

Real-Time Forecasting of Winds, Waves, Storm Surge & Tides

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**Coastal Hydroscience Analysis, Modeling
& Predictive Simulations Laboratory**

 **CHAMPS Lab**

<http://champs.cecs.ucf.edu>

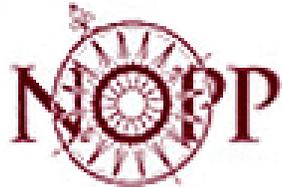
Outline

- NOPP Real-Time Forecasting System
 - Focus on the Waves
- St. Johns River Model:
 - Hurricane Floyd Hindcast Modeling

NATIONAL OCEANOGRAPHIC PARTNERSHIP PROGRAM
**REAL-TIME FORECASTING SYSTEM
OF WINDS, WAVES AND SURGE
IN TROPICAL CYCLONES**

HURRICANEWAVES.ORG

Real-Time Forecasting System of Winds, Waves and Surge in Tropical Cyclones

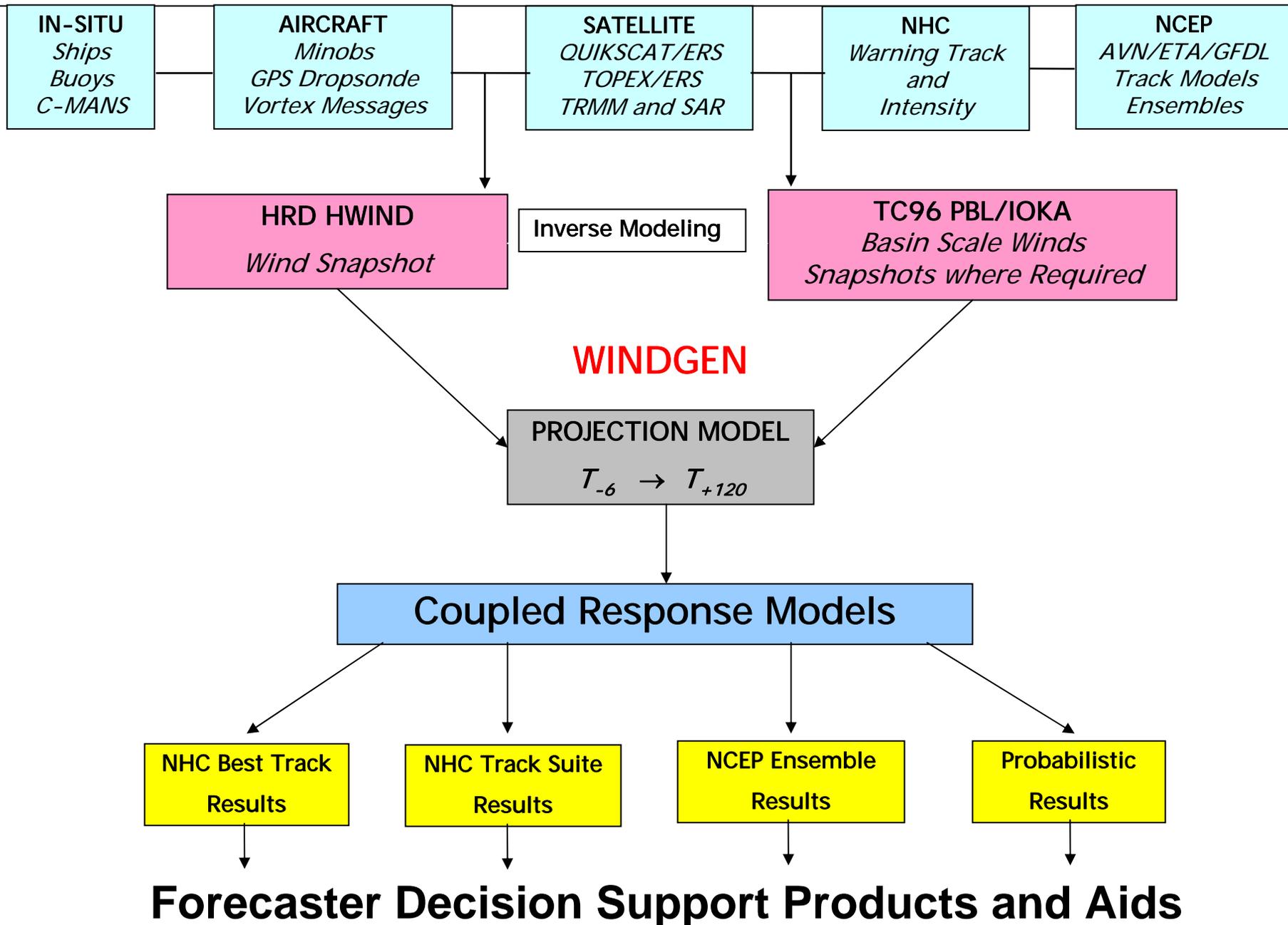


National Oceanographic Partnership Program

Promoting Partnerships for the Future of Oceanography

- University of Miami: **Hans C. Graber & Mark A. Donelan**
- University of Central Florida: **Scott C. Hagen**
- University of Florida: **Donald N. Slinn**
- U.S. Army Corps of Engineers: **Robert E. Jensen**
- NOAA/AOML/HRD: **Mark Powell & Peter G. Black**
- NOAA NWS Meteorological Services Division: **John L. Guiney**
- Oceanweather, Inc.: **Vincent J. Cardone & Andrew T. Cox**

Real-Time Forecasting of Winds, Waves and Storm Surge & Tides



WINDGEN

PROJECTION MODEL

$T_{-6} \rightarrow T_{+120}$

Coupled Response Models

**NHC Best Track
Results**

**NHC Track Suite
Results**

**NCEP Ensemble
Results**

**Probabilistic
Results**

Forecaster Decision Support Products and Aids

Wave Model: WAM-Cycle-4.5_2

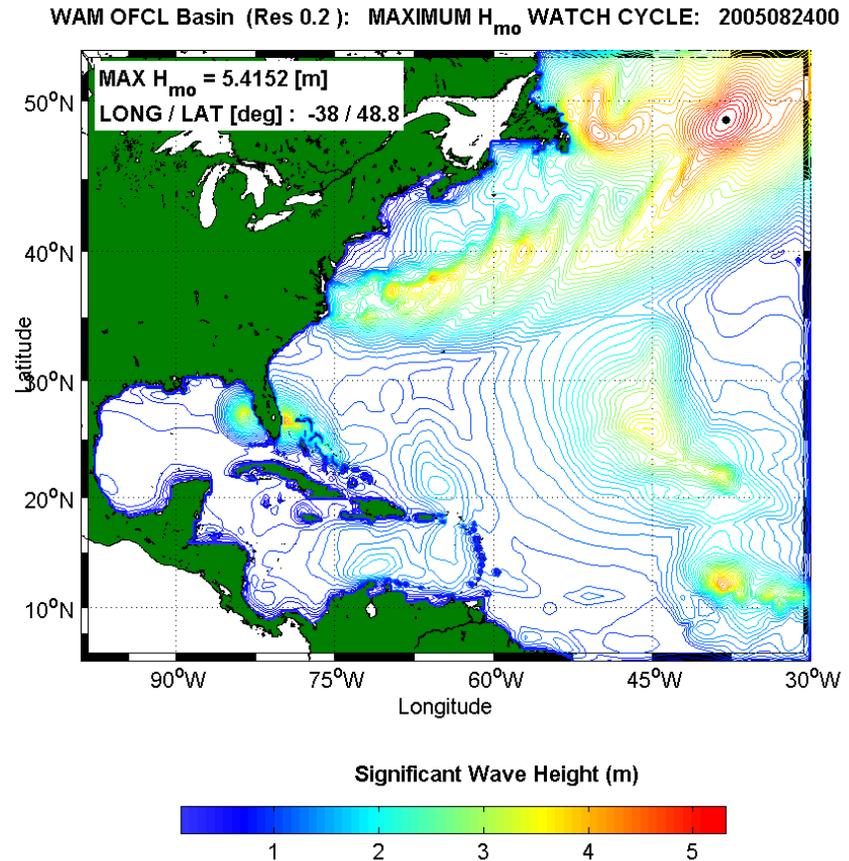
- General Information

- Action Balance Eqn.

- Advection
- Source Terms:
 - S_{in} , S_{ds} , S_{nl} , S_{w-b} , S_{brk}

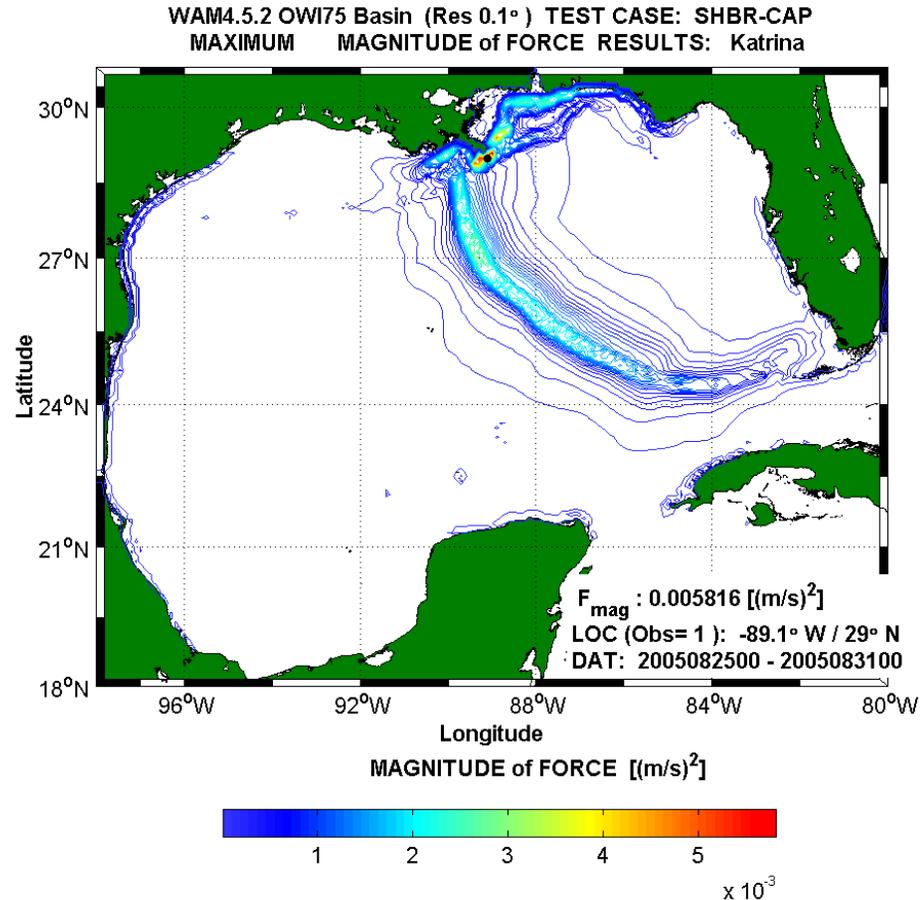
- Modifications

- Multiple Boundaries
- Limiter independent
- Depth Induced Breaking
- Improved Architecture
- Parallel Programming Paradigm



Operational Forecasting

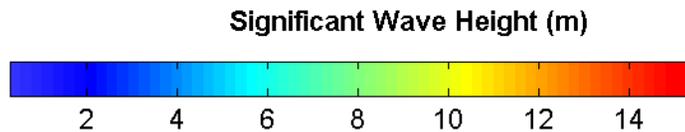
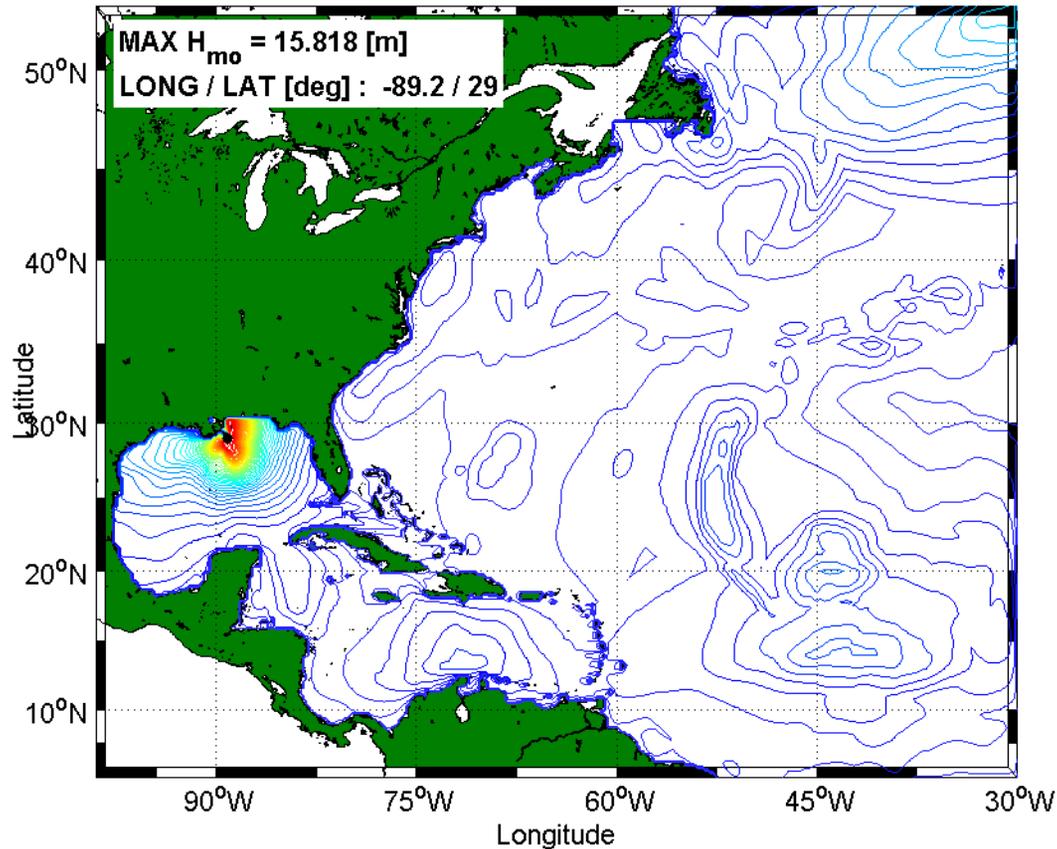
- Output:
 - Radiation Stress Fields to Surge Modeling
 - At 30-min intervals
 - Products
 - Map / Field Parameters
 - Verification
 - Ensembles



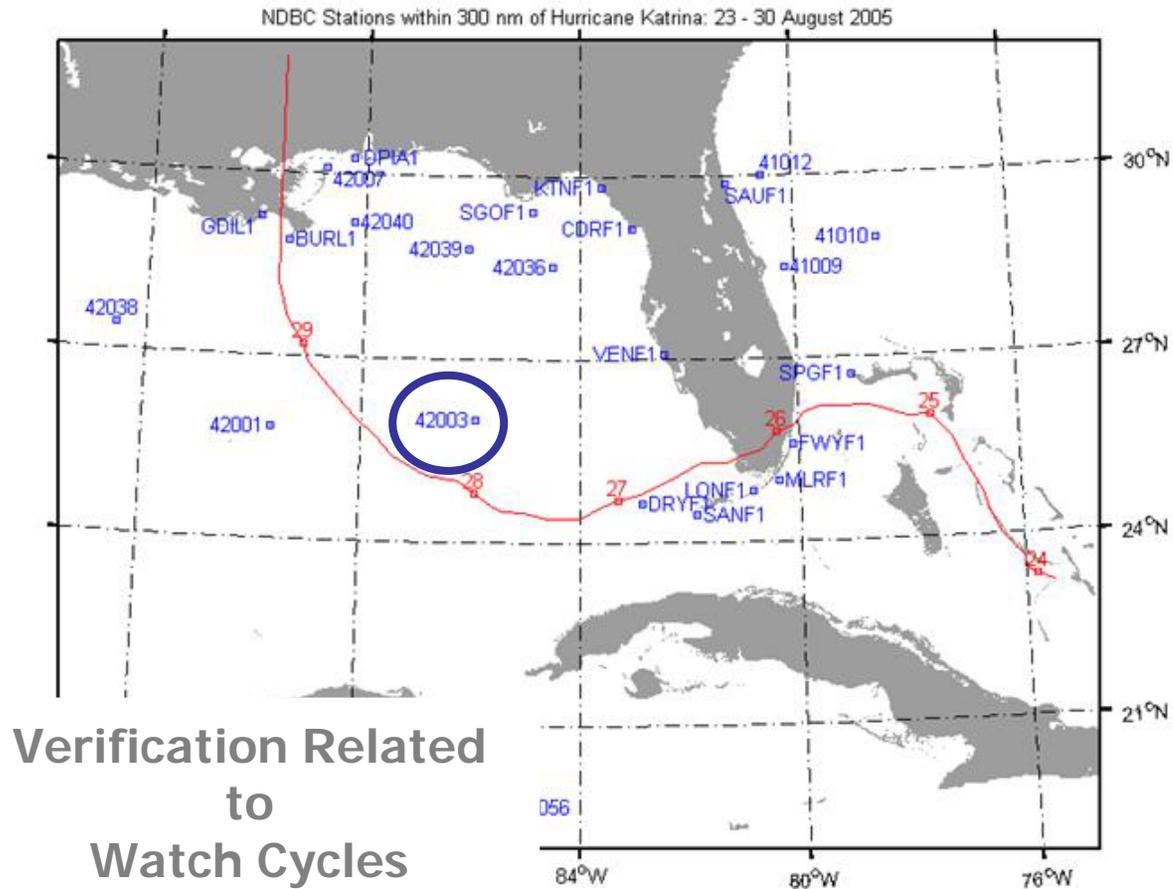
Operational Forecasting: Product

Maximum SWH over Forecast Cycle (August 25 to 30, 2005)

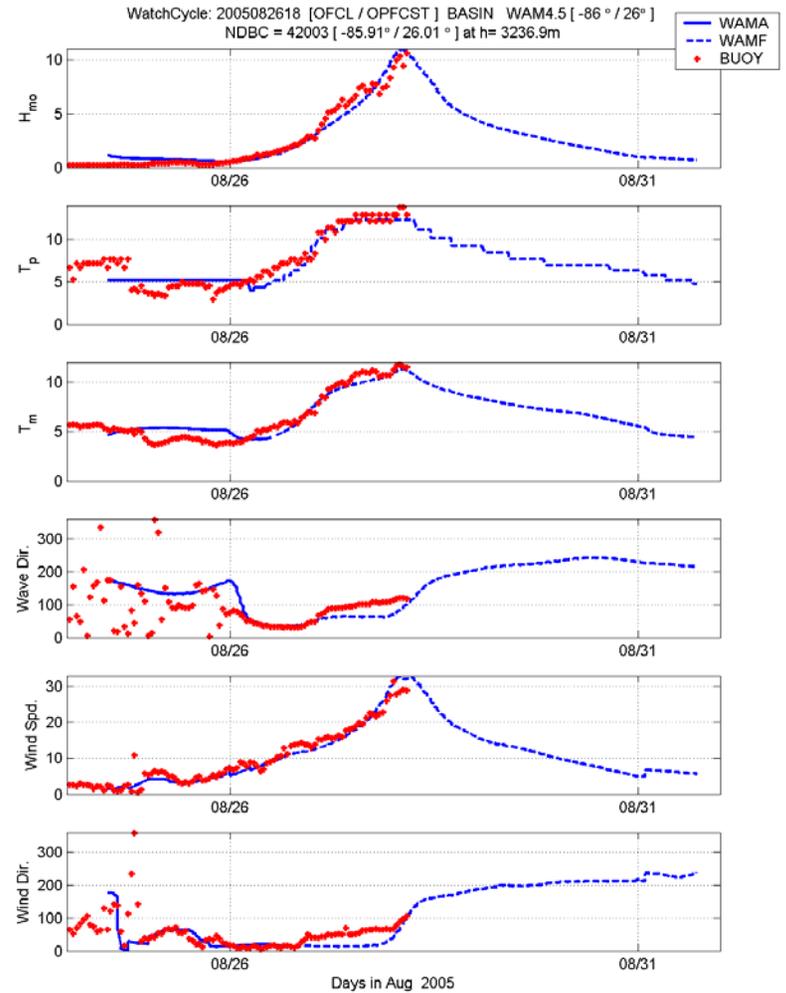
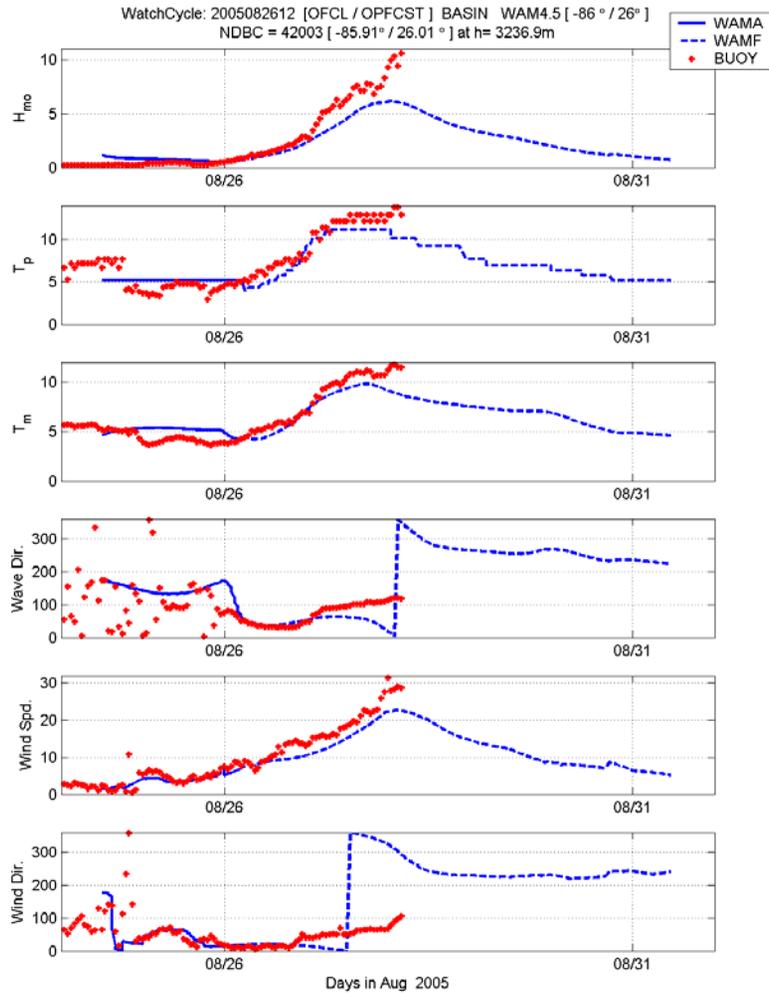
WAM OFCL Basin (Res 0.2): MAXIMUM H_{mo} WATCH CYCLE: 2005082912



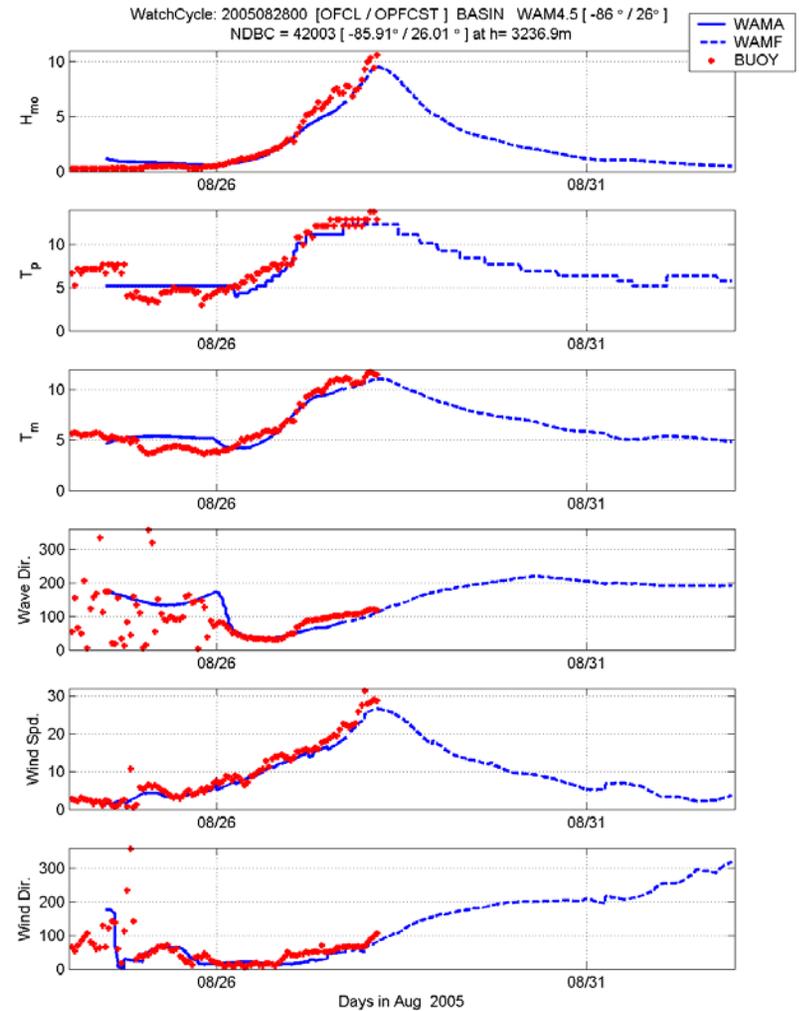
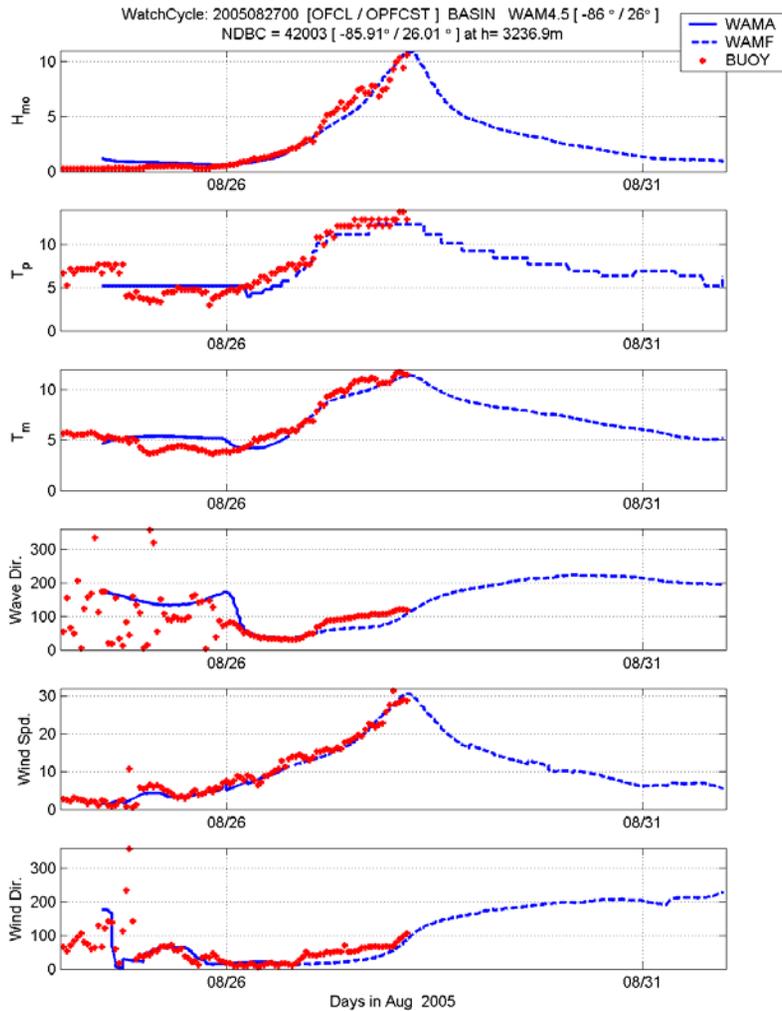
Operational Forecasting: Verification



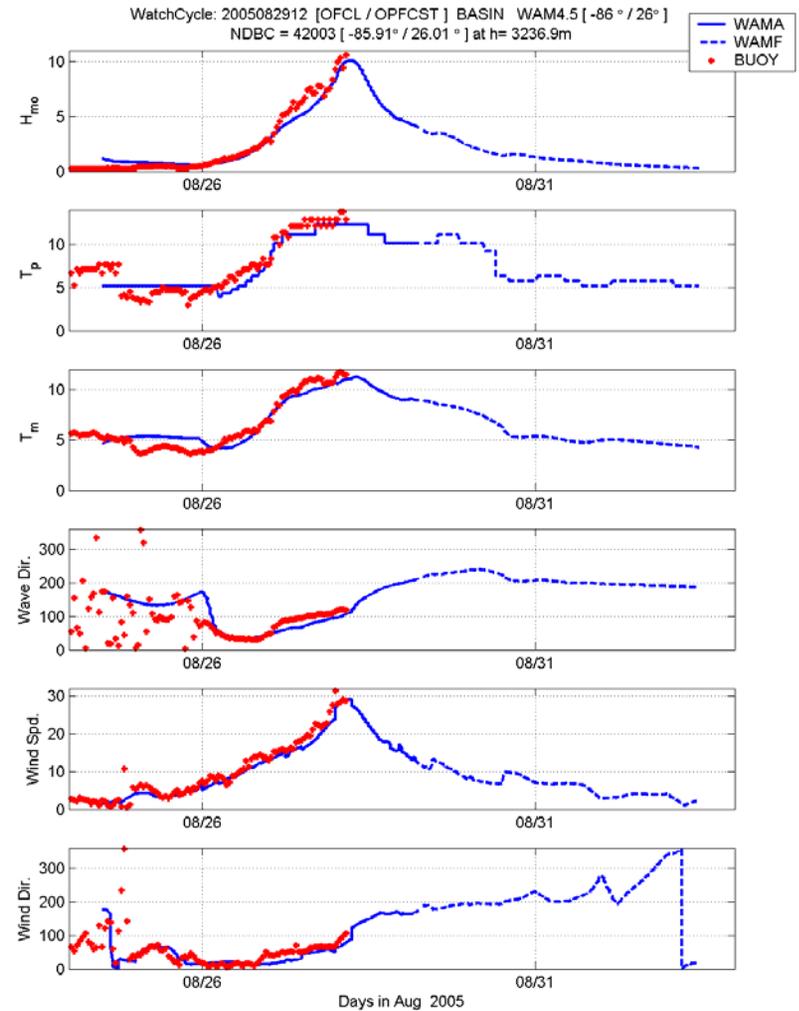
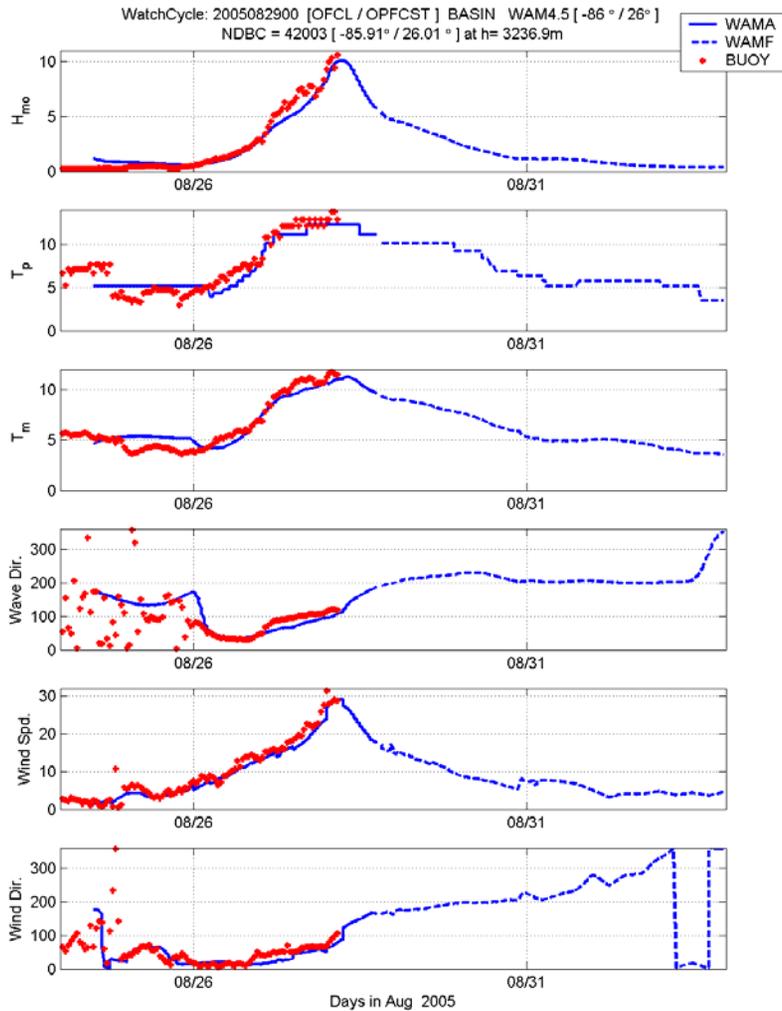
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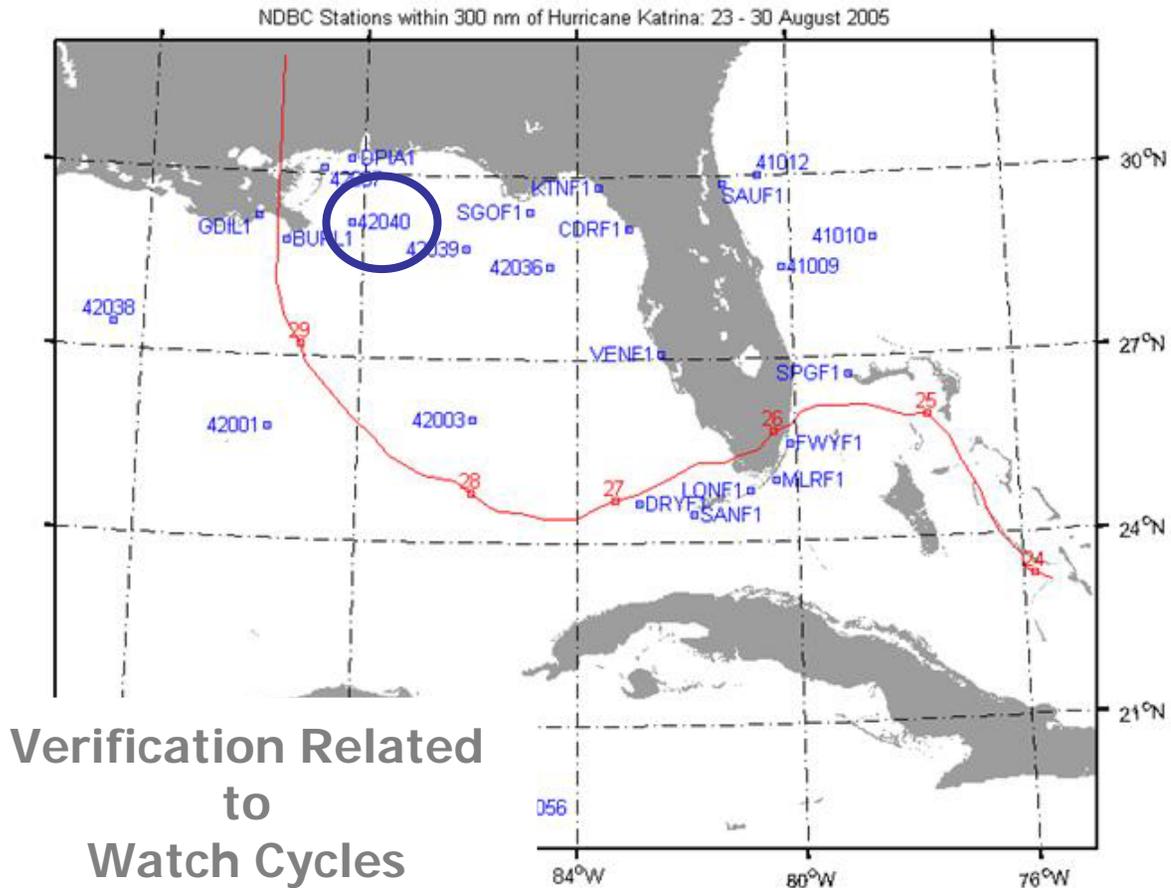
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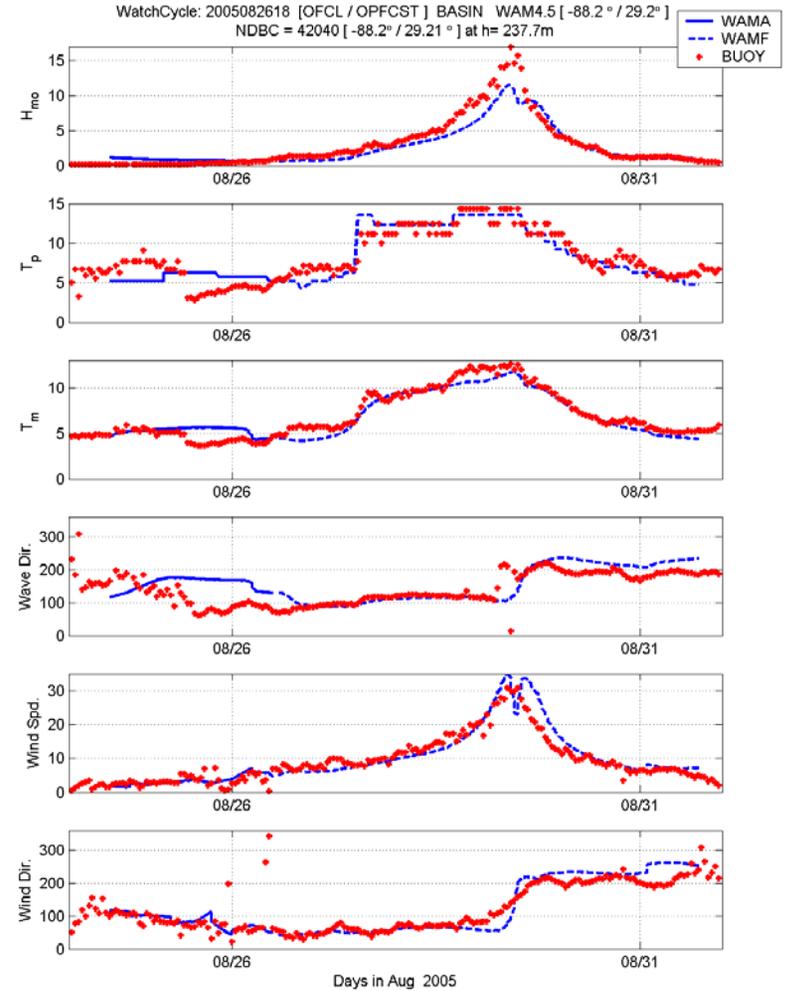
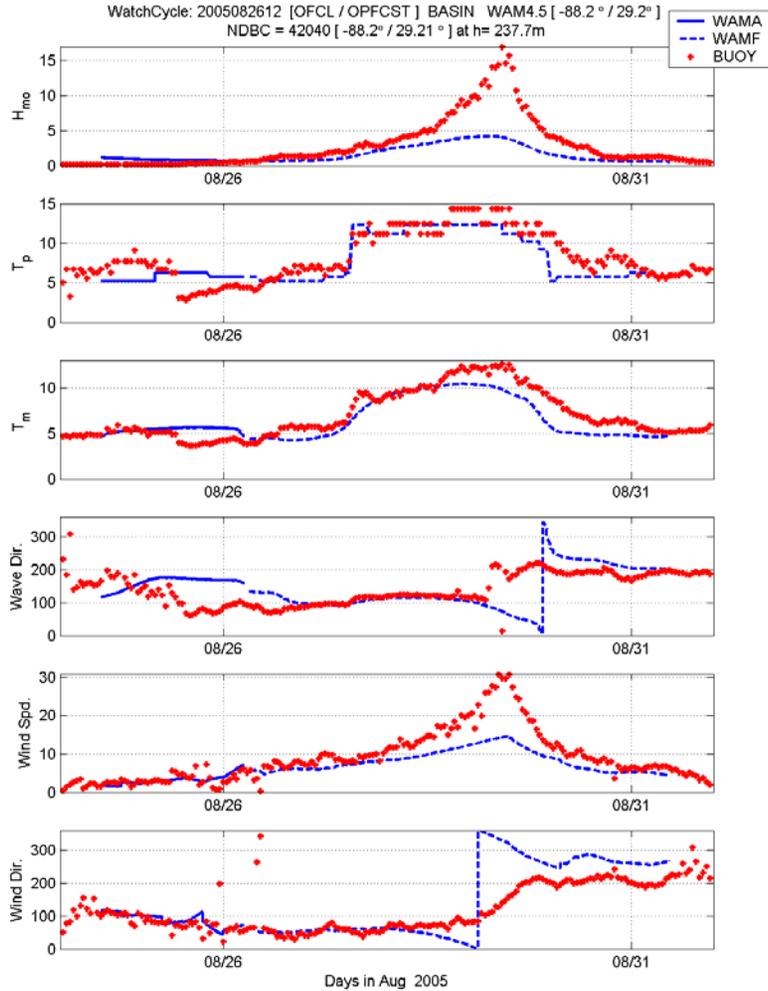
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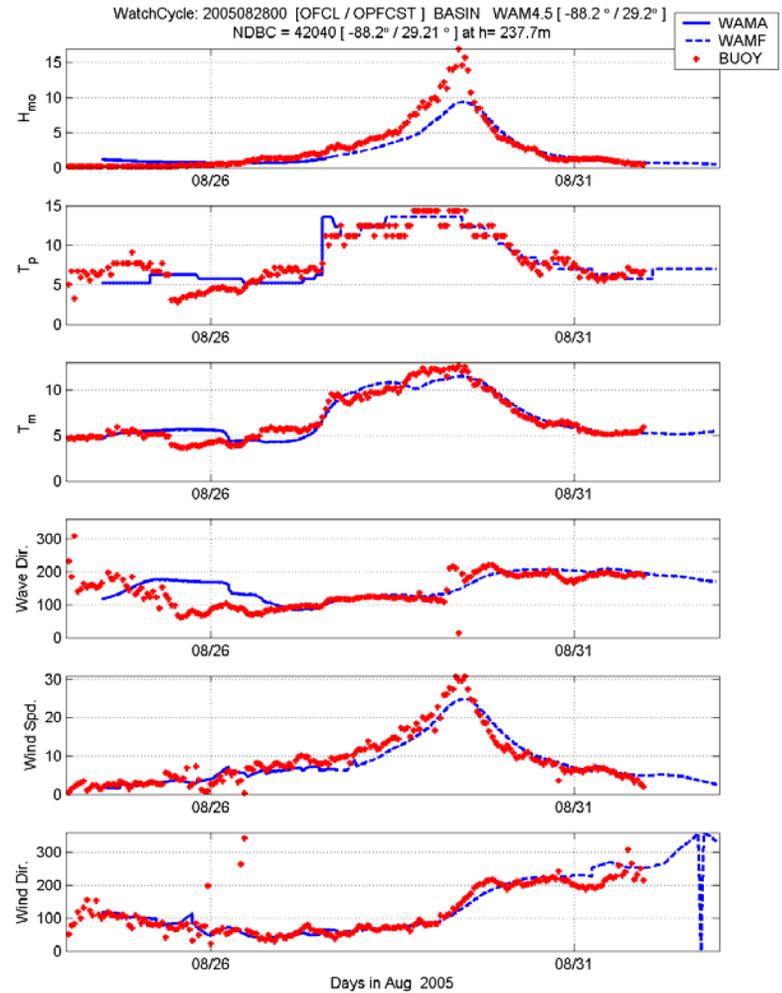
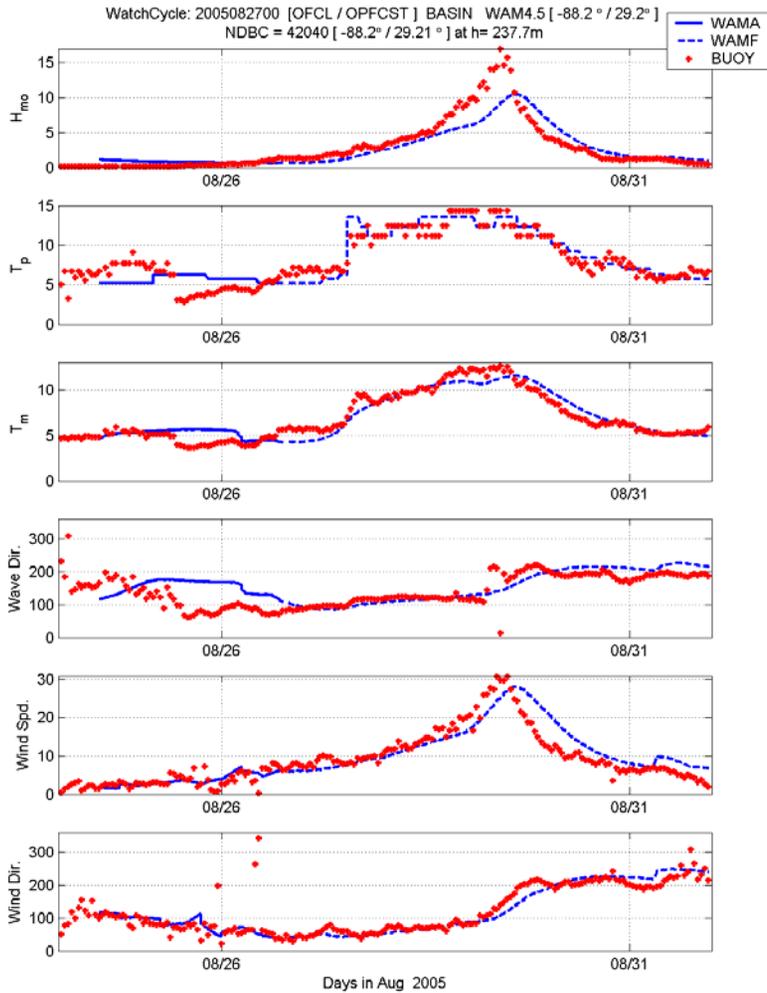
Operational Forecasting: Verification



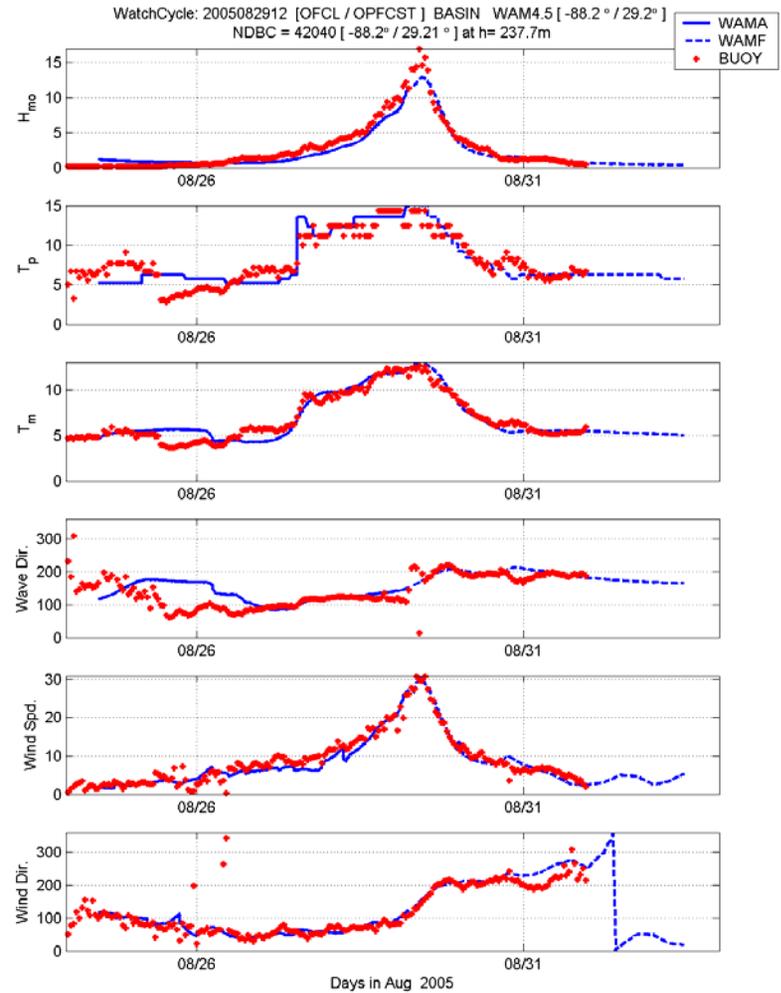
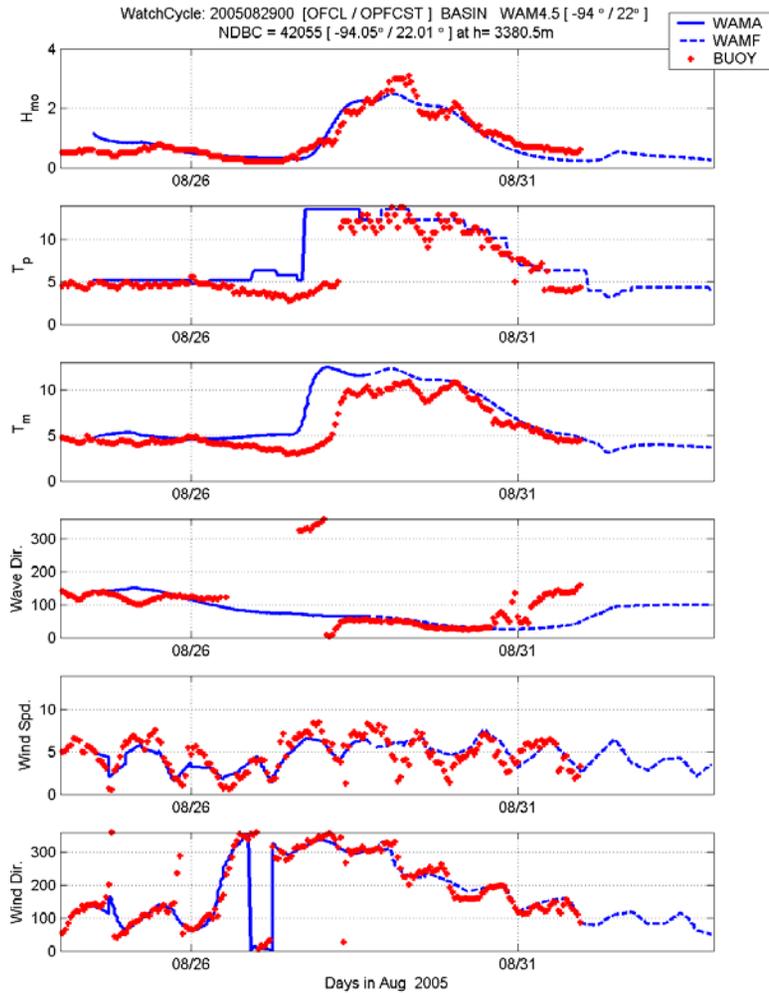
Operational Forecasting: Verification



Operational Forecasting: Verification



Operational Forecasting: Verification



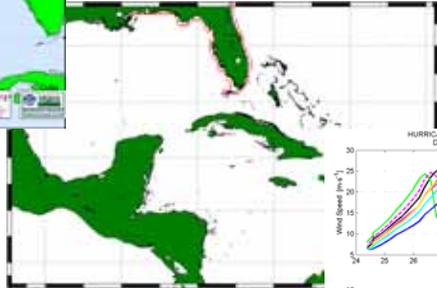
Probabilistic Output Products

For Five Day Forecast

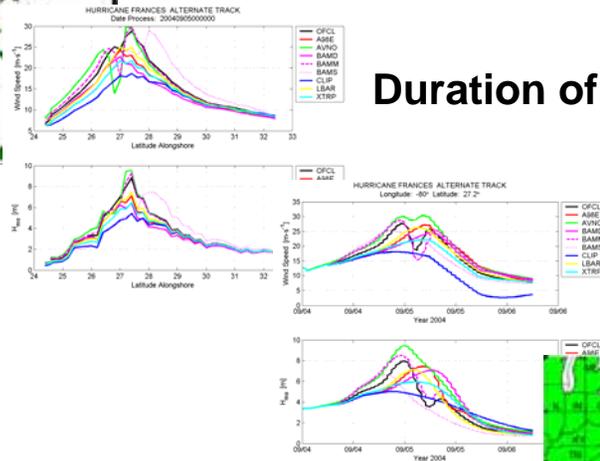
Track Ensemble



Output Locations near Landfall



Duration of Hurricane Winds & Waves



Spatial Extent of Hurricane Winds & Waves



Wave Height Exceedance Map

*Utilization by
Emergency Managers*

TIDES AND WAVES FOR THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM



Office of Hydrologic Development



Dr. Pedro Restrepo, NOAA/NWS/OHD

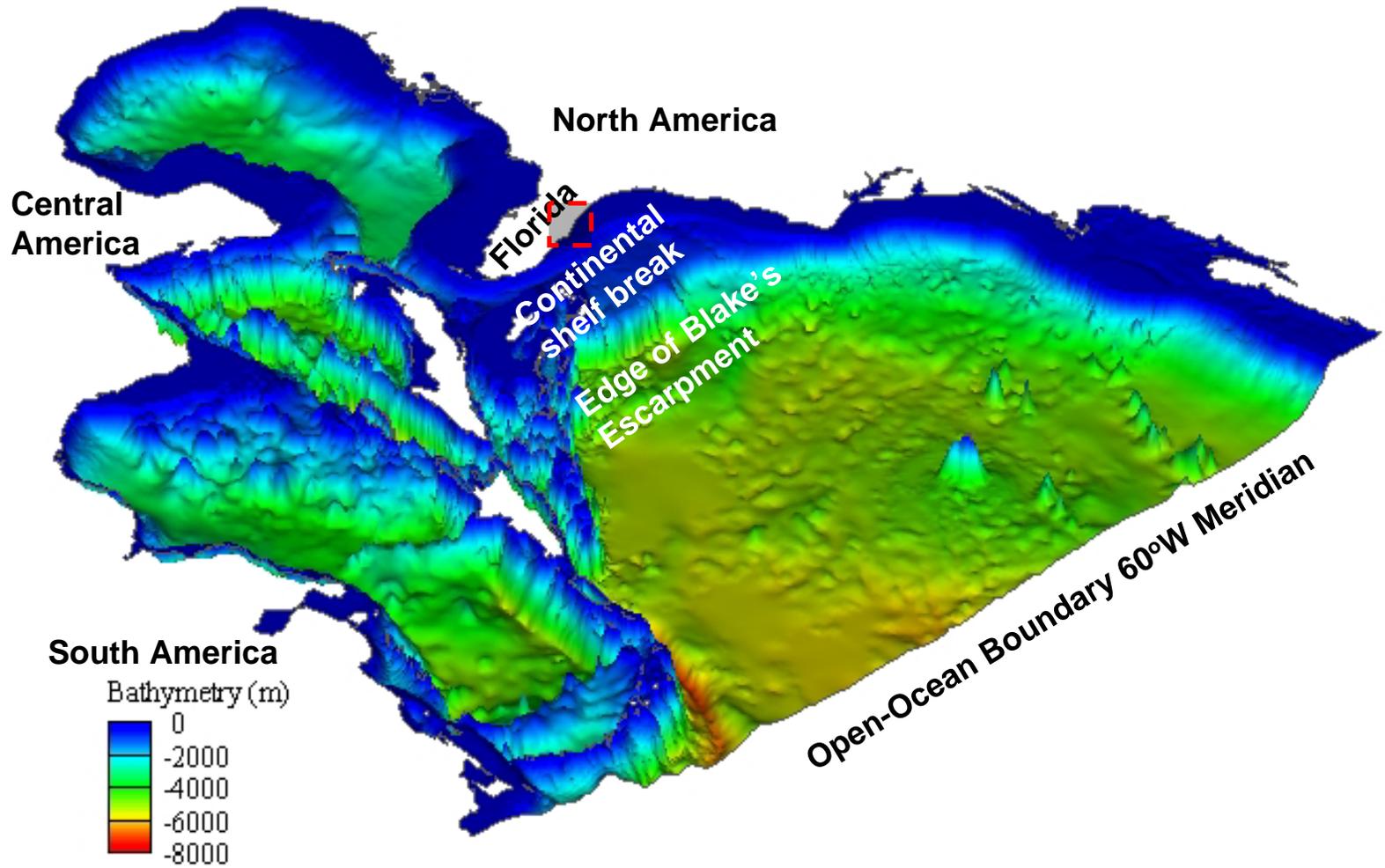
Ms. Reggina Cabrera, SERFC → NOAA/NWS/OHD

TIDES AND WAVES FOR THE NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM

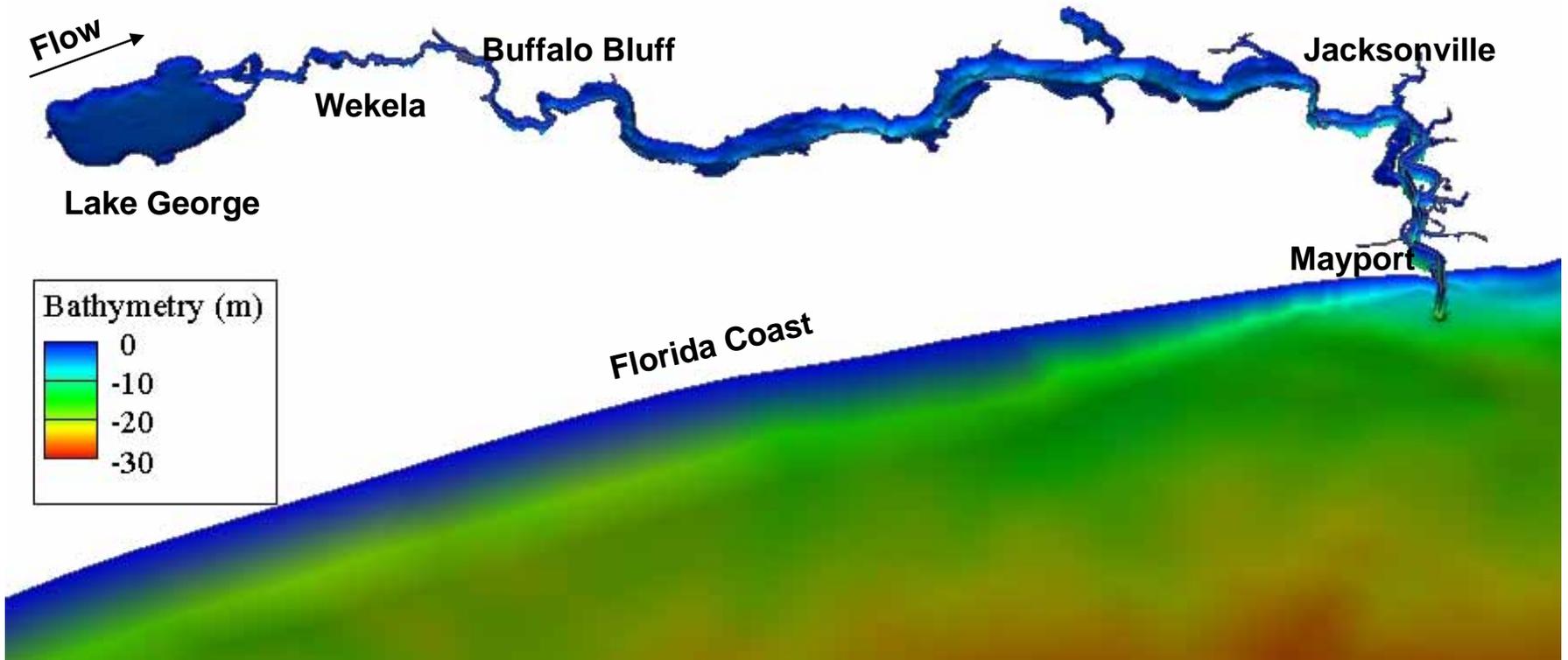
NOAA/NWS/OHD Project Goals

- Development of a 2D model for the St. Johns River to predict in real-time flow, tides (astronomic and meteorologic)
 - i. Develop the model and examine test cases
 - ii. Examine uni-coupling model of short and long wave models
 - iii. Fully couple the short and long wave models

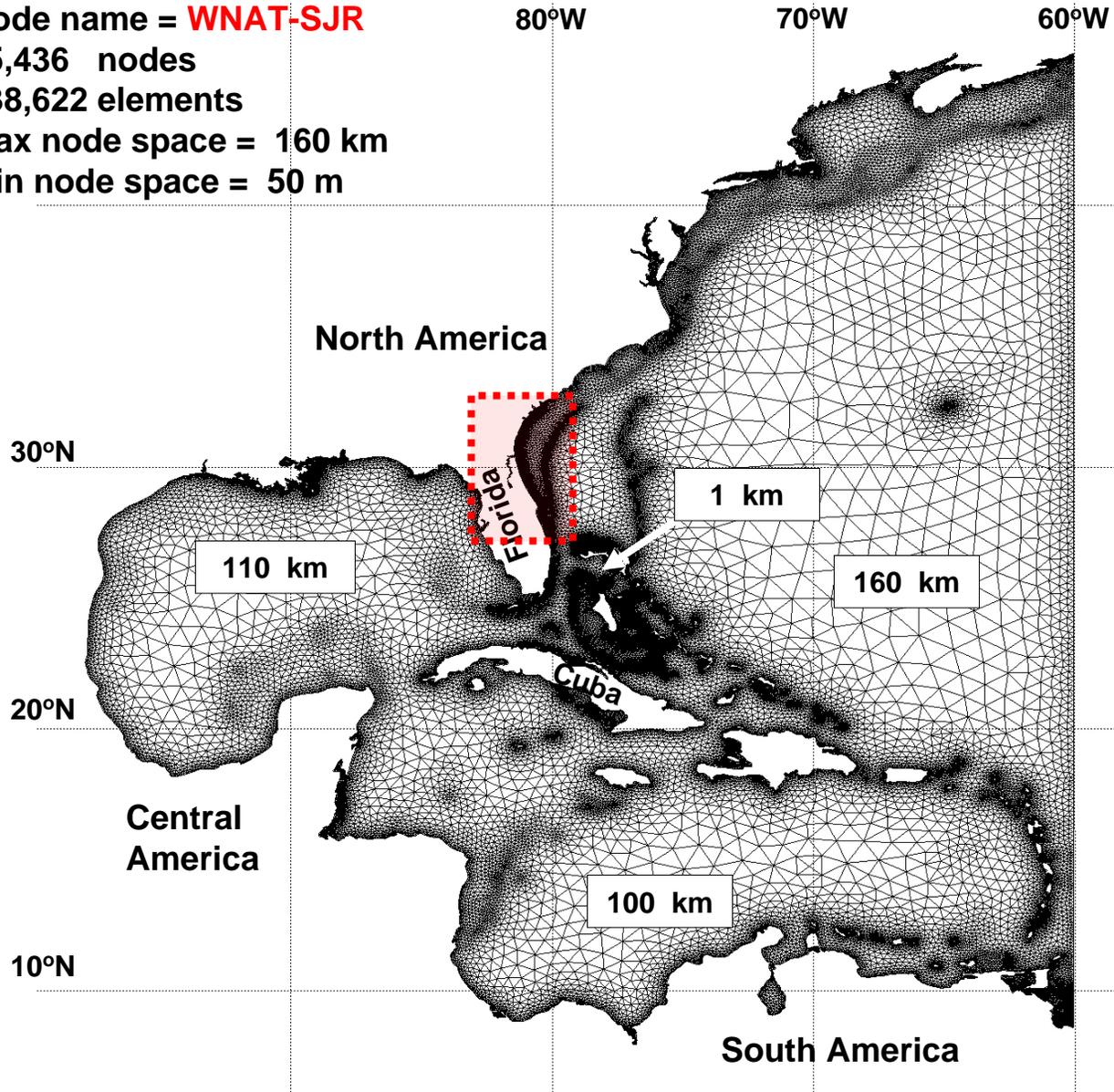
Western North Atlantic Tidal (WNAT) Model Domain

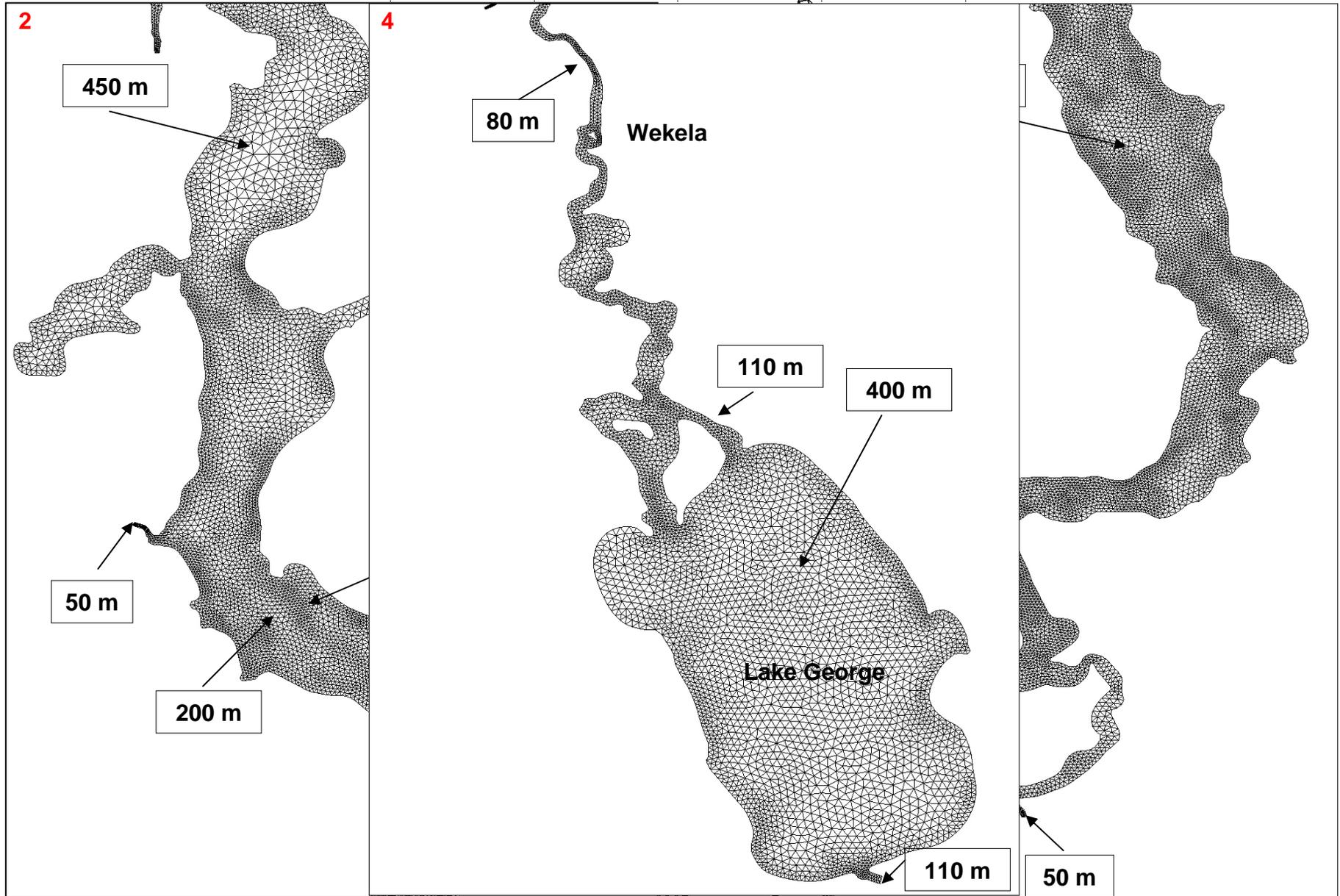


St. Johns River Region

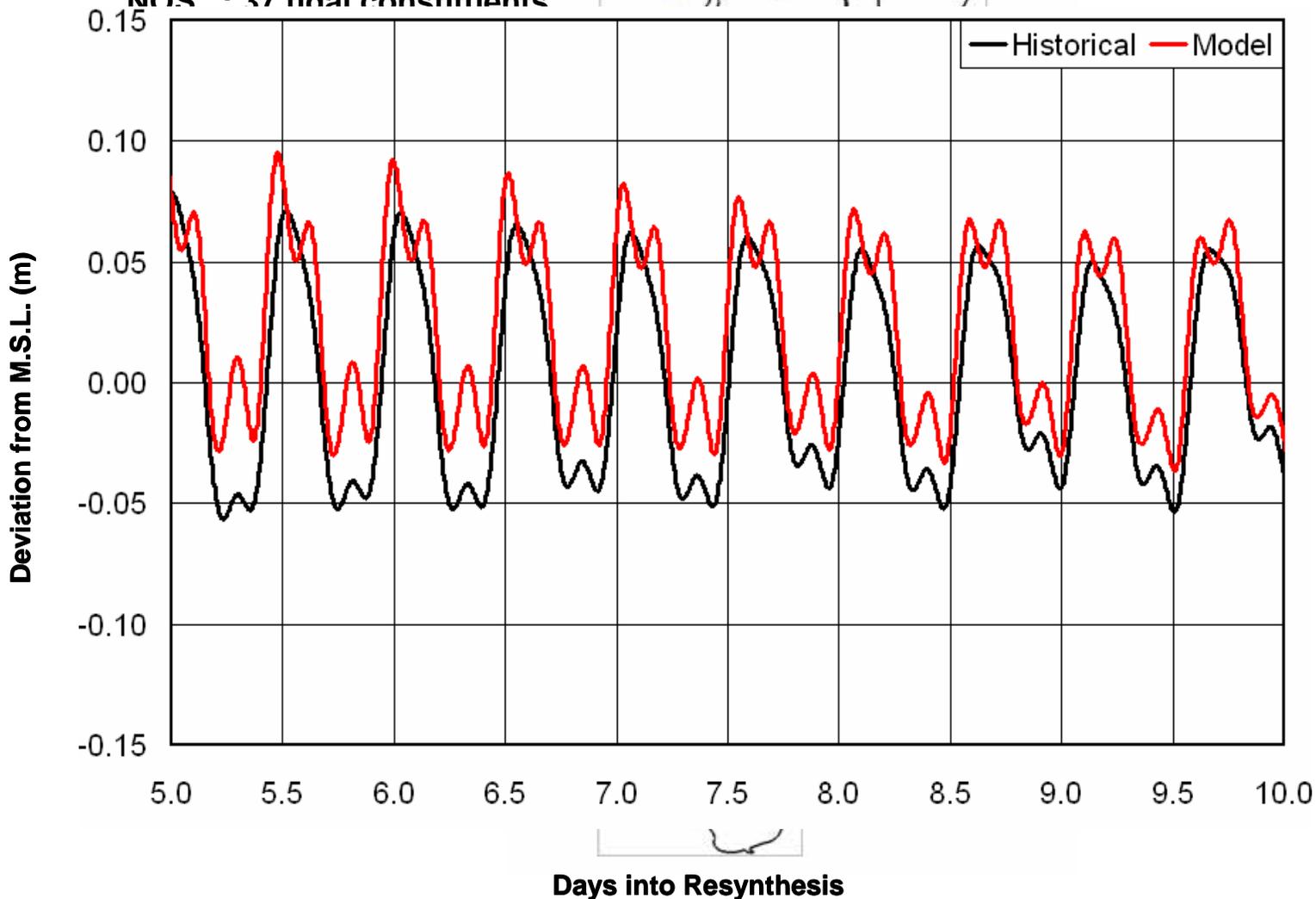


Code name = **WNAT-SJR**
75,436 nodes
138,622 elements
Max node space = 160 km
Min node space = 50 m

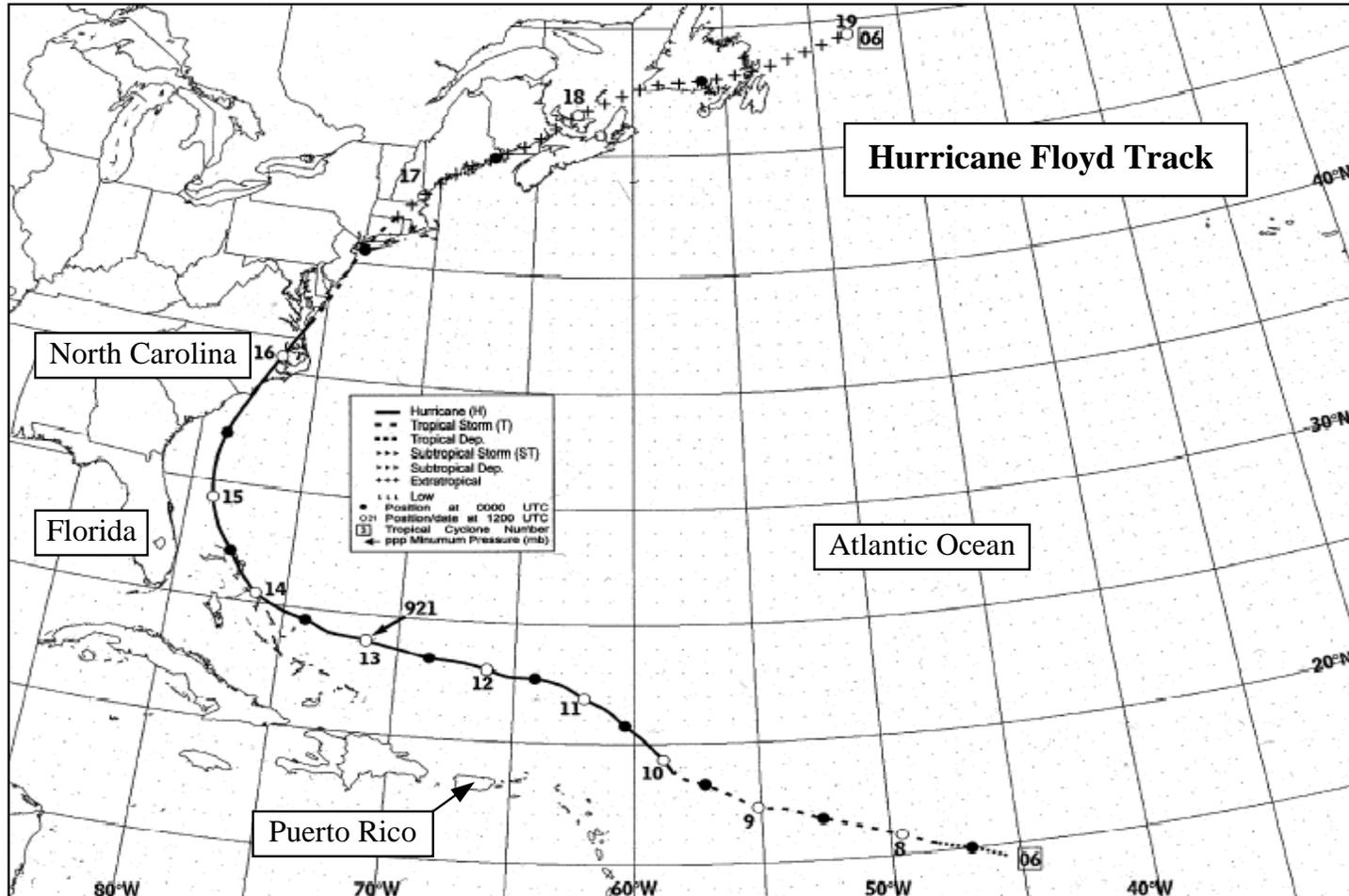




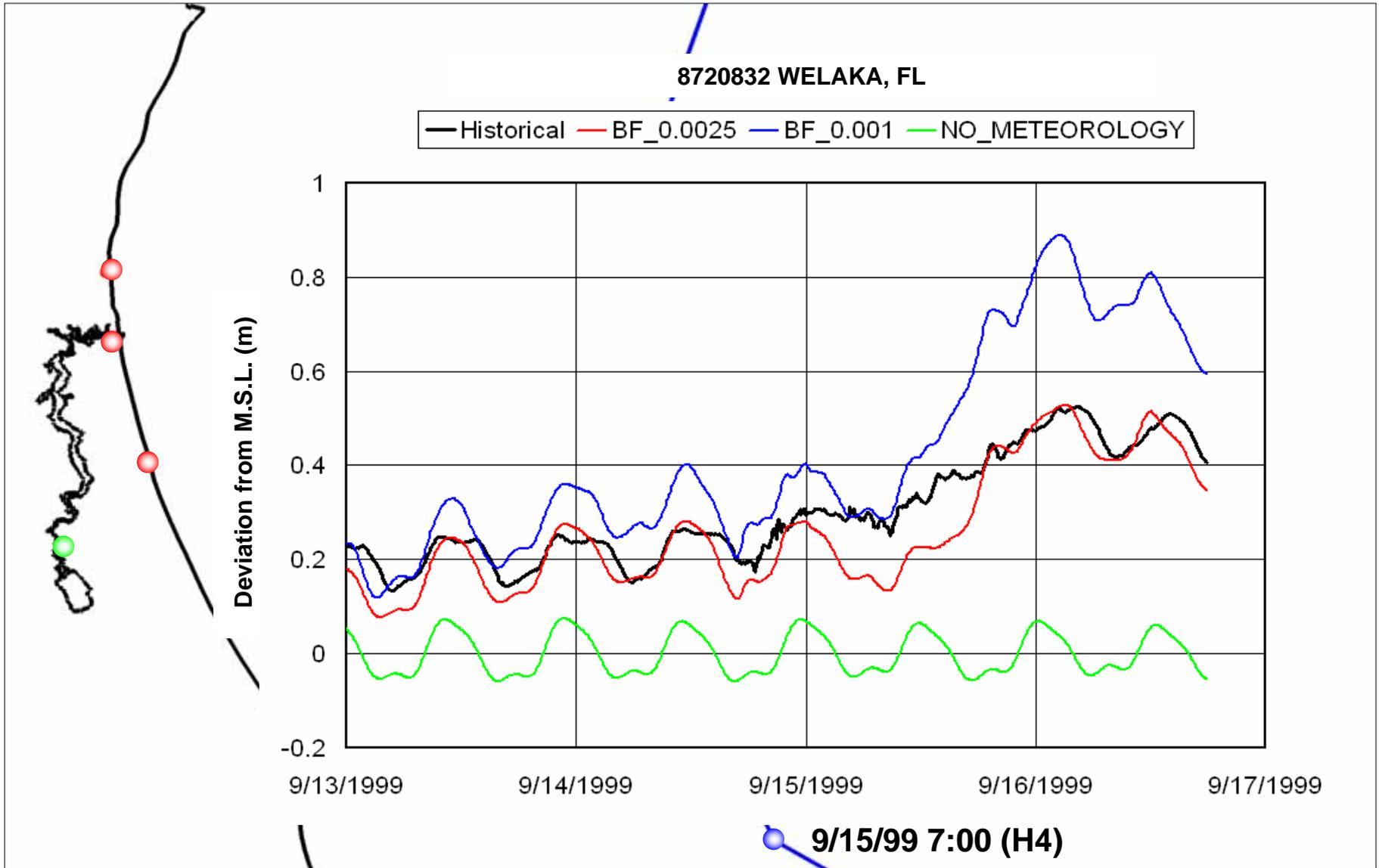
12 NOS Tidal Stations
in St. Johns River
Harmonic Analysis
NOS - 37 tidal constituents



Hurricane Floyd



(NOAA, 1999)



Poster: Pseudo-Operational Forecast for the St. Johns River



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