

COASTAL ECOMORPHOLOGICAL REAL-TIME FORECASTING (CERF) SYSTEM

August 31, 2016



**THE WATER INSTITUTE
OF THE GULF™**



OUTLINE



Introduction

- Objectives



The Forecast System: CERF

- Overview
- Domain
- Model description
- Applications



Future Developments

- Migration to Client Server
- Extension of Capabilities and Domain



OBJECTIVES

- Develop a forecast system for Coastal Louisiana to:
 - Provide real-time forecast for
 - Water level
 - Salinity
 - Temperature
 - Support the management of existing restoration projects
 - e.g. Davis Pond and Caernarvon
 - Support the design of large scale monitoring programs
 - e.g. SWAMP





THE FORECAST SYSTEM: CERF



HOW DOES CERF WORK?

Import Data

Observed data and
Large scale forecasts

Delft-FEWS platform



Forecasting model

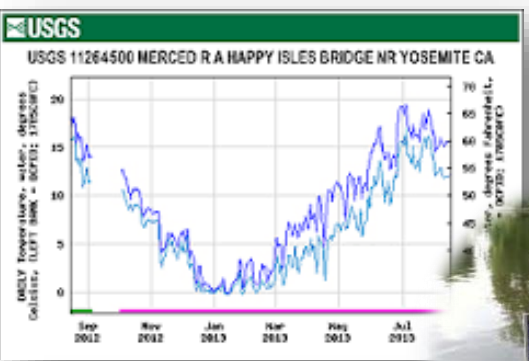
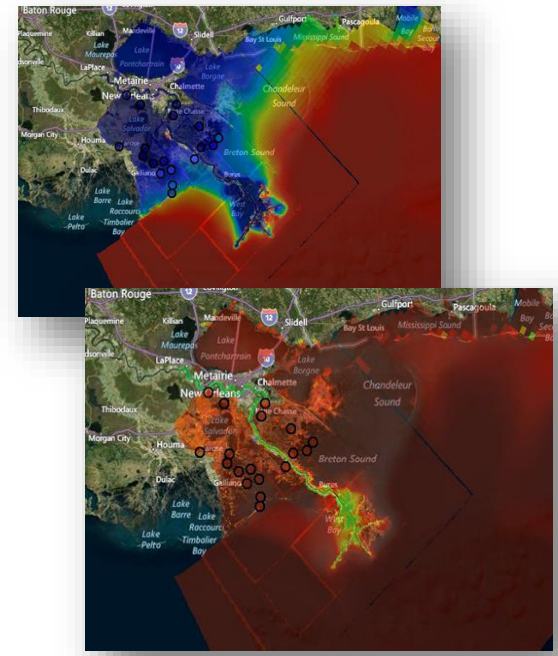
Delft3D



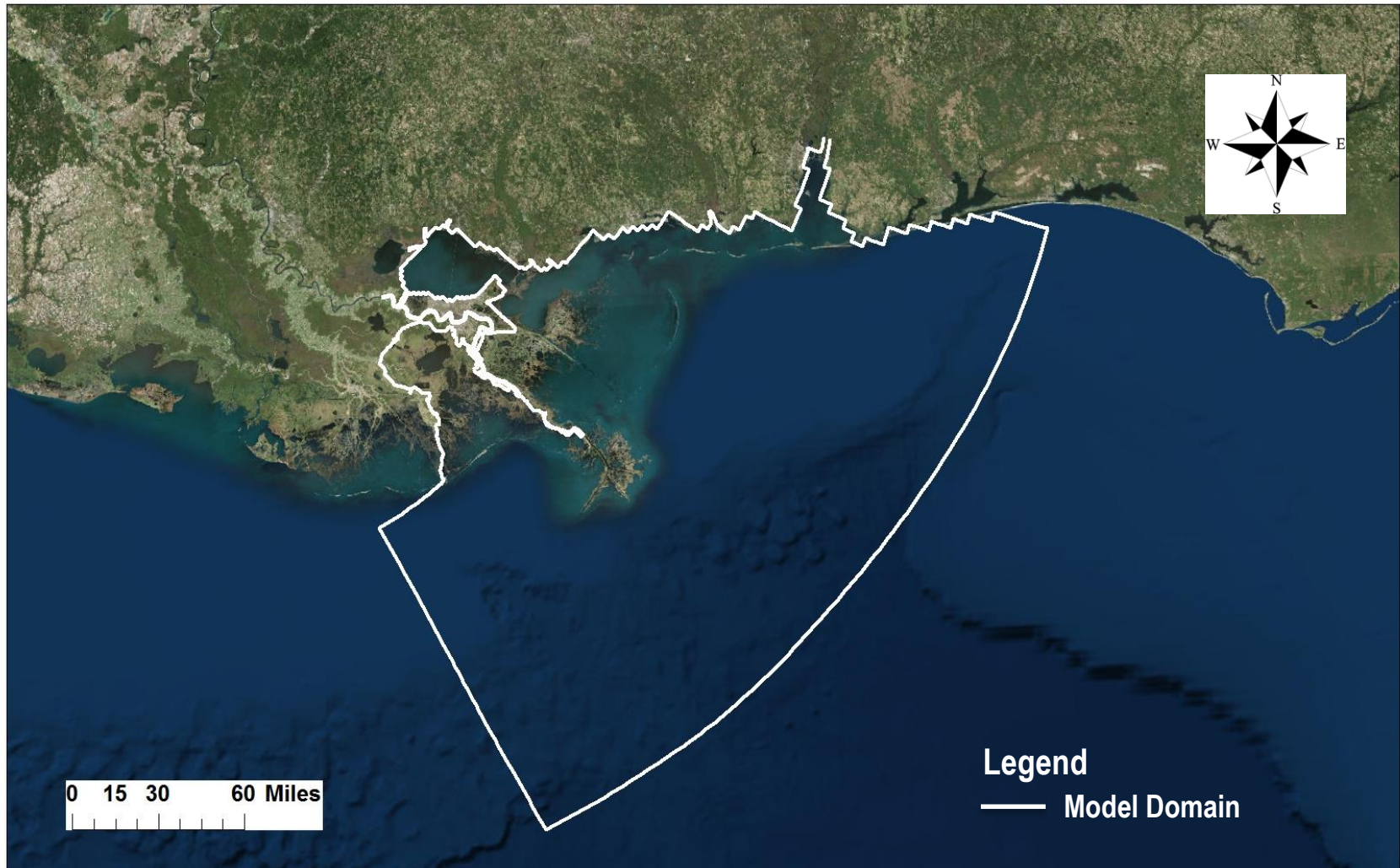
Model output

Maps and Timeseries

Delft-FEWS platform



THE FORECAST SYSTEM DOMAIN



CERF: MAP OVERVIEW

Coastal Eco-morphological Real-time Forecasting (CERF) System (Stand alone)

File Tools Options Help

1: Forecasts

- Measured
 - Import data from OFSDE
 - Import data from SHEF
 - RRS processed data
 - Import data USGS Coastal Sites
 - Import data from GCOOS
 - Import data from CRMS
- Forecast
 - Westbay
 - Super Regional
 - TO27
 - Boundaries
 - Structures
 - Output

2: Data Viewer

3: Plot Overview

- ACME
- ALMO
- ALTO
- ANGUILLA
- ANNAPOLIS
- ANTOINE RVR @ ANTOINE
- ARKABUTLA DAM
- ARKADELPHIA
- ARKANSAS CITY
- ARKANSAS/PENDELTON FERRY
- ARLINGTON
- ASHEVILLE
- AUGUSTA
- Alexandria
- B. Bartholomew/Betha

4: Plots

- River Discharge Adjusted Instantaneous
- Observed Tide Instantaneous
- Precipitation Areal Mean
- Precipitation Areal Mean (Forecast)
- Air Temperature Areal Mean
- Air Temperature Areal Mean (Forecast)

Map Overview

Map Plots Topology Modifiers

5: Logs

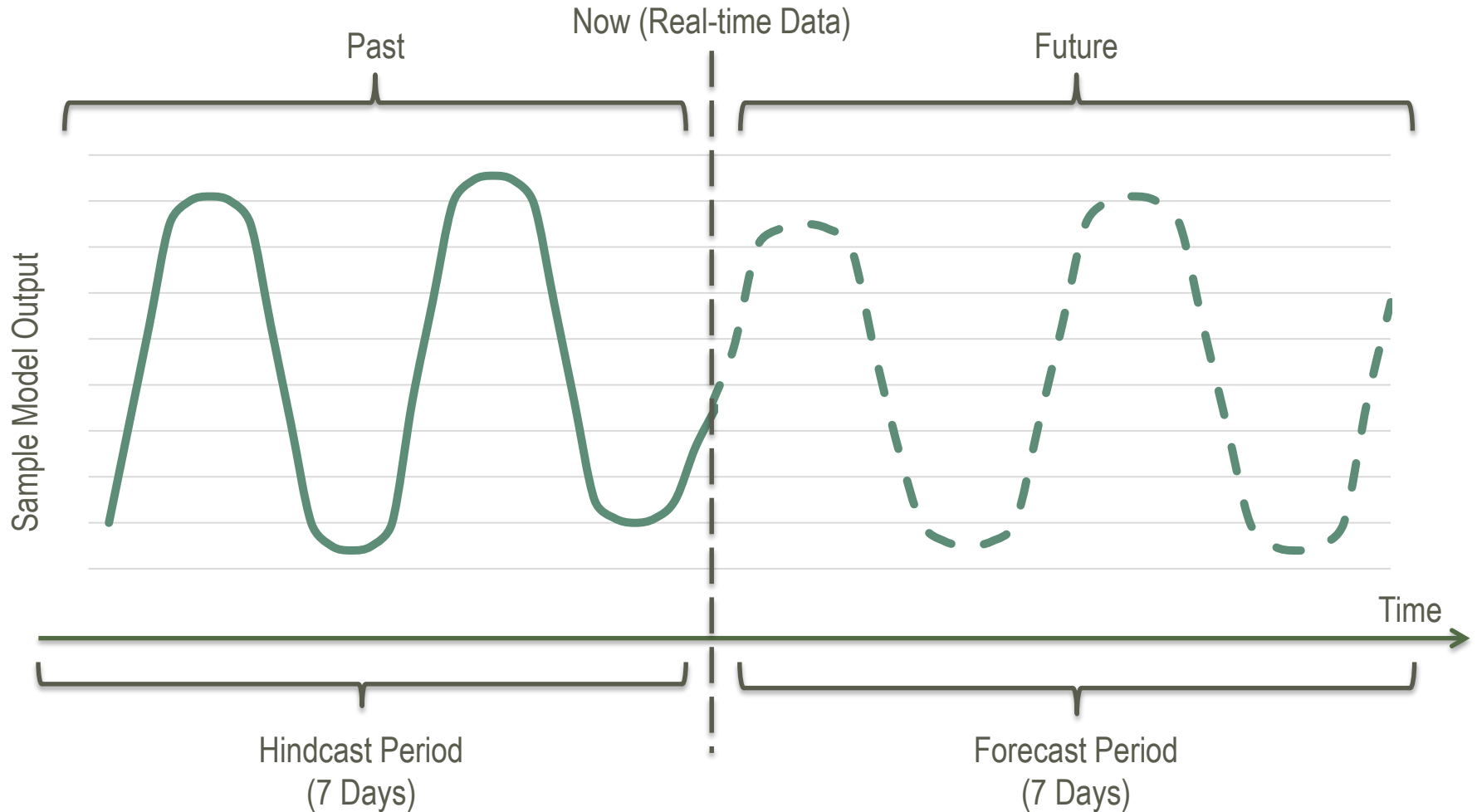
```

***** ERROR, PLEASE READ BELOW !!! *****
07-28-2016 16:45:17 INFO - Application.Startup.Finished: The application finished starting up. (5.8s)
07-28-2016 16:45:17 INFO - Gui.Initialized: Graphical user interface initialized.
07-28-2016 16:45:15 INFO - Started FewPiSvcImp on localhost: 8100
07-28-2016 16:45:15 WARN - User permissions not initialized! Permission EXP will be allowed
07-28-2016 16:45:15 WARN - User permissions not initialized! Permission EXP will be allowed
07-28-2016 16:45:14 INFO - Session.Created: Stand-alone system
07-28-2016 16:45:14 INFO - Config.Check.Finished: Check of configuration finished.
07-28-2016 16:45:14 INFO - Configuration.Available: Configuration available in local filesystem.
07-28-2016 16:45:14 INFO - Config.Check.Finished: Check of configuration started.
  
```

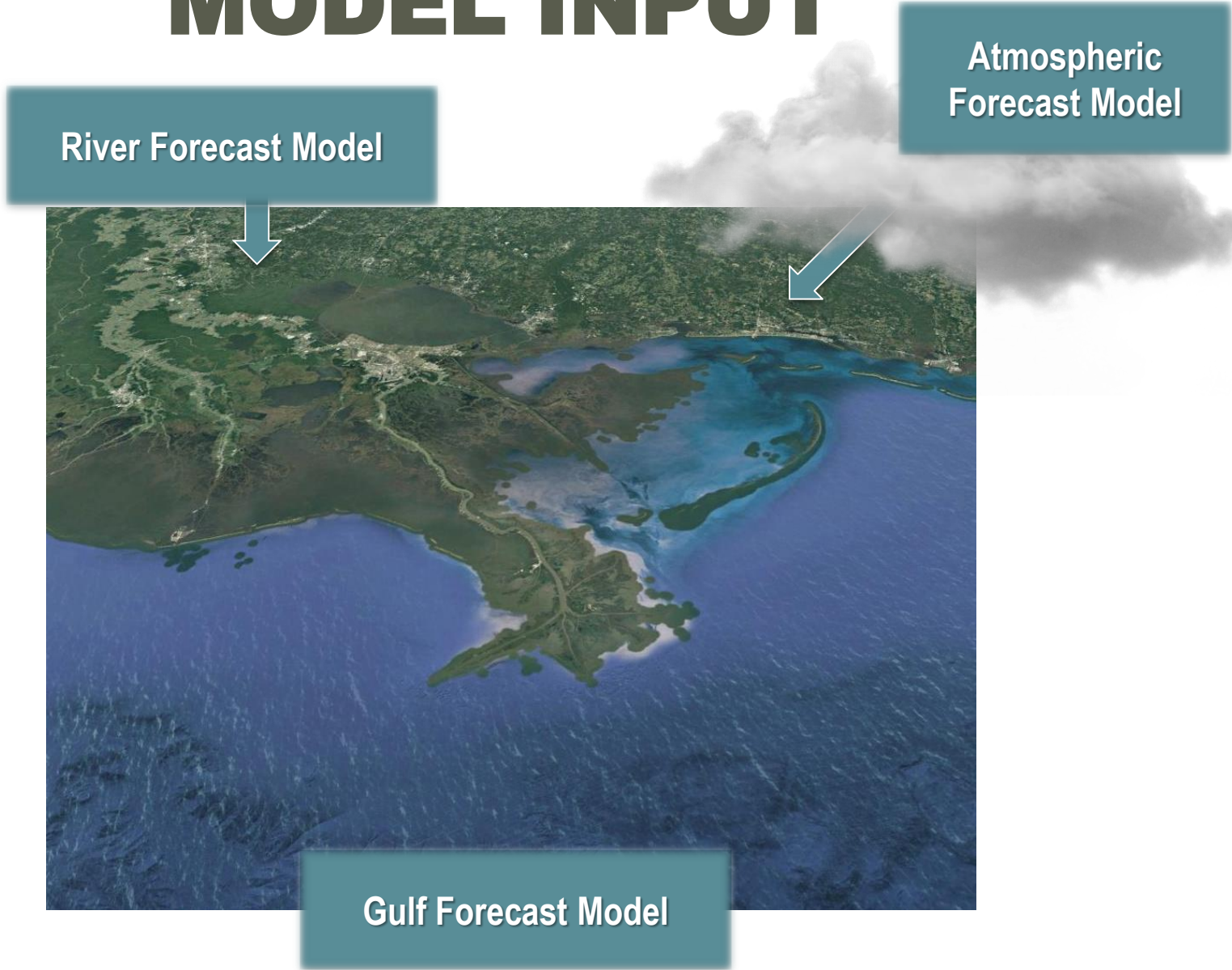
6: Logs | 9: Run Info | 7: Forecaster notes

Francesca Messina | Current system time: 07-26-2016 00:00 GMT | 16:48:06 GMT | 11:48:06 CDT | Stand alone | -91.986 , 29.858 | 0.0 MB/s | 150 MB

FORECASTING PERIOD

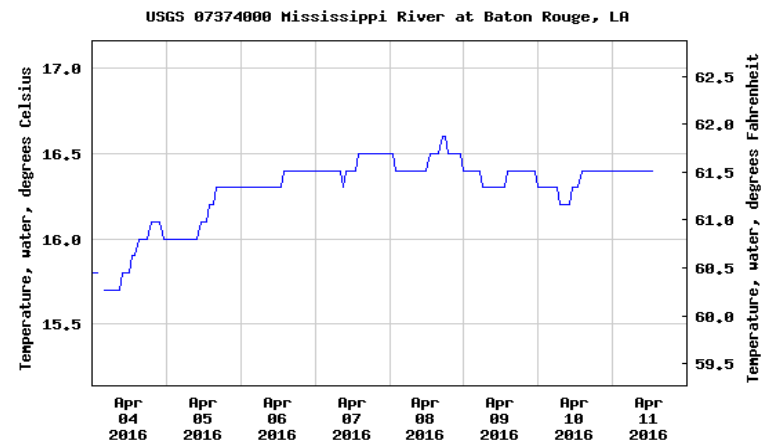
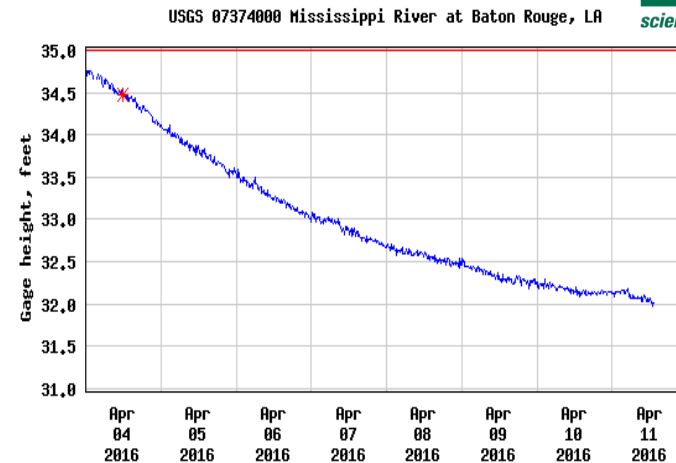


MODEL INPUT



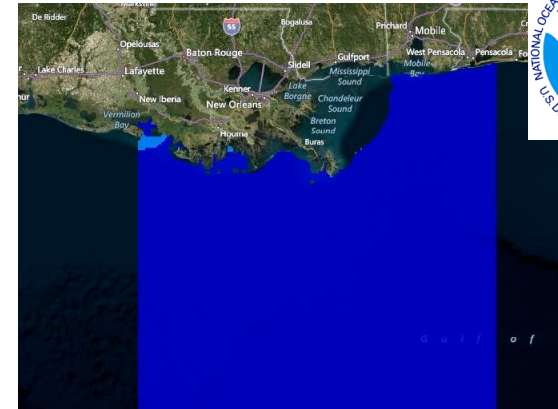
MODEL INPUT

- Boundary Conditions
 - River
 - Water inflow
 - Hindcast: USGS and USACE data
 - Forecast: NOAA (National Weather Service) forecast
 - Temperature
 - Hindcast: USGS data
 - Forecast: USGS data extrapolation

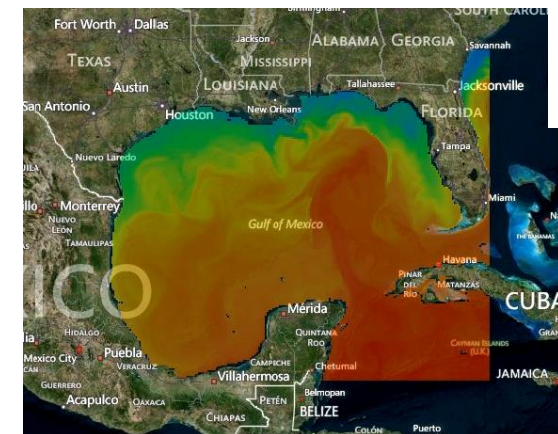


MODEL INPUT

- Boundary Conditions
 - Open Water
 - Tide
 - Hindcast and Forecast: Extratropical Surge and Tide Operational Forecast (ESTOFS)
 - Salinity
 - Hindcast and Forecast: Hybrid Coordinate Ocean Model (HYCOM)
 - Temperature
 - Hindcast and Forecast: Hybrid Coordinate Ocean Model (HYCOM)



Surge

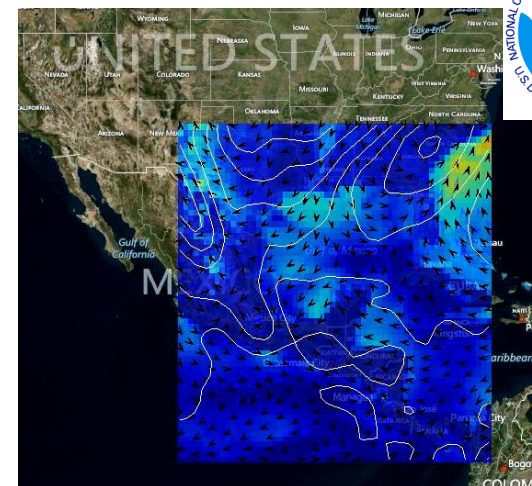


Temperature

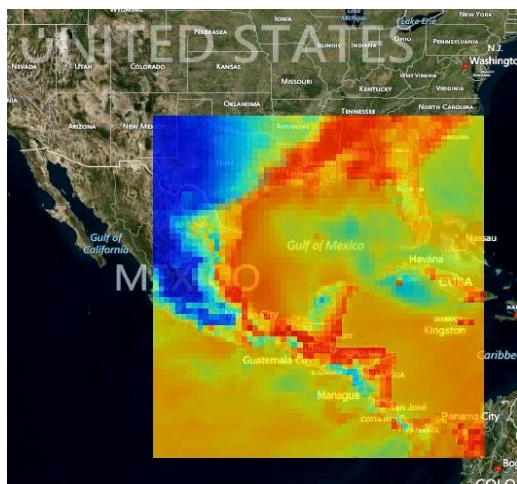


MODEL INPUT

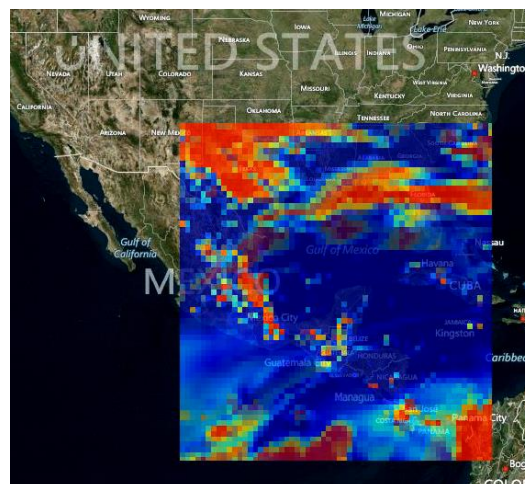
- Boundary Conditions
 - Atmospheric Forcing
 - Hindcast and Forecast:
 - Wind: Global Forecast System (GFS)
 - P&ET: Global Forecast System (GFS)
 - Temperature (heat flux, CC, RH, etc.): Global Forecast System (GFS)



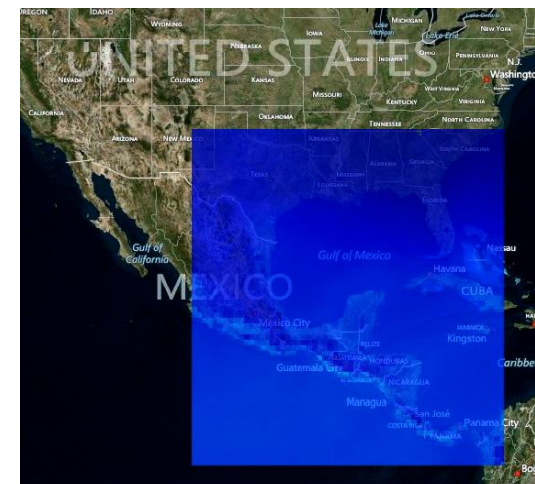
Wind



Relative humidity



Cloud coverage

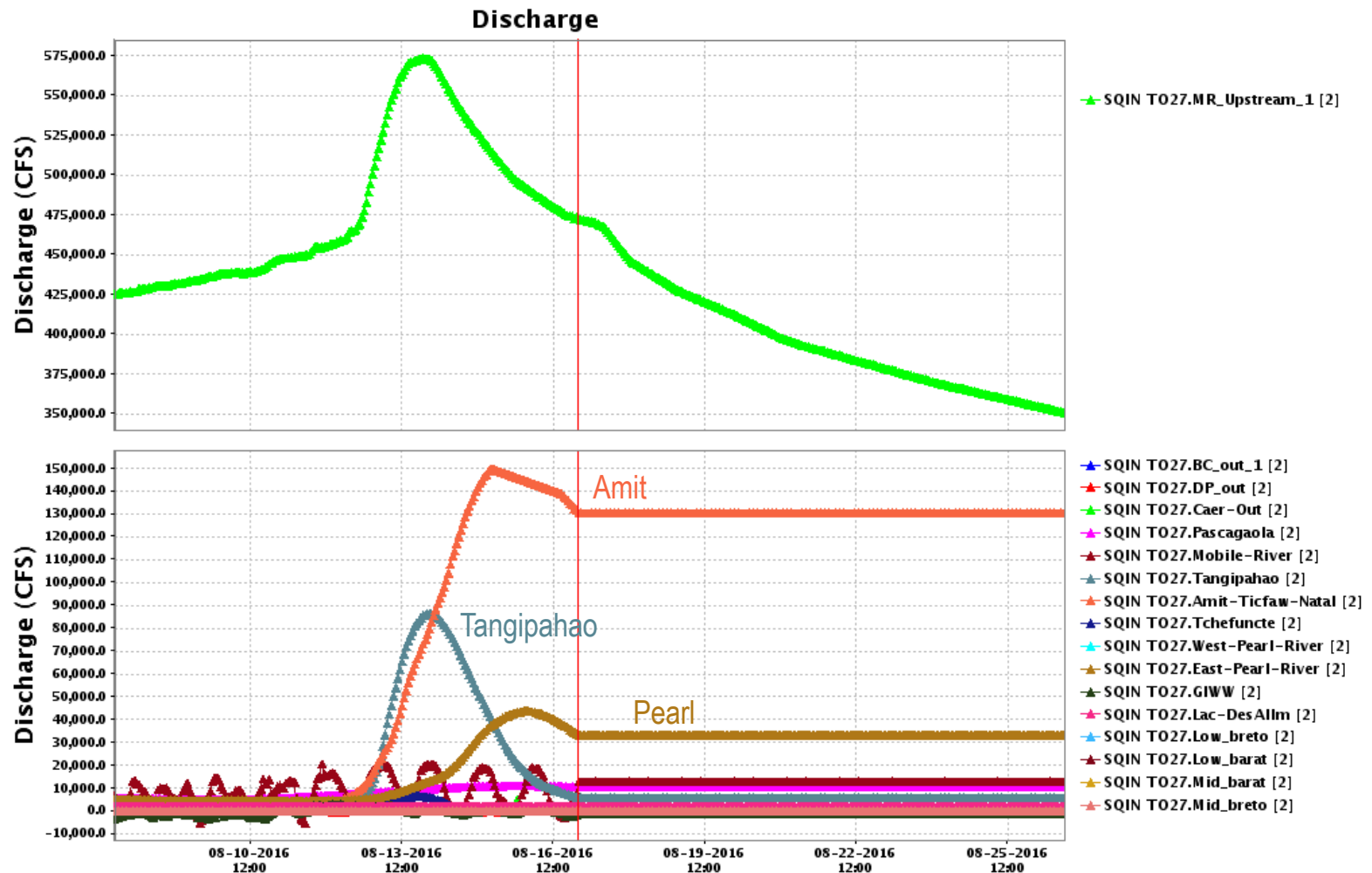


Air Temperature



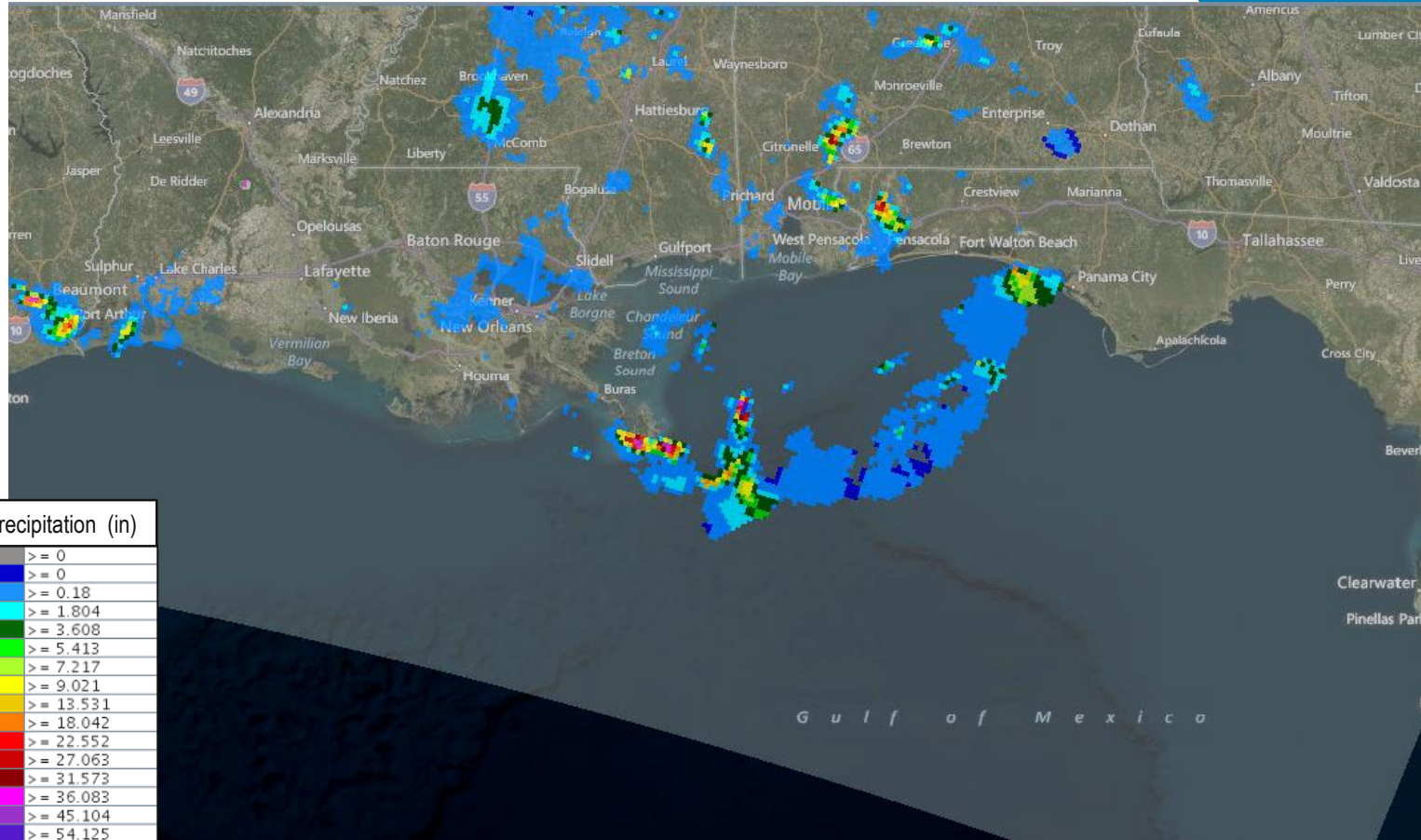
MODEL INPUT

DISCHARGE DURING THE RECENT FLOOD EVENT



MODEL INPUT PRECIPITATION DURING THE RECENT FLOOD EVENT

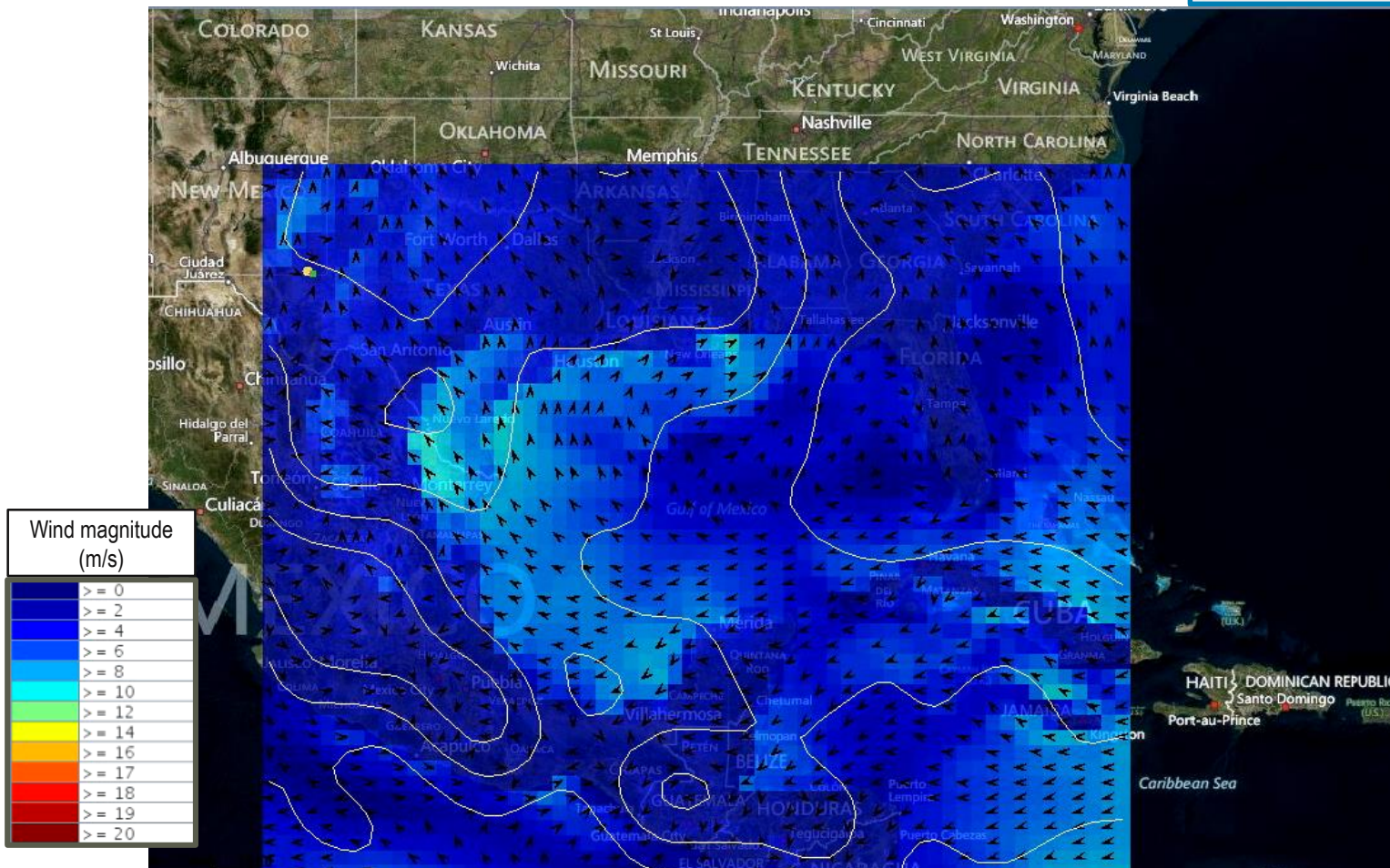
08-10-2016 02:00:00 GM



MODEL INPUT

WIND DURING THE RECENT FLOOD EVENT

08-12-2016 03:00:00 GM



CERF: MODEL OUTPUT

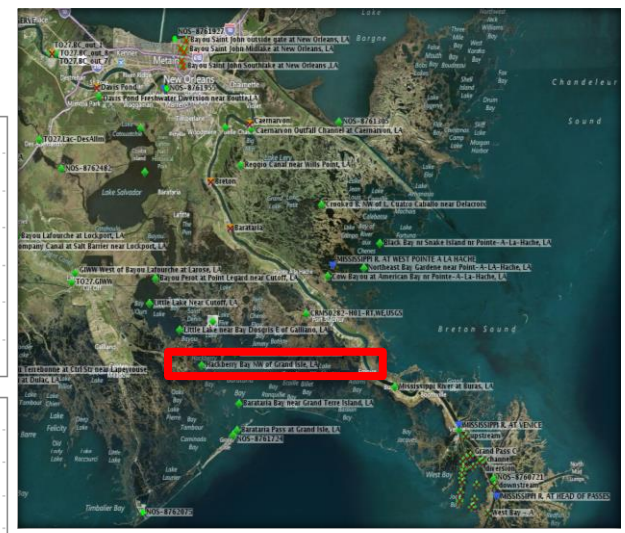
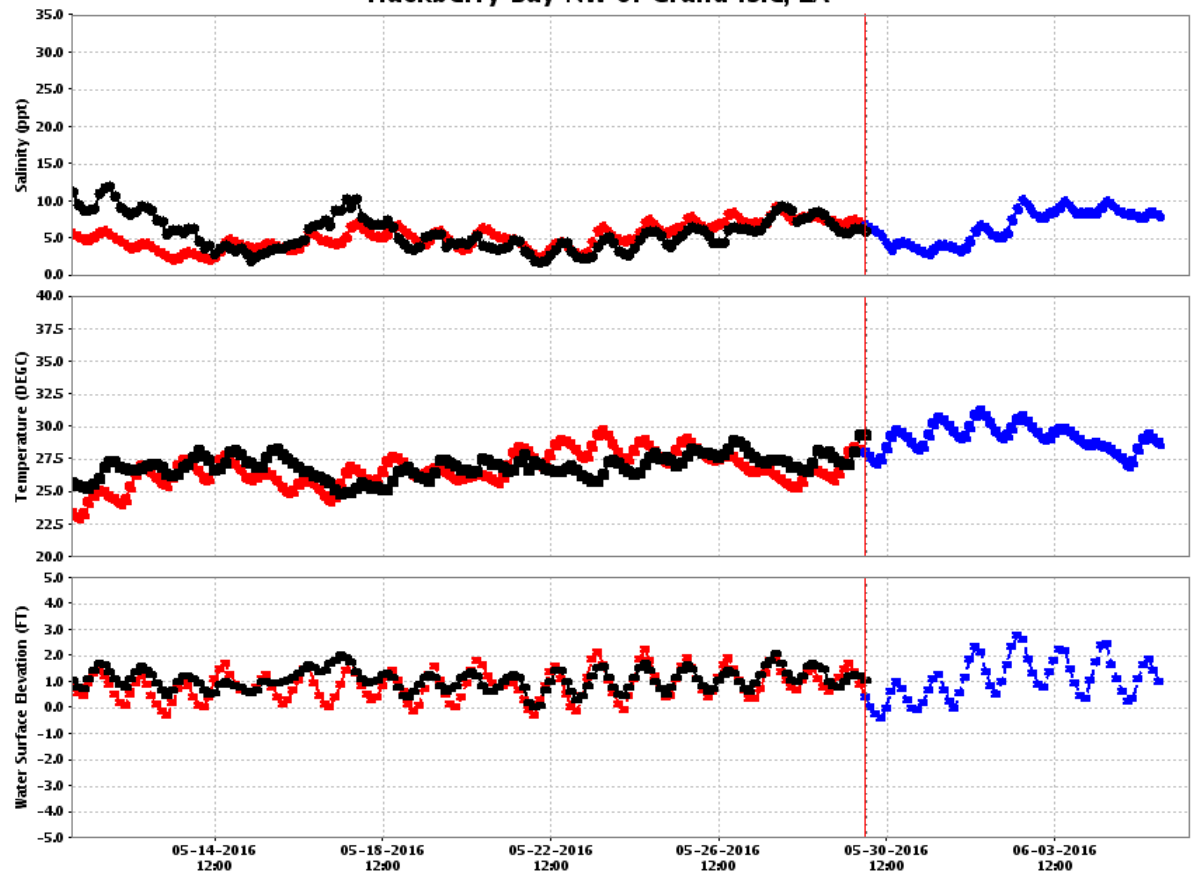
The screenshot displays the CERF software interface. At the top, the title bar reads '07-20-2016 12:00:00 GMT'. The main window is divided into several sections:

- Left Panel (Data Viewer):** Contains a tree view of data sources including 'CEGAPS', 'Measured', 'Forecast', and 'Gridded Data'. A legend below lists various parameters like 'River Discharge Observed', 'Salinity Parts P Thousand', and 'Temperature' with corresponding color scales.
- Center Panel (Map):** Shows a map of the Gulf of Mexico region with a color-coded overlay representing salinity. The overlay shows higher salinity (red/orange) in the open ocean and lower salinity (blue) near the coast. A scale bar at the bottom of the map indicates 0, 20, 40, 60, 80, 100 km.
- Bottom Panel (Toolbar):** Contains buttons for 'Plots', 'Topology', 'Modified', 'Spatial Data', 'Database Viewer', and 'Manual Forecast'. Two red boxes highlight the 'Plots' and 'Spatial Data' buttons.
- Bottom Panel (Logs):** Displays a log of system activities, including workflow completion and data store operations. The log shows the current time as 07-22-2016 20:34:25.

At the bottom of the screen, there is a navigation bar with buttons for '6: Logs', '9: Run Info', and '7: Forecaster notes'. The text 'Real Time Forecasting - CERF' is overlaid on the bottom left, and the number '16' is in the bottom right corner.

MODEL OUTPUT TIMESERIES

Hackberry Bay NW of Grand Isle, LA



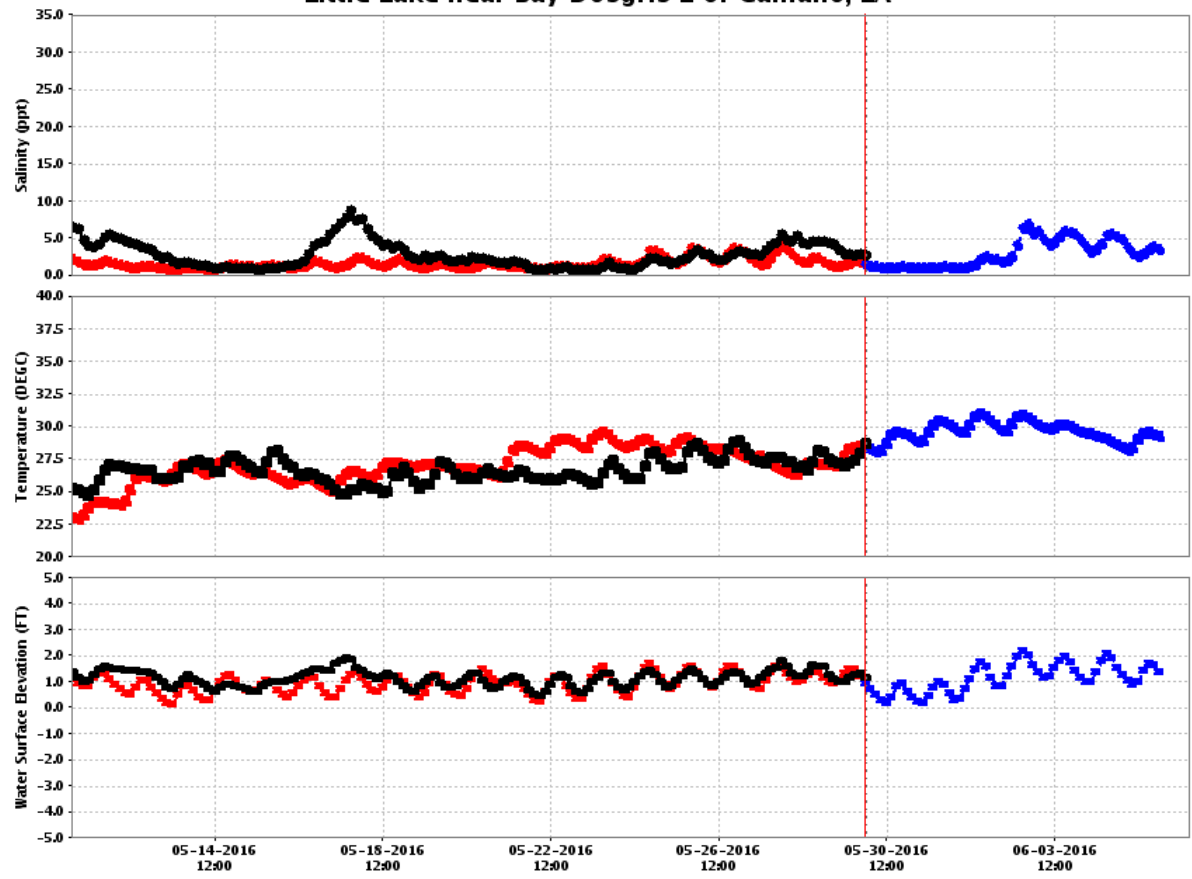
— hindcast
 — forecast
 ● measured

Delft3D_TO27_V2_Hindcast: [1] 05-30-2016 00:00:00 GMT Current Delft3D_TO27_V2_Forecast: [2] 05-30-2016 00:00:00 GMT Current

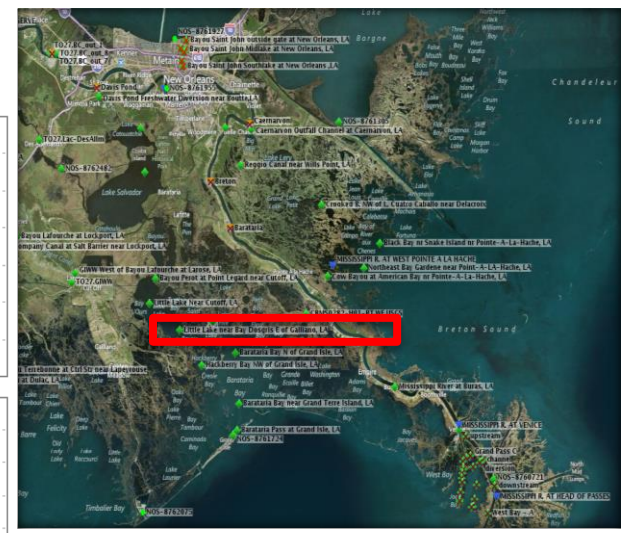


MODEL OUTPUT TIMESERIES

Little Lake near Bay Dosgris E of Galliano, LA



Delft3D_TO27_V2_Hindcast: [1] 05-30-2016 00:00:00 GMT Current Delft3D_TO27_V2_Forecast: [2] 05-30-2016 00:00:00 GMT Current

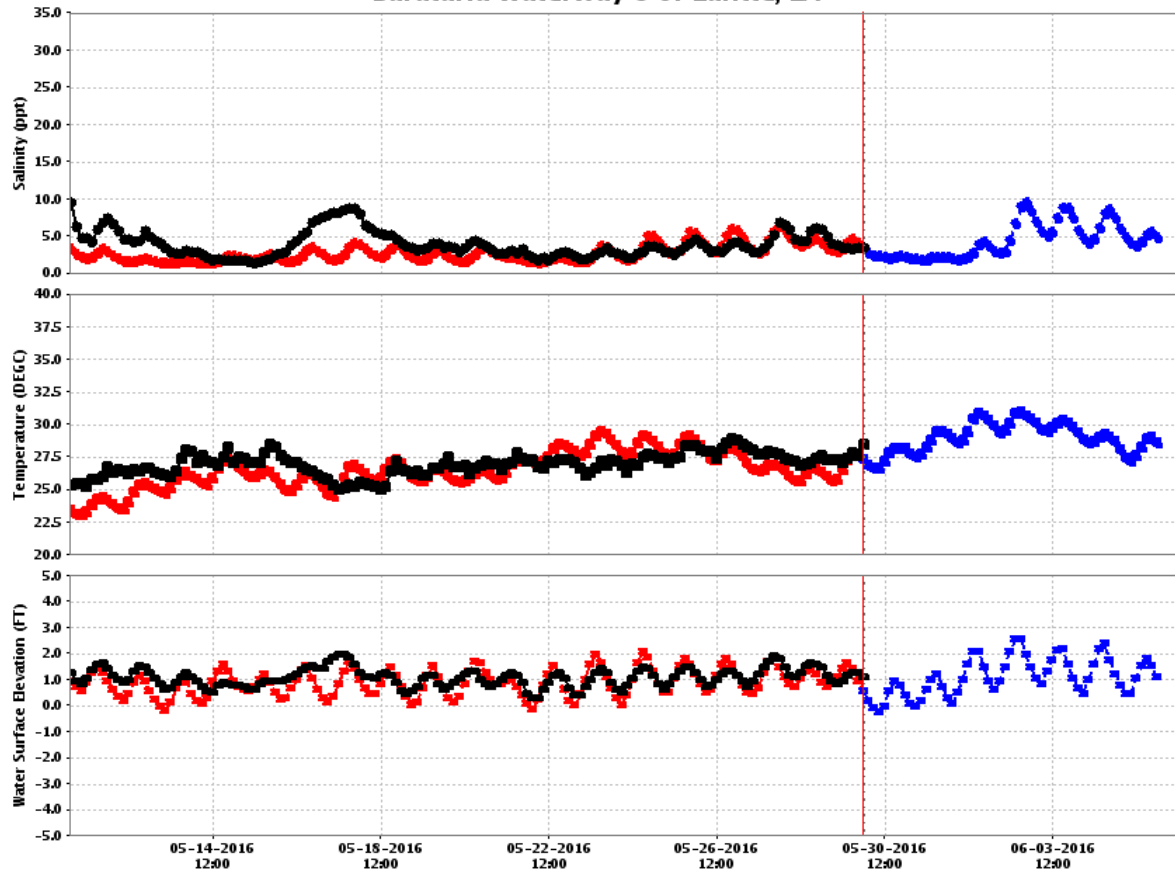


— hindcast
 — forecast
 — measured

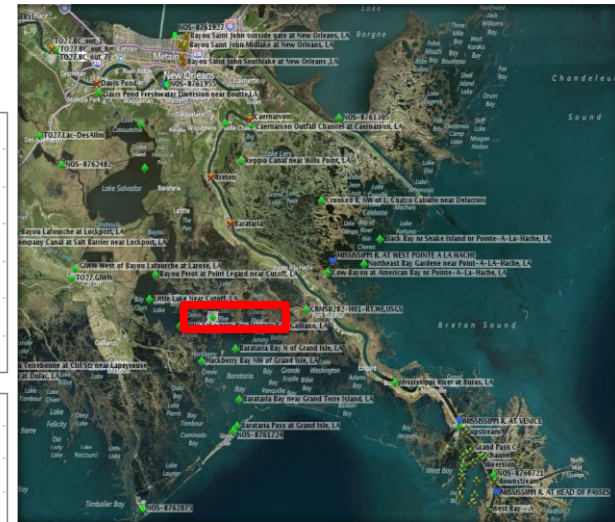


MODEL OUTPUT TIMESERIES

Barataria Waterway S of Lafitte, LA



Delft3D_TO27_V2_Hindcast: [1] 05-30-2016 00:00:00 GMT Current Delft3D_TO27_V2_Forecast: [2] 05-30-2016 00:00:00 GMT Current

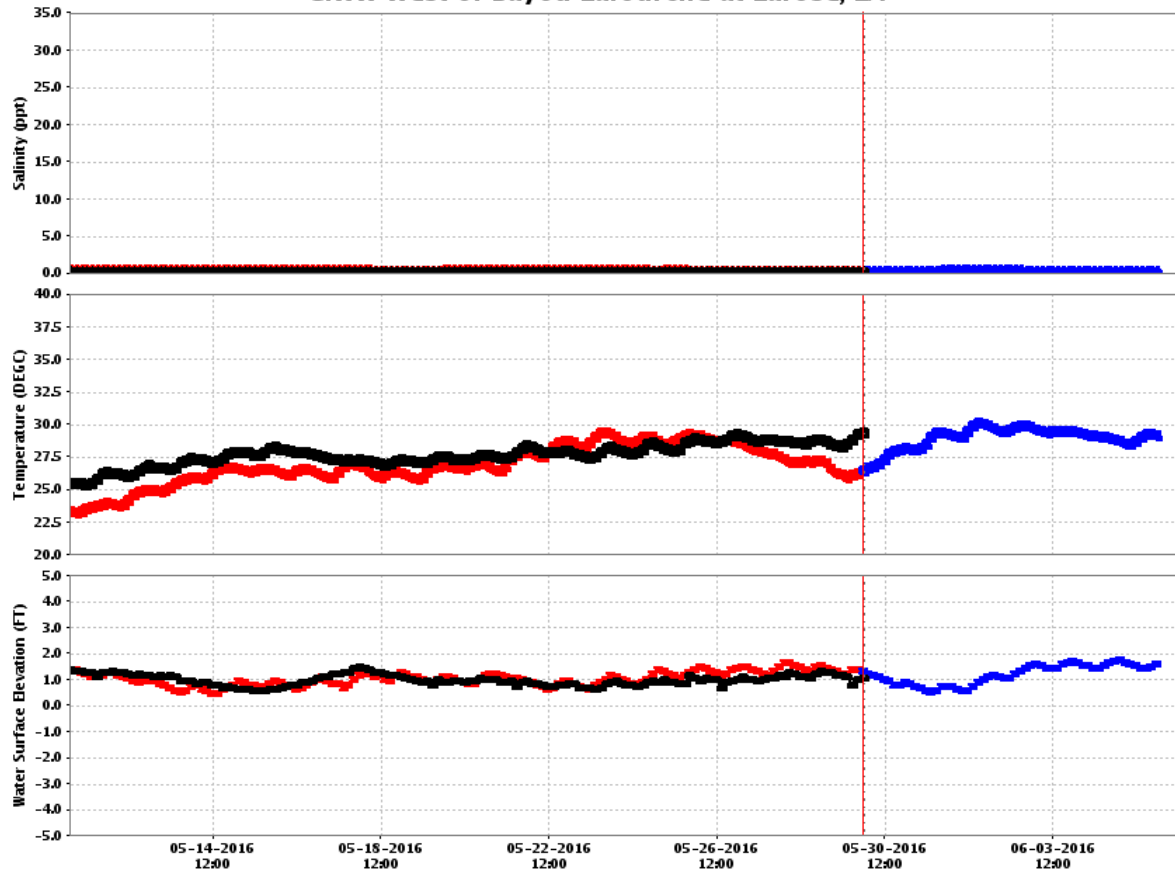


- hindcast
- forecast
- measured

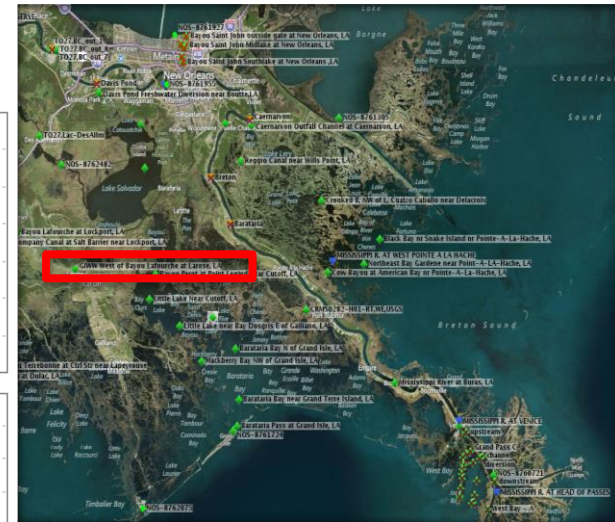


MODEL OUTPUT TIMESERIES

GIWW West of Bayou Lafourche at Larose, LA



Delft3D_T027_V2_Hindcast: [1] 05-30-2016 00:00:00 GMT Current Delft3D_T027_V2_Forecast: [2] 05-30-2016 00:00:00 GMT Current

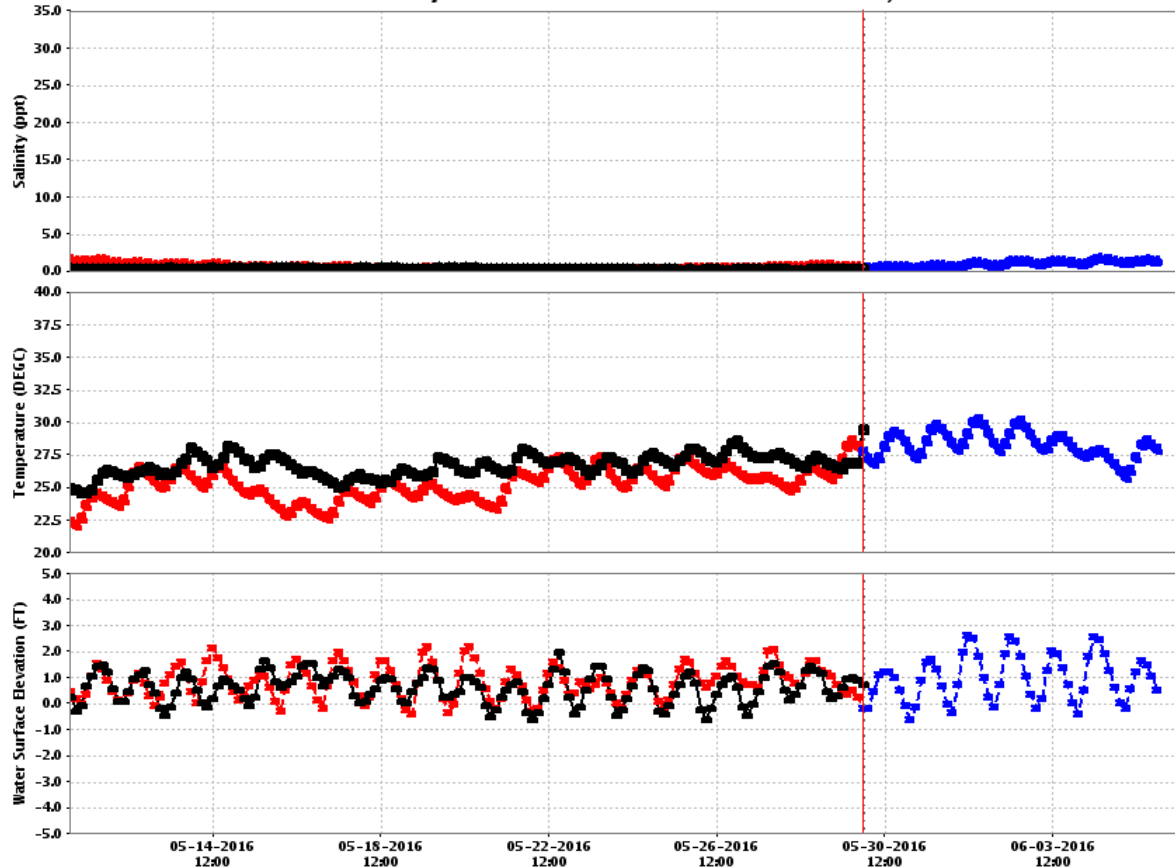


- hindcast
- forecast
- measured

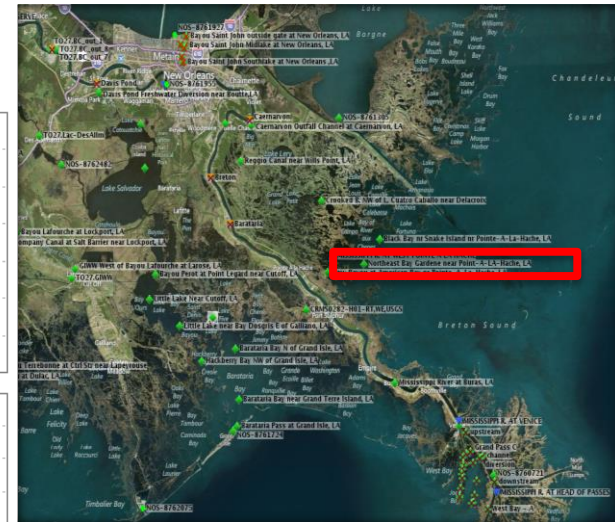


MODEL OUTPUT TIMESERIES

Northeast Bay Gardene near Point-A-LA-Hache, LA



Delft3D_TO27_V2_Hindcast: [1] 05-30-2016 00:00:00 GMT Current Delft3D_TO27_V2_Forecast: [2] 05-30-2016 00:00:00 GMT Current

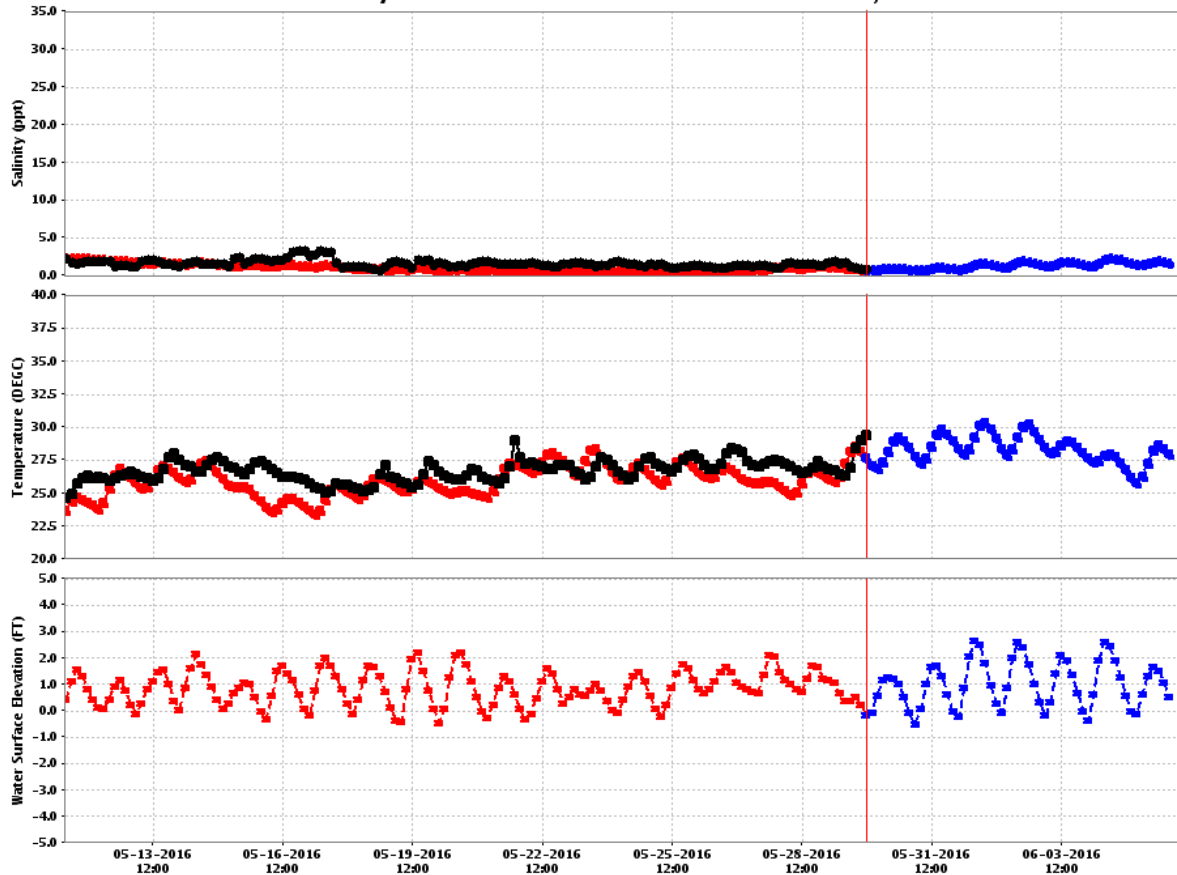


- hindcast
- forecast
- measured

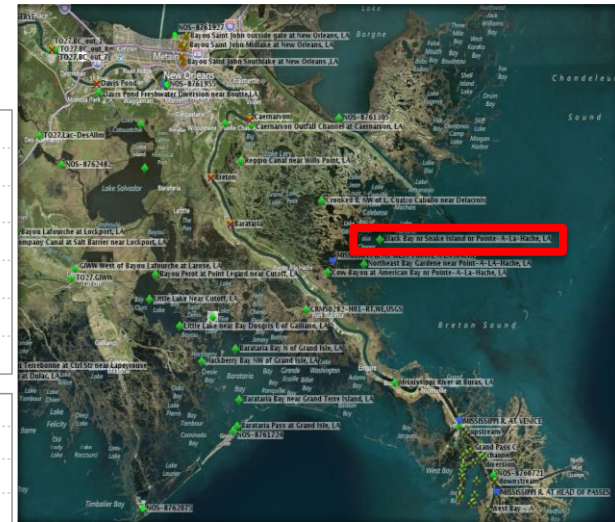


MODEL OUTPUT TIMESERIES

Black Bay nr Snake Island nr Pointe-A-La-Hache, LA



Delft3D_TO27_V2_Hindcast: [1] 05-30-2016 00:00:00 GMT Current Delft3D_TO27_V2_Forecast: [2] 05-30-2016 00:00:00 GMT Current

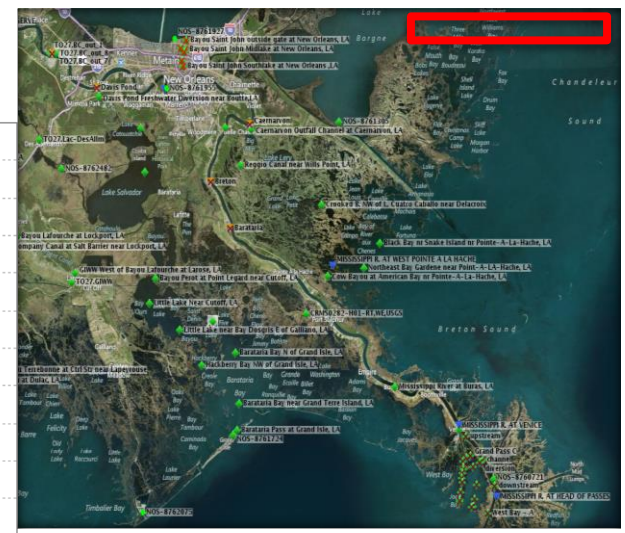
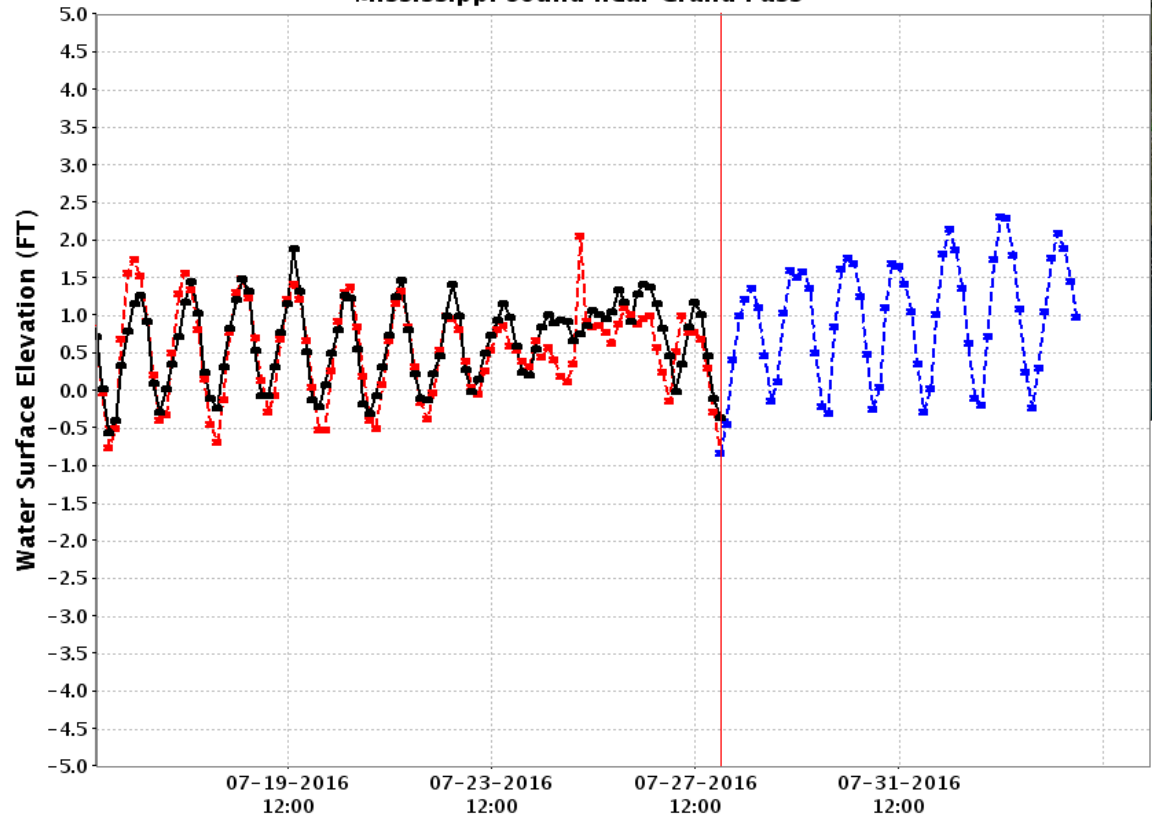


- hindcast
- forecast
- measured



MODEL OUTPUT WATER LEVEL

Mississippi Sound near Grand Pass

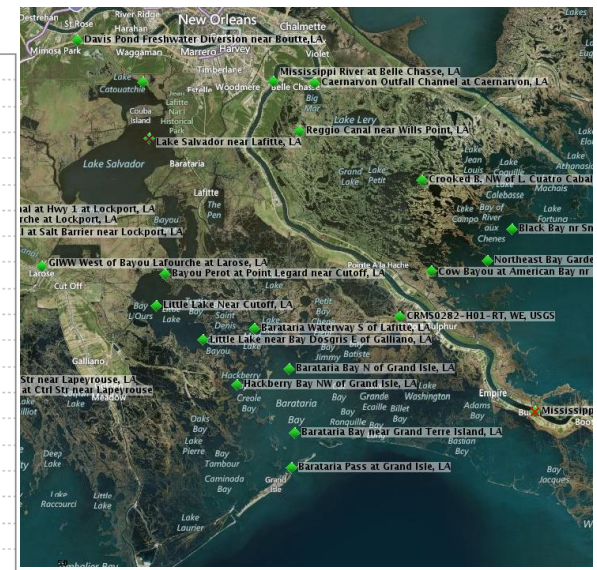
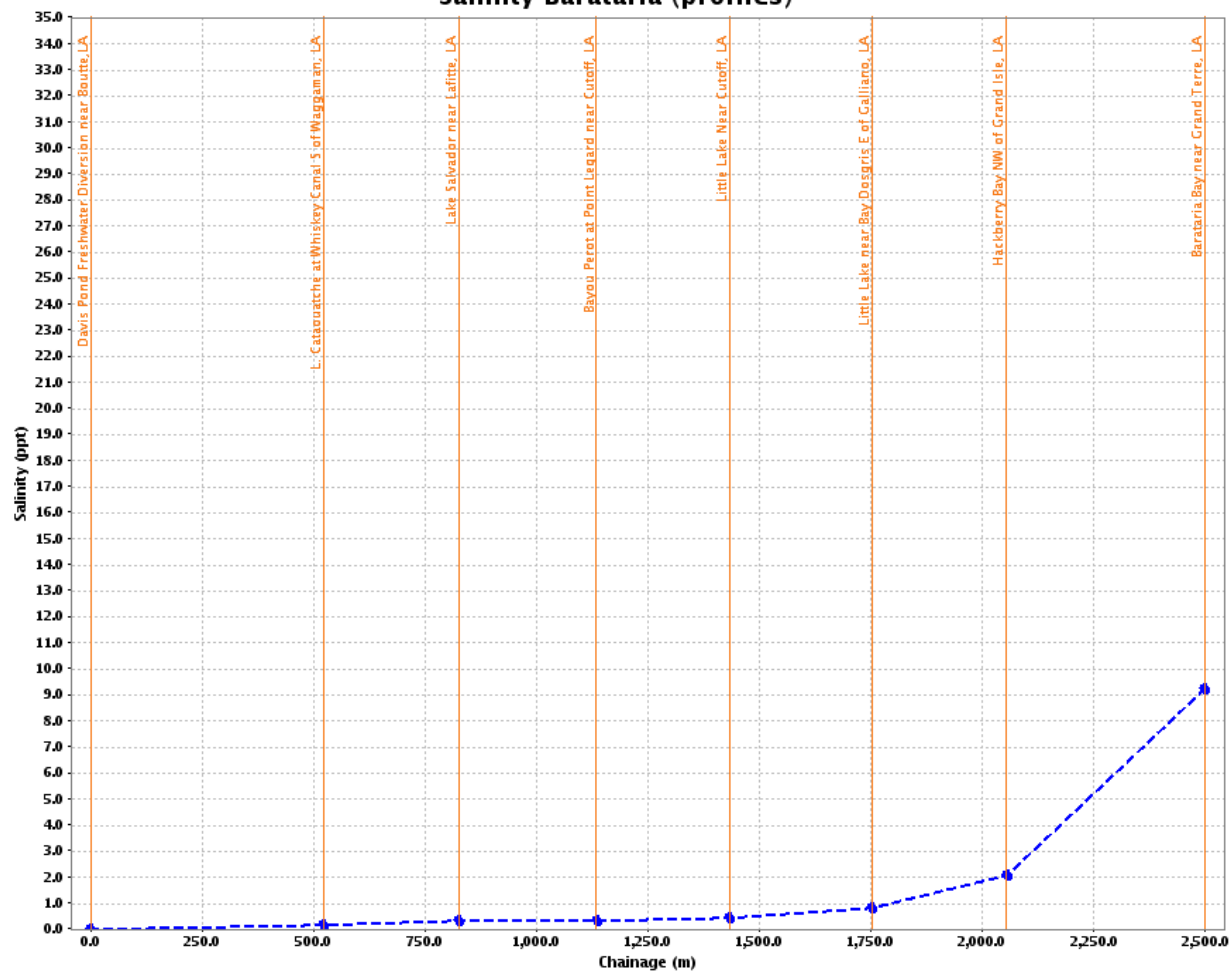


- hindcast
- forecast
- measured



MODEL OUTPUT SALINITY PROFILE

Salinity Barataria (profiles)

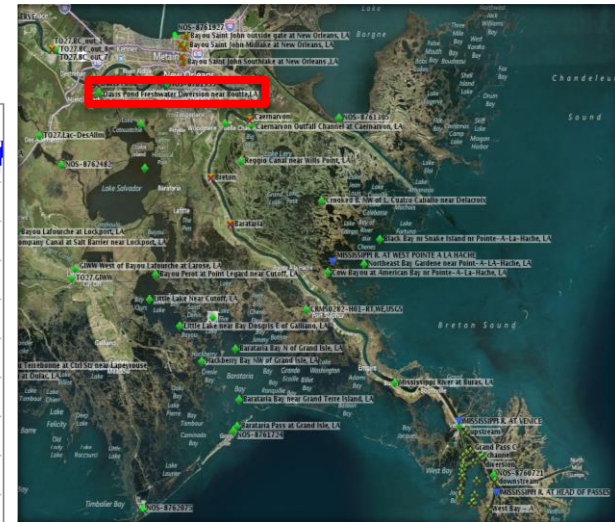
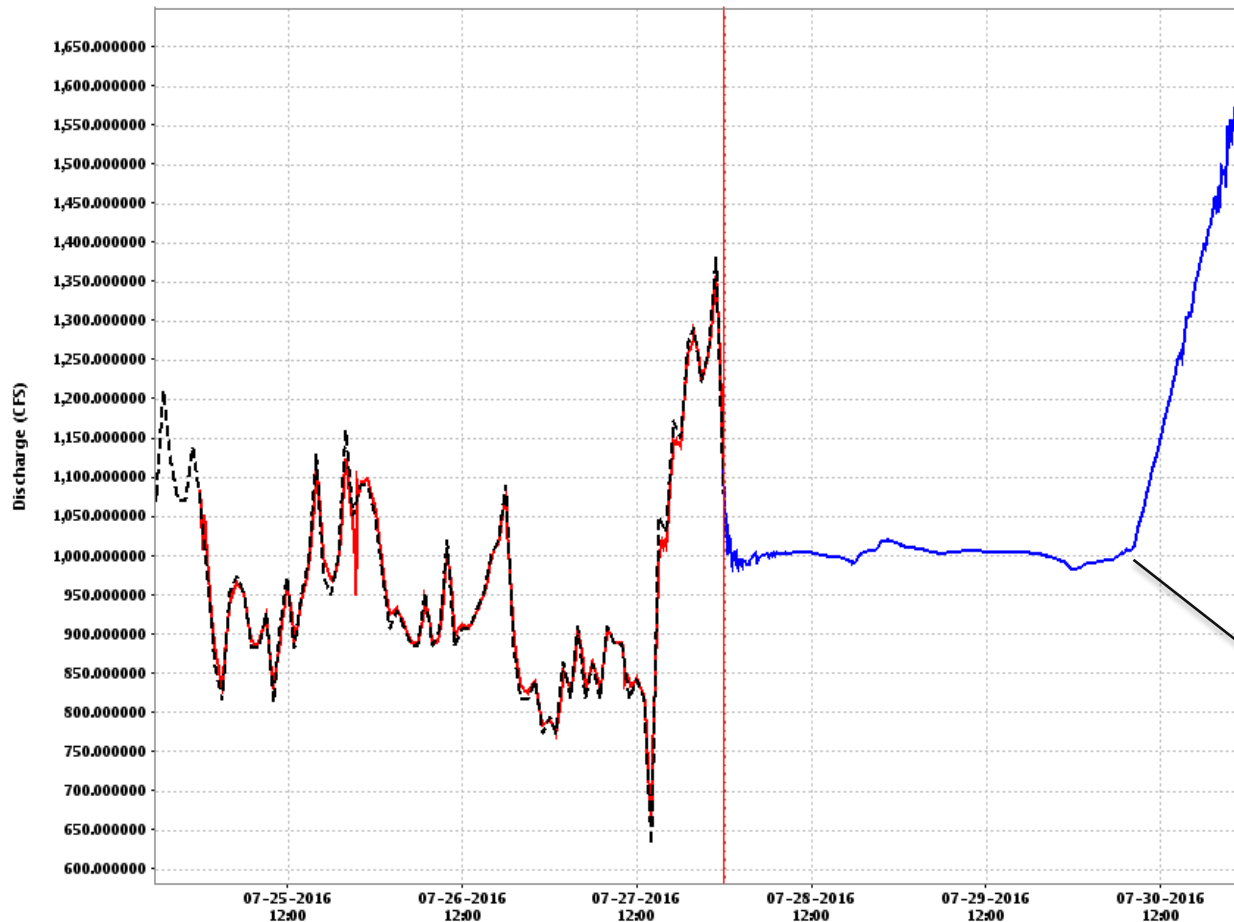


- ◆ hindcast
- ◆ forecast
- ◆ measured



MODEL OUTPUT WATER DISCHARGE

Davis Pond Outfall



- hindcast
- forecast
- measured

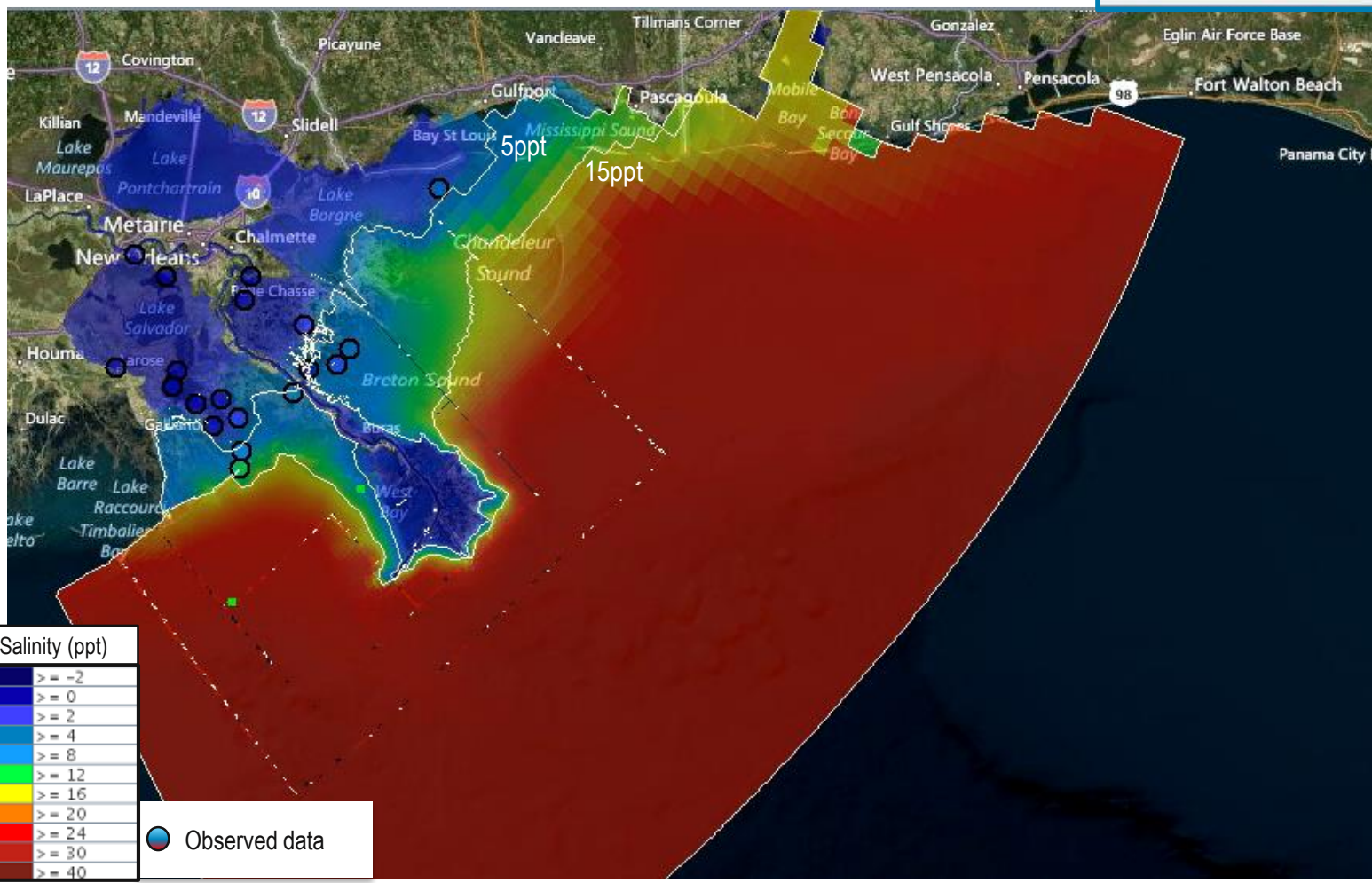
Salinity at Barataria Waterway > 5ppt



SALINITY ANIMATION: CURRENT FORECAST

08-21-2016 03:00:00 GMT

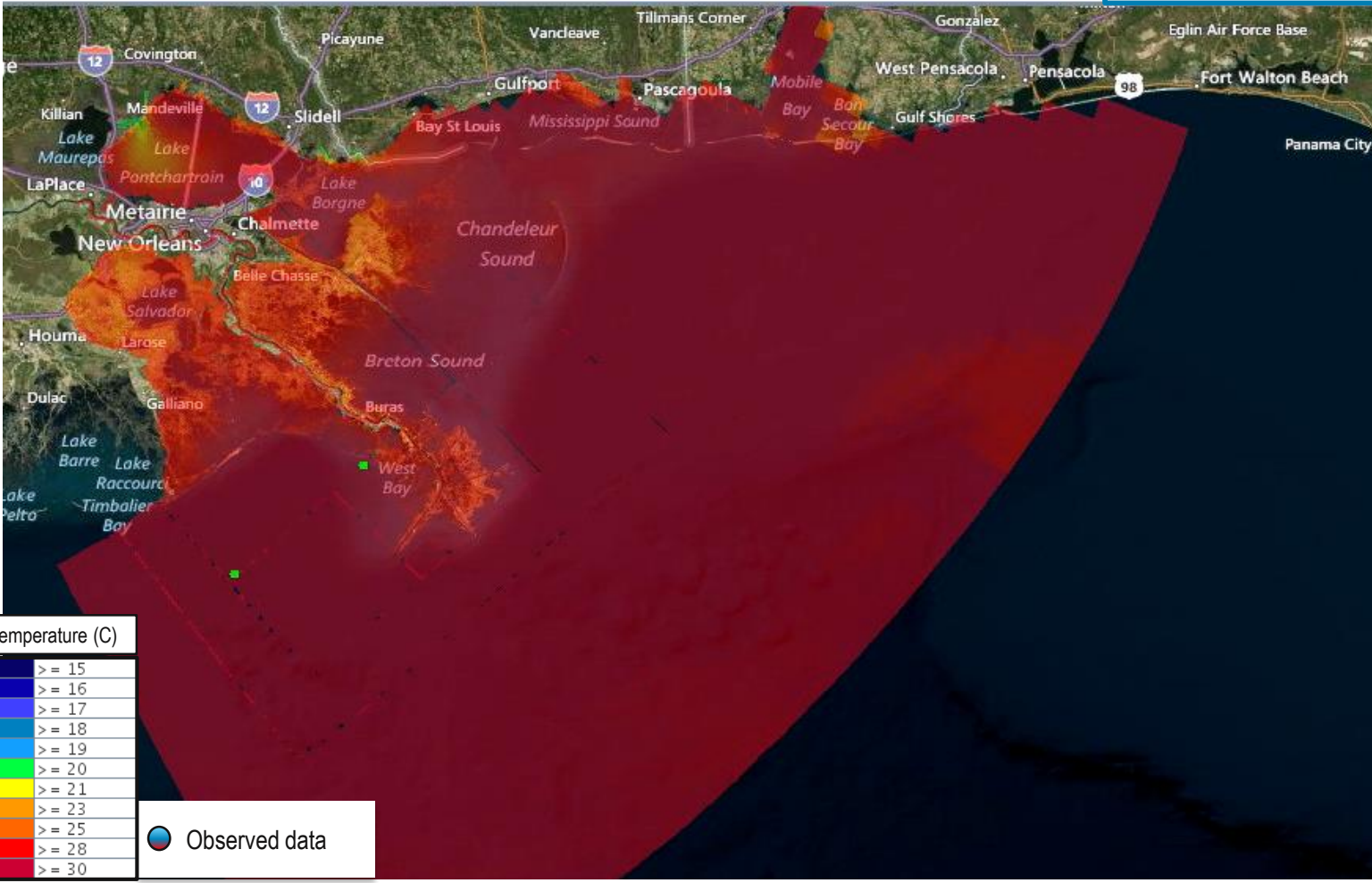
Forecast



TEMPERATURE ANIMATION: CURRENT FORECAST

08-21-2016 03:00:00 GMT

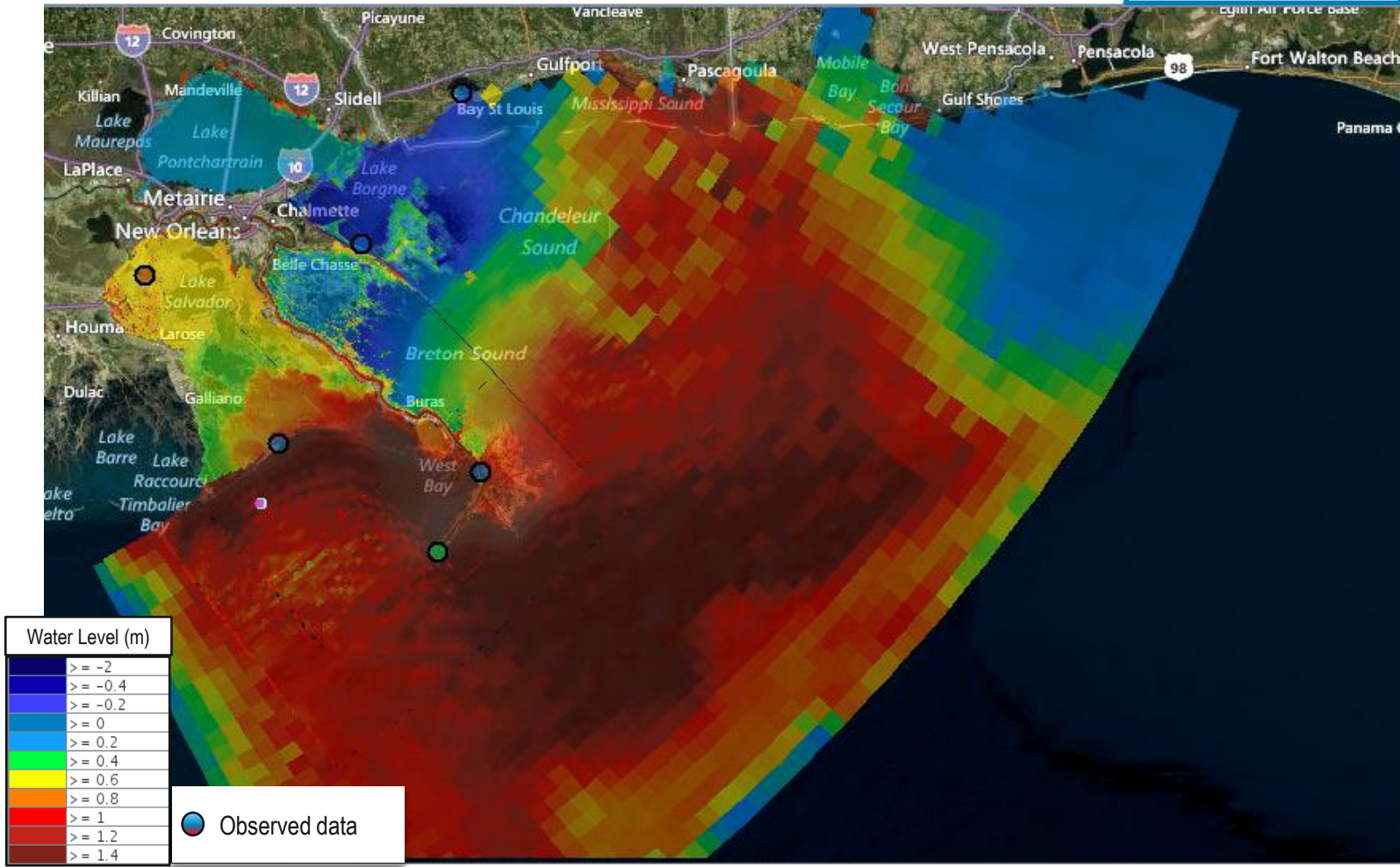
Forecast



WATER LEVEL ANIMATION: FLOOD EVENT

08-12-2016 03:00:00 GMT

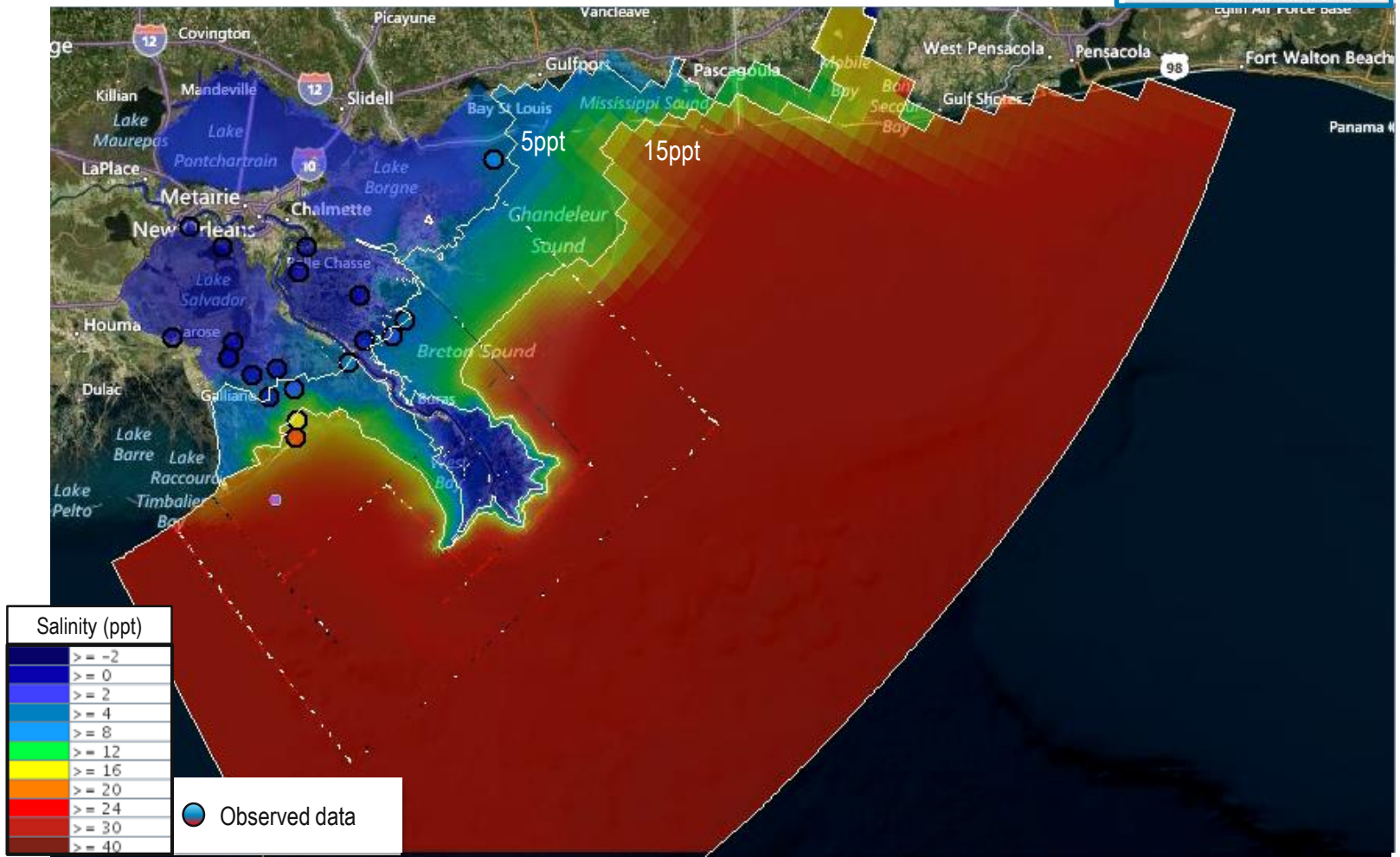
Hindcast



SALINITY ANIMATION: FLOOD EVENT

08-12-2016 03:00:00 GMT

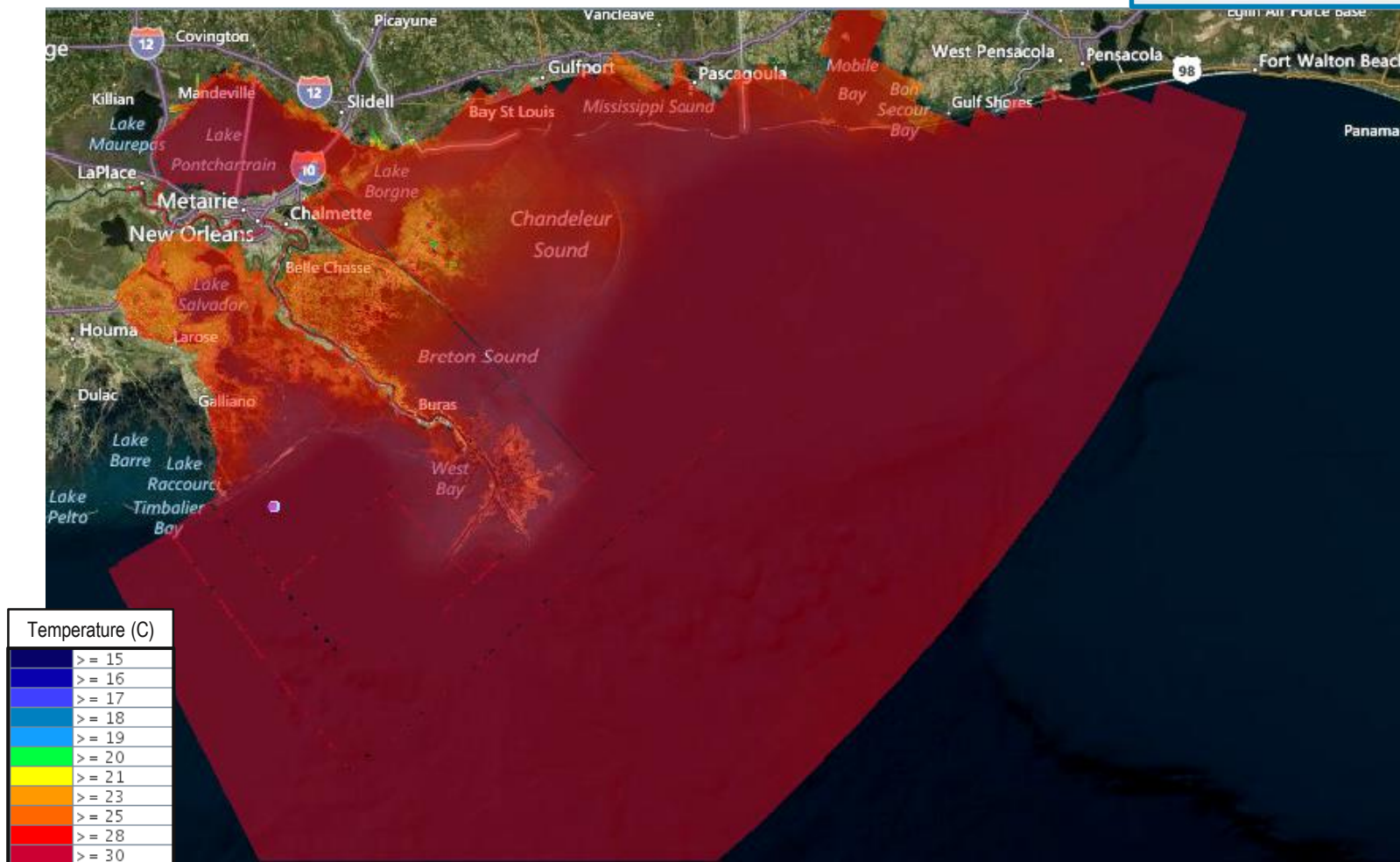
Hindcast



TEMPERATURE ANIMATION: FLOOD EVENT

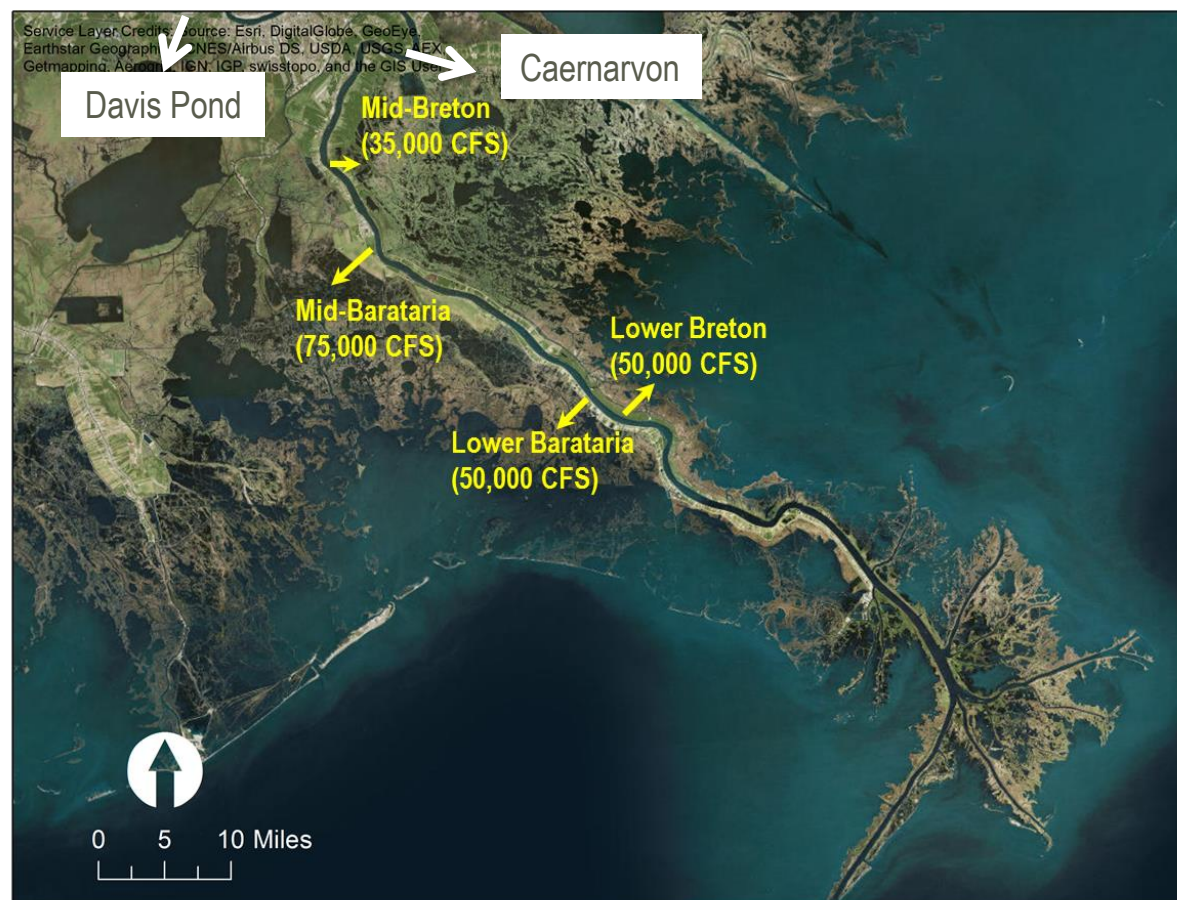
08-12-2016 03:00:00 GMT

Hindcast

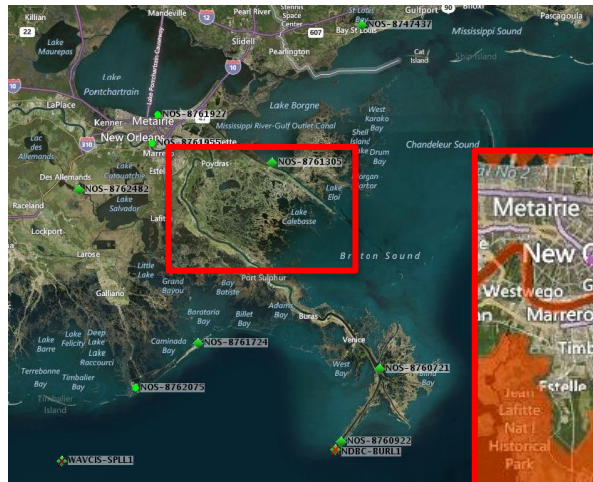


APPLICATIONS: MANAGING DIVERSIONS

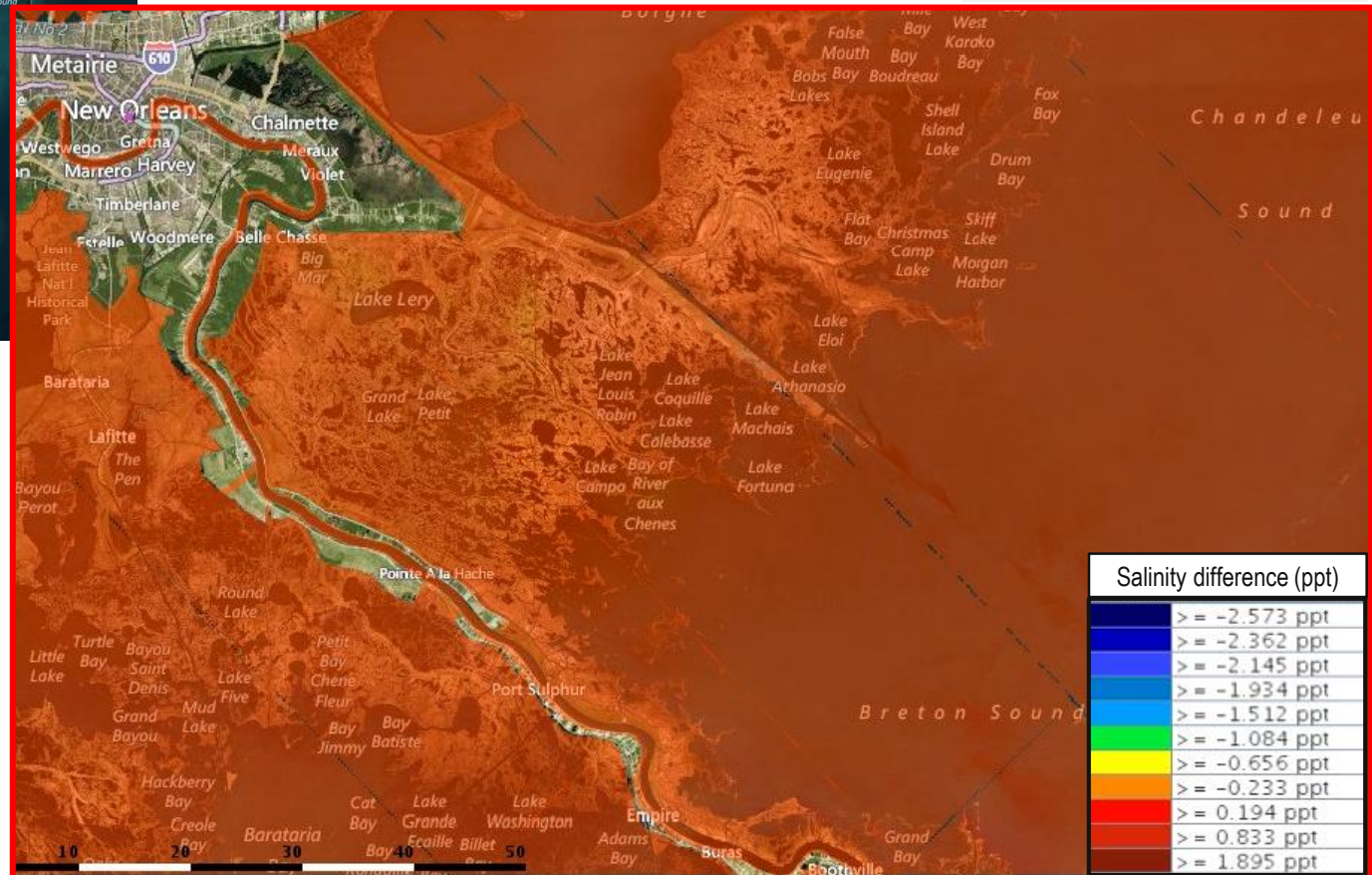
- Forecast information on operation scenarios
- Coordinate operations among multiple diversions



APPLICATIONS: MANAGING DIVERSIONS



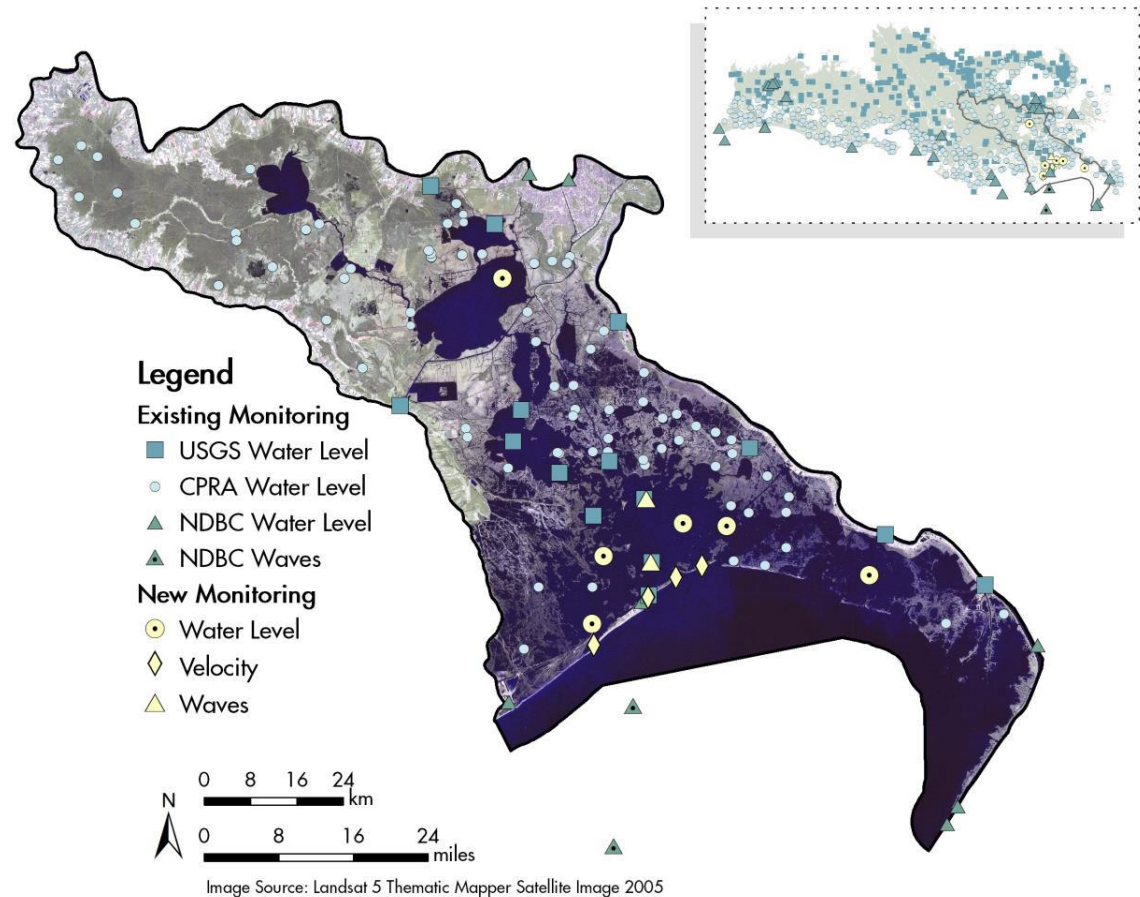
08-23-2016 03:00:00 GMT



- Salinity difference between:
 - Caernarvon discharge: 0 cfs
 - Caernarvon discharge: 4000 cfs

APPLICATIONS: MONITORING PROGRAMS

- Integrate data feed with forecast output for extensive basin conditions
- Use CERF to adaptively optimize placement of stations and frequency of measurements



Existing and new site locations for waves, velocity and water level



FUTURE DEVELOPMENTS



FUTURE DEVELOPMENTS

- Migrate to client server
 - System available directly to field offices/managers/users
- Expand Spatial Coverage: Louisiana Coastal Zone
- Expand capabilities (as data become available from SWAMP) to include:
 - Select nutrients of interest
 - Turbidity, TSS, other





**THE WATER INSTITUTE
OF THE GULF™**

THANK YOU

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Deltares

Davis Ponds

■ Min discharge:
1000cfs=28.32m³/s

Caernarvon

■ Min discharge: 0 cfs=0m³/s



● USGS13 - Crooked B. NW of L. Cuatro Caballo near Delacroix
June - November (5ppt)

● USGS16 - Black Bay nr Stone Island nr Pointe-A-La-Hache
December - May (15ppt)

● USGS5 - Barataria Waterway S of Lafitte
June - November (5ppt)

● USGS7 - Barataria Bay near Grand Terre Island
December - May (15ppt)

