

# **XM Satellite Marine Weather - The successful result of Stennis Space Center's technology cluster**

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Mississippi State University

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WorldWinds Inc.

- I. Background on cluster*
- II. Storm surge modeling*
- III. XM Satellite Marine Weather*
- IV. IP issues*

# *Enterprise for Innovative Geospatial Solutions*

# *Enterprise for Innovative Geospatial Solutions*

- I. Partnership among NASA, State of Mississippi, and universities to develop the geospatial industry in Mississippi (includes 35 companies).
- II. WorldWinds, Inc., was one of the 7 charter members when cluster formed in 1997.
- III. Collaboration with WorldWinds, Inc. since 1997 through several funded EIGS grants

# *Enterprise for Innovative Geospatial Solutions*

## *(continued)*

### IV. R&D work on:

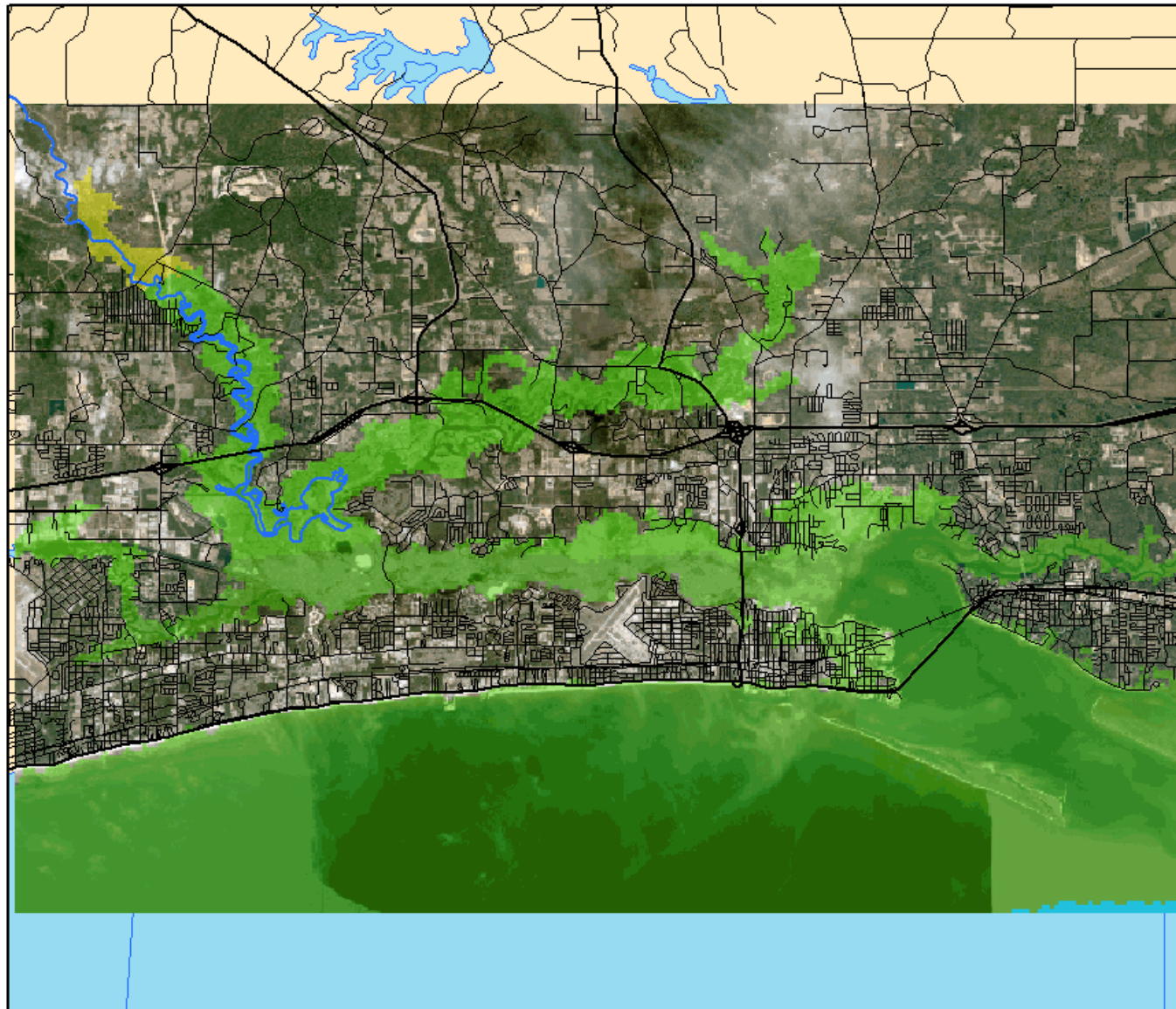
- A. Mesoscale models -- MM5, COAMPS
- B. Ocean wave model – Wavewatch
- C. Inland Lake model – WindWave
- D. Storm surge and hydrodynamic model – ADCIRC
- E. Assimilation of NASA and NOAA satellite data through 4DVAR, MVOI, and nudging techniques.
- F. MODIS landuse data in mesoscale models

*SBIR Phase II research*

*Storm surge simulations*

*“Maximum of Maximums”*

# Maximum of Maximums - Category 1



## Surge Levels in Feet

category1\_maximum

CODE

-9.999 - -6.000

-5.999 - -3.000

-2.999 - 0.000

0.001 - 3.000

3.001 - 6.000

6.001 - 9.000

9.001 - 12.000

12.001 - 15.000

15.001 - 18.000

18.001 - 21.000

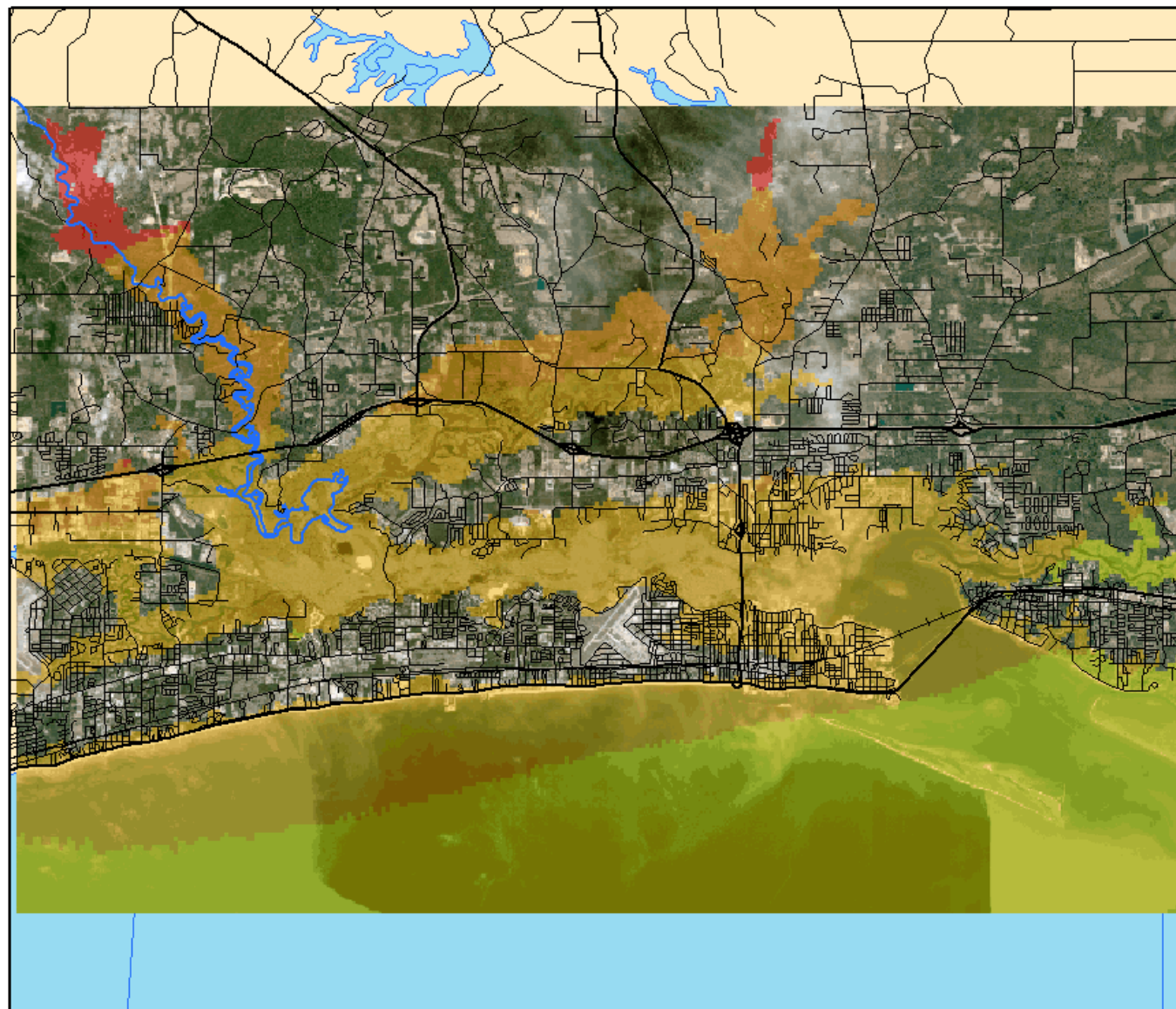
21.001 - 24.000

24.001 - 27.000

27.001 - 30.000

30.001 - 33.000

## Maximum of Maximums - Category 3



### Surge Levels in Feet

category3\_maximum

CODE

-9.999 - -6.000

-5.999 - -3.000

-2.999 - 0.000

0.001 - 3.000

3.001 - 6.000

6.001 - 9.000

9.001 - 12.000

12.001 - 15.000

15.001 - 18.000

18.001 - 21.000

21.001 - 24.000

24.001 - 27.000

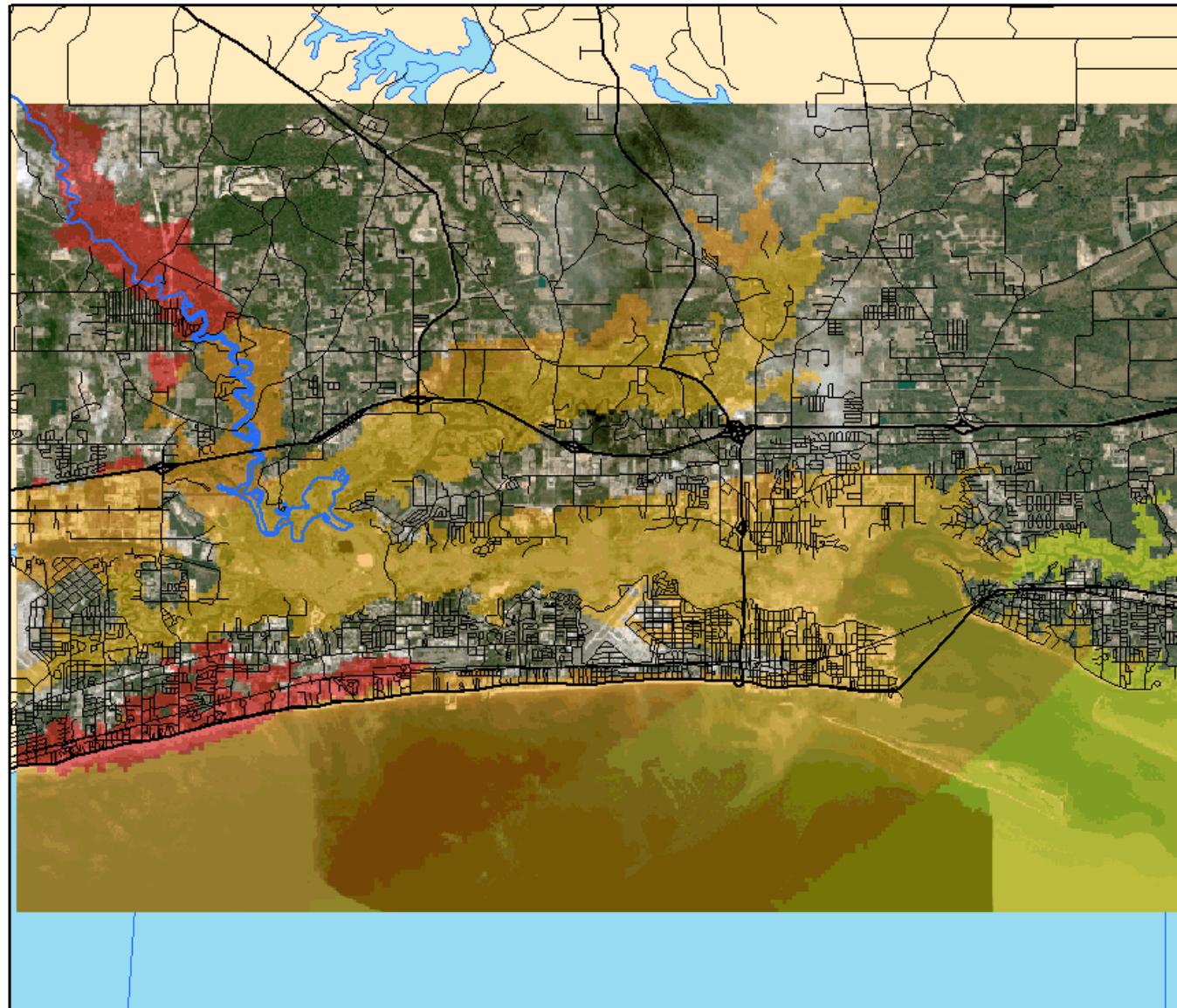
27.001 - 30.000

30.001 - 33.000

*Storm size influence*



## Category 5 - Gulfport Landing - 5mph Track - Small Diameter



Surge Levels in Feet

cat5\_5mph\_150km\_max

CODE

-9.999 - -6.000

-5.999 - -3.000

-2.999 - 0.000

0.001 - 3.000

3.001 - 6.000

6.001 - 9.000

9.001 - 12.000

12.001 - 15.000

15.001 - 18.000

18.001 - 21.000

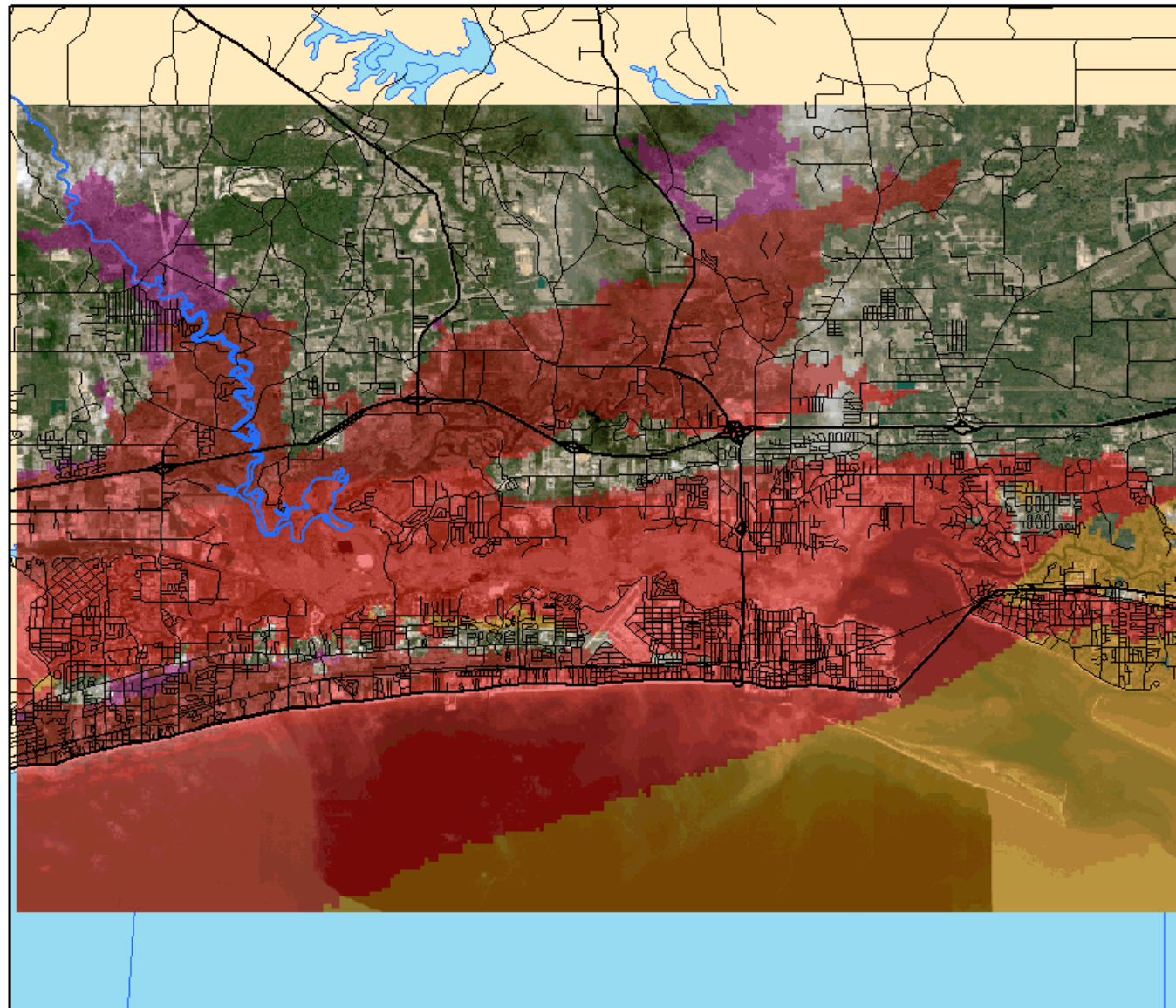
21.001 - 24.000

24.001 - 27.000

27.001 - 30.000

30.001 - 33.000

## Category 5 - Gulfport Landing - 5mph Track - Large Diameter



Surge Levels in Feet

cat5\_5mph\_350km\_max

CODE

-9.999 - -6.000

-5.999 - -3.000

-2.999 - 0.000

0.001 - 3.000

3.001 - 6.000

6.001 - 9.000

9.001 - 12.000

12.001 - 15.000

15.001 - 18.000

18.001 - 21.000

21.001 - 24.000

24.001 - 27.000

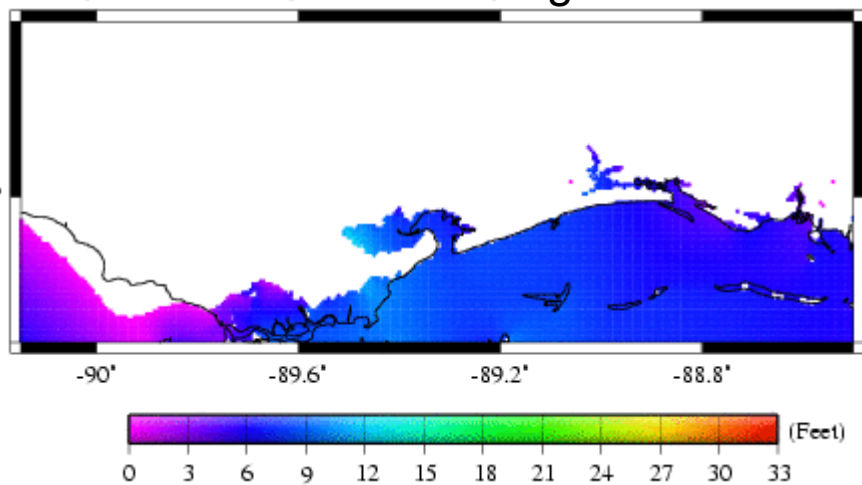
27.001 - 30.000

30.001 - 33.000

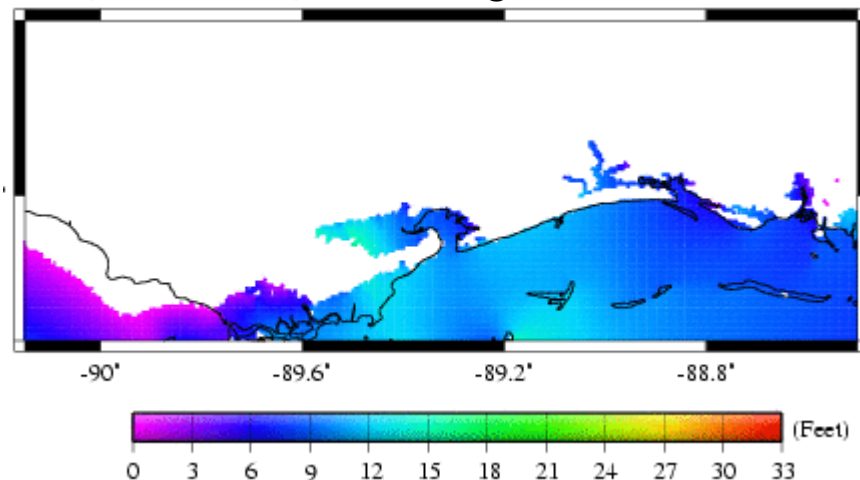
*Katrina simulation*



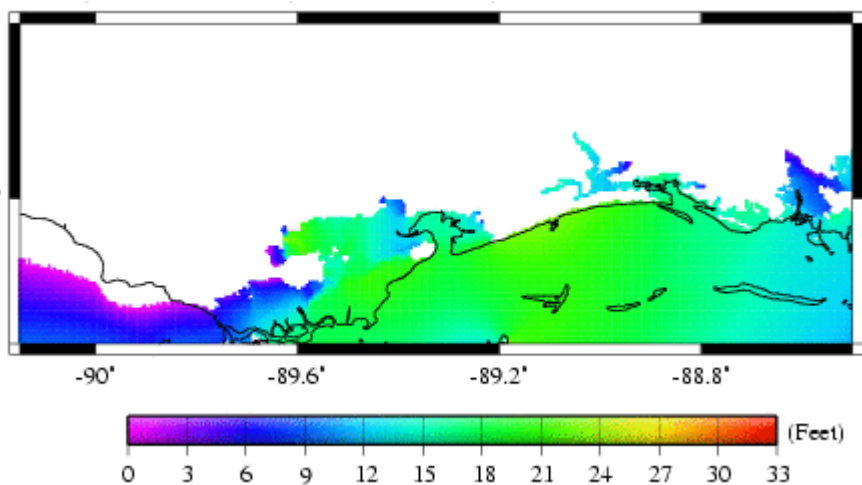
Katrina storm surge at 5AM



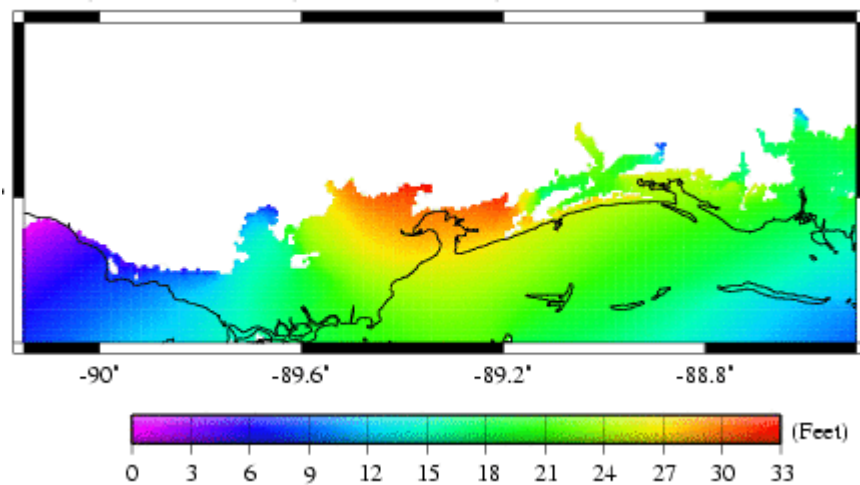
Katrina storm surge at 7AM



Katrina storm surge at 9AM



Katrina storm surge at 11AM



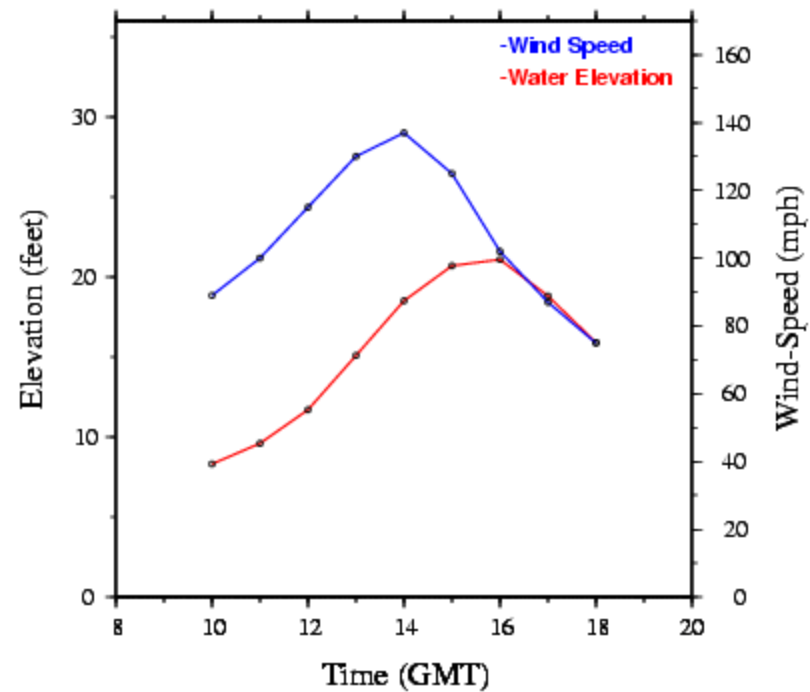
*Timing of wind versus surge*

## Hurricane Katrina (Adcirc Simulation)

TimeSeries for August 29th 10Z through 18Z

Lon=-89.190, Lat=30.185

Bay\_St.Louis (East\_Gulf)



***XM Satellite Radio***

- I. In 2003, WxWorx Inc. was established as an affiliate of Baron Services. Working in conjunction with XM Satellite Radio Inc., XM WX Satellite Weather was created to provide up-to-date weather information for boat owners. XM WX Satellite Weather uses the XM Radio satellites and signal quality to deliver specific weather-related data.
- II. One WxWorx product is marine data. WorldWinds provides:
  - A. COAMPS output
  - B. Wavewatch and WindWave
  - C. Buoy data
  - D. High-resolution Coastwatch SST



III. WxWorx then adds the following information to the product:

- A. Radar
- B. Severe storm tracks
- C. Satellite
- D. Country warnings
- E. Inland surface data
- F. City forecasts
- G. Hurricane track
- H. Lightning
- I. Marine Zone forecasts

# Forecasts for XM Satellite Radio



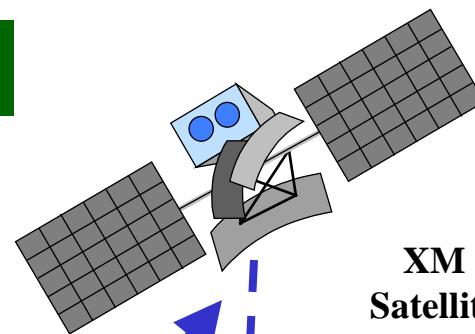
**WorldWinds**

**Stennis Space Center**

*( Weather, SST, and Wave Data )*



*(Weather Graphics and  
NEXRAD)*



**XM  
Satellite  
Radio**

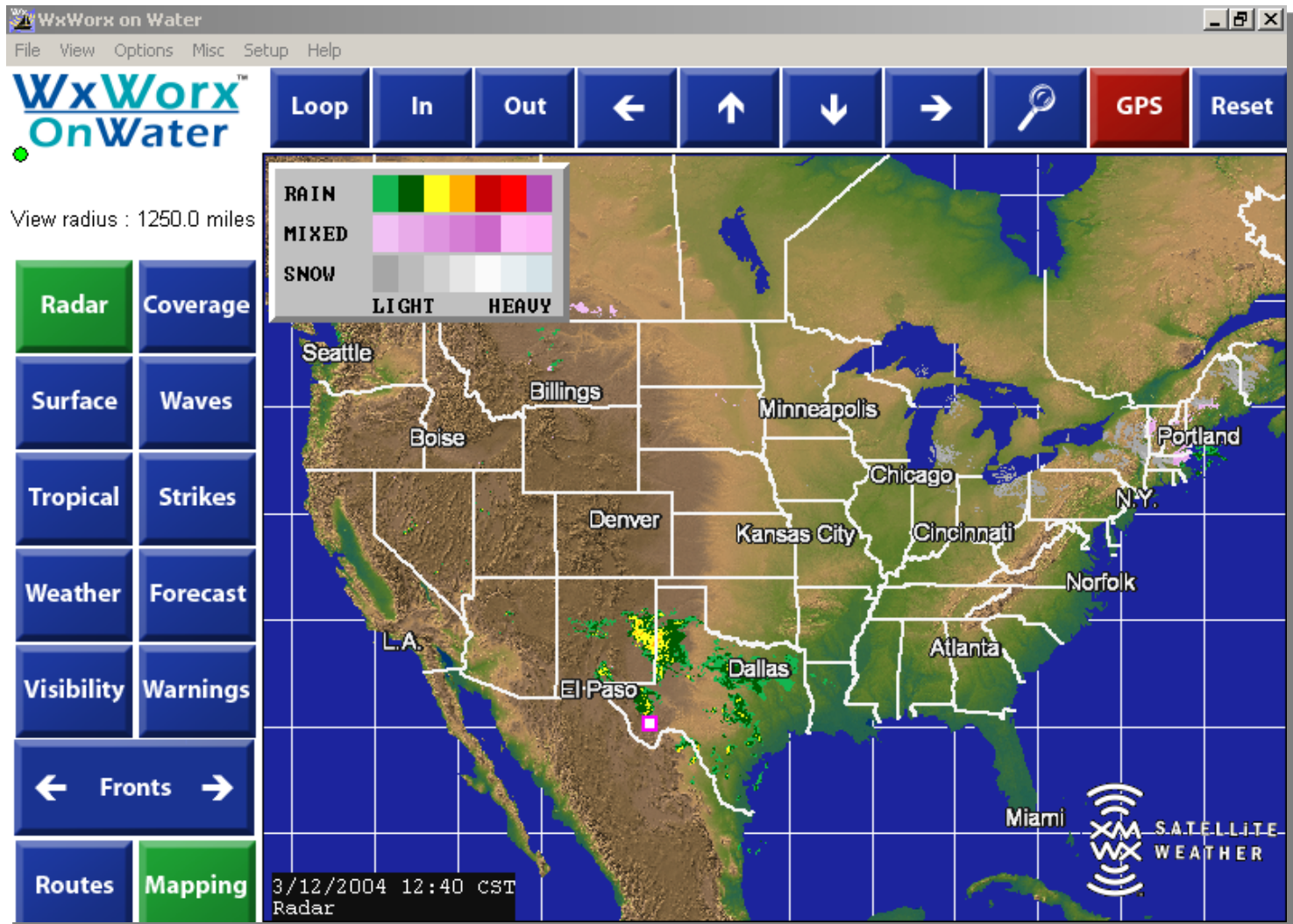
**Maritime vessel**

**Data displayed on laptop  
or Garmin unit**



*See [www.wxworx.com](http://www.wxworx.com) or [www.xmradio.com/weather](http://www.xmradio.com/weather)*

# Laptop hooked to satellite antenna



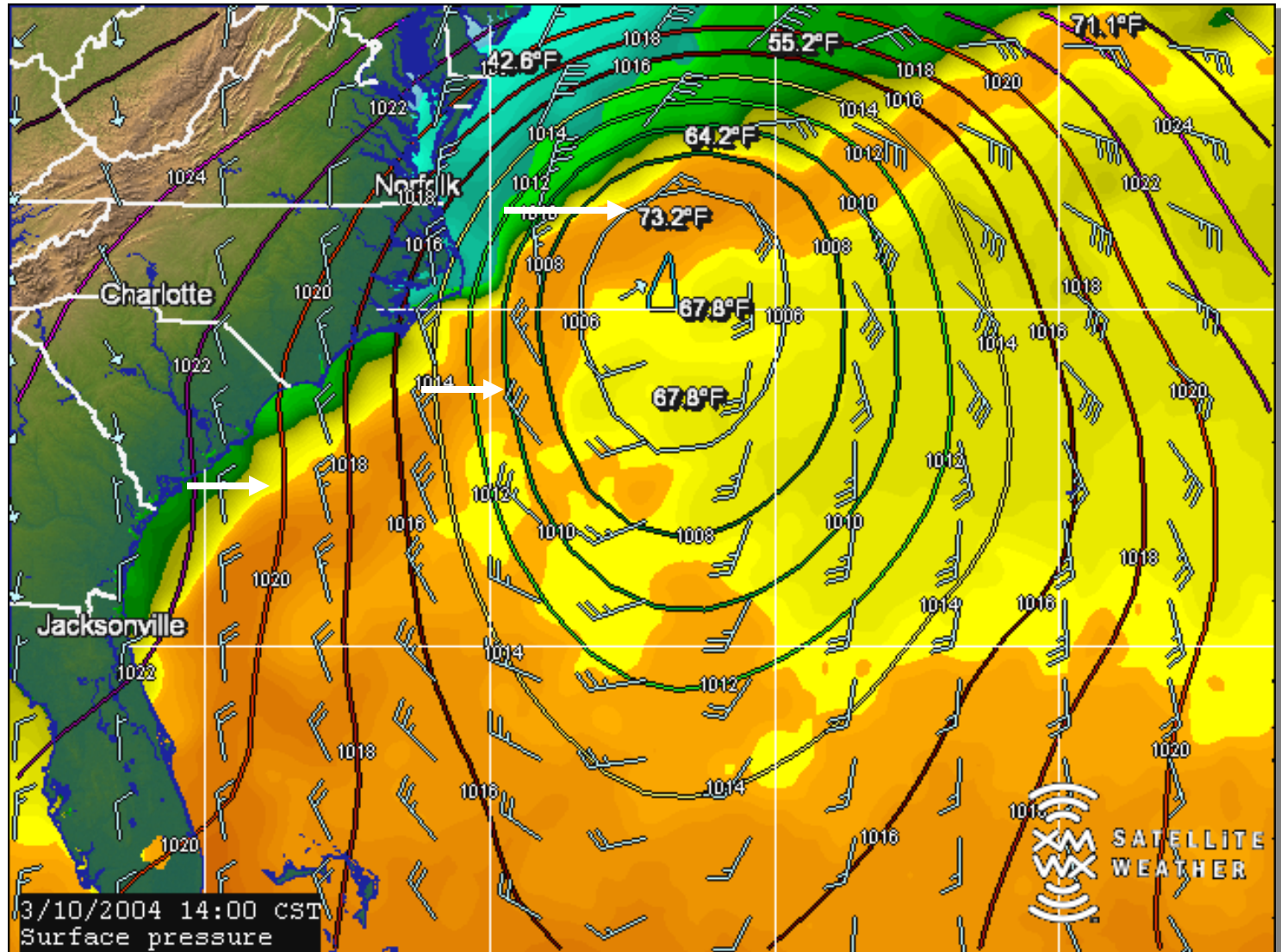
# SURFACE CONDITIONS

Surface

- Sea temperatures
- Winds at the surface
- Pressure

*COAMPS  
Output,*

*SST data from  
NOAA's Office of  
Satellite Data  
Processing and  
Distribution*



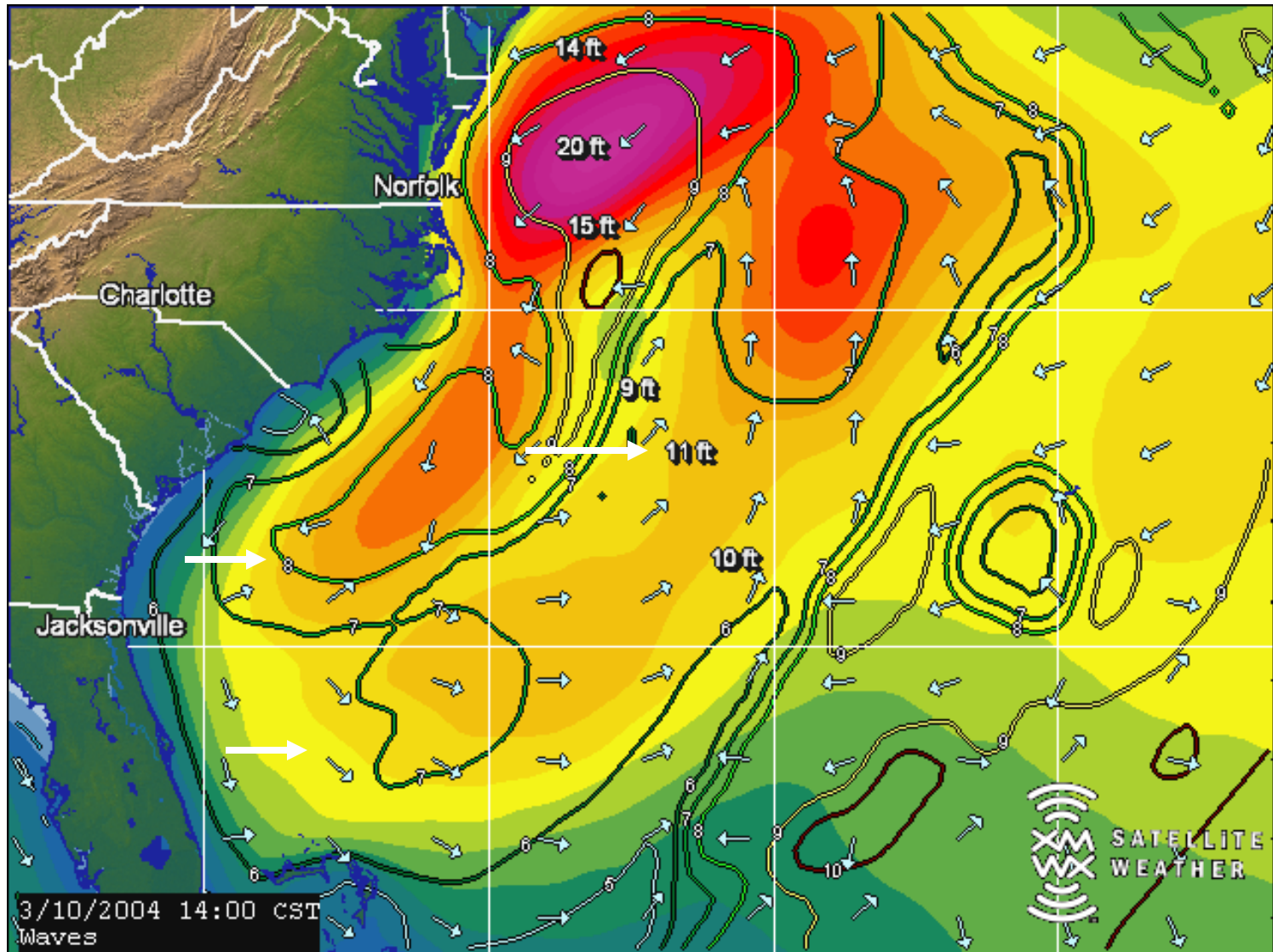


# OCEAN WAVE INFORMATION

## Waves

- Wave heights
- Wave period
- Wave direction

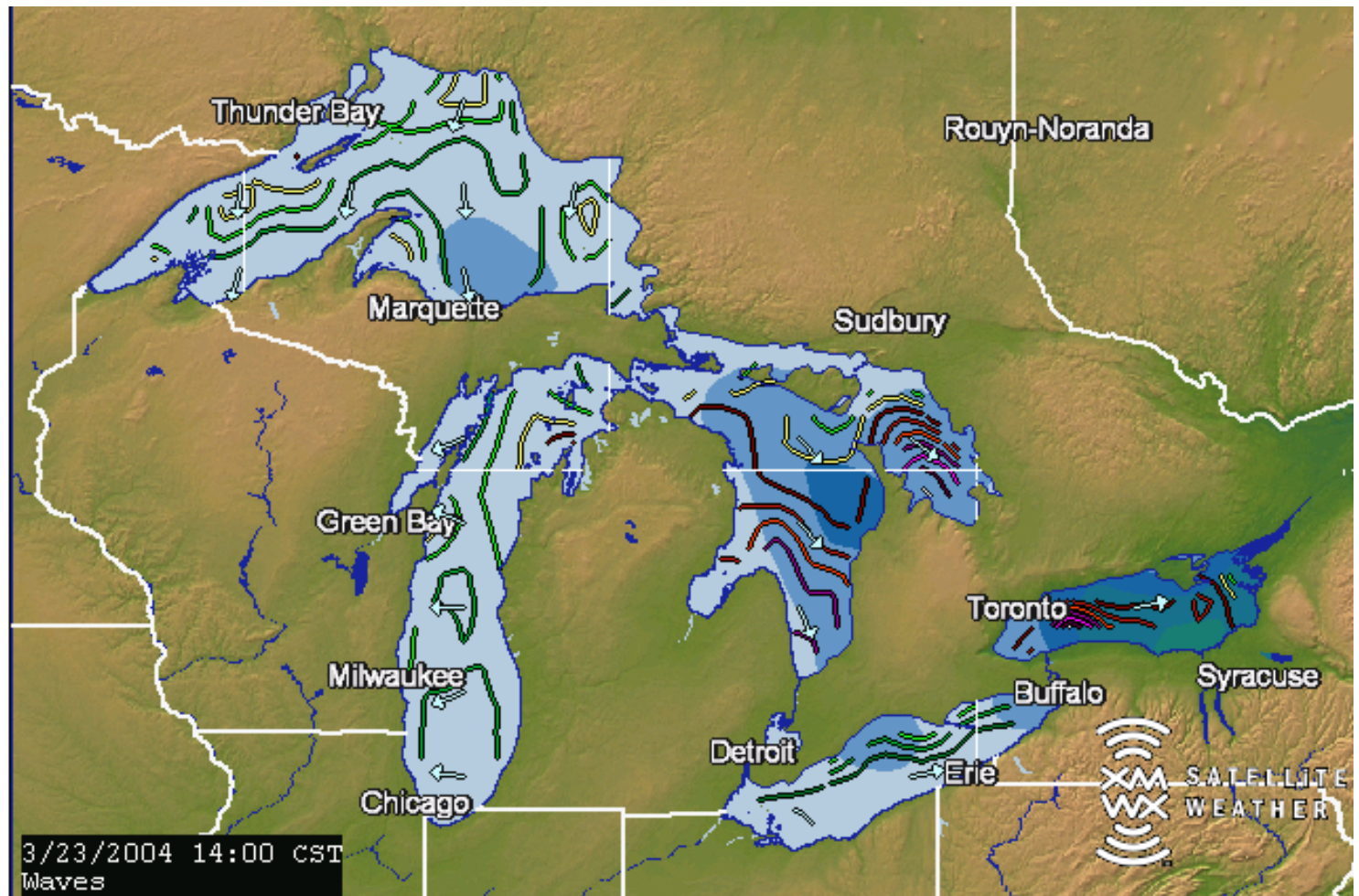
*Wavewatch  
Output*



# INLAND LAKE WAVE INFORMATION

Zoom in  
On a lake

*Windwave  
Output*



# BUOY INFORMATION

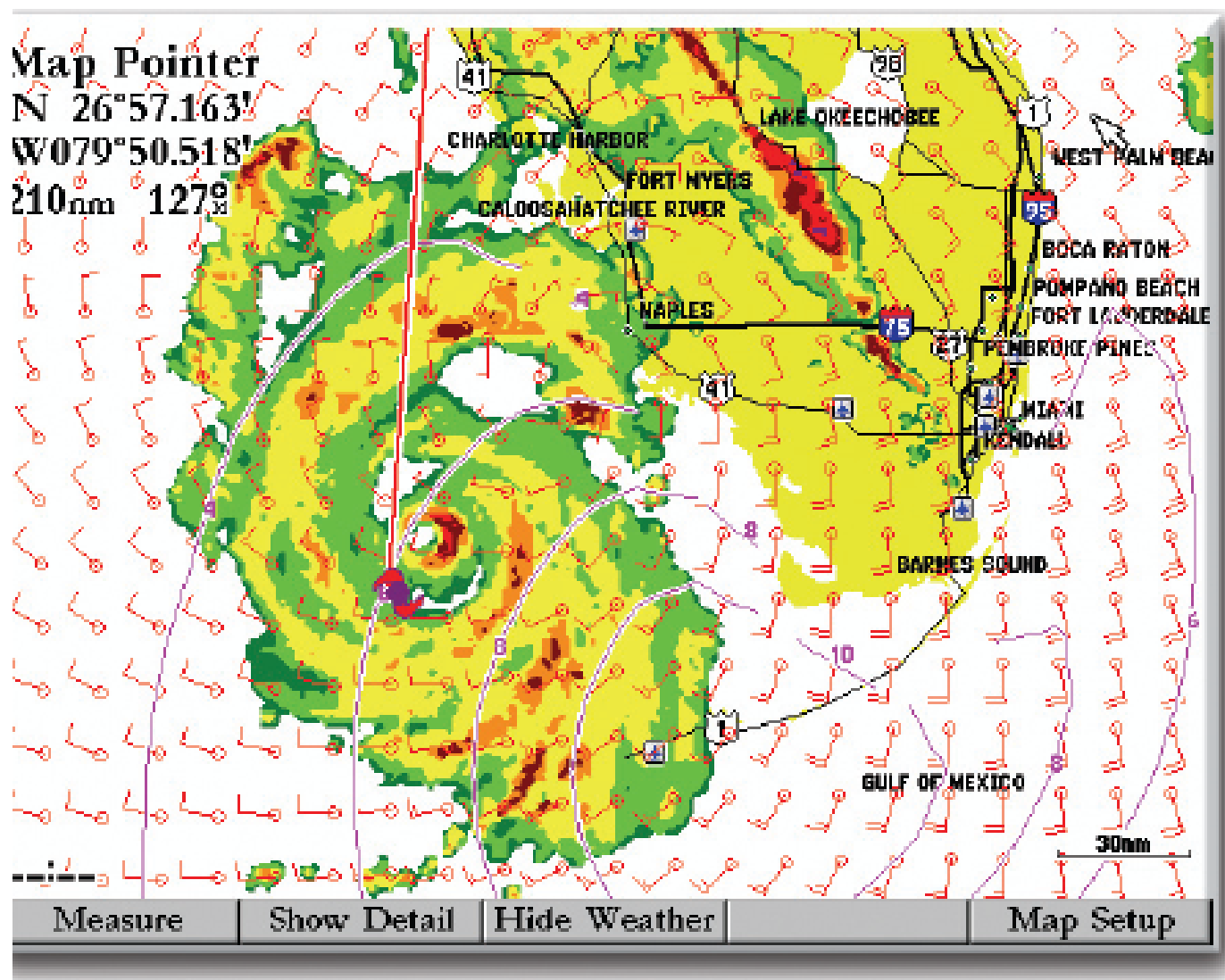


# LIGHTNING and RADAR





# OVERLAY of DATA



# Garmin alternatives to laptop software



# Garmin handheld!



JA Air Center 2005

By the way, both play XM Satellite radio music and news as well

# Issues involving intellectual property rights

The current dilemma:

When software was partially funded by the state and NASA, with matching funds from the company, over a 7-year period, and the professor has been employed by two universities, who owns what?

Currently an issue. Probably other researchers, who collaborate with companies, may be encountering similar issues.

I fear it's a disincentive for companies to work with universities.

# Conclusions

- I. This NASA incubator concept, in which universities and companies interact, has overall been a positive experience, and I recommend the AMS and NOAA formally endorse a similar methodology for “NOAA incubators.”
- II. Innovative storm surge modeling and atmospheric Modeling R&D resulted at WorldWinds, Inc., resulting in timely Katrina work and a cutting edge mobile weather appliance.
- III. Intellectual property issues require further clarification and advanced planning.