Experimental Storm Surge Simulations for Hurricane Katrina

Hassan Mashriqui, Ph.D., P.E.
Paul Kemp, Ph.D.
Ivor van Heerden, Ph.D.
Young Yang, William Scullin, Rob Cunningham,
Emily Hyfield, DeWitt Braud

Hurricane Center, Louisiana State University
Baton Rouge, Louisiana

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ADCIRC – 2D Hydrodynamic Model

Input & Output

- Hurricane Wind Velocities – input
- Atmospheric Pressure – input
- Location of the “eye” – input

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- Surge or Sea Surface Elevation – output
- Speed or Velocity (Currents) – output
Forecasting (ADCIRC)

- Track, Central Pressure, Maximum Sustained Winds from NHC Advisory
- Interpolation based on Unisys Inc. Data (0.5 hr)
- Run Planetary Boundary Layer Wind Model (1.5 hr)
- Initiate ADCIRC with Storm Near Jamaica
- Simulate 8 days on 240 processors in SuperMike (2.5 hr)
- Post-Processing (0.5 to 1.0 hr)
- Develop Maximum Storm Surge Graphic with SMS and Animation
- Submit Products to OEP and Post on www.hurricane.lsu.edu/floodprediction (0.5 to 1.0 hr)

- Total time elapsed 5 to 8 hr
SuperMike – 1024 CPUs
2005 - Storms Simulated at LSU

* Hurricane Wilma
* Hurricane Rita
* Hurricane Katrina
* Hurricane Emily
* Hurricane Dennis
* Tropical Storm Cindy
* Tropical Storm Arlene
Hurricane Katrina
29 August 2005
NEW ORLEANS, ONE OF OUR “BOWL” CITIES.
NOTE THE RIVER’S ELEVATION IN RELATION TO THE BOWL
Katrina Forecasts (CTD)

- NHC Web Advisory ‡ LSU Web
- Advisory 16, Saturday 0400 ‡ 14:31 (10.5 hr)
- Advisory 17, Saturday 1000 ‡ 15:06 (5.1 hr)
- **Advisory 18, Saturday 1600 ‡ 22:07 (6.1 hr)**
- Advisory 22, Sunday 0700 ‡ 14:57 (7.9 hr)
- Advisory 25, Sunday 2200 ‡ 4:28 (6.5 hr)
- Advisory 31, Tuesday 1000 Hindcast
Katrina Adv 17
27 August 10 AM CDT

Surge (ft)
21.0
19.3
17.5
15.0
14.0
12.3
10.5
8.8
7.0
5.3
3.5
1.8
1.0
0.0

13-14 ft
21-22 ft
8-9 ft
7-8 ft
11-12 ft
7-8 ft
<table>
<thead>
<tr>
<th>Advisory Number</th>
<th>Advisory Date:Time (UTC)</th>
<th>Time to Landfall (h)</th>
<th>Date:Time (UTC)</th>
<th>Elapsed Time (h)</th>
<th>New Orleans Flooding</th>
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<td>16</td>
<td>8/27/05 0900</td>
<td>51</td>
<td>8/27/05 1930</td>
<td>10.5</td>
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<td>17</td>
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<td>45</td>
<td>8/27/05 2000</td>
<td>5</td>
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<td>18</td>
<td>8/27/05 2100</td>
<td>39</td>
<td>8/28/05 0300</td>
<td>6</td>
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<td>22</td>
<td>8/28/05 1200</td>
<td>24</td>
<td>8/28/05 2000</td>
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<td>25</td>
<td>8/29/05 0300</td>
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<td>31</td>
<td>8/30/05 1500</td>
<td>-27</td>
<td>Post Storm</td>
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Advisory # 18, Saturday 2200 (CDT)

Hurricane Katrina,
Advisory #18
August 27, 2005
NO MARGIN OF ERROR

LSU scientists took projected tracks of Hurricane Katrina on Saturday evening and produced a frightening scenario: A wall of water surging in from all sides pushing up against the urban levees. Wave action is seen topping levees in Kenner, eastern New Orleans and along the Mississippi River-Gulf Outlet.

1. FIRST TO GO
   Unprotected areas in Plaquemines Parish could flood first Monday.

2. THE BETSY SCENARIO
   Hurricane force winds are projected to top levees in eastern New Orleans, pushing water into the 9th Ward, the Mohoude area and even into Mid-City.

3. SLIDELL SOAKED
   Large parts of Slidell could be inundated by 10-11 foot storm surges.

4. PUMPED-UP LAKE
   Eastern winds in advance of the storm could pump water from Lake Borgne and from Breton and Chandeleur sounds into Lake Pontchartrain, raising the lake’s surface by 12 feet.

5. OVER THE TOP
   Waves equal to half the surge height or more could top the surge water and could overtop levees on the south shore of Lake Pontchartrain and around Chalmette.

6. GOING ASHORE
   As Katrina moves inland and the winds come from the north, the High Lake Pontchartrain waters could stream across St. Charles Parish and turn east along Airline Highway into Kenner.
Katrina’s Track

Local Time    ZULU Time
08/29/05 1130 C 08/29/16.5
08/29/05 1000 C 08/29/15Z
08/29/05 0830 C 08/29/13.5
08/29/05 0700 C 08/29/12Z
08/29/05 0530 C 08/29/10.5

Hurricane Katrina Track
- Dr. Hassan Mashriqui, P.E. / LSU

Monday 08/29/05 0400 CDT   08/29/09Z
This surge path was predicted 3 months before Katrina!!

--- and presented to the emergency managers in New Orleans on 19 May 2005
“The Funnel” - Crescent City’s Trojan Horse - 19 May 2005
Conclusions

• Technology saved lives, about 85% evacuation for Katrina

Future use

• predicting levee overtopping and failure
• guiding pre-landfall flood-fighting efforts
• staging post-landfall breach closure equipment and supplies
• FEMA Flood Map update
Thank You