COVID CLINIC
COVID CLINIC

PRESENTED BY UNIVERSITY OF HOUSTON

TAMEST
# NATURAL HAZARDS SUMMIT

Responding to and Mitigating the Impacts

PART I: VIRTUAL SUMMIT
10.19.2021

#NATURALHAZARDSSUMMIT

Theme One:

PREDICTION, WARNING AND RESPONSE TO ALERTS AND WARNINGS

Moderated by:

KISHOR MEHTA, PH.D., P.E. (NAE)

P.W. Horn Professor of Civil, Environmental and Construction Engineering

Texas Tech University

Panel:

Preparing for Future Disasters

ED HIRS, M.B.A.

UH Energy Fellow
University of Houston

CHIEF TONYA L. HOOVER

Acting Fire Administrator
United States Fire Administration

DAVID ROBERT MAIDMENT, PH.D. (NAE)

Professor Emeritus
The University of Texas at Austin

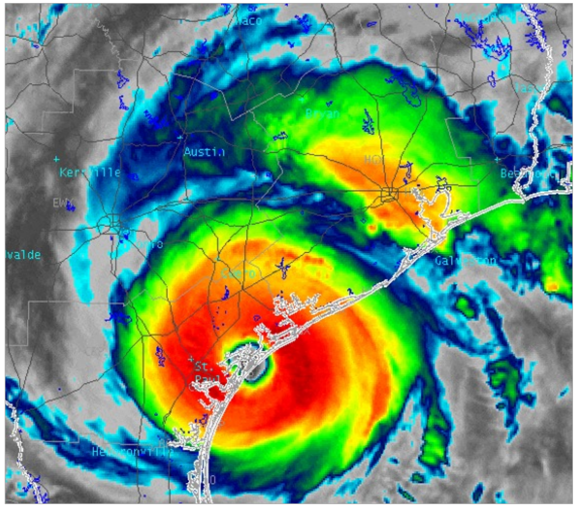
OLGA WILHELMI, PH.D.

Research Scientist
National Center for Atmospheric Research

Responding to Floods

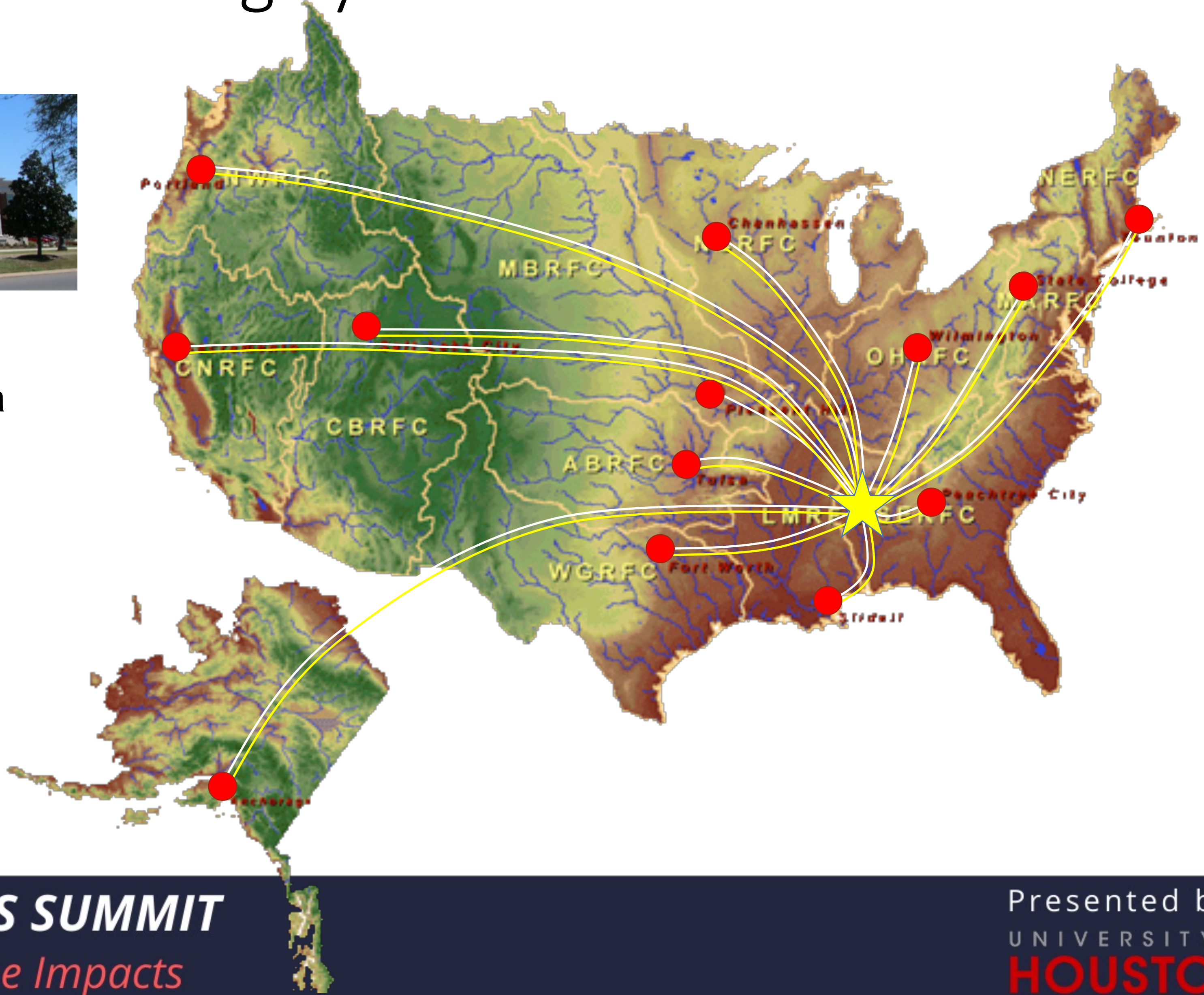
Presented by David R. Maidment
Center for Water and the Environment
University of Texas at Austin

19 October 2021



A New Flood Forecasting System for the United States

- A National Water Center was established on the Tuscaloosa campus of University of Alabama by the National Weather Service and federal agency partners
- It has a mission to assess hydrology in a new way at the continental scale for the United States


Portland
NWRFC
Chanhassen
NCRFC
NERFC
Taunton
State College
MARFC
MBRFC
Salt Lake City
Wilmington
OHRFC
CNRFC
Pleasant Hill
CBRFC
ABRFC
Tulsa
Peachtree City
LMRFC
SERFC
WGRFC
Fort Worth
Slidell
Anchorage

Texas Advanced Computing Center

Used to build Prototype of the National Water Model (2014-2015)

STAMPEDE
SUPERCOMPUTER

THE UNIVERSITY OF TEXAS AT AUSTIN

NSF

NCAR

1.2 million gallon cooling tank

National Water Model

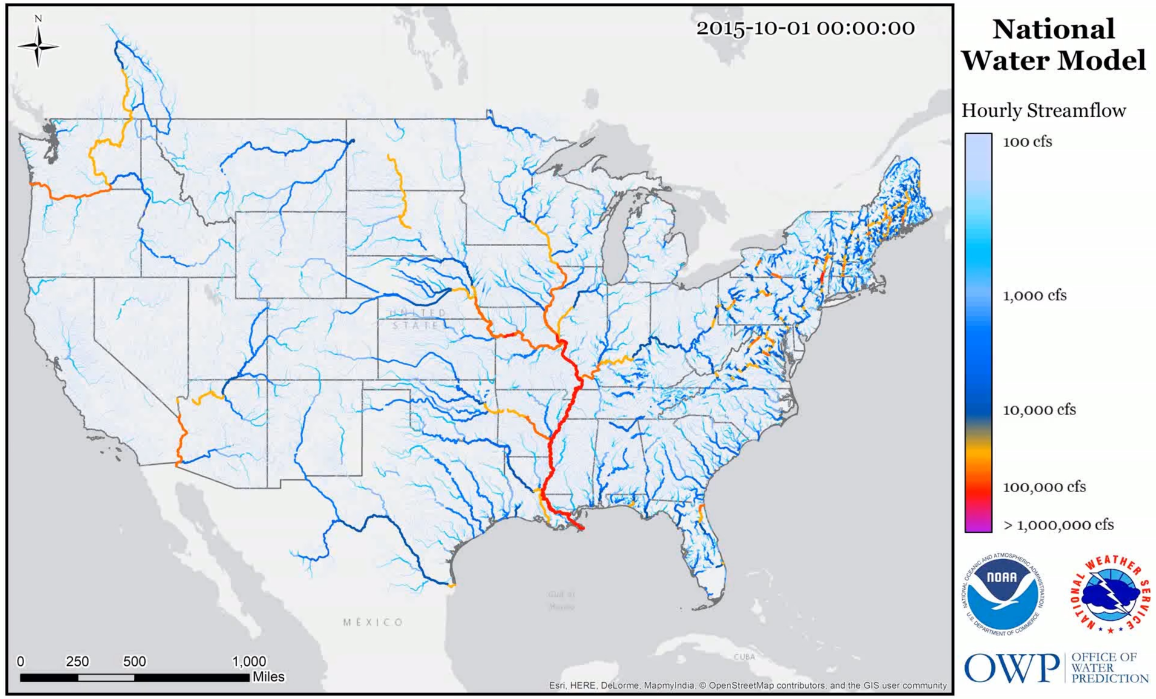
Water is now like weather – forecast everywhere all the time

Operational Since 2016

Forecast Configurations:

- 3-Hour and 28-Hour Analysis and **Assimilation** (Hourly and Daily)
- 18-Hour **Short Range** Forecast (Hourly)
- 10-Day **Medium Range** Forecast (6-Hourly)
- 30-Day **Long Range** Forecast (Daily)

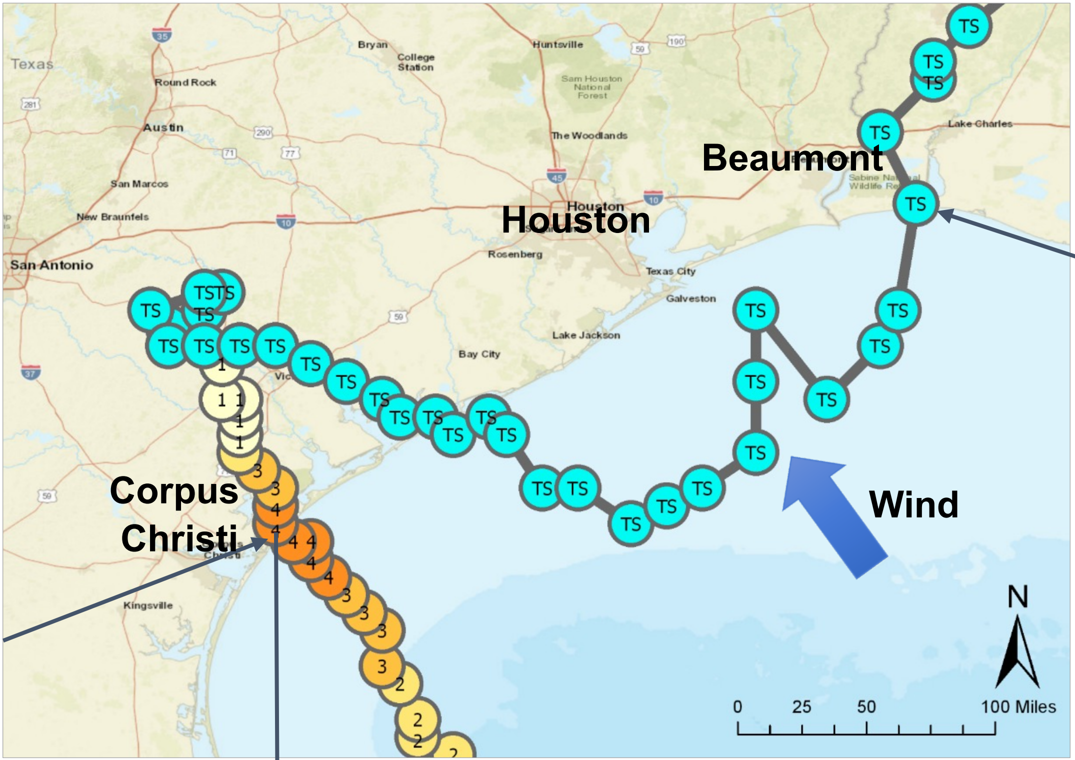
Continuous water forecasting for 2.7 million stream reaches in US


2015-10-01 00:00:00
National Water Model
Hourly Streamflow
100 cfs
1,000 cfs
10,000 cfs
100,000 cfs
> 1,000,000 cfs
N
0
250
500
1,000
Miles
MEXICO
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
OWP OFFICE OF WATER PREDICTION

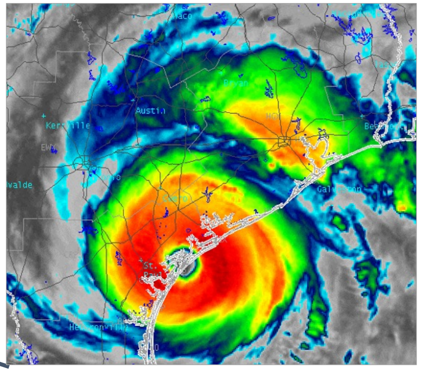
Hurricane Harvey, August 2017

Strength

- 4 ⎫
- 3 ⎬ **Hurricane Category**
- 2 ⎪
- 1 ⎭
- ● ⎫ **Tropical Storm**
- ● ⎭

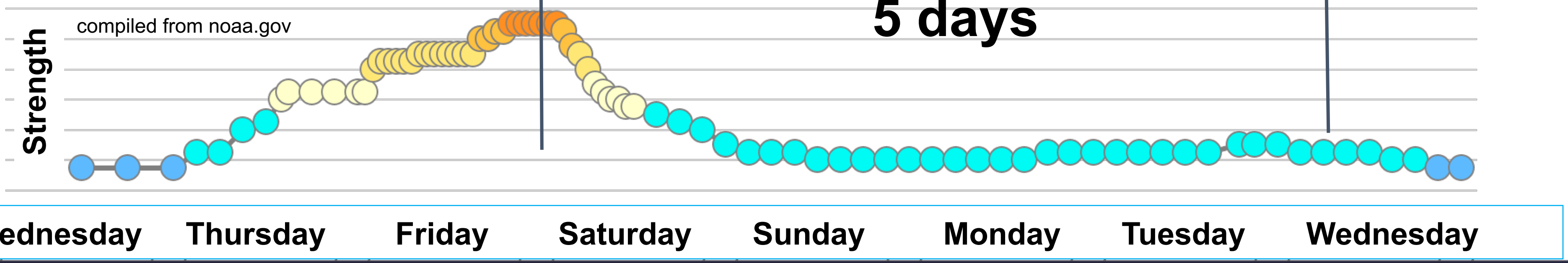

Beaumont
Houston
Corpus Christi
Wind
N
0 25 50 100 Miles
San Antonio
Austin
Round Rock
San Marcos
New Braunfels
Bryan
College Station
Huntsville
The Woodlands
Rosenberg
Texas City
Galveston
Lake Jackson
Bay City
Kingsville
Lake Charles
TS
1
2
3
4

First Landfall as
Category 4 Hurricane
at 10PM on
Friday 25 August



Second Landfall as
Tropical Storm
at 4 AM on
Weds 30 August

5 days

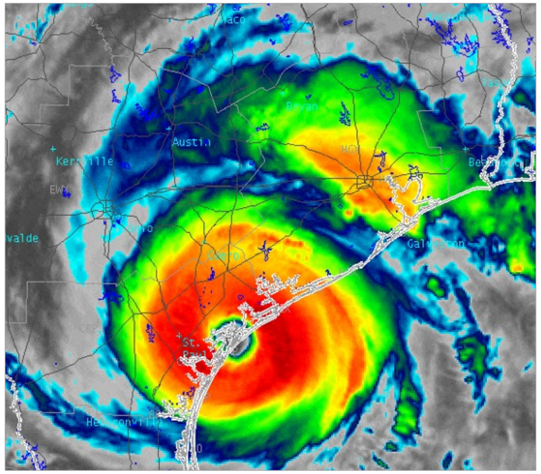


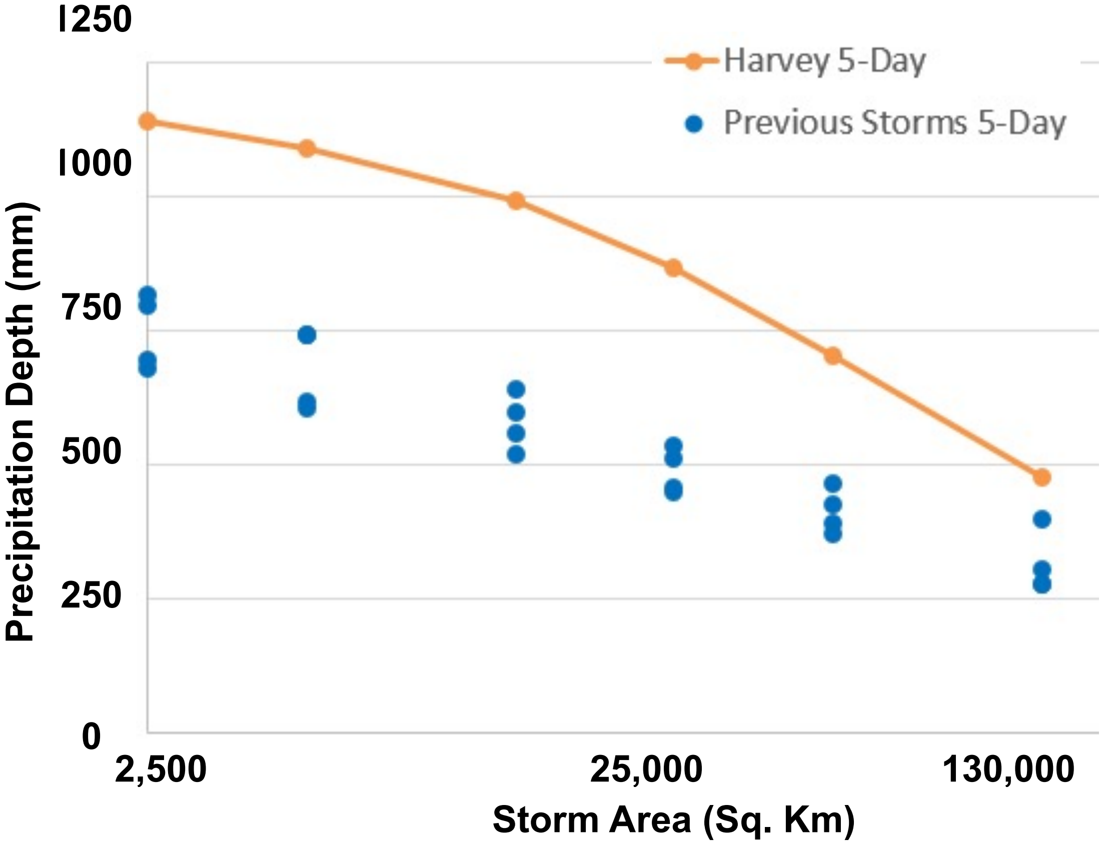
Hurricane Harvey – Record Precipitation

Harvey **2-day** precipitation was the **worst recorded storm** in US history

Harvey **3-day** Precipitation averaged **125 mm more** than previous worst storms

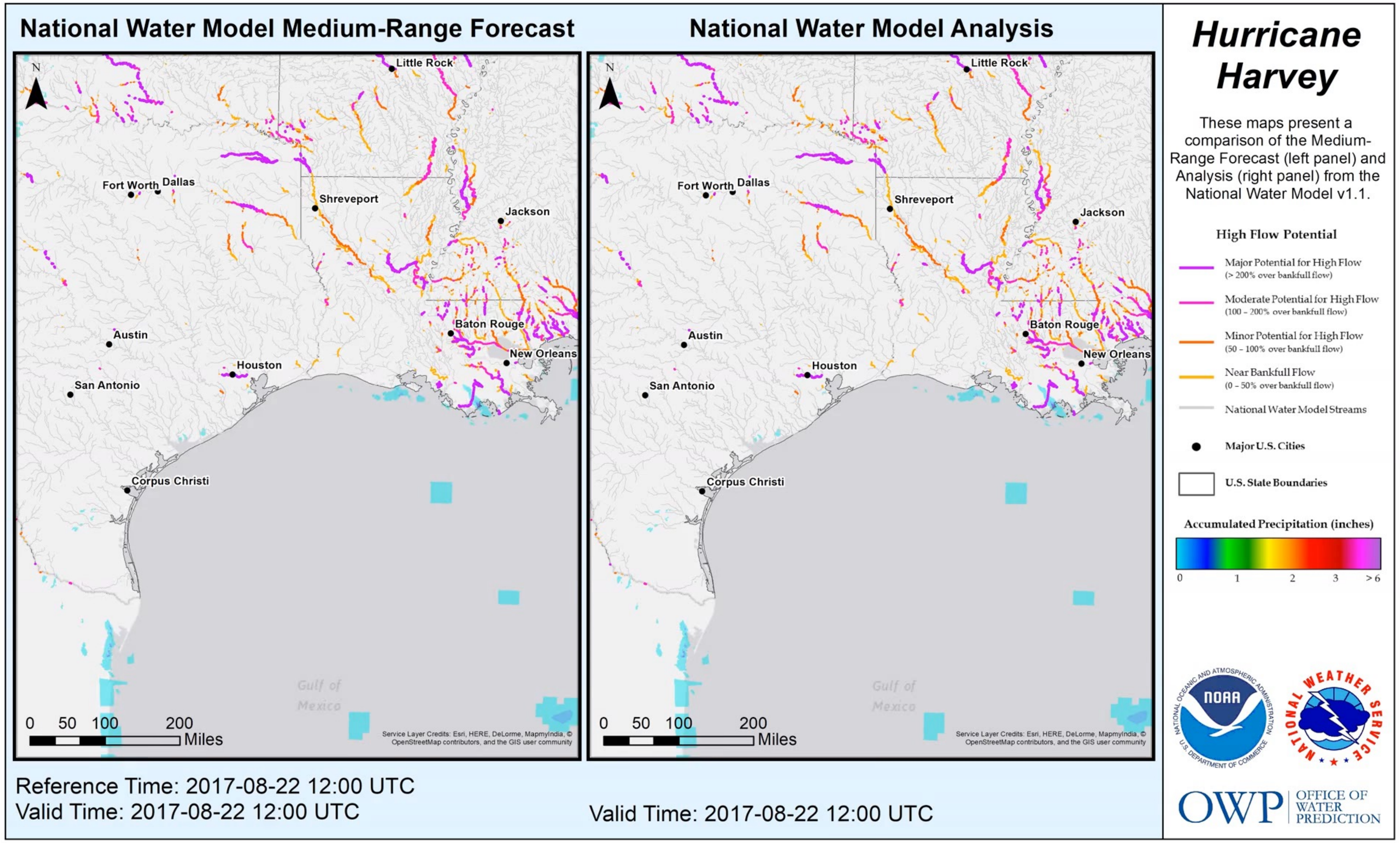
Harvey **5-day** Precipitation averaged ***280 mm more*** than previous worst storms





Forecasting Harvey using National Water Model

10-day Ahead Forecast **Actual**


National Water Model Medium-Range Forecast
National Water Model Analysis
Hurricane Harvey
N
Little Rock
Fort Worth
Dallas
Shreveport
Jackson
Baton Rouge
New Orleans
Austin
Houston
San Antonio
Corpus Christi
Gulf of Mexico
0 50 100 200 Miles
Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
High Flow Potential
Major Potential for High Flow (> 200% over bankfull flow)
Moderate Potential for High Flow (100 - 200% over bankfull flow)
Minor Potential for High Flow (50 - 100% over bankfull flow)
Near Bankfull Flow (0 - 50% over bankfull flow)
National Water Model Streams
Major U.S. Cities
U.S. State Boundaries
Accumulated Precipitation (inches)
0
1
2
3
> 6
NOAA
National Weather Service
OWP OFFICE OF WATER PREDICTION

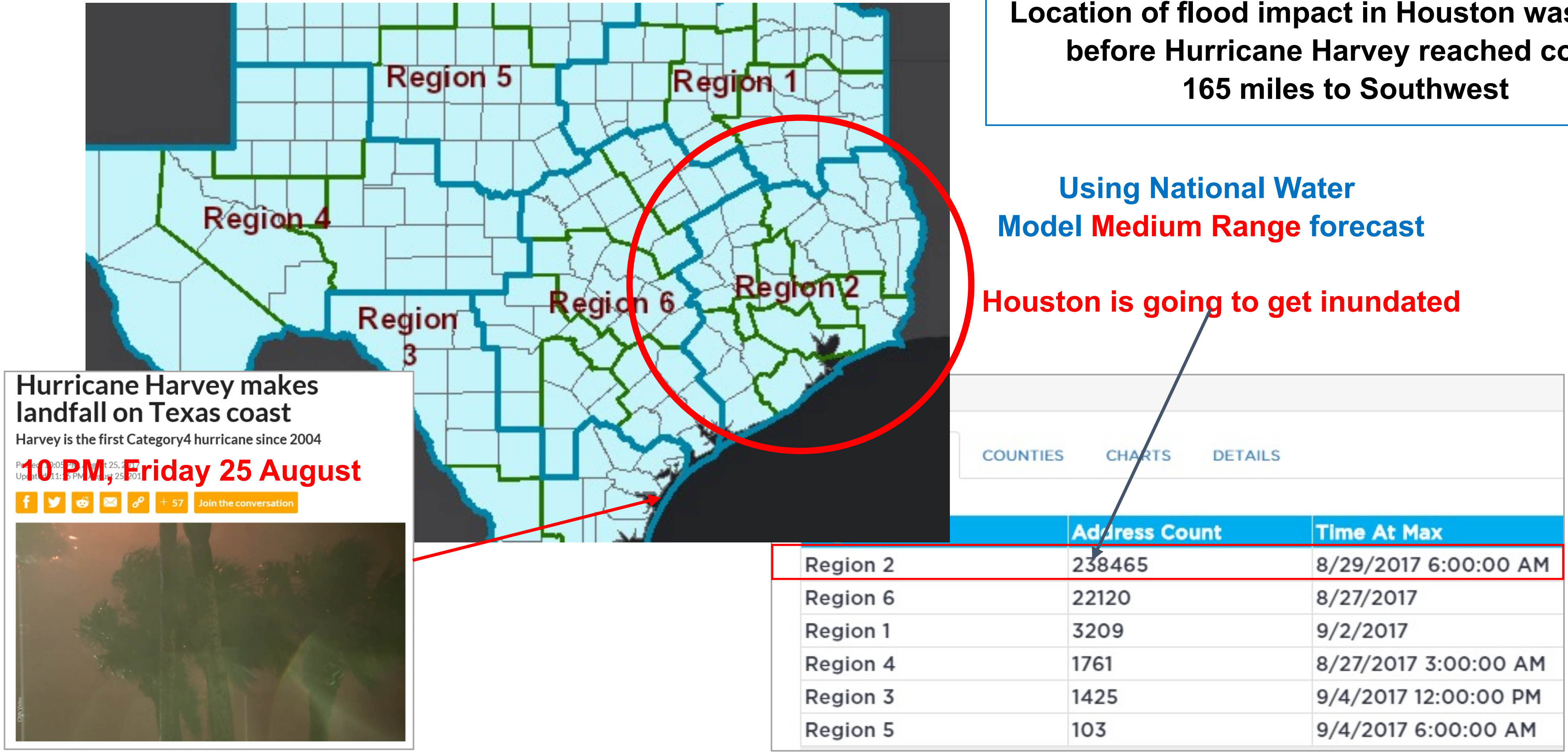
These maps present a comparison of the Medium-Range Forecast (left panel) and Analysis (right panel) from the National Water Model v1.1.

Reference Time: 2017-08-22 12:00 UTC
Valid Time: 2017-08-22 12:00 UTC

Valid Time: 2017-08-22 12:00 UTC

Forecasting the Flood Impact of Harvey

Location of flood impact in Houston was known before Hurricane Harvey reached coast 165 miles to Southwest


Region 5
Region 1
Region 4
Region 3
Region 6
Region 2
+ 57
Join the conversation
COUNTIES
CHARTS
DETAILS

Using National Water Model Medium Range forecast

Houston is going to get inundated

Hurricane Harvey makes landfall on Texas coast

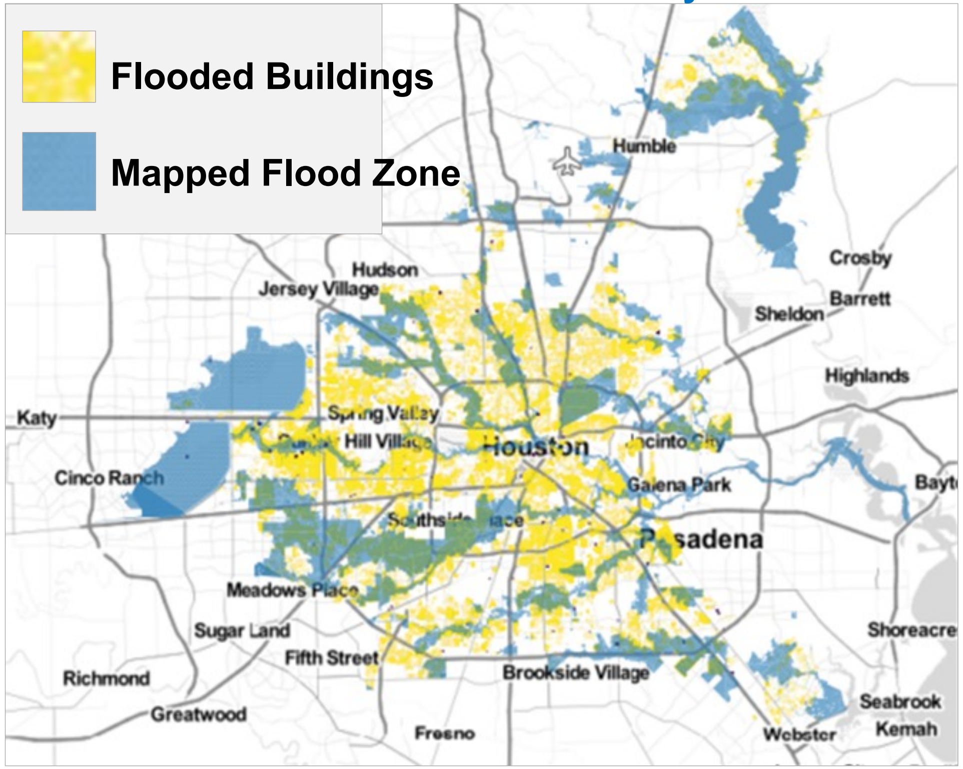
Harvey is the first Category4 hurricane since 2004

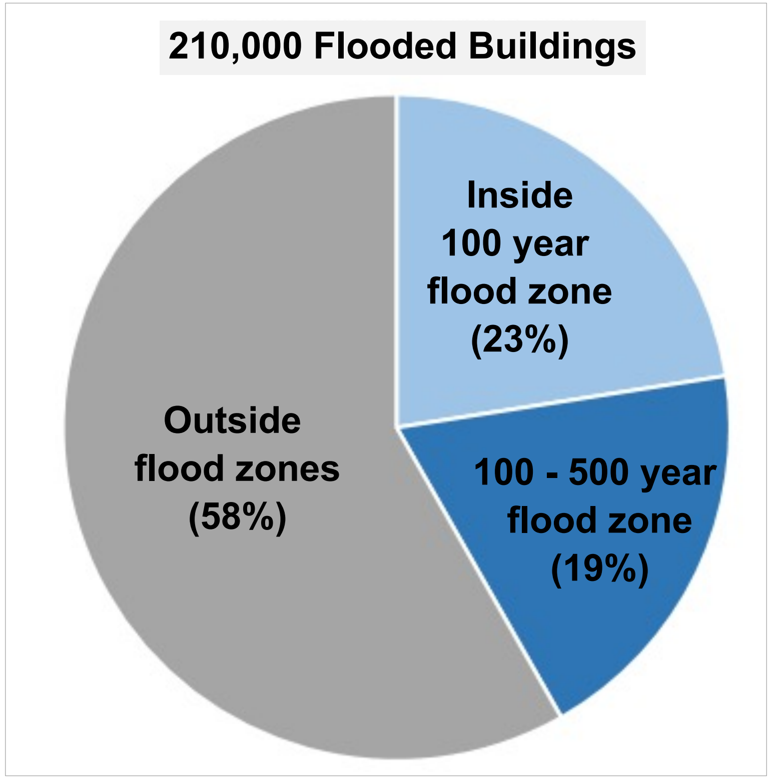
10 PM, Friday 25 August

	Address Count	Time At Max
Region 2	238465	8/29/2017 6:00:00 AM
Region 6	22120	8/27/2017
Region 1	3209	9/2/2017
Region 4	1761	8/27/2017 3:00:00 AM
Region 3	1425	9/4/2017 12:00:00 PM
Region 5	103	9/4/2017 6:00:00 AM

Flooded Residential Buildings in Houston

Flood covered 64% of area of City of Houston


Flooded Buildings
Mapped Flood Zone
Humble
Crosby
Barrett
Sheldon
Highlands
Hudson
Jersey Village
Katy
Spring Valley
Hill Village
Houston
Jacinto City
Galena Park
Cinco Ranch
Bayt
Southside Place
Pasadena
Meadows Place
Sugar Land
Shoreacre
Fifth Street
Richmond
Brookside Village
Seabrook
Greatwood
Fresno
Webster
Kemah


210,000 Flooded Buildings

Source: City of Houston, Civis, Dewberry

Questions

- Are increases in flood severity and frequency anticipated?
- What are recent tools and models?
  - National Water Model is a tremendous innovation
  - Hydrology has always been “bottom up” from local watersheds
  - Now it is also “top-down” from continental scale – connecting cause and effect
- Where are gaps in knowledge?
  - Linking coastal, riverine and direct rainfall-based flooding
  - Dealing with the complexities of urban areas
  - Linking physical impact with social vulnerability