Hurricane Recovery and Community Post – Disaster Planning - **October 29, 2008**

Coastal Mapping for Louisiana and Texas

Gary Zimmerer, P.E.
FEMA DR-1791-TX

FEMA

Agenda

- Introductions
- Technical Assistance
- Storm Surge Modeling
- Digital Flood Insurance Rate Maps
- Questions

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Hazards and Performance Analysis Group Technical Assistance

- Comprehensive technical analysis
- Engineering and design
- Technical reporting
- Research support
- Collection of disaster specific data

Mitigation Assessment Team Objectives:

- Conducts *forensic engineering analyses* to determine causes of building failure and success
- Provides *recommendations* that communities, states and organizations/agencies can take to reduce future damages and protect lives and property in hazard areas
- Increase damage resistance through *improvements in construction codes and standards, designs, methods, and materials* used for both new construction and post-disaster repair and recovery

Flood – Foundation Performance

- Slabs

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Flood – Structural Performance

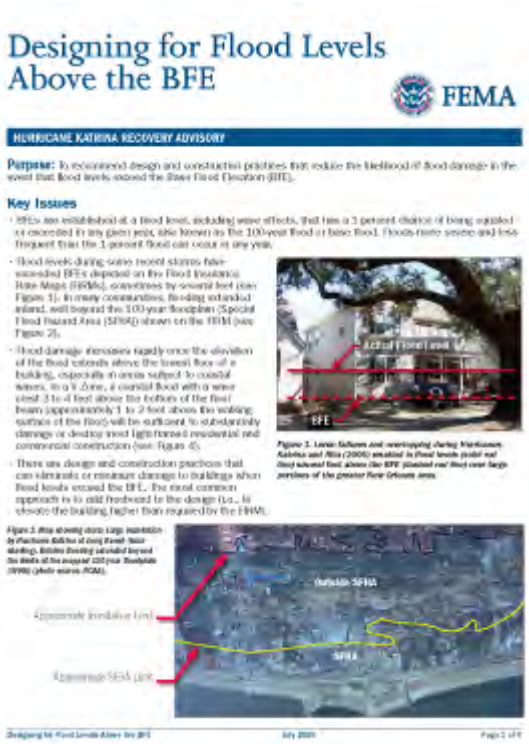
- Successes

Wind Induced Roofing & Siding Issues

MAT Products and Reports for:

- State and Local Governments
  - Floodplain managers
  - Code officials
  - Emergency managers
  - Applicants for grants / subgrants
- Architects and Engineers
- Contractors and Manufacturers
- Facility Managers

Hurricane Katrina Recovery Advisories



Designing for Flood Levels Above the BFE

FEMA

HURRICANE KATRINA RECOVERY ADVISORY

Purpose: To recommend design and construction practices that reduce the likelihood of flood damage in the event that flood levels exceed the Base Flood Elevation (BFE).

Key Issues

- BFEs are established at a flood level, including wave effects, that has a 1 percent chance of being equaled or exceeded in any given year, also known as the 100-year flood or base flood. Floods more severe and less frequent than the 1 percent flood can occur in any year.
- Flood levels during some recent storms have exceeded BFEs depicted on the Flood Insurance Rate Maps (FIRMs), sometimes by several feet (see Figure 1). In many communities, flooding extended inland, well beyond the 100-year floodplain (Special Flood Hazard Area (SFHA)) shown on the FIRM (see Figure 2).
- Flood damage increases rapidly once the elevation of the flood exceeds above the lowest floor of a building, especially in areas subject to coastal waves. In a V Zone, a coastal flood with a wave crest 3 to 4 feet above the bottom of the floor beam (approximately 1 to 2 feet above the walking surface of the floor) will be sufficient to substantially damage or destroy most light-framed residential and commercial construction (see Figure 4).
- There are design and construction practices that can eliminate or minimize damage to buildings when flood levels exceed the BFE. The most common approach is to add freeboard to the design (i.e., to elevate the building higher than required by the FIRM).

Actual Flood Level

BFE

Figure 1. Loss failures and overlapping during Hurricanes Katrina and Rita (2005) enabled by flood levels (solid red line) exceeding flood, above (for BFE (dashed red line) over large portions of the greater New Orleans area.

Outside SFHA

Approximate Inundation Limit

SFHA

Approximate Mean Limit

MITIGATION ASSESSMENT TEAM REPORT

HURRICANE *Katrina*

IN THE GULF COAST

E. FEMA Hurricane Katrina Recovery Advisories

FEMA has prepared a series of Recovery Advisories that present guidance for design, construction, and restoration of buildings in areas subject to coastal flooding and high winds from Hurricane Katrina. To date, eight advisories have been prepared and are included in this appendix:

- Reconstruction Guidance Using Data on Katrina Surge Inundation and Advisory Base Flood Elevation Maps
- Initial Assessment for Flooded Buildings
- Design and Construction in Coastal A Zones
- The ABCs of Returning to Flooded Buildings
- Attachment of Brick Veneer in High-Wind Regions
- Attachment of Rooftop Equipment in High-Wind Regions
- Rooftop Attachment of Lightning Protection Systems in High-Wind Regions
- Designing for Flood Levels Above the BFE

These Advisories are also available online at http://www.fema.gov/library/viewRecord.do?id=1536 where future Advisories will also be posted.

HURRICANE KATRINA IN THE GULF COAST MITIGATION ASSESSMENT TEAM REPORT 8-1

The ABC's of Returning to Flooded Buildings

FEMA

HURRICANE KATRINA RECOVERY ADVISORY

Hurricane Katrina produced widespread flooding from both storm surge and levee breaches. The combination of water intrusion and delayed re-entry due to evacuation requirements and power interruption has created a situation that presents significant challenges to individuals returning to flood-damaged buildings. The following tips are designed to assist impacted individuals when they are able to return their flooded property. Additional information can be found in the Hurricane Katrina Recovery Advisory, Initial Assessment for Flooded Buildings.

Anticipate what you will need

- Personal protective equipment including safety shoes or heavy rubber boots may be worn if you are not sure if the waterline has been pumped out; work gloves; eye protection; rubber gloves for cleaning or when using sanitizing chemicals; a hard hat; and respiratory protection in case there is mold or bacteria contamination (respirators with HEPA cartridges or dust masks with a rating of N-95 or higher should be used). These can be obtained from hardware stores or home improvement stores. If materials containing asbestos are suspected, it will be necessary to use a respirator with a HEPA cartridge in accordance with Federal requirements.
- Tools for entry and cleaning such as a pry bar, shovel, and a flashlight with extra batteries (Figure 1).
- Camera or video recorder for recording conditions for use in insurance claims.
- Hand and face cleaning supplies such as alcohol wipes or hand sanitizer gel.
- Cleaning supplies for salvageable materials including potable water, chemical cleaners/sanitizers, sponges, buckets, and wiping rags.
- Personal supplies to protect fragile salvaged items during transport.
- First aid kit.
- Pen and paper, tape, scissors, and small plastic storage bags for writing down serial numbers and taking samples of damaged materials to support insurance claims.

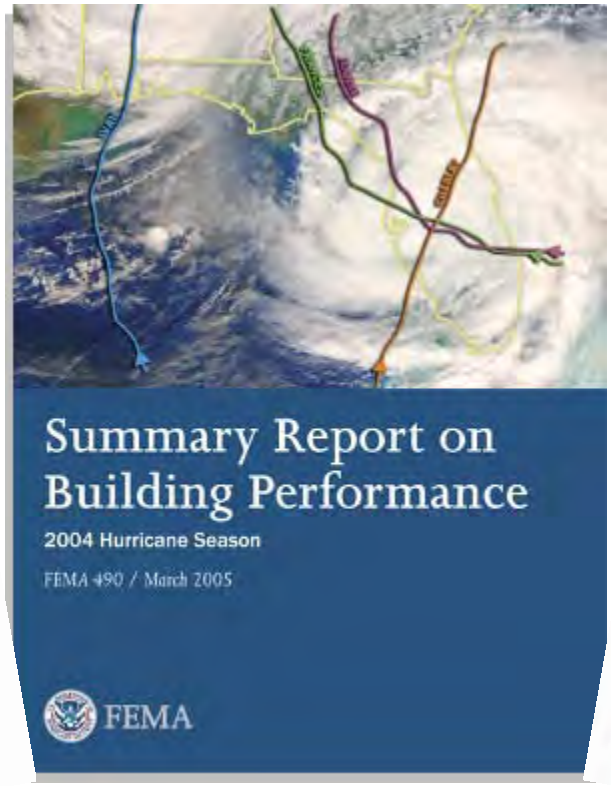
Figure 1. Tools for entry and cleaning.

Be realistic about your limitations

- Even initial assessment and salvage can be hot, heavy work.
- If at all possible, work with another person while in the house. Unforeseen hazards can exist, so having help nearby is prudent.
- Avoid entry, even with personal protective equipment, if you have serious pre-existing health issues:
  - Asthma/allergies
  - Compromised immune system
  - Heart problems
  - Open cuts or wounds
- Get help moving large items such as furniture and appliances.
- Do not underestimate the impact of psychological shock and physical effort:
  - Identify someone in advance who you can talk to about your situation and feelings.
  - See the resources section for some potential contacts.

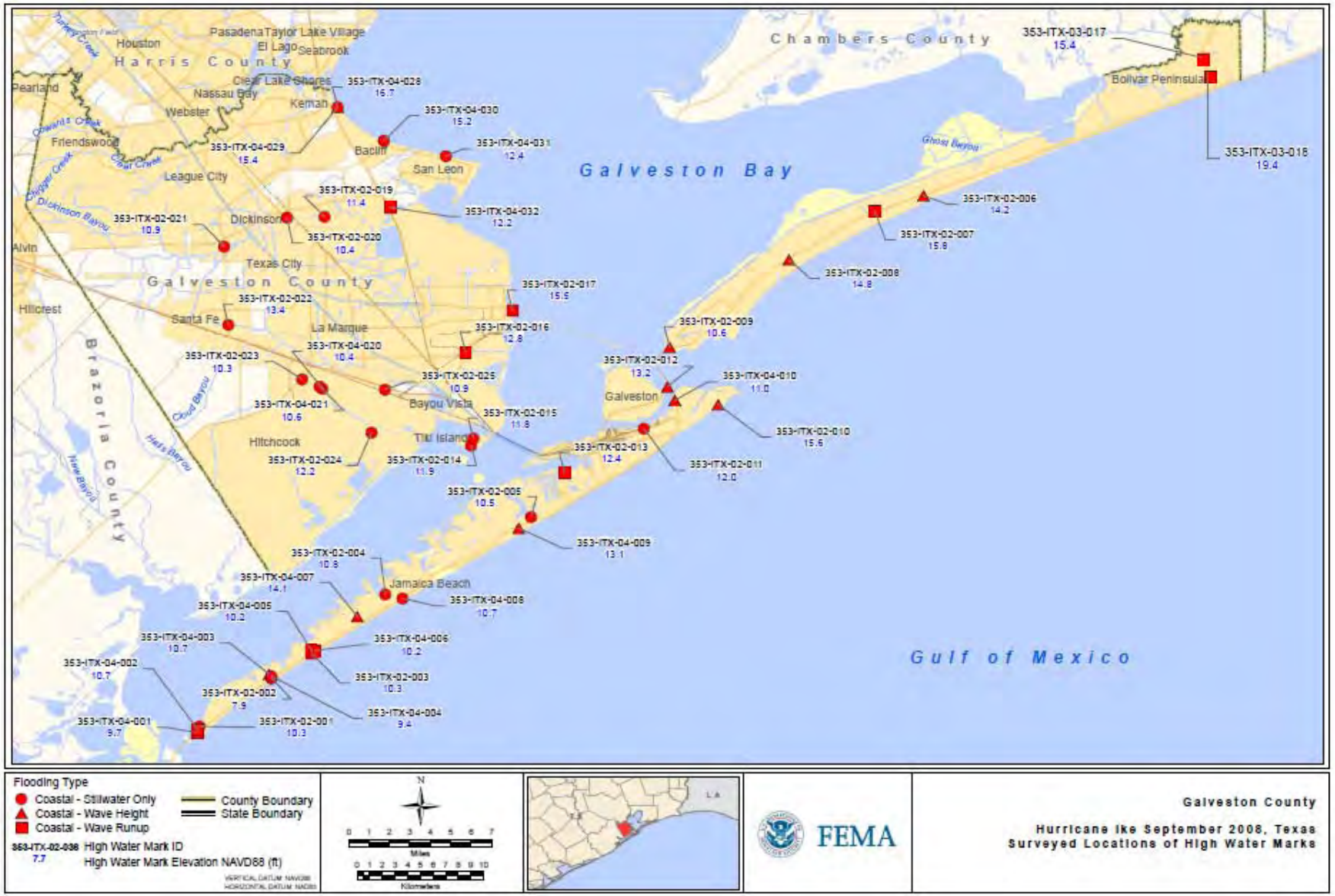
The ABCs of Returning to Flooded Buildings November 2005 Page 1 of 3

MAT Products



Coastal High Water Marks

- Numerous agencies collection efforts
- FEMA sponsored effort
- Harris, Galveston, Brazoria, Orange, Chambers, Jefferson
- Louisiana effort underway


Chambers County
Harris County
Galveston County
Galveston Bay
Gulf of Mexico
Houston
Pasadena
Taylor Lake Village
El Lago
Seabrook
Pearland
Clear Lake Shores
Nassau Bay
Kemah
Webster
Friendswood
League City
Bacliff
San Leon
Bolivar Peninsula
Ghost Bayou
Dickinson
Alvin
Texas City
Hillcrest
Santa Fe
La Marque
Bayou Vista
Galveston
Tiki Island
Hitchcock
Jamaica Beach
Brazoria County
Clear Creek
Dickinson Bayou
Chigger Creek
Edwards Creek
Mud Bayou
Hall's Bayou
Haws Bayou
353-ITX-03-017 15.4
353-ITX-03-018 19.4
353-ITX-04-028 15.7
353-ITX-04-030 15.2
353-ITX-04-031 12.4
353-ITX-04-029 15.4
353-ITX-02-019 11.4
353-ITX-04-032 12.2
353-ITX-02-021 10.9
353-ITX-02-020 10.4
353-ITX-02-006 14.2
353-ITX-02-007 15.6
353-ITX-02-008 14.8
353-ITX-02-017 15.5
353-ITX-02-022 13.4
353-ITX-02-016 12.8
353-ITX-02-009 10.6
353-ITX-04-020 10.4
353-ITX-02-023 10.3
353-ITX-02-012 13.2
353-ITX-04-010 11.0
353-ITX-02-025 10.9
353-ITX-04-021 10.6
353-ITX-02-015 11.8
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353-ITX-02-005 10.5
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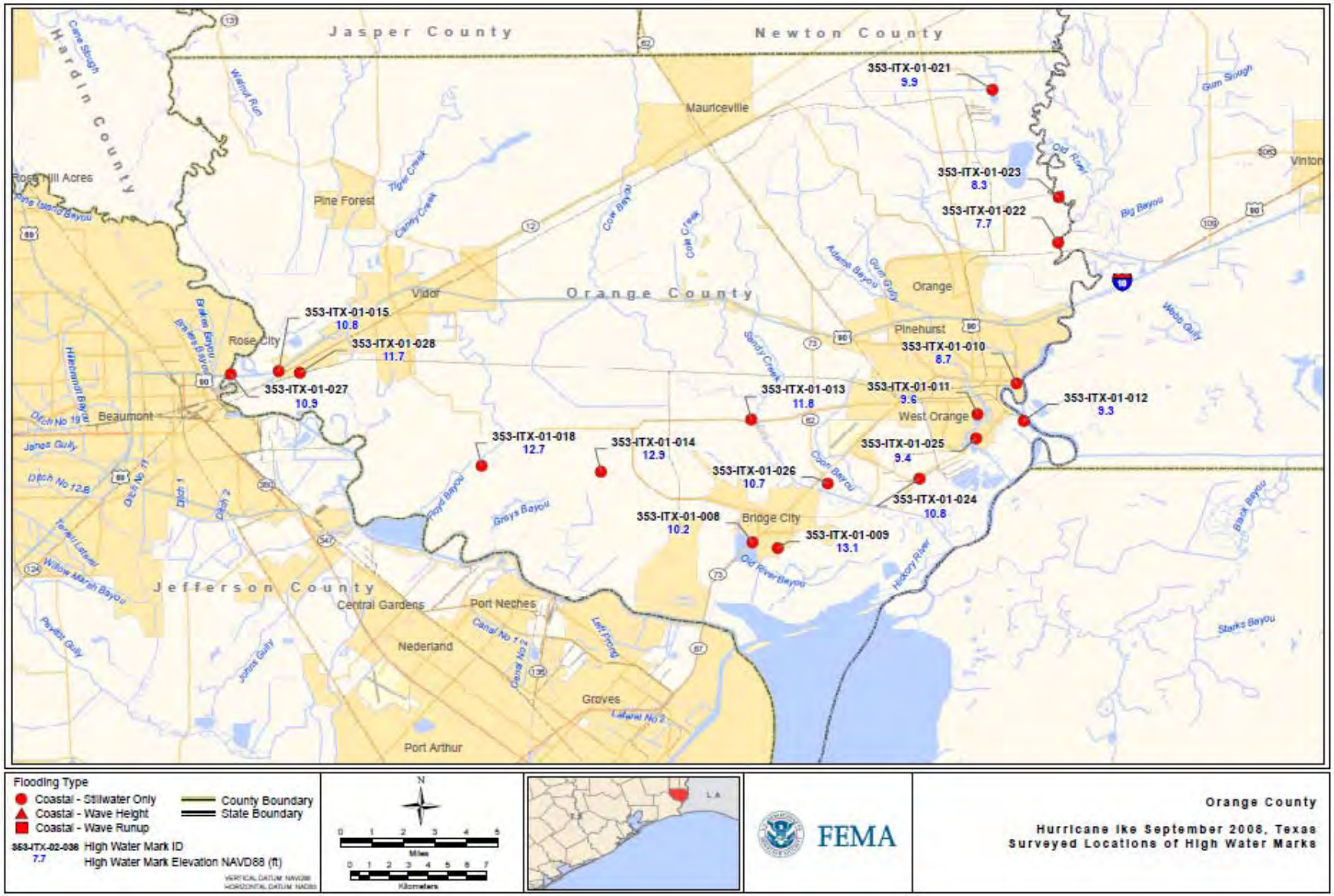
353-ITX-04-006 10.2
353-ITX-04-002 10.7
353-ITX-02-003 10.3
353-ITX-02-002 7.9
353-ITX-04-004 9.4
353-ITX-04-001 9.7
353-ITX-02-001 10.3
Flooding Type
Coastal - Stillwater Only
Coastal - Wave Height
Coastal - Wave Runup
County Boundary
State Boundary
353-ITX-02-036 High Water Mark ID
7.7 High Water Mark Elevation NAVD88 (ft)
VERTICAL DATUM: NAVD88
HORIZONTAL DATUM: NAD83
N
0 1 2 3 4 5 6 7
Miles
0 1 2 3 4 5 6 7 8 9 10
Kilometers
LA
TX
FEMA
Galveston County
Hurricane Ike September 2008, Texas
Surveyed Locations of High Water Marks


Jasper County
Newton County
Hardin County
Orange County
Jefferson County
Maurice ville
Pine Forest
Rose Hill Acres
Vidor
Orange
Pinehurst
Rose City
Beaumont
West Orange
Bridge City
Central Gardens
Port Neches
Nederland
Groves
Port Arthur
353-ITX-01-021
9.9
353-ITX-01-023
8.3
353-ITX-01-022
7.7
353-ITX-01-015
10.8
353-ITX-01-028
11.7
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9.3
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12.7
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12.9
353-ITX-01-025
9.4
353-ITX-01-026
10.7
353-ITX-01-024
10.8
353-ITX-01-008
10.2
353-ITX-01-009
13.1
Flooding Type
Coastal - Stillwater Only
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County Boundary
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353-ITX-02-036 High Water Mark ID
7.7 High Water Mark Elevation NAVD88 (ft)
N
Miles
Kilometers
LA
FEMA
Orange County
Hurricane Ike September 2008, Texas
Surveyed Locations of High Water Marks

FEMA

Project : Hurricane Ike, 2008 (HMTAP Task Order # HSFEHQ-08-J-0053)

Contents : High Water Mark (HWM) Survey Report

HWM ID :	353-ITX-01-026	Date of Flood Event :	Sept 13, 2008
Name of Storm Event :	Hurricane Ike, 2008	Date of Peak :	N/A
Disaster Number :	FEMA-1791-DR-TX	Source of Date of Peak :	N/A
Stream Name/Flood Source :	Gulf of Mexico	HWM Quality :	Good
Survey Ele. (US FT) NAVD88 :	10.7	NGVD 29 :	10.6
Flooding Type :	Coastal - Stillwater Only		
HWM Object, Surface :	Interior Wall		
HWM Address :	398 Berwick Dr , Bridge City		
Type of HWM :	Mud Line	County : Orange	State : Texas

Name of Flagger/Interviewer :	Chris Roenning	Michael Sarhan	Flagger Company:	URS Corp.
Date of Flagging/Interview :	09/27/2008			

Survey Crew :	JC	Company :	ESP Associates, P.A.
Survey Date :	9/27/08	Vertical Datum :	NAVD 88 Horizontal Datum: NAD 83
Map Projection Used :	Texas Central 4203		
Survey Latitude :	30.0452		
Survey Longitude :	-93.8139	Apx. Bldg Floor Elevation :	N/A

000-ITX-01-026-95.jpg

000-ITX-01-026-97.jpg

Survey Certification : High water mark survey is certified to 0.25 feet vertically and 10 feet horizontally with a 95% accuracy level

John Avery, Jr. - PLS, State of Texas
ESP Associates, P.A. Registration Number : 1560
P.O. Box 7030 Charlotte, NC 28241 Phone Number : 704-583-4949

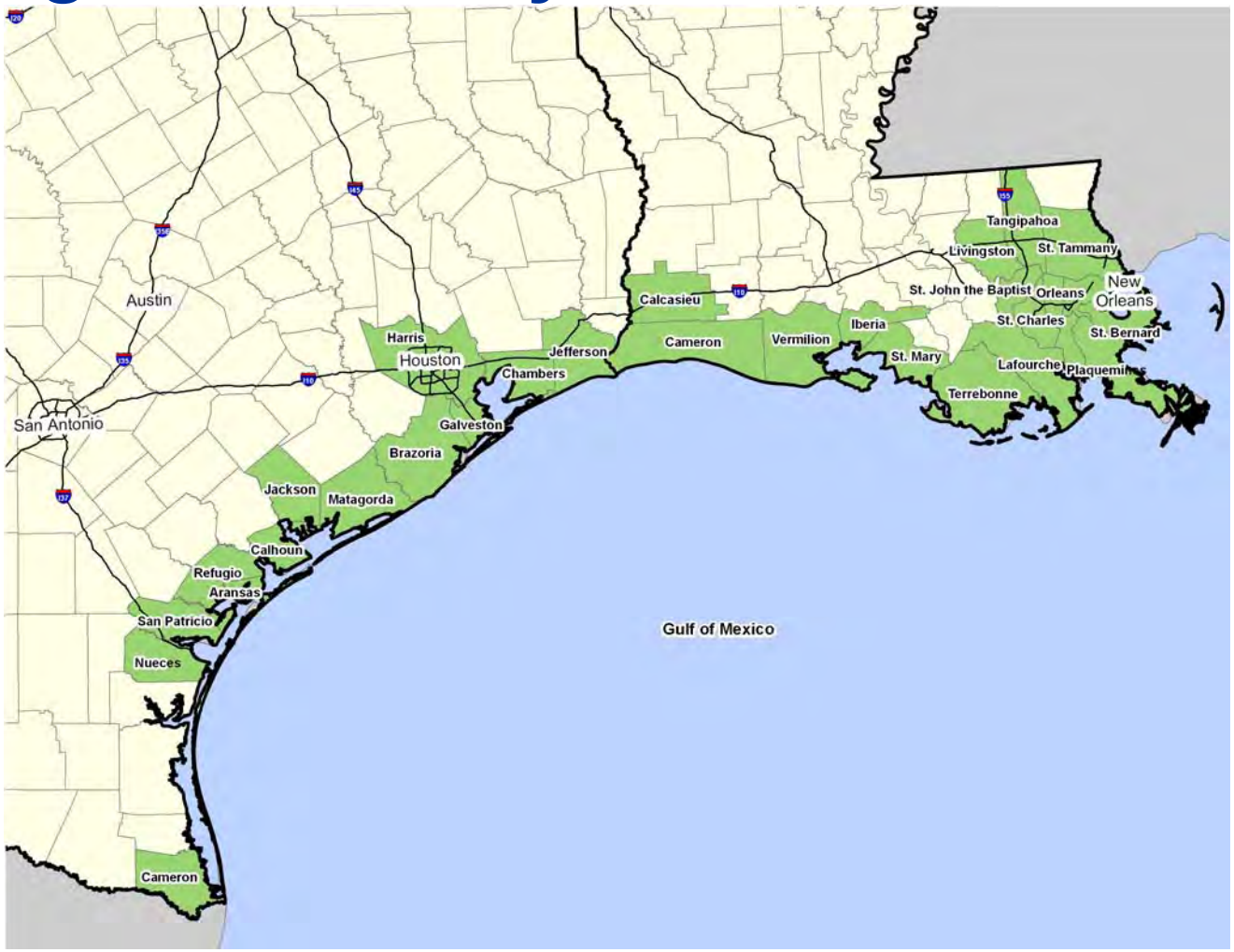
Project : Hurricane Ike 2008 - Rapid Response HMTAP Task Order(s): HSFEHQ-08-J-0053

Background/Storm Surge History

- Gulf Coast effective coastal analysis is 30 years old
  - Development changes
  - Subsidence impact
  - Wetlands Degradation/Accretion
  - Coastal Erosion
  - Additional Historical Storm Data
  - Enhanced Topographic Data

- Need for new analysis identified prior to Katrina and Rita

Background/Study Area



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Storm Surge Analysis – Technical Process Overview

- ADvanced CIRCulation model (ADCIRC)
- ADCIRC model
  - Grid Development
  - Grid Validation Runs
  - Production Runs
- Statistical Analysis
- Quality Assurance/Quality Control (QA/QC)
  - Internal review
  - External review

Storm Surge Analysis – ADCIRC Model

- ADCIRC Model
  - Hydrodynamic Model for Coastal Oceans, Inlets, Rivers and Floodplains
  - Simulates the storm surge for a given storm event

Surge Modeling of the Gulf Coast
Project Team/Collaborating Organizations

- USACE-MVN
- USACE-SWG
- ERDC
- FEMA Region 6
- NOAA
- U of Notre Dame
  U of Texas
- U of Oklahoma

- ARCADIS
- Taylor Engineering
- Ayres Associates
- OceanWeather
- Applied Risk Associates

>65 personnel active on project.
>100 total involved.

FEMA

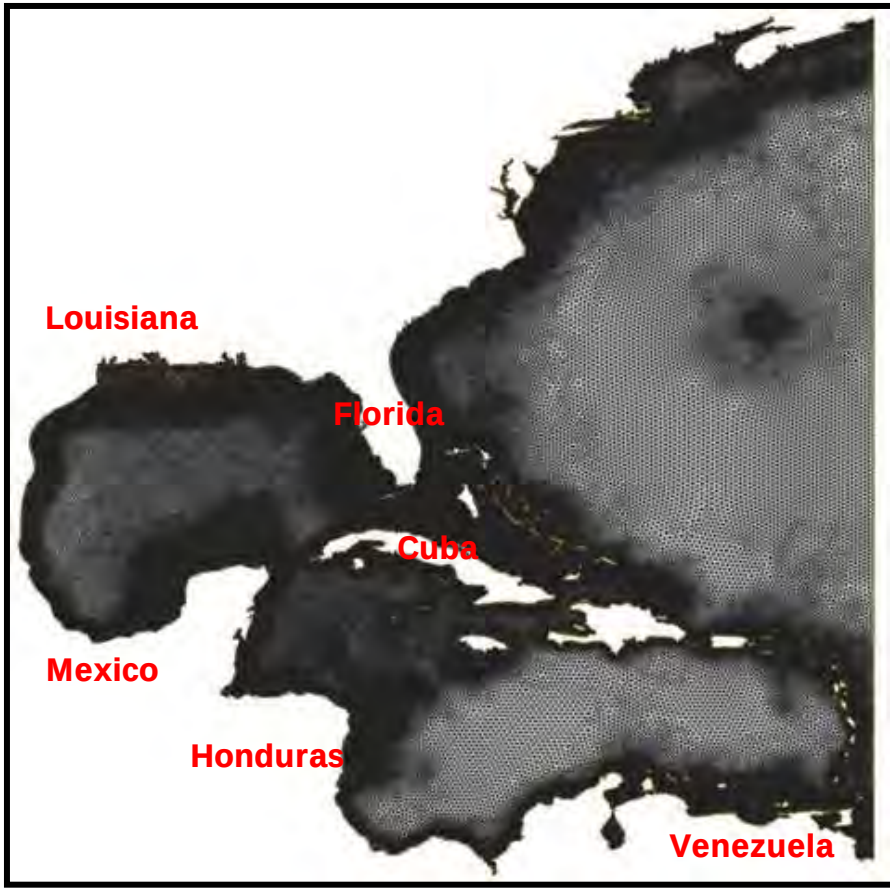
Surge Modeling of the Gulf Coast
JPM-OS Method

Parameters Considered in JPM-OS

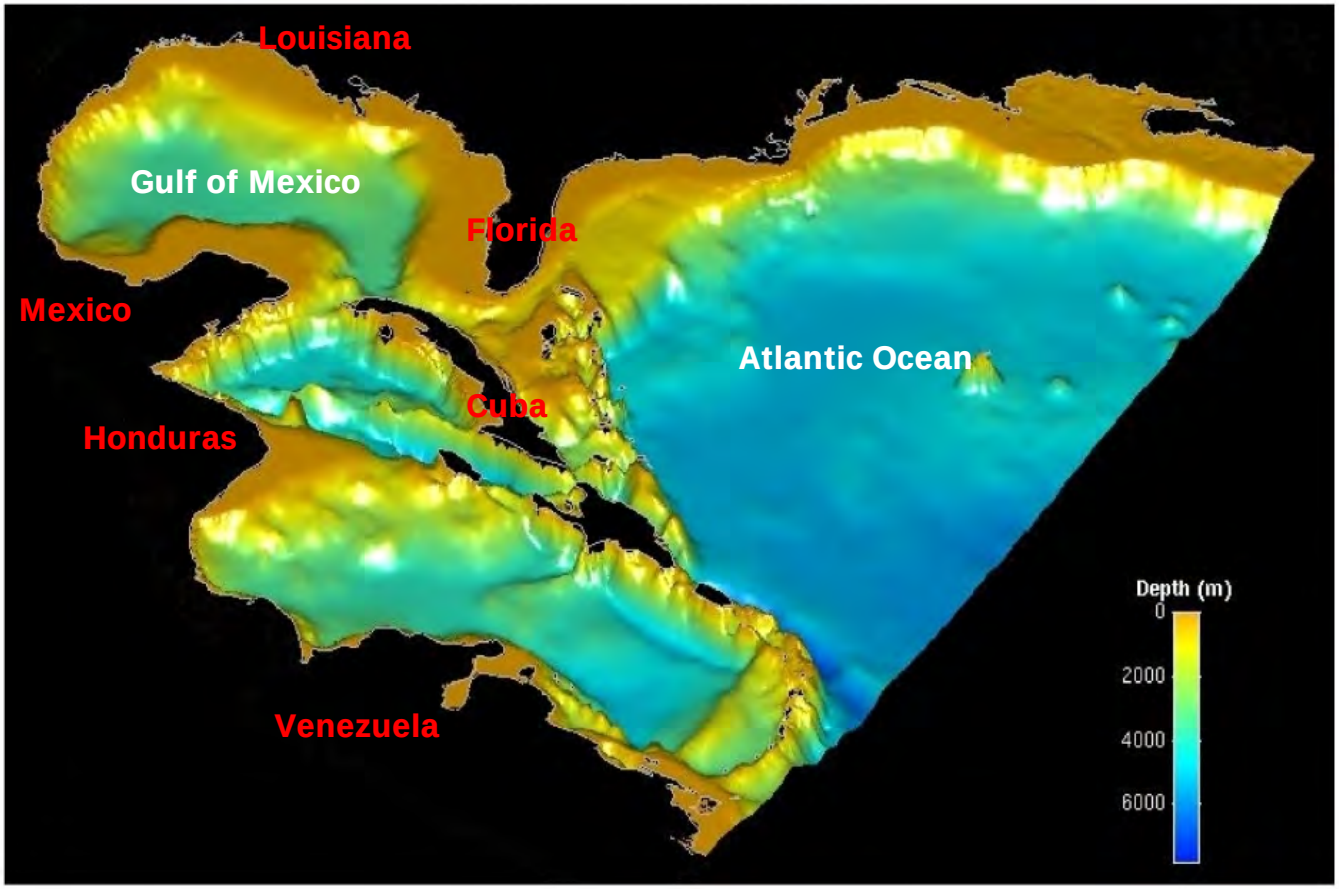
- Central Pressure
- Radius to Maximum Wind Speed
- Angle of Track Relative to Coast
- Forward Speed of Storm
- Holland B Parameter - Internal wind structure
- Distance Between Track Landfall and Point of Interest

Storm Surge Analysis – Grid Development

- Grid represents ground surface
- Based on:
  - LiDAR and bathymetric data
  - Drive-by GPS surveys
  - As-built plans
- 60 meter minimum spacing
- Increased at topographic features
- Millions of nodes
- Up to 18 meter contour



Storm Surge Analysis – Grid Development



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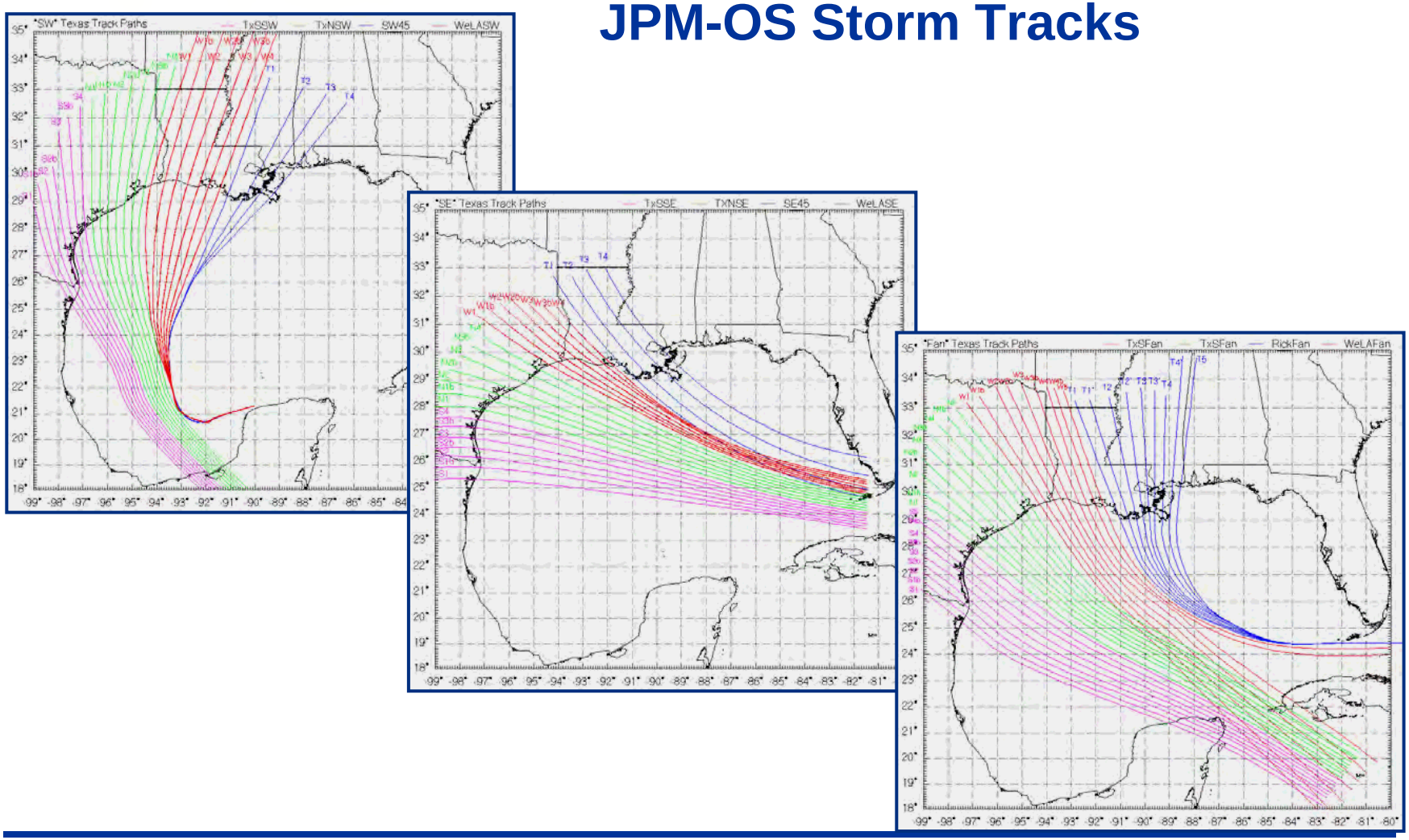
Surge Modeling of the Gulf Coast
JPM-OS Storm Tracks



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Surge Modeling of the Gulf Coast
JPM-OS Computer Resource Requirements

Clock hours per storm:

Cray XT3	ERDC Sapphire	7.8 hours
Sun Constellation	UT Ranger	40 minutes
Dell Linux Cluster	UT Lonestar	8 hours

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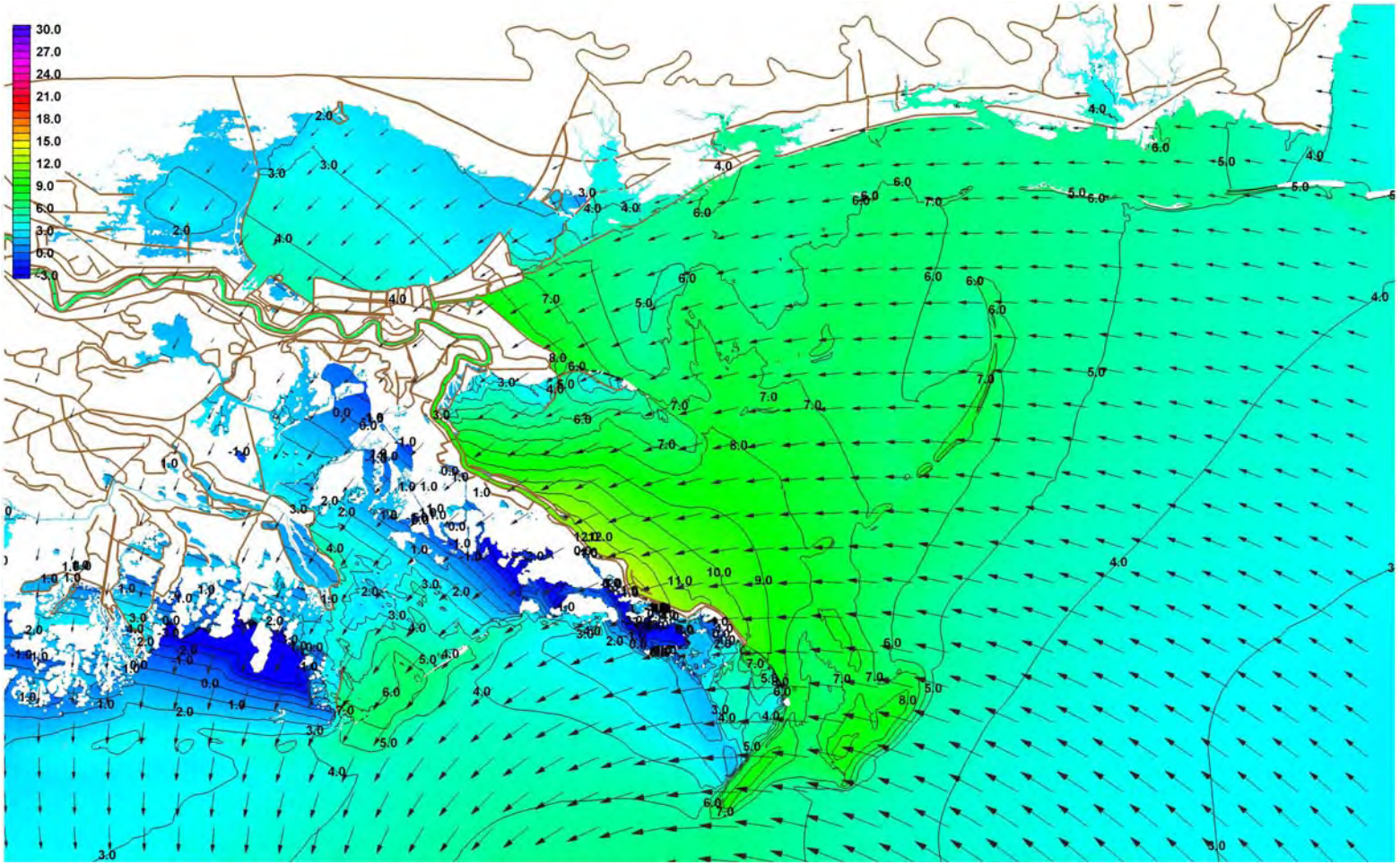
Surge Modeling of the Gulf Coast
JPM-OS Katrina Hindcast



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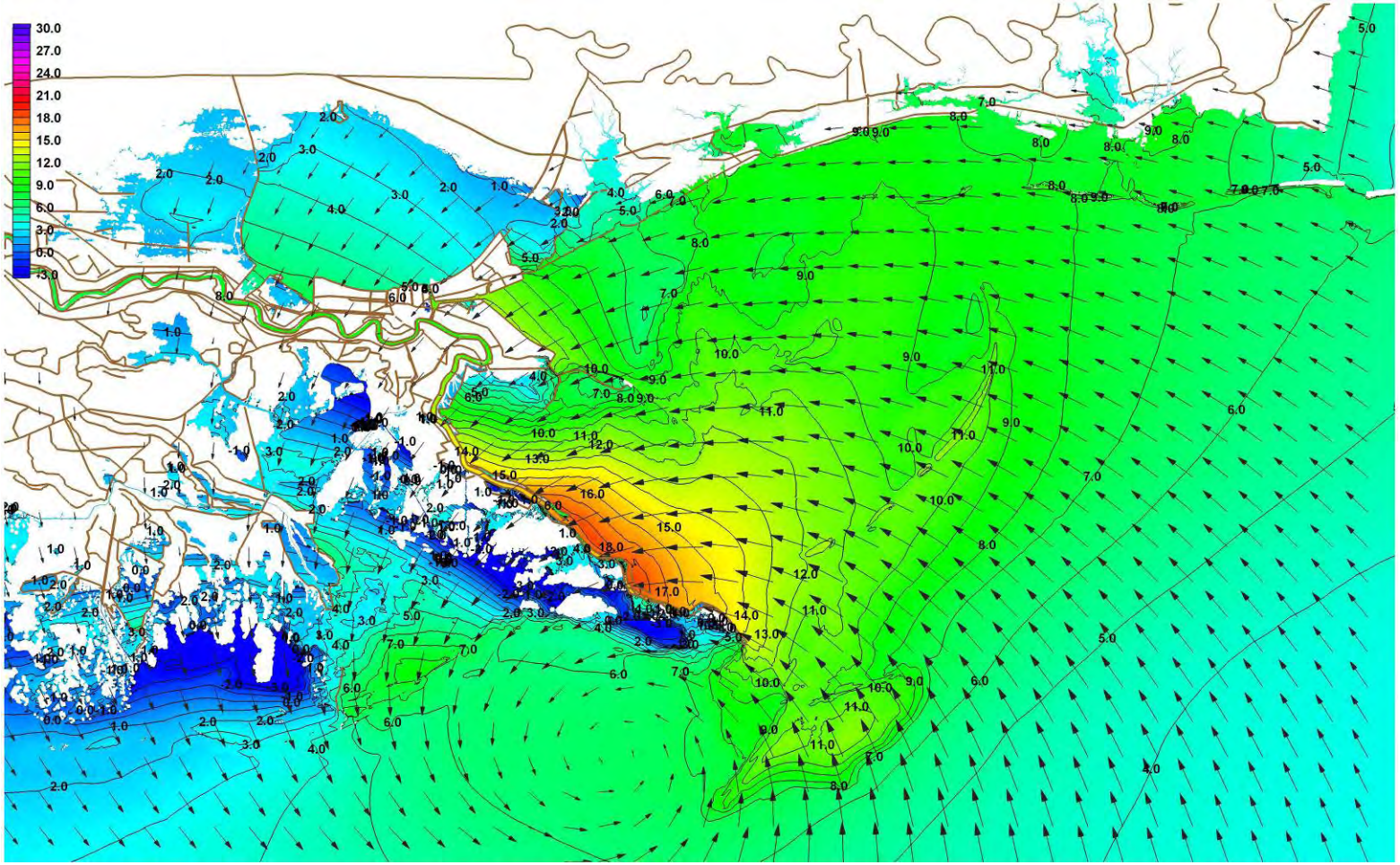
Surge Modeling of the Gulf Coast
JPM-OS Katrina Hindcast



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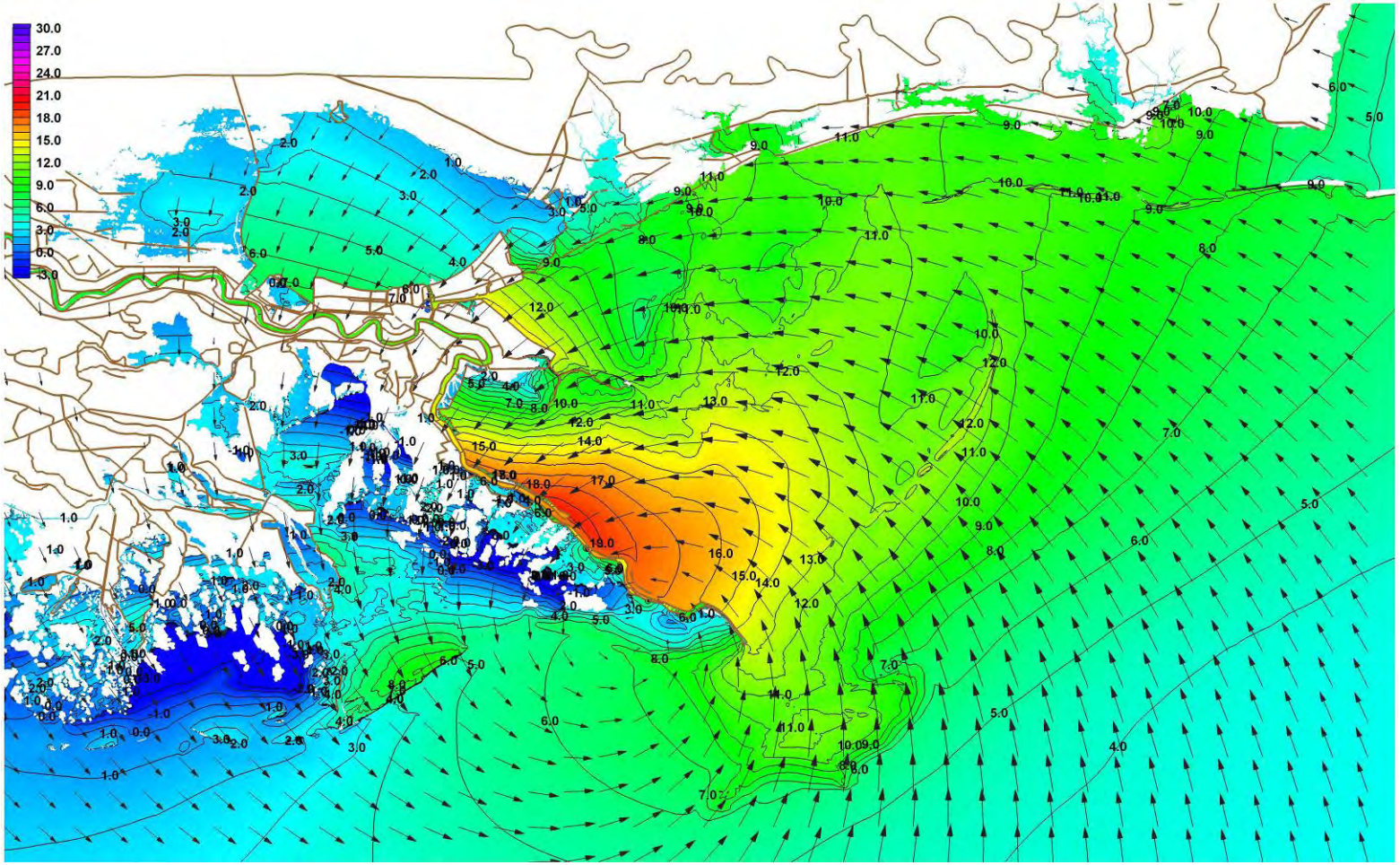

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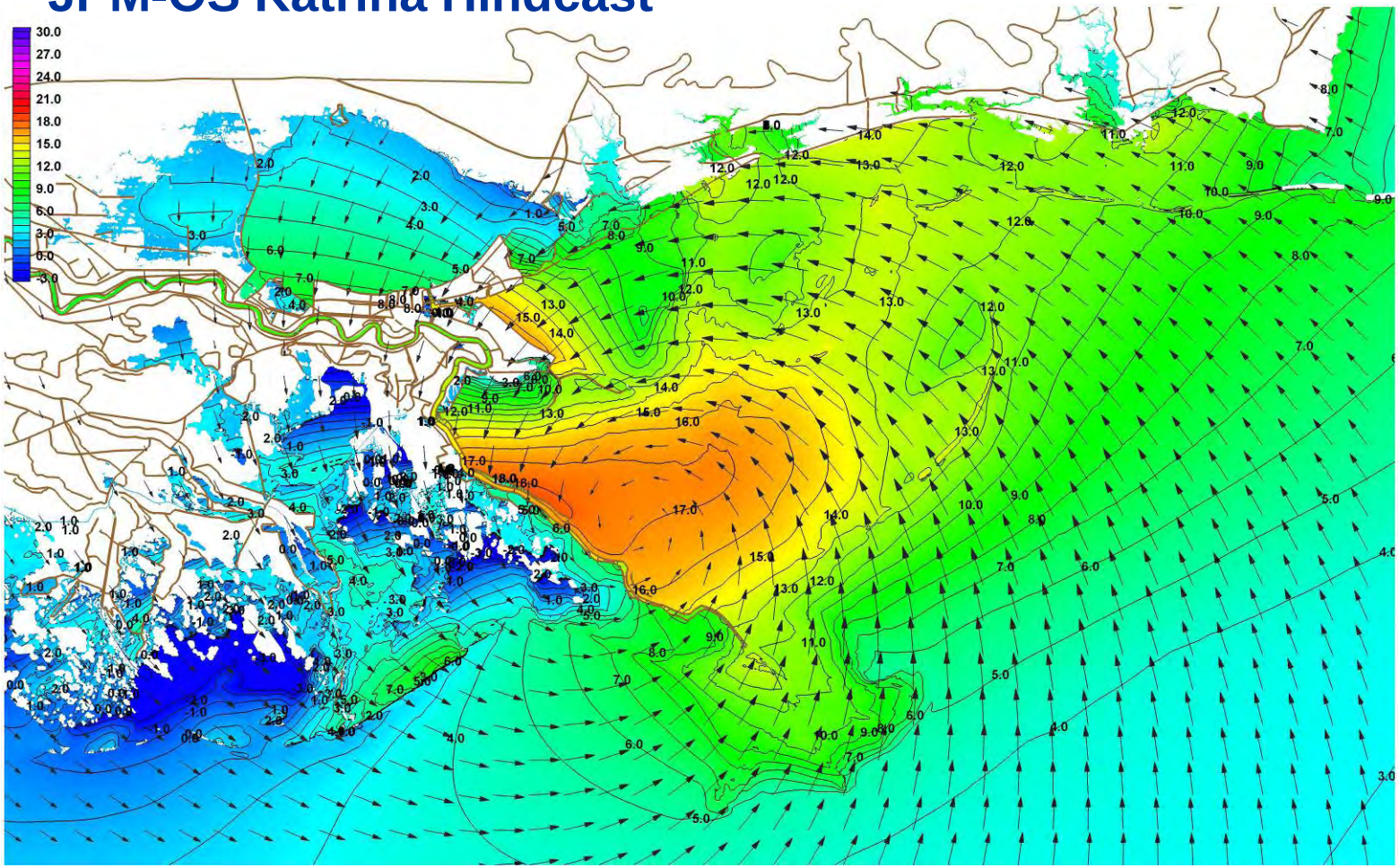
Surge Modeling of the Gulf Coast
JPM-OS Katrina Hindcast



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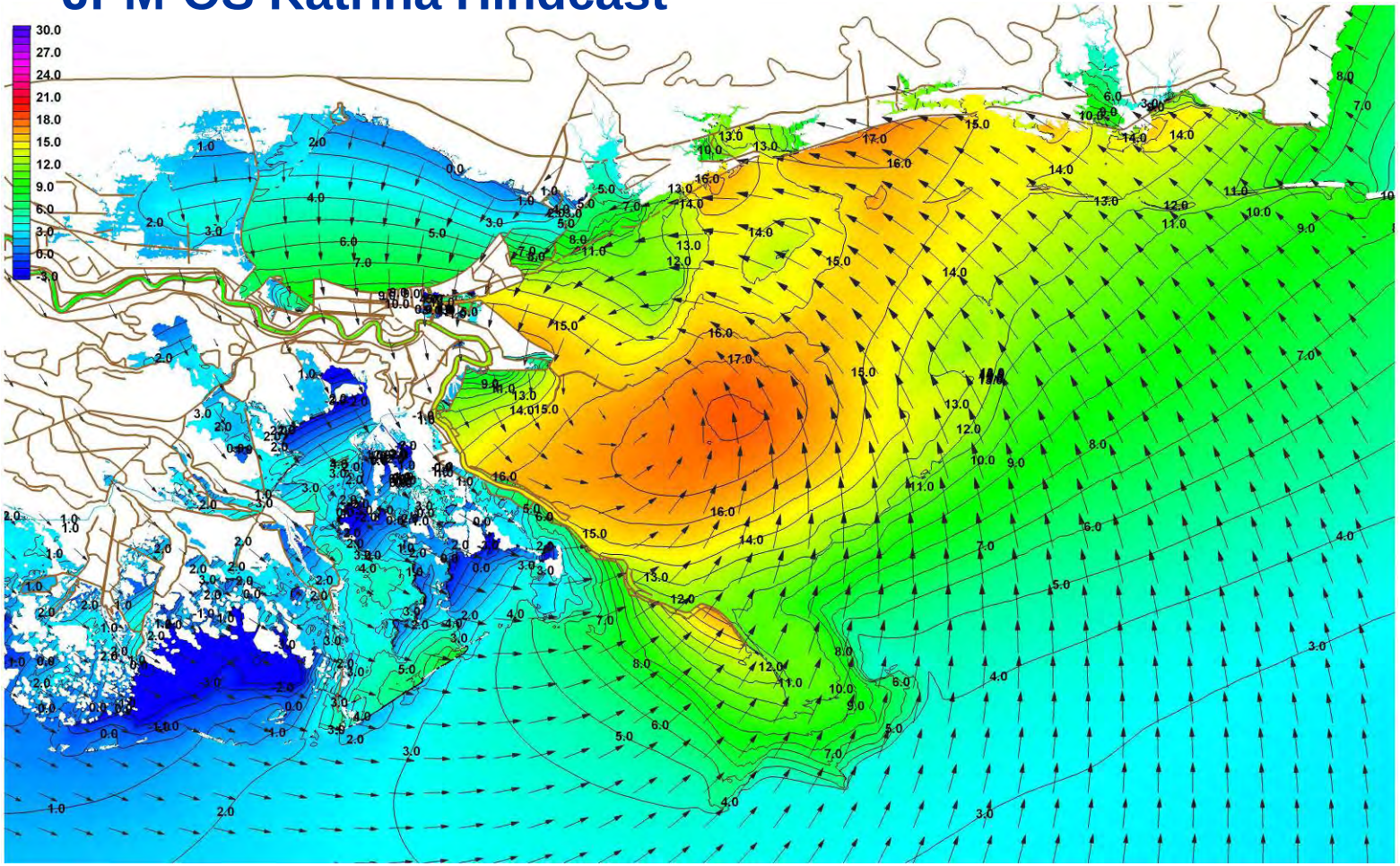

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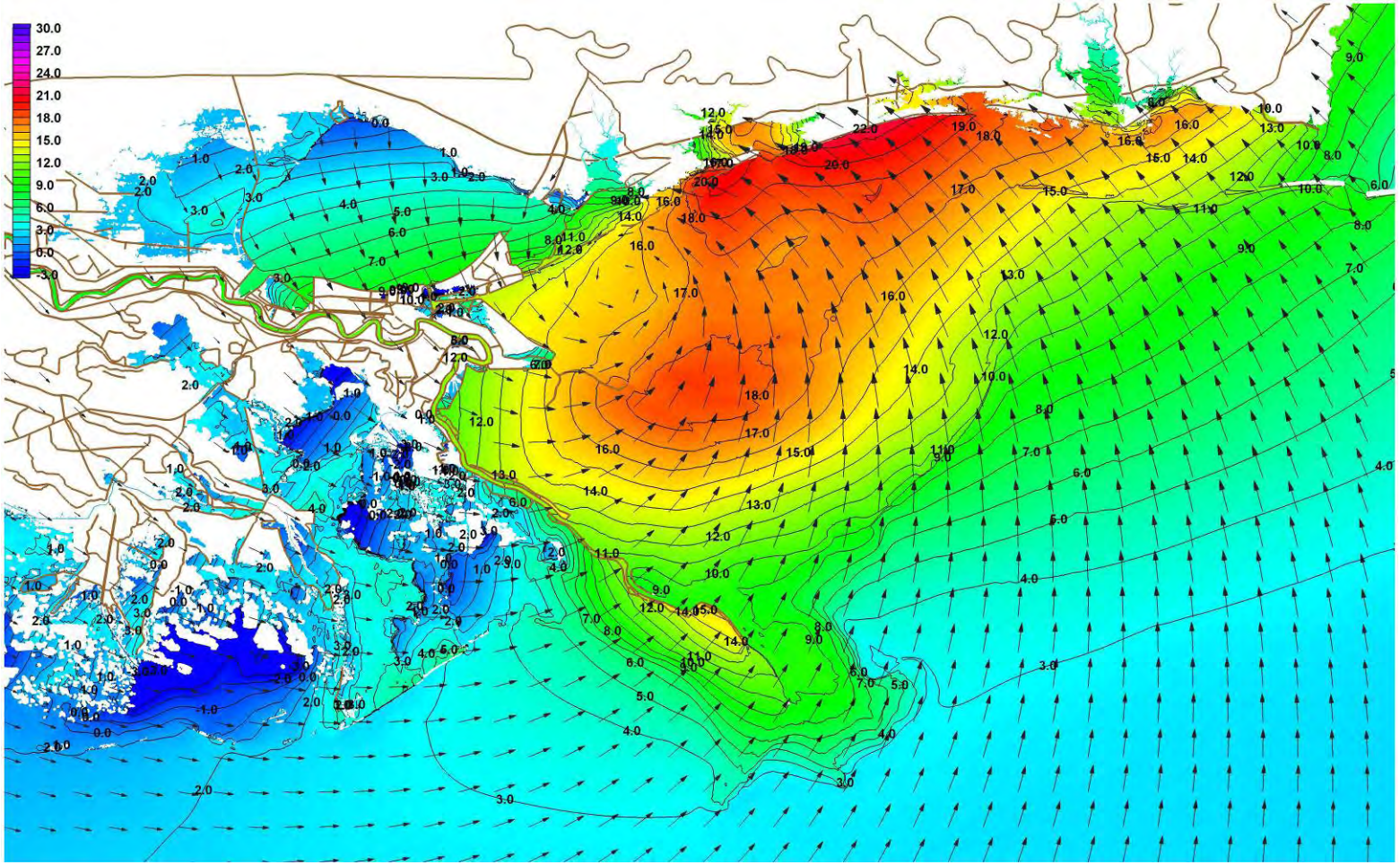

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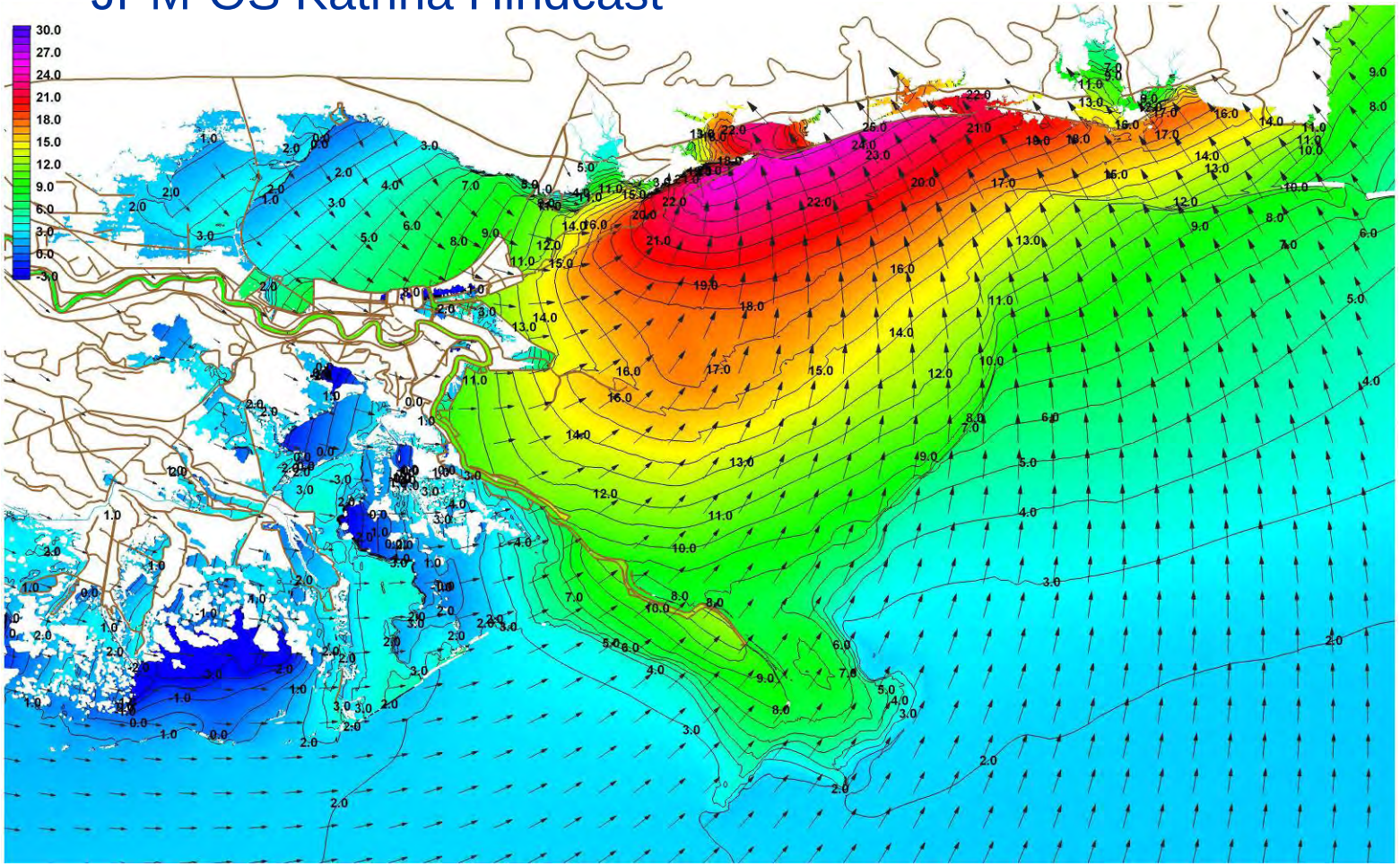
Surge Modeling of the Gulf Coast
JPM-OS Katrina Hindcast



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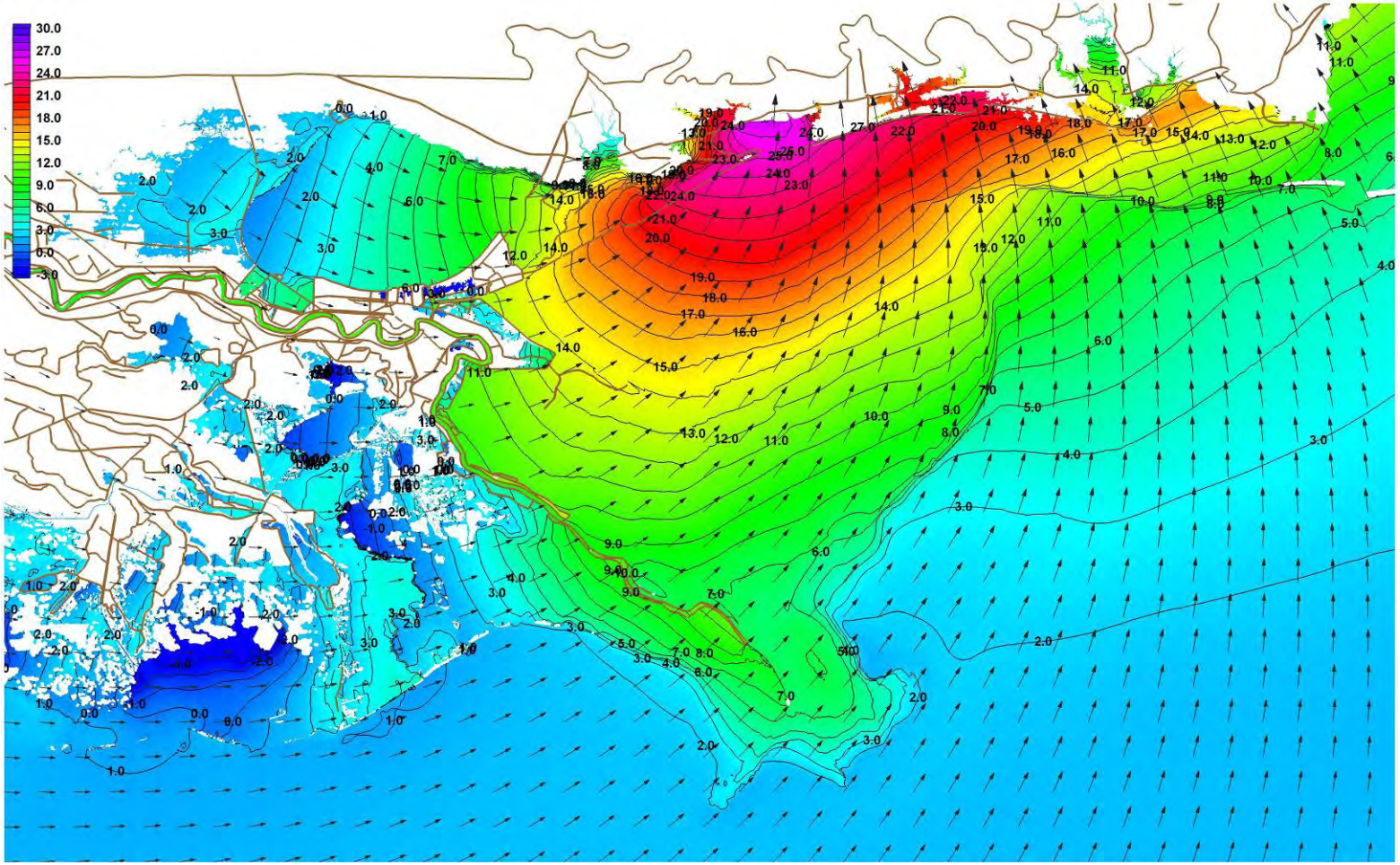
JPM-OS Katrina Hindcast



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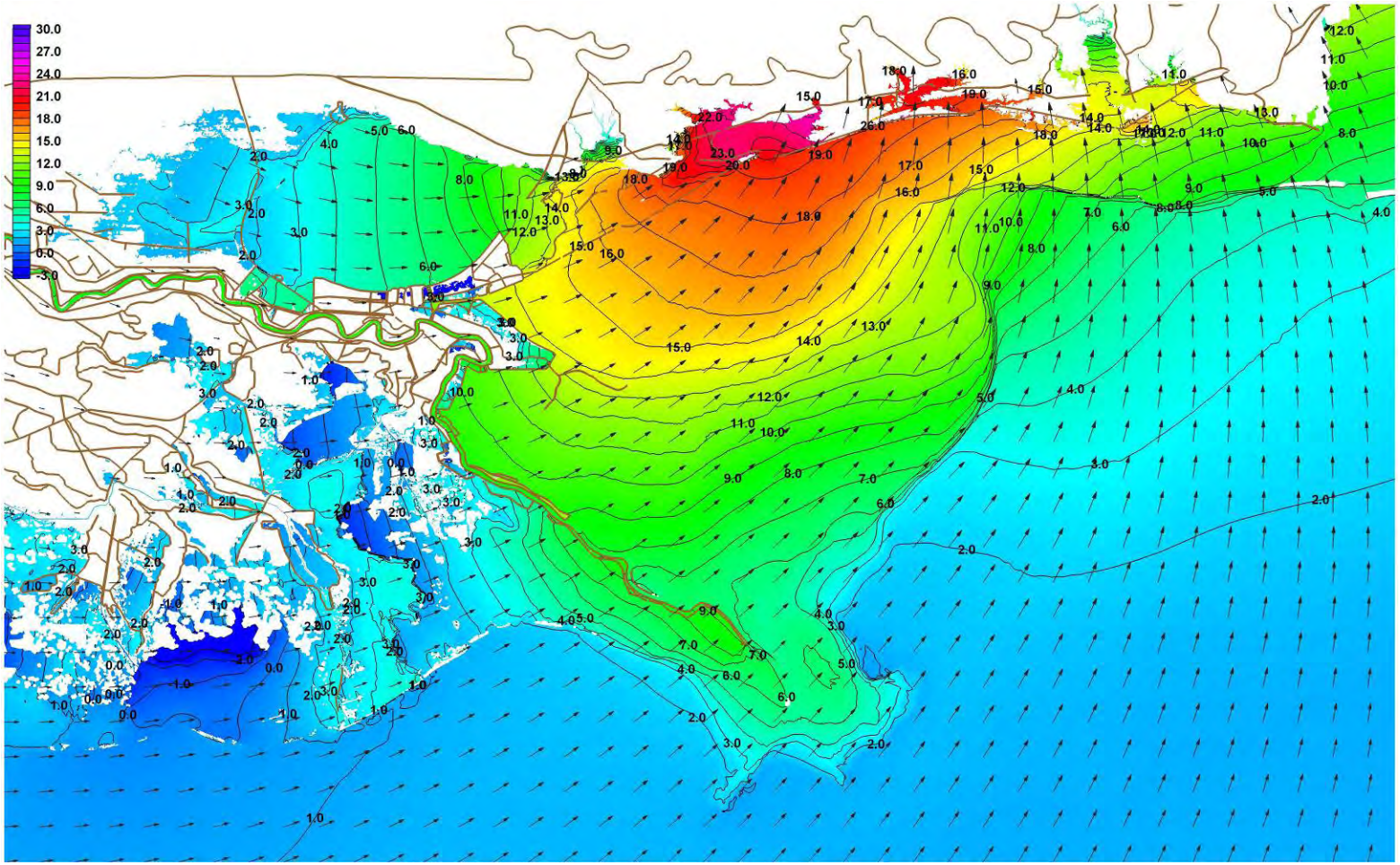
Surge Modeling of the Gulf Coast
JPM-OS Katrina Hindcast



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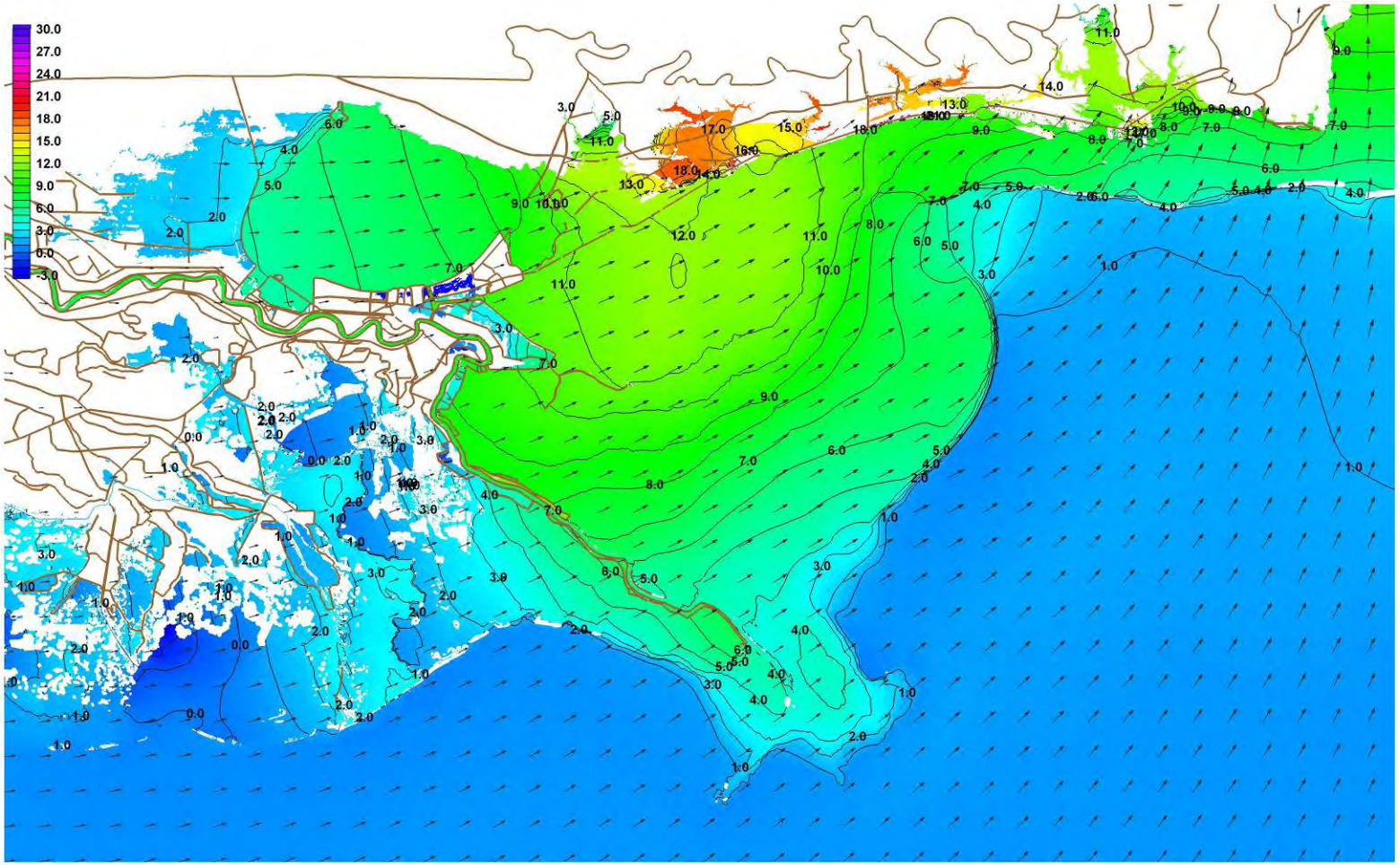

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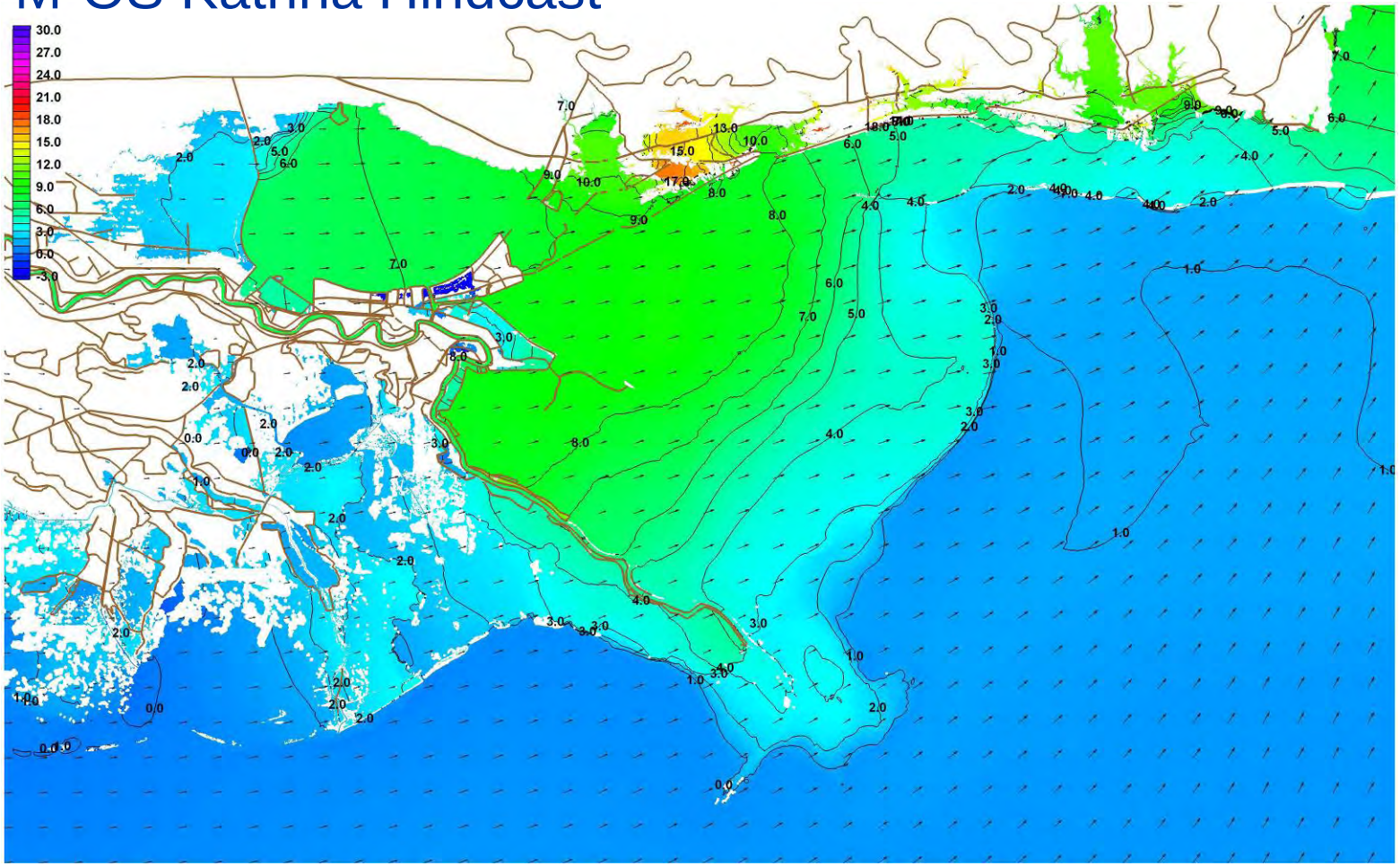

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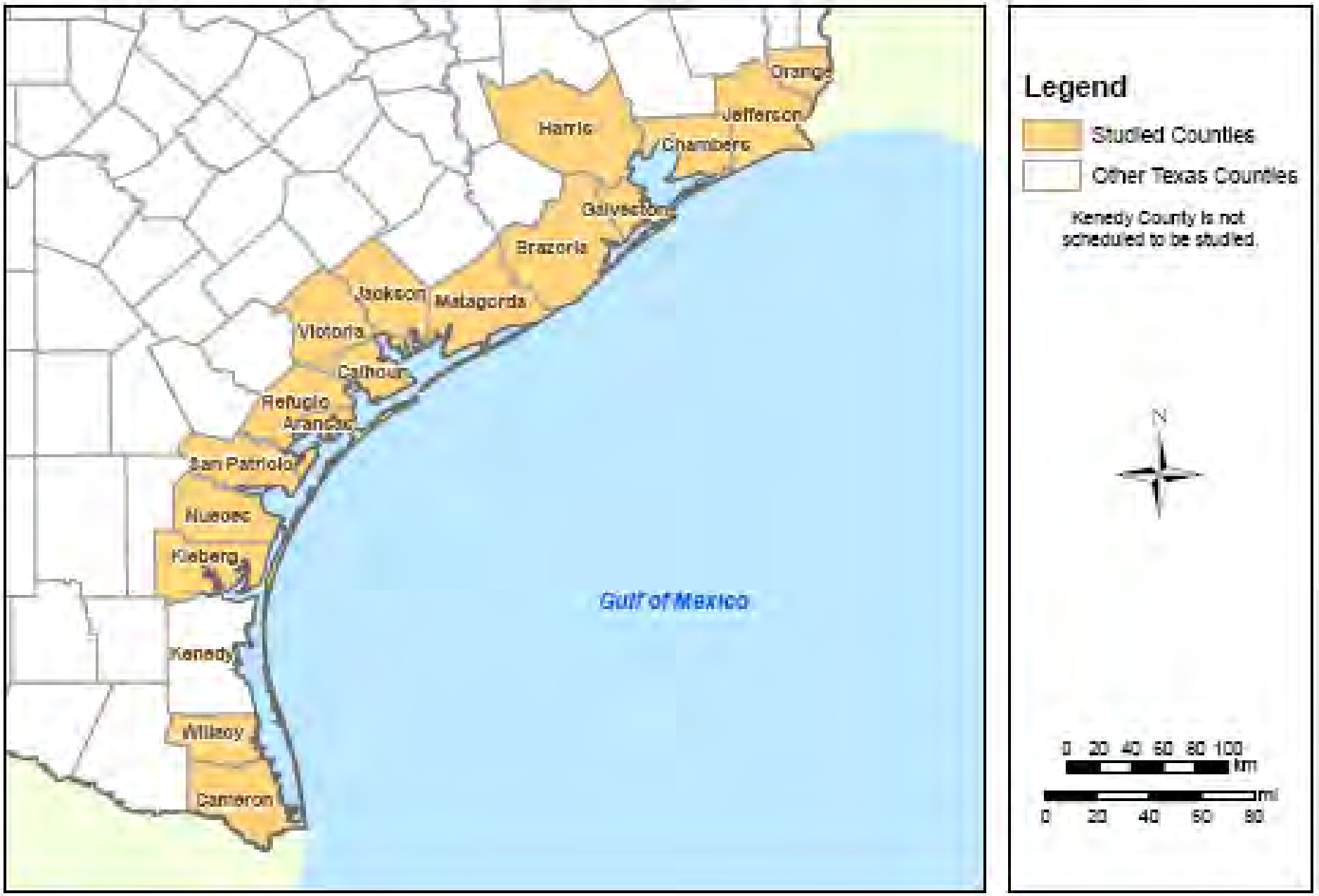
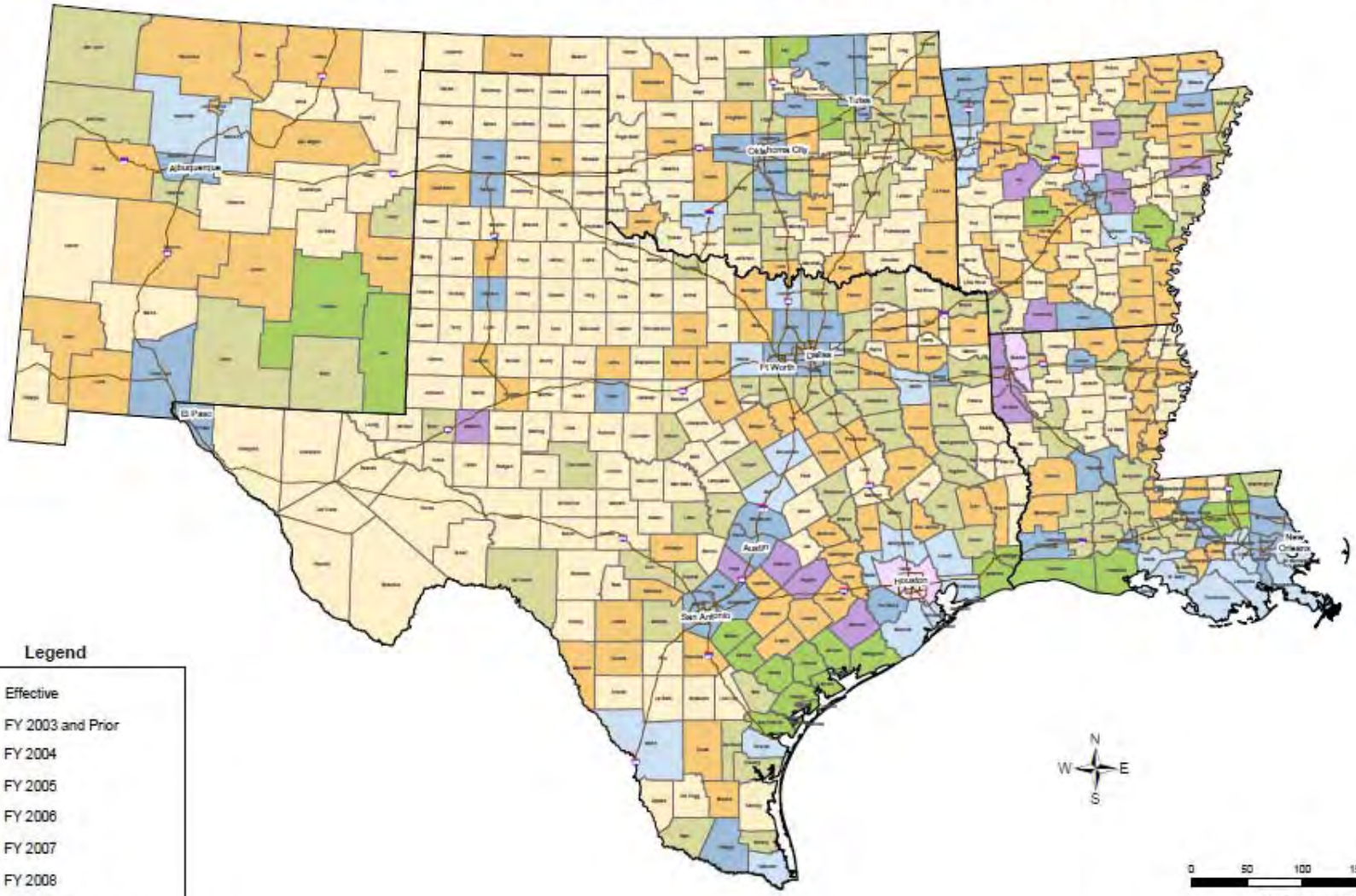
Surge Modeling of the Gulf Coast Conclusions

- State Of Art Tool To Enhance:
  - Planning and Risk Analysis
  - Risk Communication
- One Consistent Federal Methodology
- One Consistent Federal Answer
- Interactive GIS Database for Information

Texas Coastal Counties with MapMod Studies



FEMA REGION VI MULTI-YEAR FLOOD HAZARD IDENTIFICATION PLAN



Coastal Outreach in Louisiana

- Louisiana Mapping Project (LaMP)
- www.lamappingproject.com

Mission Statement

The mission of the Louisiana Mapping Project is to assist Louisiana Gulf coast communities in making informed floodplain management decisions through understanding flood recovery data by coordinating the dissemination of timely and accurate information among Federal, State and Local agencies.

Louisiana Mapping Project

Charting Our Coastal Future

LaMP

WELCOME

Welcome to the home page for the Louisiana Mapping Project (LaMP). The LaMP effort is being undertaken by Department of Homeland Security's Federal Emergency Management Agency (FEMA) as part of its ongoing nationwide effort to update and modernize flood hazard maps. The LaMP effort will result in homeowners, business owners, State and local government officials, and other citizens of 15 parishes in Louisiana receiving more accurate flood hazard and risk information. Click here to view a map of the affected Louisiana parishes.

PRELIMINARY FLOOD MAP RELEASE BEGINS

"Open House" type Public Meetings

After a major effort to update the surge inundation methodology used on the Louisiana Gulf Coast, FEMA is now releasing "Preliminary" Flood Insurance Rate Maps to the southern Louisiana Parishes. As the maps are released, the LaMP team will engage in an intensive effort to help citizens in the affected parishes determine the impact of the new flood data on their individual situations. "Open House" type public meetings are being conducted in every parish to inform business and home owners about their options regarding the new preliminary maps. These meetings are being conducted by the parish and community governments with support from FEMA, the LaMP Team, the Corps of Engineers, the study contractors, and others. These "Open House" meetings are being advertised by the parish and community governments in local newspapers, radio and television announcements

Community Coordination Meeting

Each delivery of the new Preliminary Maps to individual parishes and communities is being announced by a press release. An interactive version of the Preliminary maps as well as the current Effective Maps and any available Advisory Base Flood Elevation Maps are being posted on this

LATEST NEWS

LaMP Call Center/Help Desk:
1-866-751-3989

June 12 , 2008
Preliminary Digital Flood Insurance Rate Maps (DFIRMs) being released

April 16, 2008
LaMP Charter Signatories

SPECIAL FEATURED ARTICLES

June 02, 2008
LaMP Videos

Am I still in the Floodplain?

New Preliminary Digital Flood Insurance Rate Maps (DFIRMs) are being

FEMA