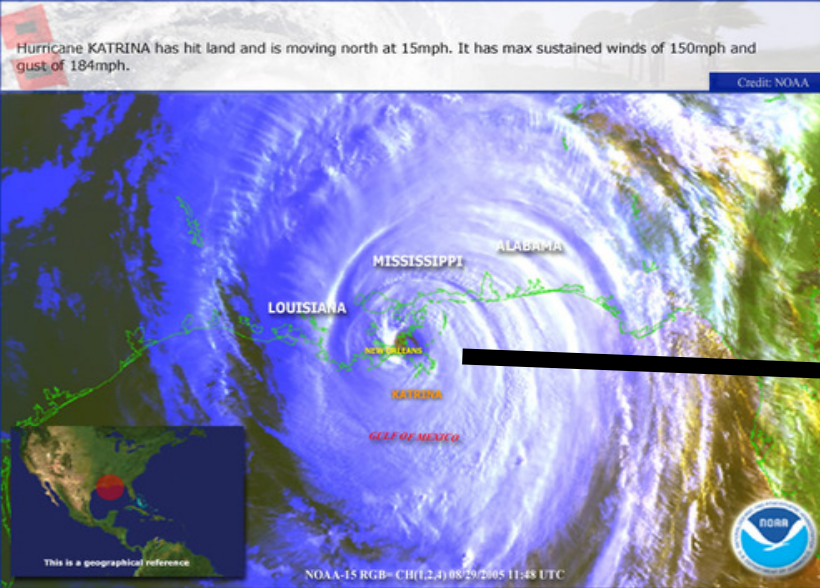


# The Storm: Detailed Hydrodynamics



Co-leads:

D.T. Resio, Senior Scientist - CHL

R.G. Dean, Professor Emeritus

U. Of Florida



# Overview of team mission and objectives

## System-wide assessment of detailed hydrodynamics

- Estimate time varying forces on levees/floodwalls (per unit width) during Hurricane Katrina:

water levels

wave fields

overtopping rates

vertical distribution of static/dynamic load

total force/total moment

near-bottom velocities



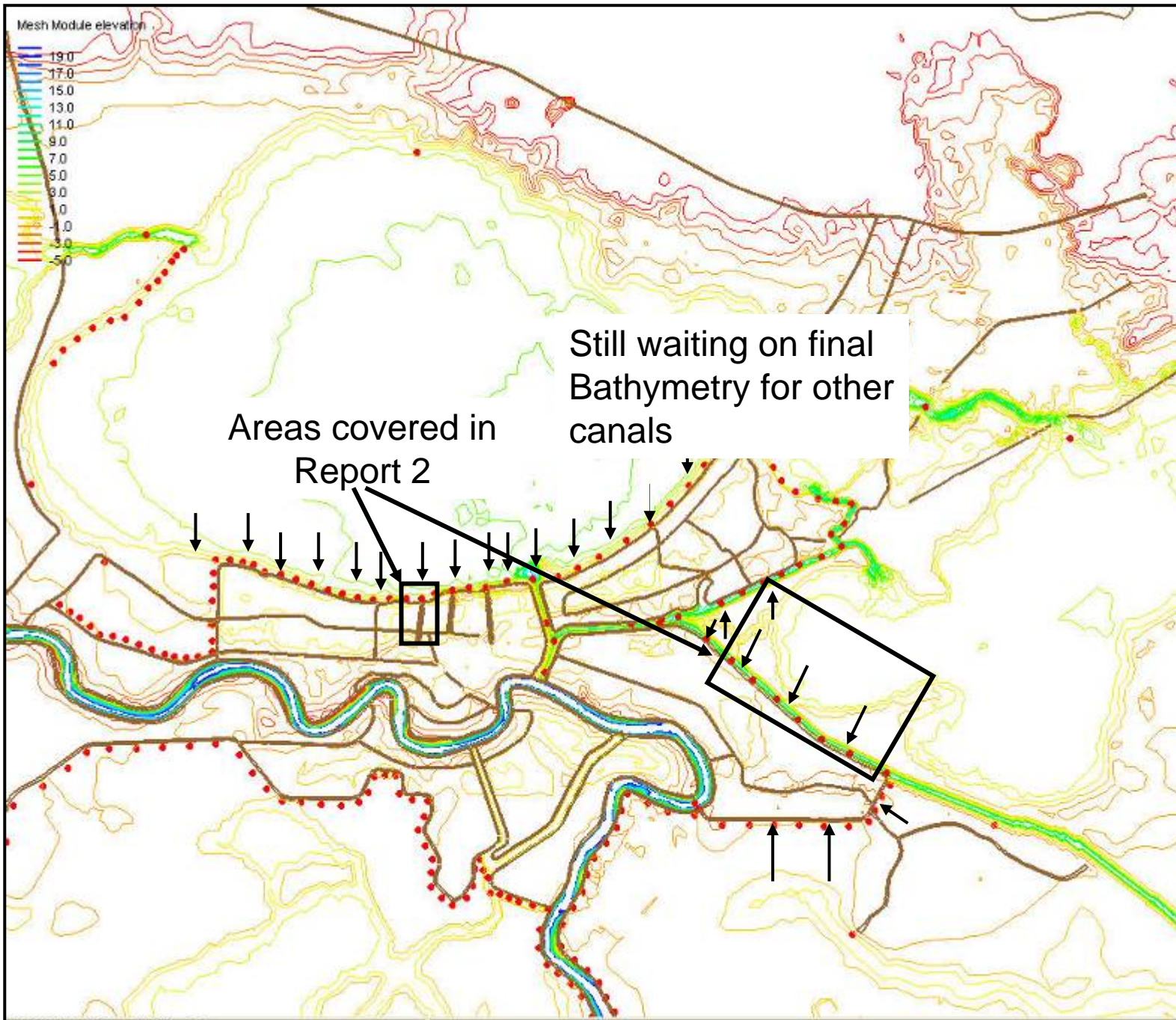
- Estimate uncertainty

model-related – run several models (STWAVE, BOUSSINESQ, PHYSICAL)

boundary forcing – examine range of boundary values

local forcing [wave/surge generation/decay] – span range of values

- Provide results to performance assessment analyses and interior flooding



Mesh Module elevation

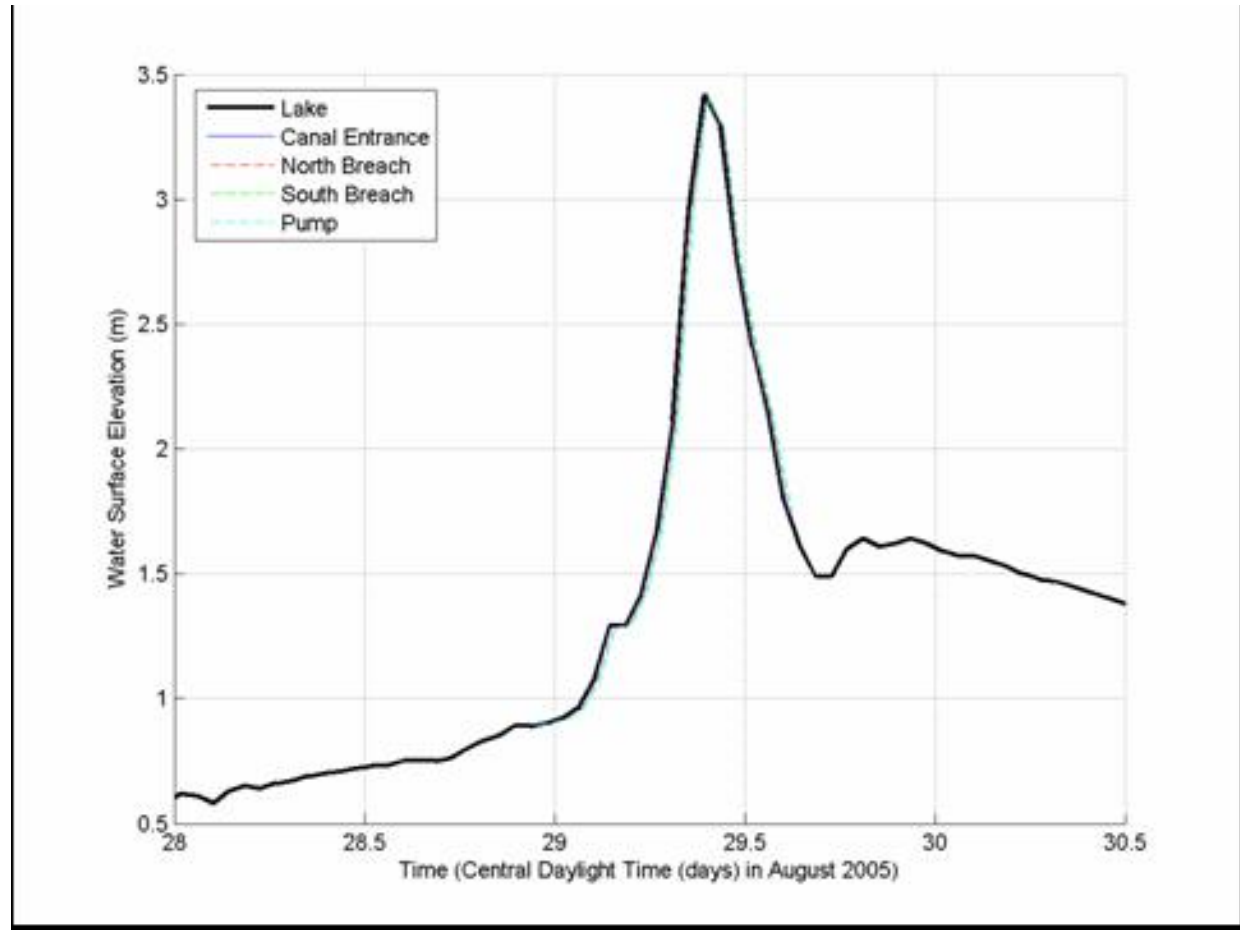
19.0
17.0
15.0
13.0
11.0
9.0
7.0
5.0
3.0
1.0
-1.0
-3.0
-5.0

Still waiting on final Bathymetry for other canals

Areas covered in Report 2

# 17<sup>th</sup> Street Canal Breach

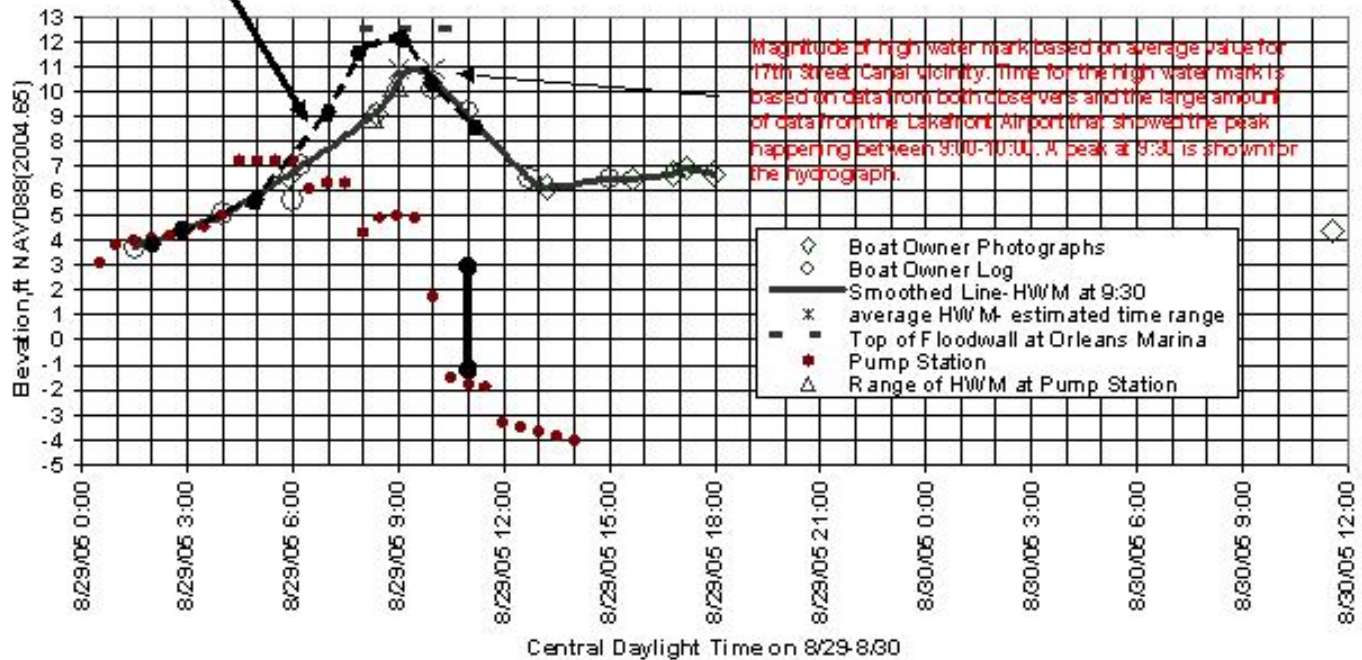




ADCIRC runs show that given no breaching the water levels throughout the canal do not vary substantially in time from the boundary levels or spatially within the canal

# ADCIRC results in Vicinity of entrance to 17<sup>th</sup> Street Canal

Lake Pontchartrain and Pump Station Hydrograph, 17th Street Canal

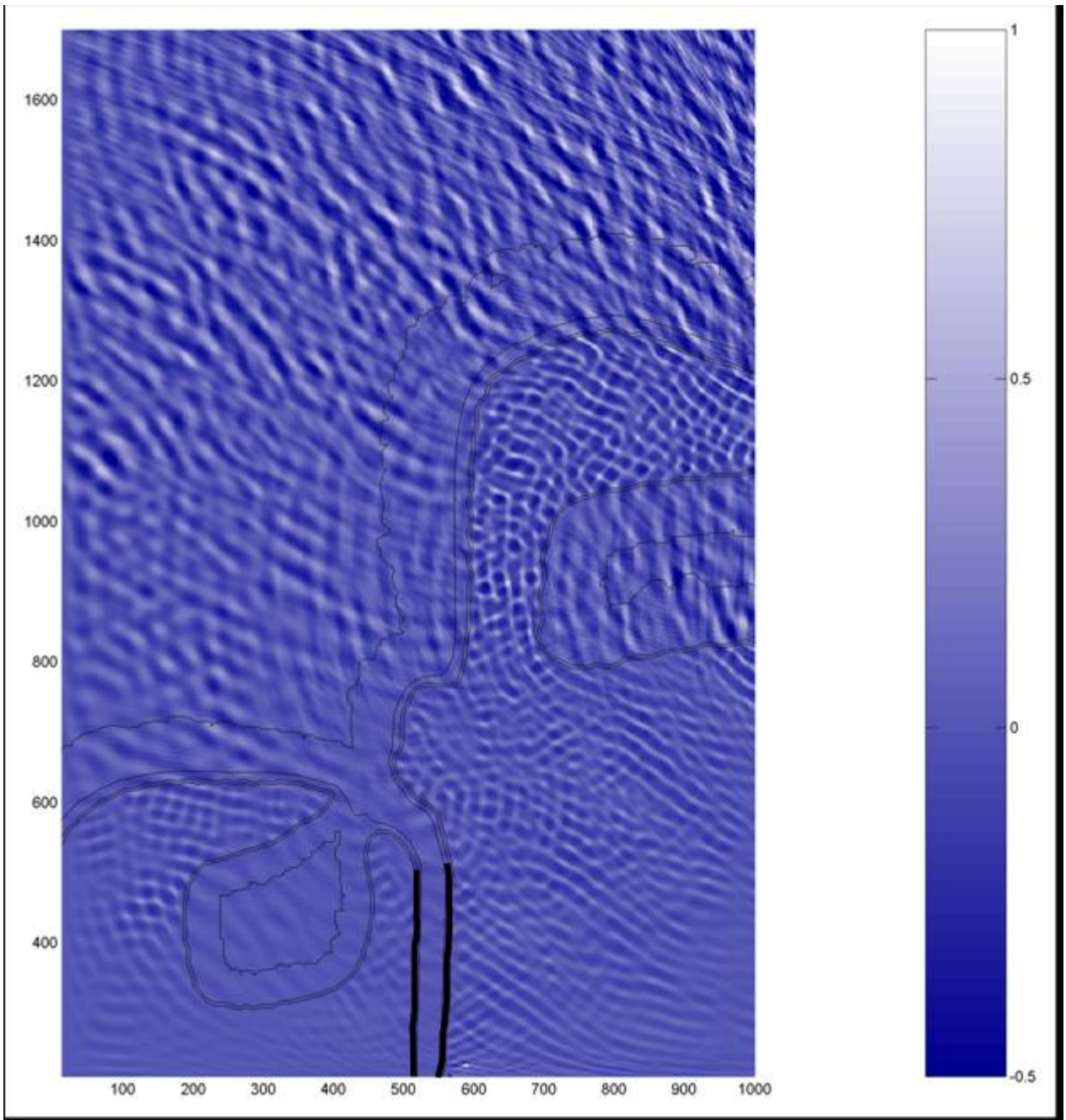


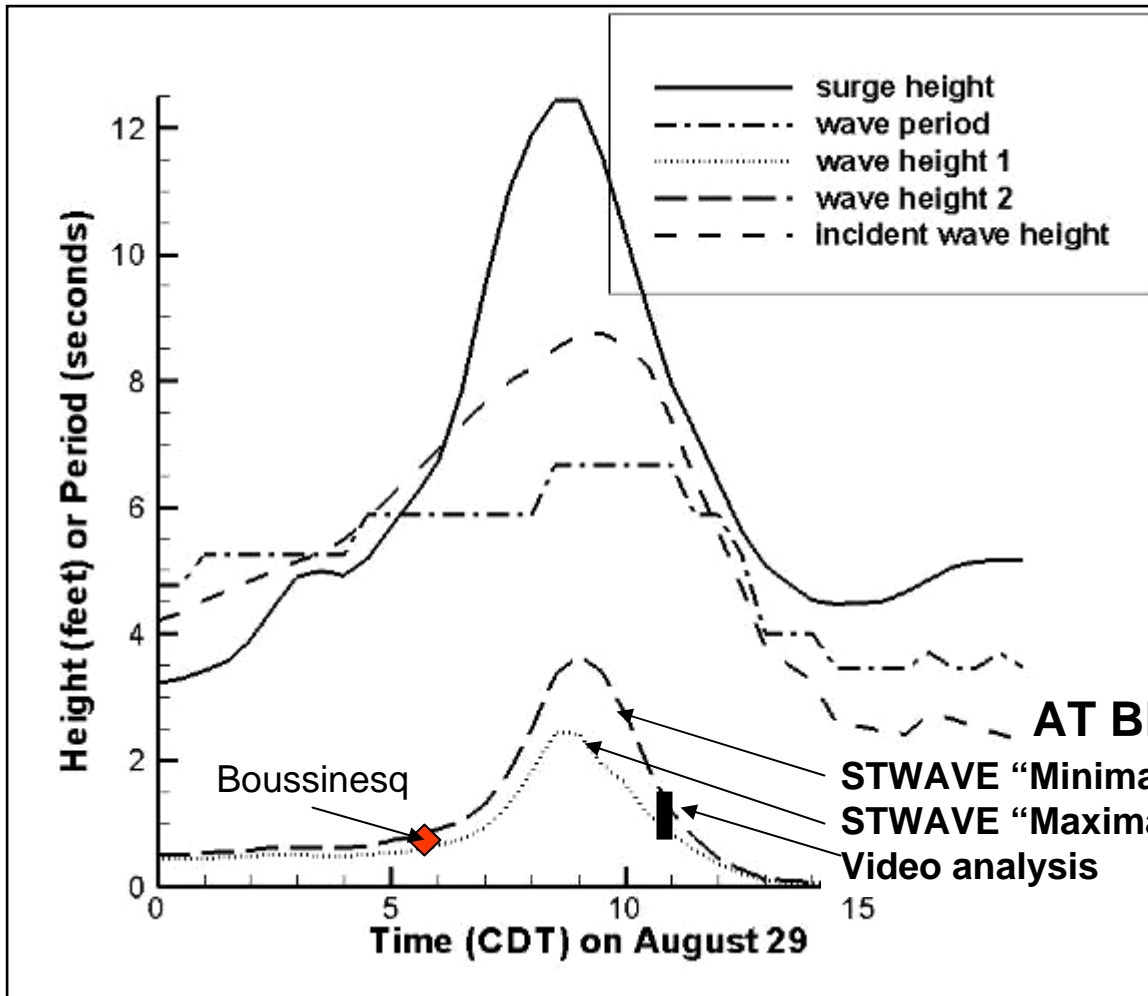
Magnitude of high water mark based on average value for 17th Street Canal vicinity. Time for the high water mark is based on data from both observers and the large amount of data from the Lakefront Airport that showed the peak happening between 9:00-10:00. A peak at 9:30 is shown for the hydrograph.

- ◇ Boat Owner Photographs
- Boat Owner Log
- Smoothed Line-HWM at 9:30
- × average HWM-estimated time range
- Top of Floodwall at Orleans Marina
- Pump Station
- △ Range of HWM at Pump Station

⋮ Preliminary water level estimated from video frames at shortly after 1100 CDT August 29th

Sample surface elevation from Boussinesq simulation at 17<sup>th</sup> Street Canal





Boussinesq

**AT BREACH**

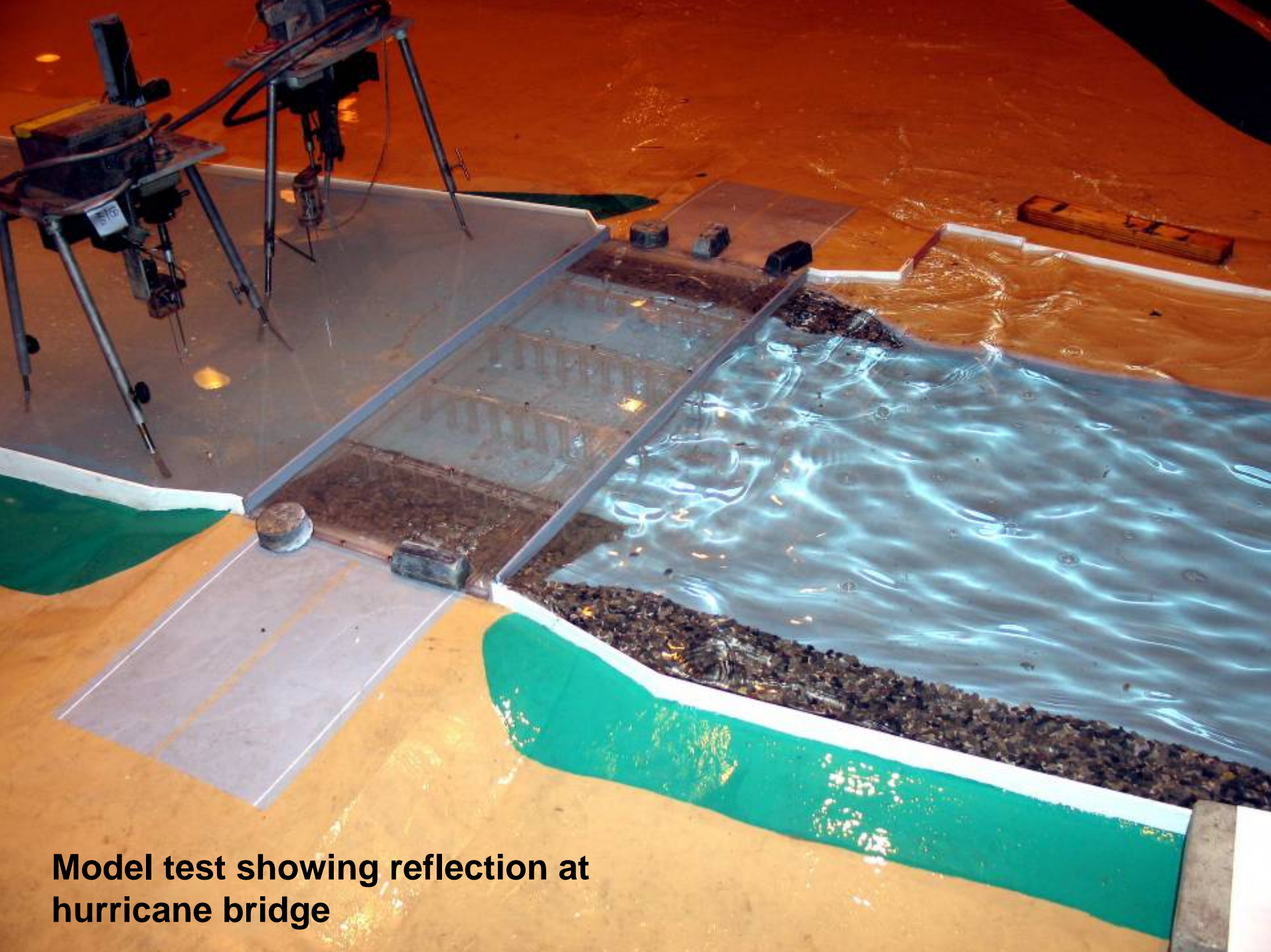
STWAVE "Minimal" energy loss  
 STWAVE "Maximal" energy loss  
 Video analysis



# 17<sup>th</sup> Street Canal 1:50 scale model



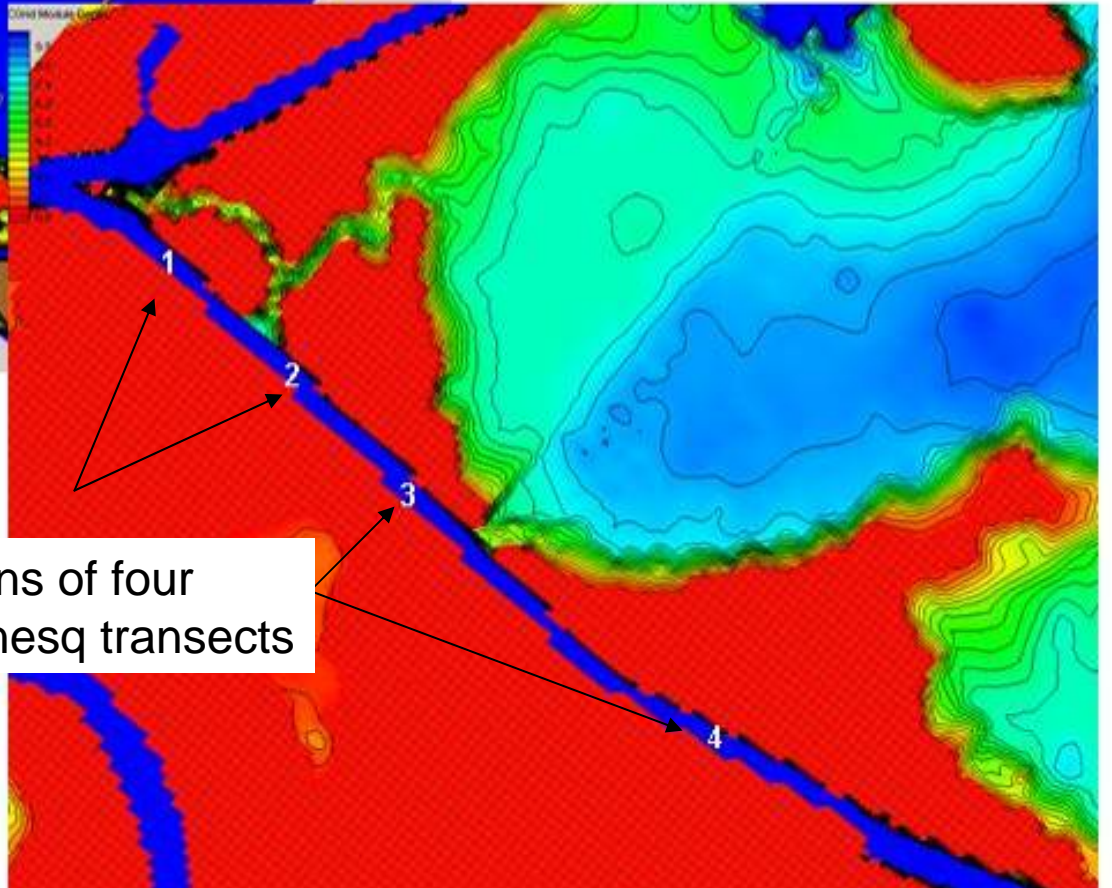
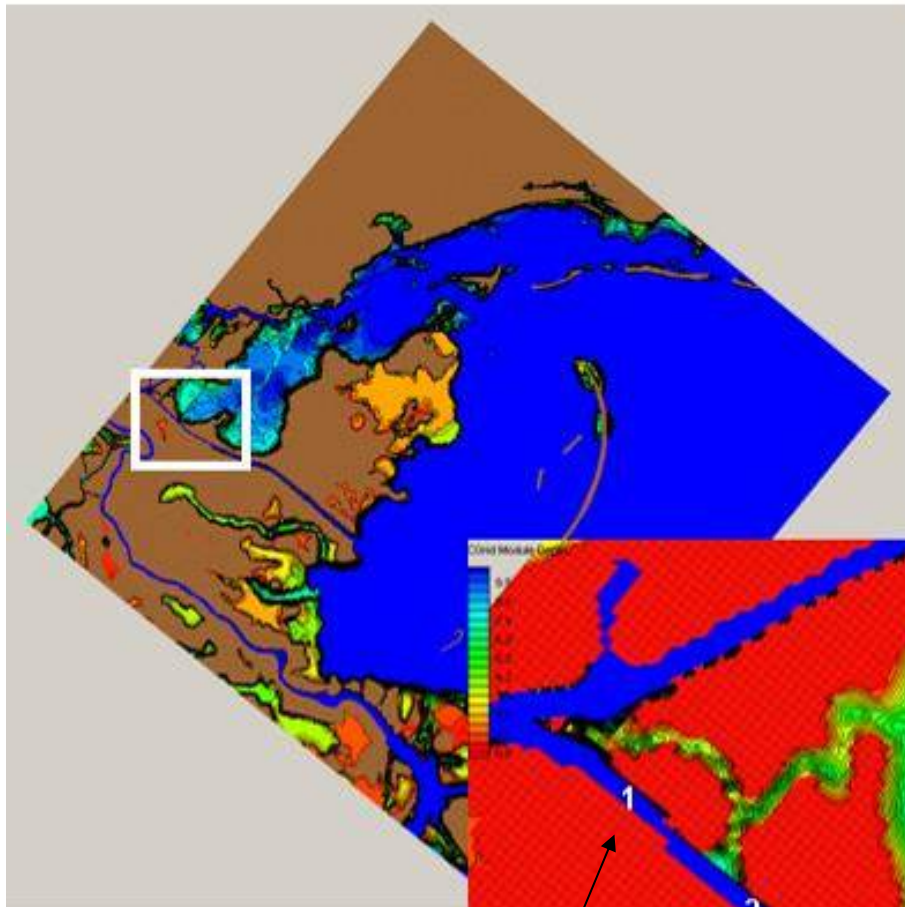
Unidirectional model runs in progress



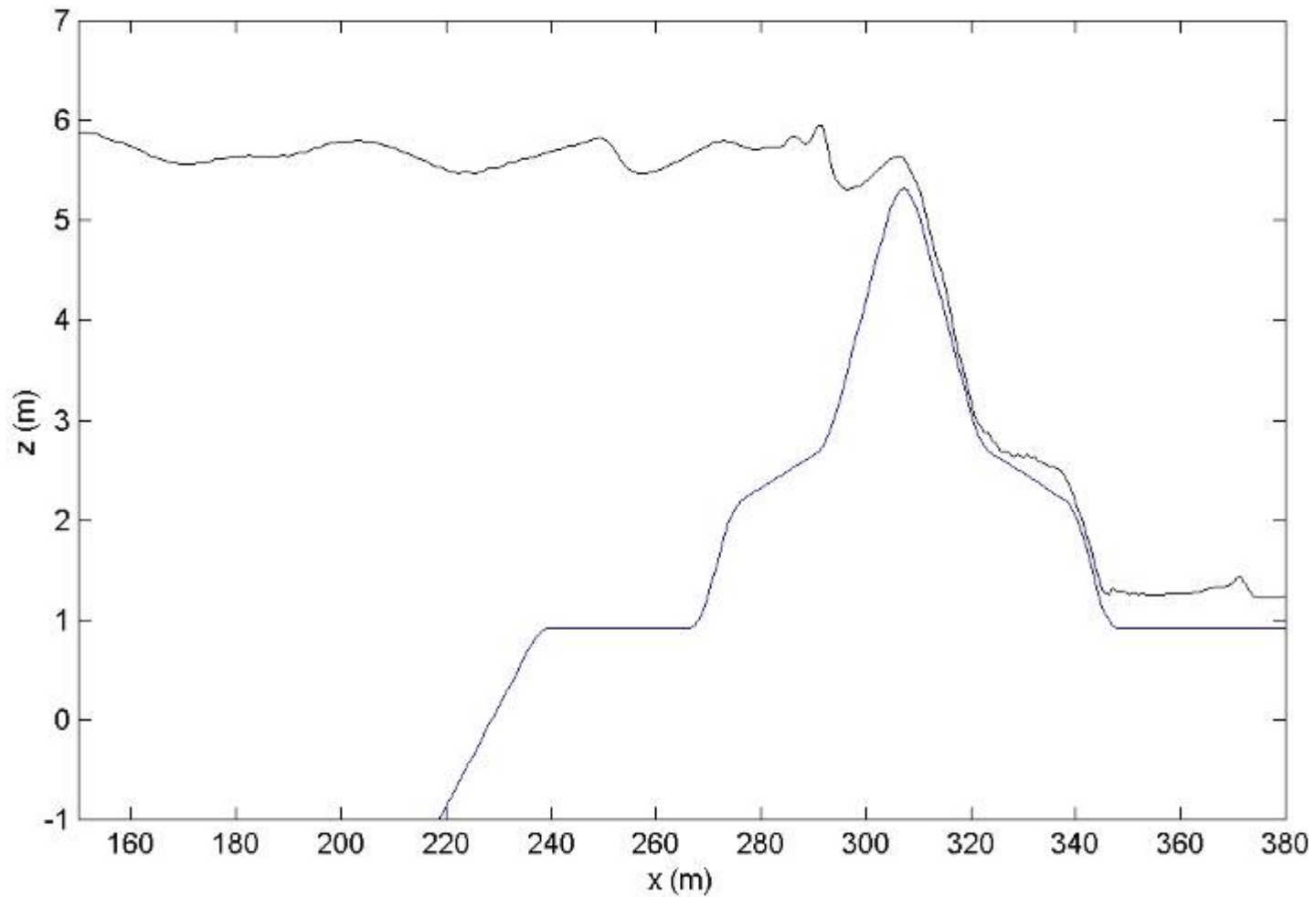
**Model test showing reflection at hurricane bridge**

**Table V-4**  
**Percentage Change From Hydrostatic Forces and Moments on a**  
**Floodwall**  
**With a Mean Water Depth of 5 feet and a 2 foot Wave Height**

<b>Percentage Change in</b>	<b>Under Crest</b>	<b>Under Trough</b>
Force	+ 44 %	-36 %
Moment	+73 %	- 49 %

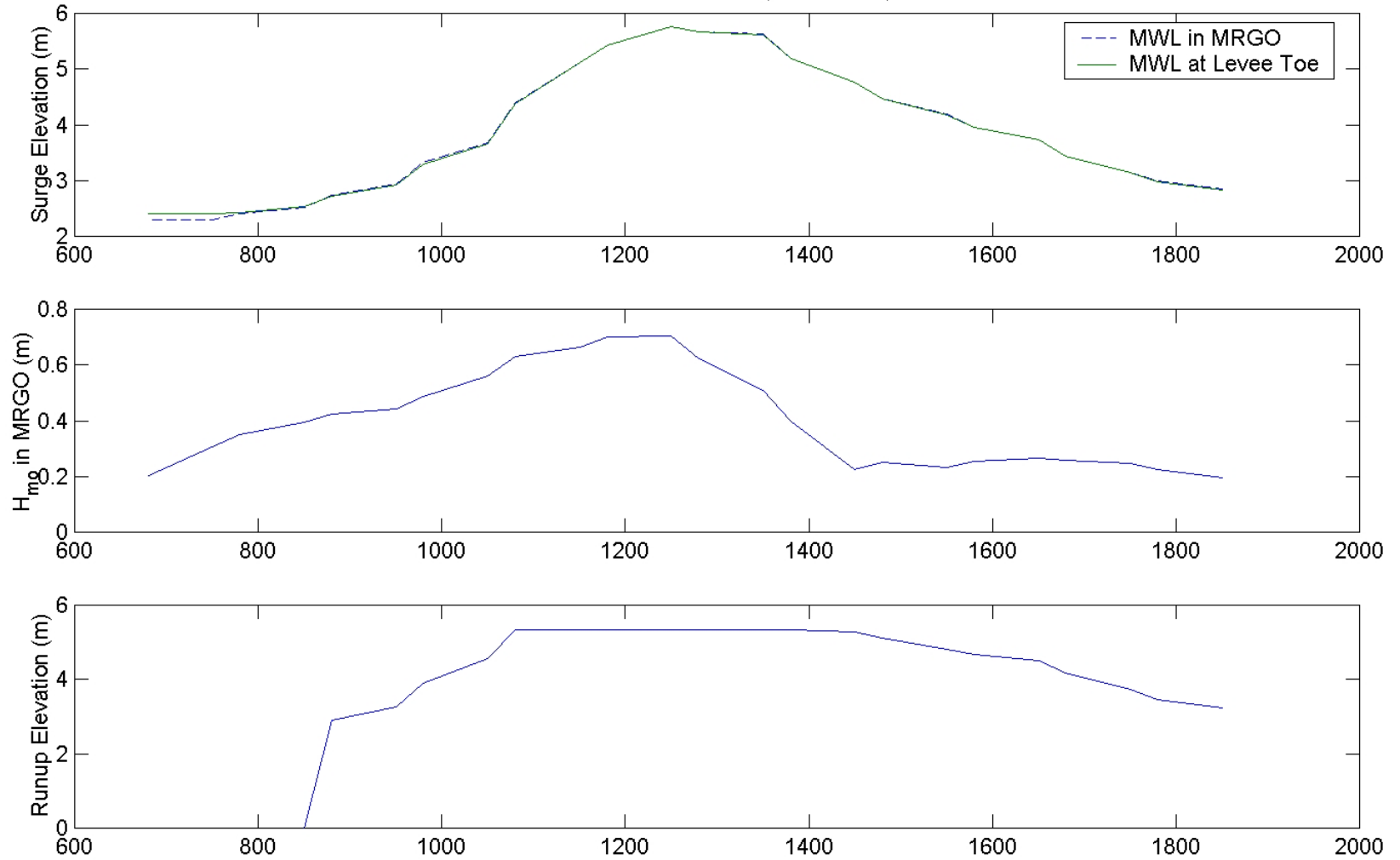


Locations of four  
Boussinesq transects

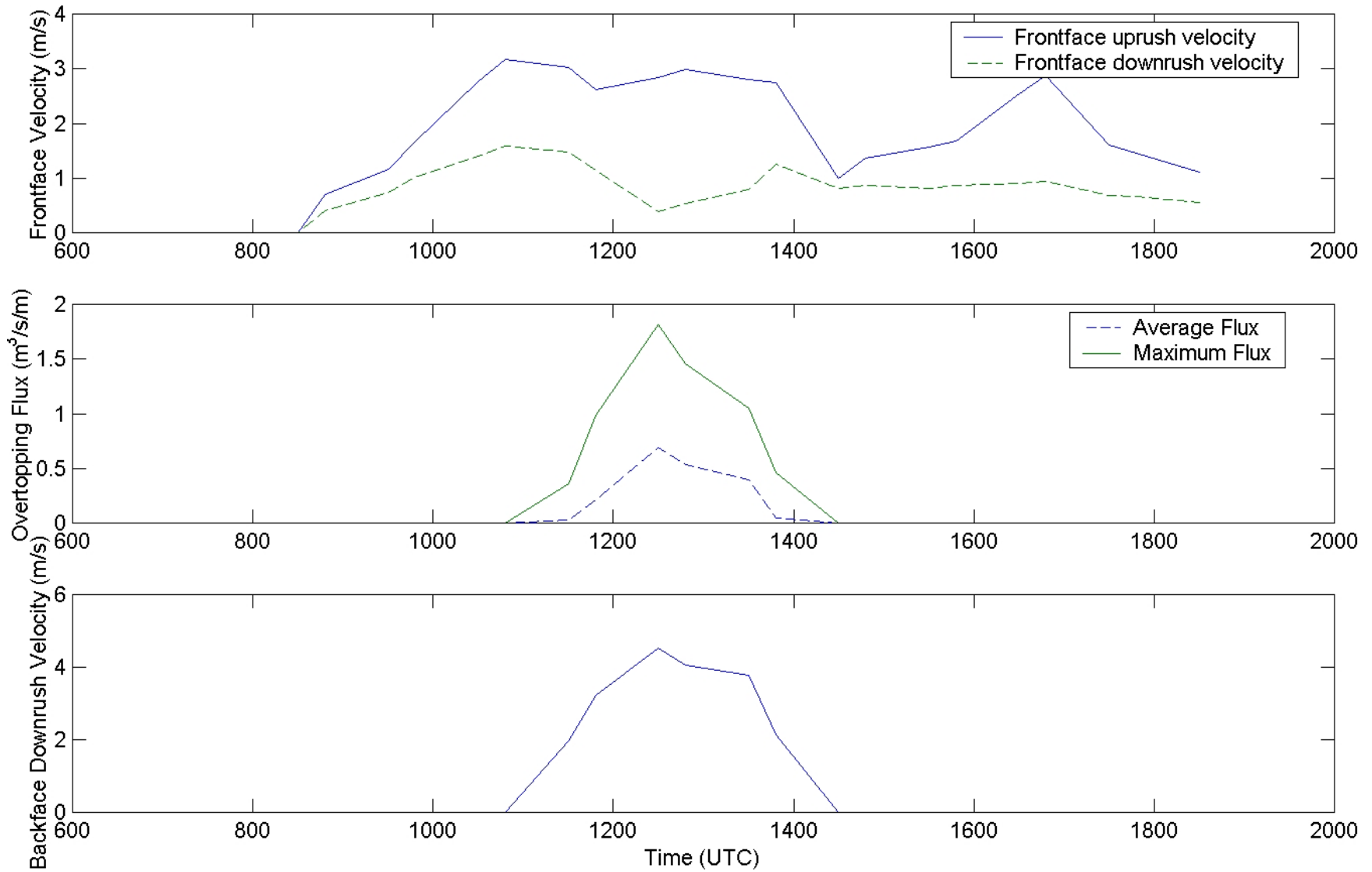


Water surface elevation snapshot along MRGO levee

MRGO STATION 430 (Location #1)



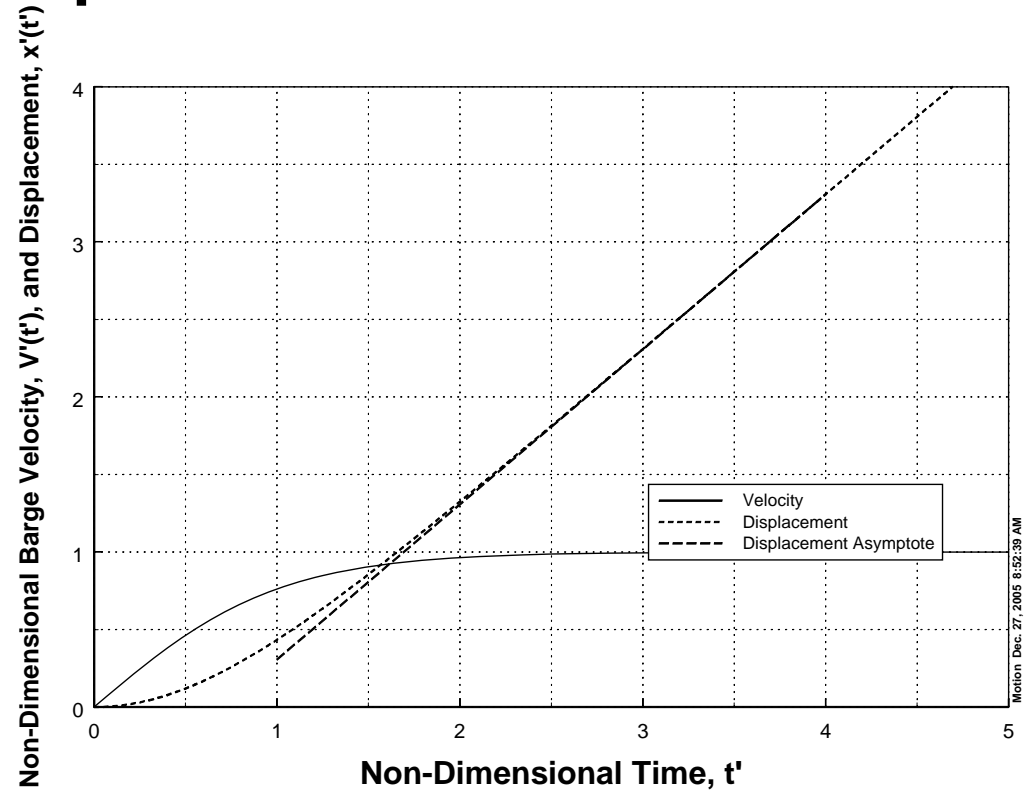
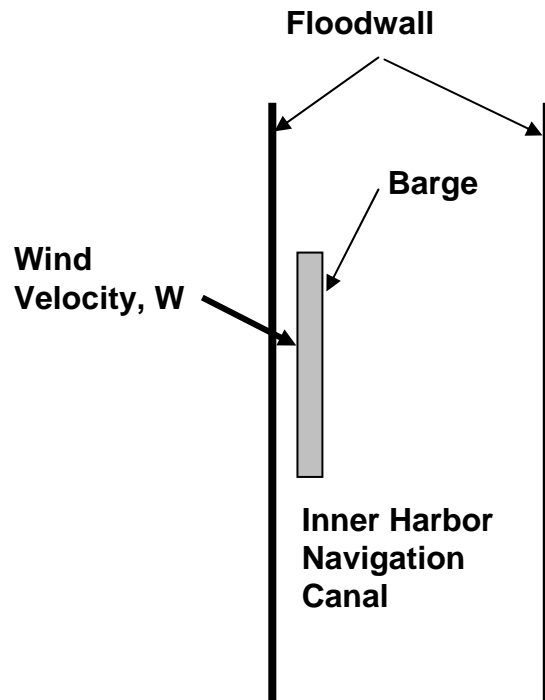
Time series of typical parameters along levee.



Time series of typical parameters along levee.

# Barge Response to Wind

- **Conclusion:**  
Barge impact could exceed hydrodynamic forces on wall





# **WAY AHEAD:**

**Establish bathymetries for IHNC, London Ave, & Orleans Ave Canals**

**Unidirectional and directional physical model tests**

**STWAVE & Boussinesq wave model runs for all Canals**

**Boussinesq model runs for St. Bernard & Plaquemines Parishes**

**High-resolution IHNC ADCIRC runs**

**Establish consistent physical framework for observations & models**

**Refine barge motion/impact analyses**

**Add engineering analyses into report, including statistics of forces, etc.**

# QUESTIONS:

Hurricane KATRINA has hit land and is moving north at 15mph. It has max sustained winds of 150mph and gust of 184mph.

Credit: NOAA

