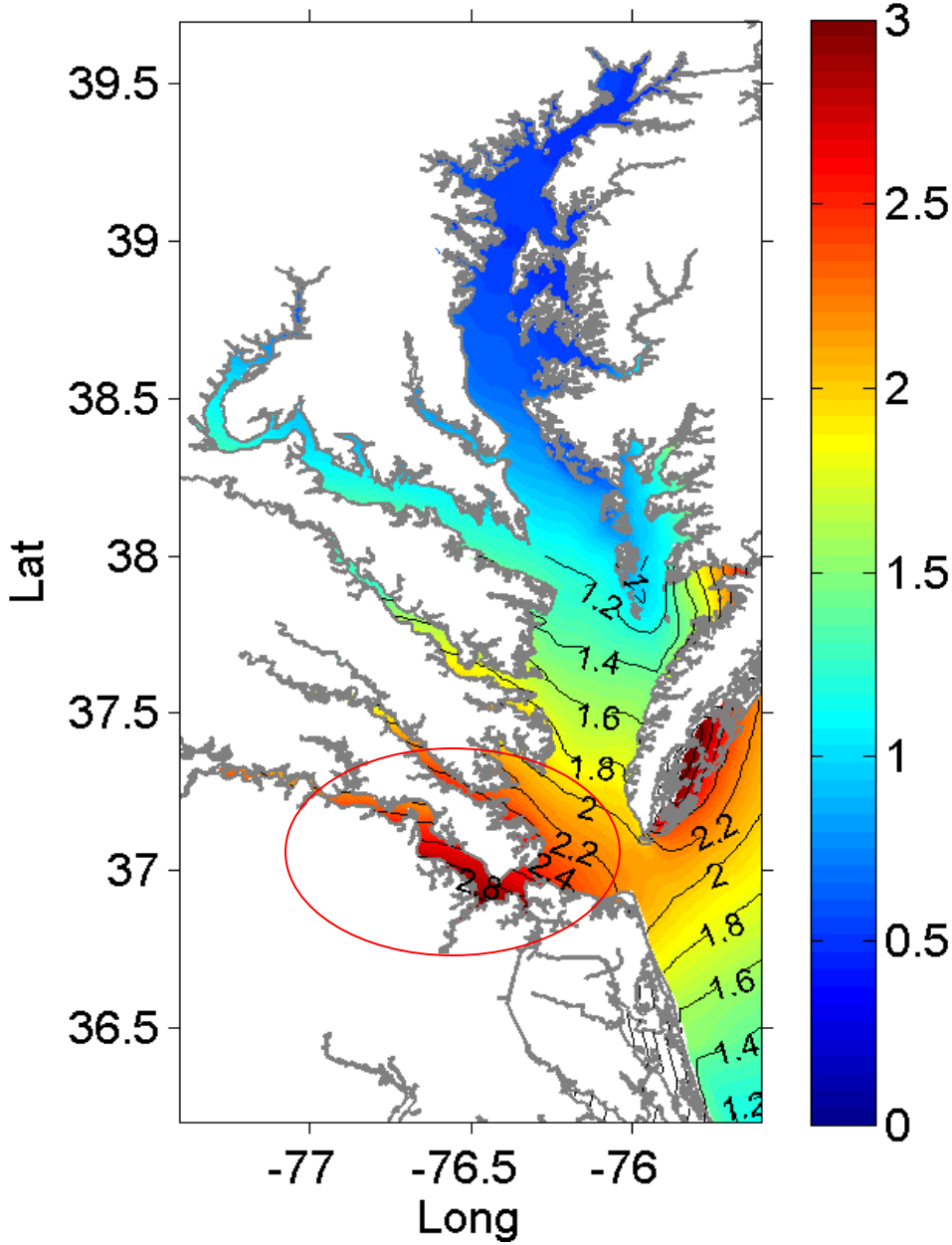
28.5
29

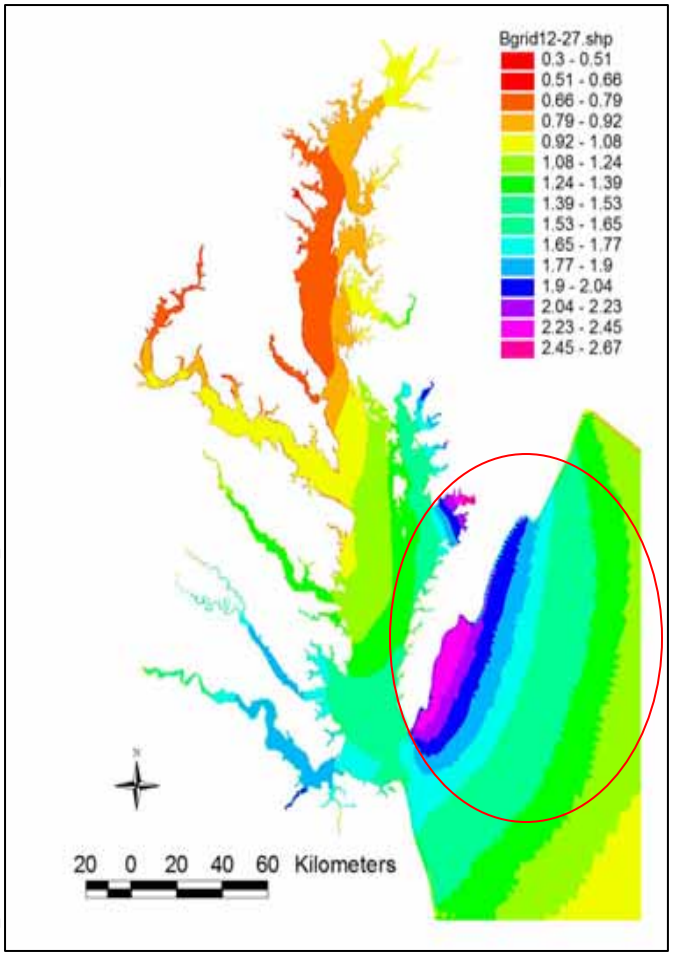

Storm Tide Prediction (GFS Wind)
Elevation (m)
1.5
1
0.5
0
-0.5
-1
25.5
26
26.5
27
27.5
28
28.5
29
Windmill Point, start from 8/25/2011,10:00 GMT
noaa
8/25 18:00
8/26 00:00
8/26 06:00
8/26 12:00
8/26 18:00
8/27 00:00
8/27 06:00
8/27 12:00
8/27 18:00



A snap shot for an animation of inundation at the Langley Air Force Base superimposed on a Google Map



*above MLLW



*above MSL

Where is the hot spots? The spatial distribution of the envelope of maximum water level above during a 30-hour forecast period.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE

10009 General Mahone Highway
Wakefield, Virginia 23888-2742

August 29, 2011

Dr. John Wells
Virginia Institute of Marine Science
P.O. Box 1346
Gloucester Point, Virginia 23062

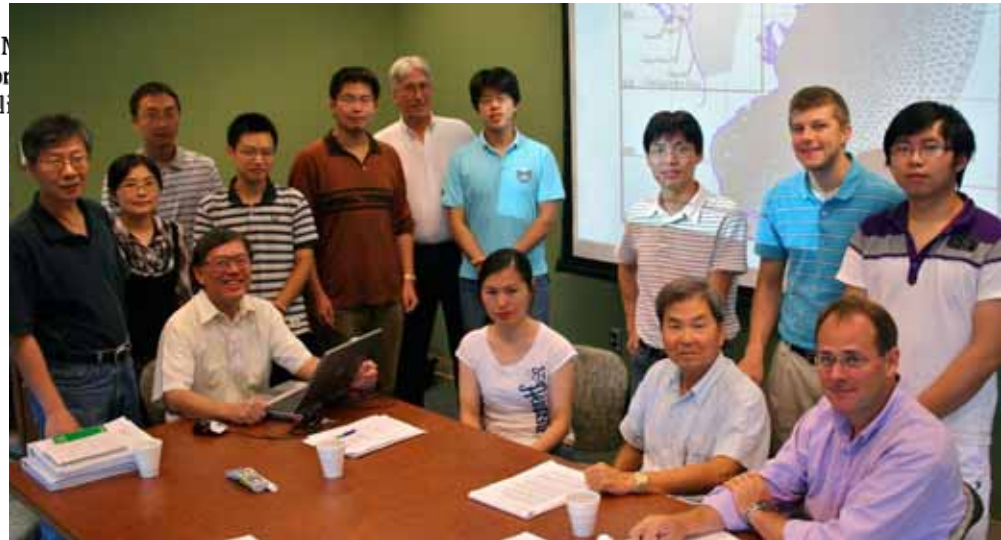
Dear Dr. Wells:

We at the National Weather Service would like to express our appreciation for all of the help and support provided by VIMS during Irene. Dr. Harry Wang contributed by producing 6 hourly runs of forecast storm surge. The details provided by his surge model enhanced the National Weather Service's ability to provide critical forecast surge information to emergency managers. These forecast were particularly useful when examining various bays and tributaries along the lower sections of the Chesapeake Bay. The COMET funded project with Dr. John Brubaker provided an excellent web site for use in observing real time water levels and forecasting location specific storm tide. The constant updating of the observations provided quick feedback allowing us to verify forecasts and monitor rapidly rising water levels as Irene approached. The comparison between the extratropical storm surge model and VIMS model with real time data provided quick feedback as to how forecasts were verifying compared to observational data.

It must be noted that these services were all provided without any funding highlighting VI commitment to applying research into operations. The services directly contributed to impr forecasts and information for Virginia residents which had an impact on the protection of l property. Thank you for all the hard work which helped to better serve the public.

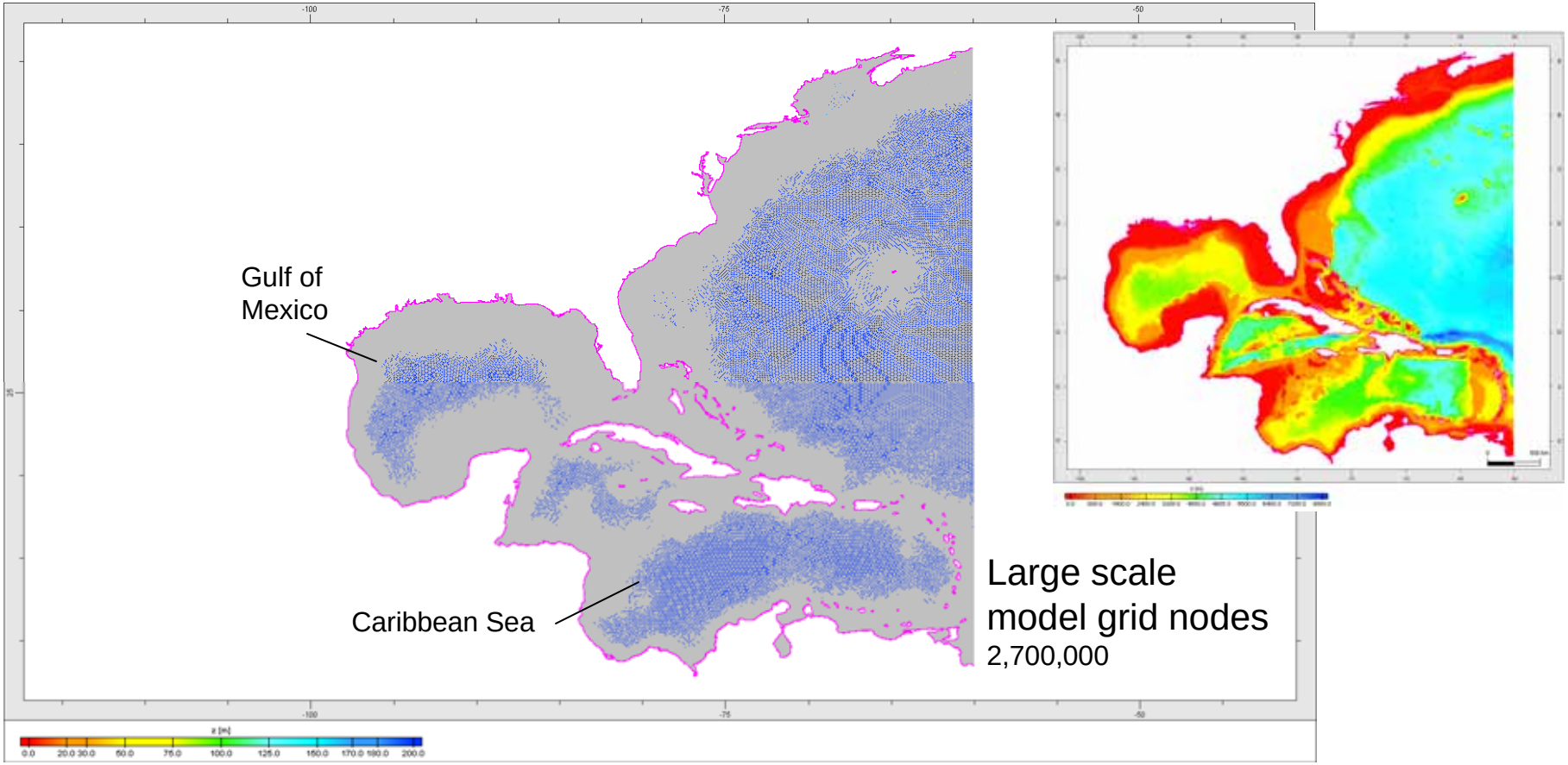
Sincerely,

VIMS ECM group win 2011 Governor's technology award



Super-regional Testbed Coastal Inundation Project in Gulf Mexico

1. NOAA funded testbed project: participated include ADCIRC, FVCOM, SELFE, SLOSH, SWAN, UnSWAN, WWM wave model

2. Forcing with the best available wind and pressure field (data assimilated OWI and H*wind during Hurricane Ike)

3. Coupled circulation and wind wave models in 2D and 3D