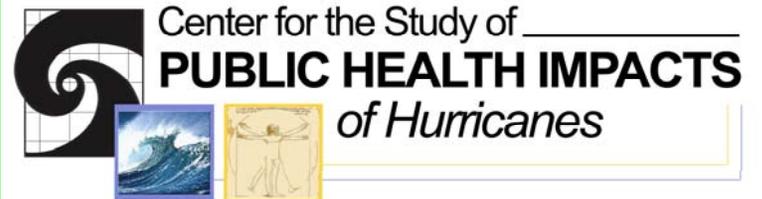
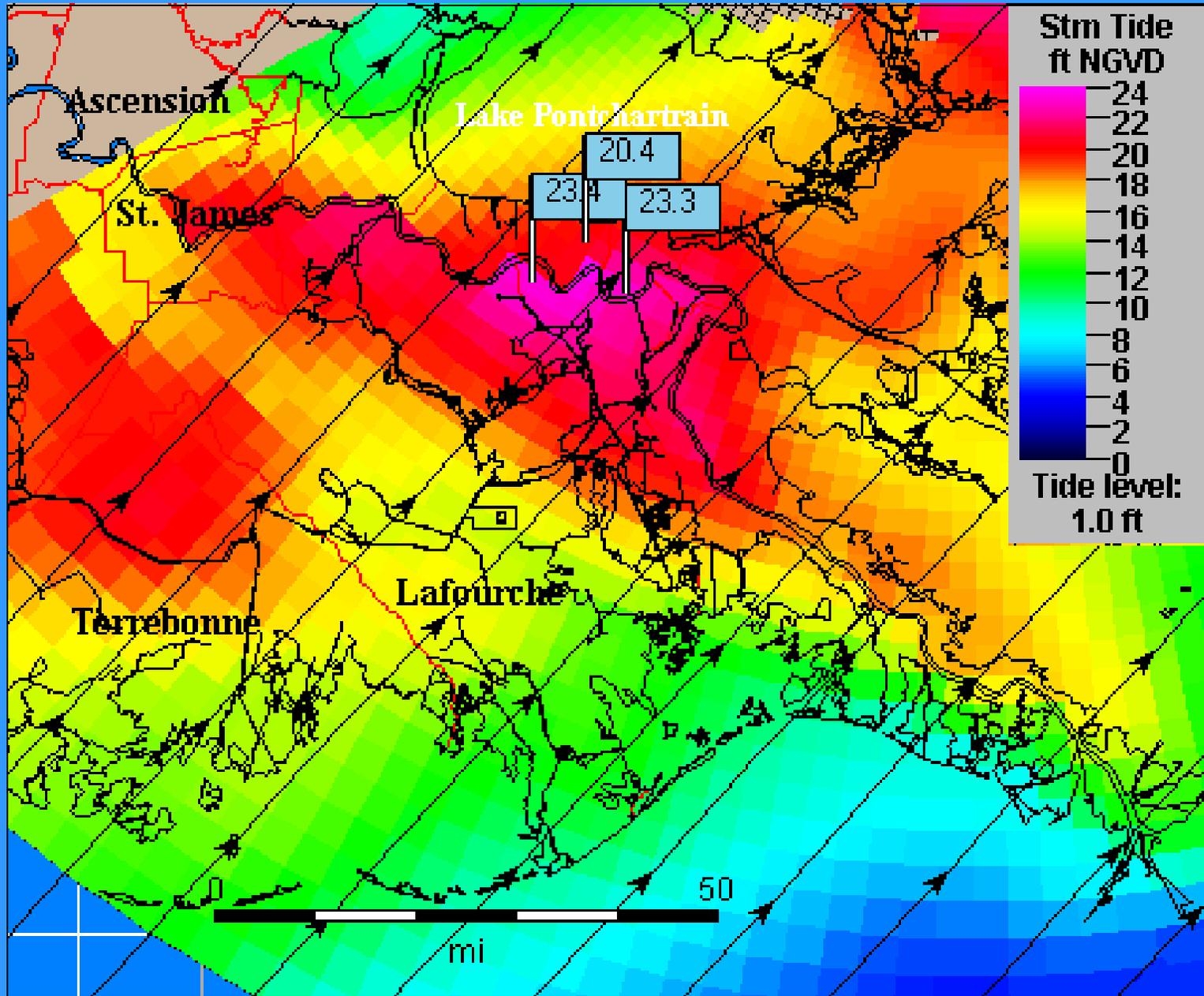


Louisiana Hurricane Realities: Surge, Computer Models, Levees and Wetlands

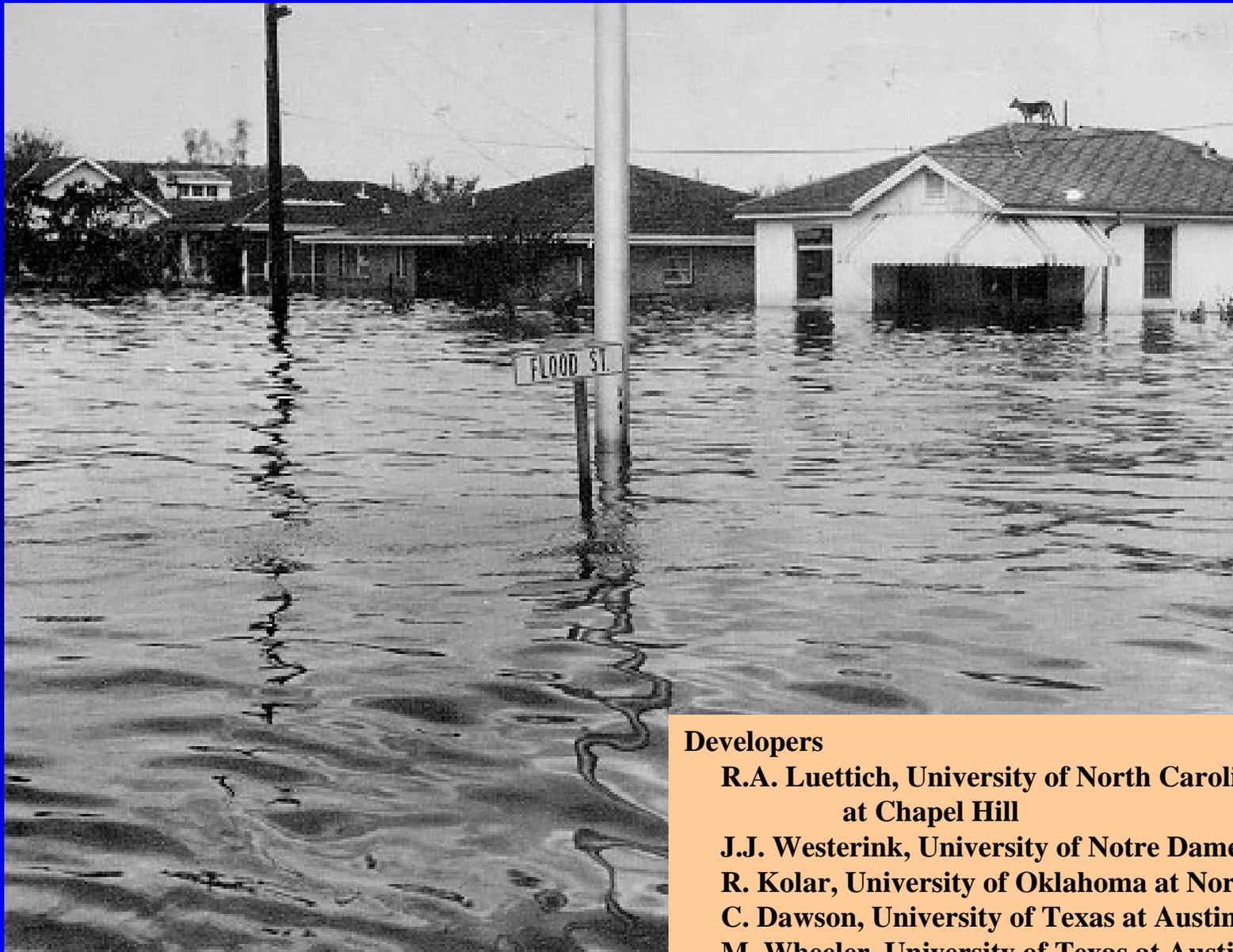
Ivor van Heerden, Ph.D. and G Paul Kemp, Ph.D.
Center for the Study of Public Health Impacts of
Hurricanes
Louisiana State University



Slow Moving Category 5 from the SW



ADCIRC Storm Surge Modeling



Developers

**R.A. Luetlich, University of North Carolina
at Chapel Hill**

J.J. Westerink, University of Notre Dame

R. Kolar, University of Oklahoma at Norman

C. Dawson, University of Texas at Austin

M. Wheeler, University of Texas at Austin

W.G. Gray, University of Notre Dame

Hurricane Betsy 1965 and a flooded New Orleans

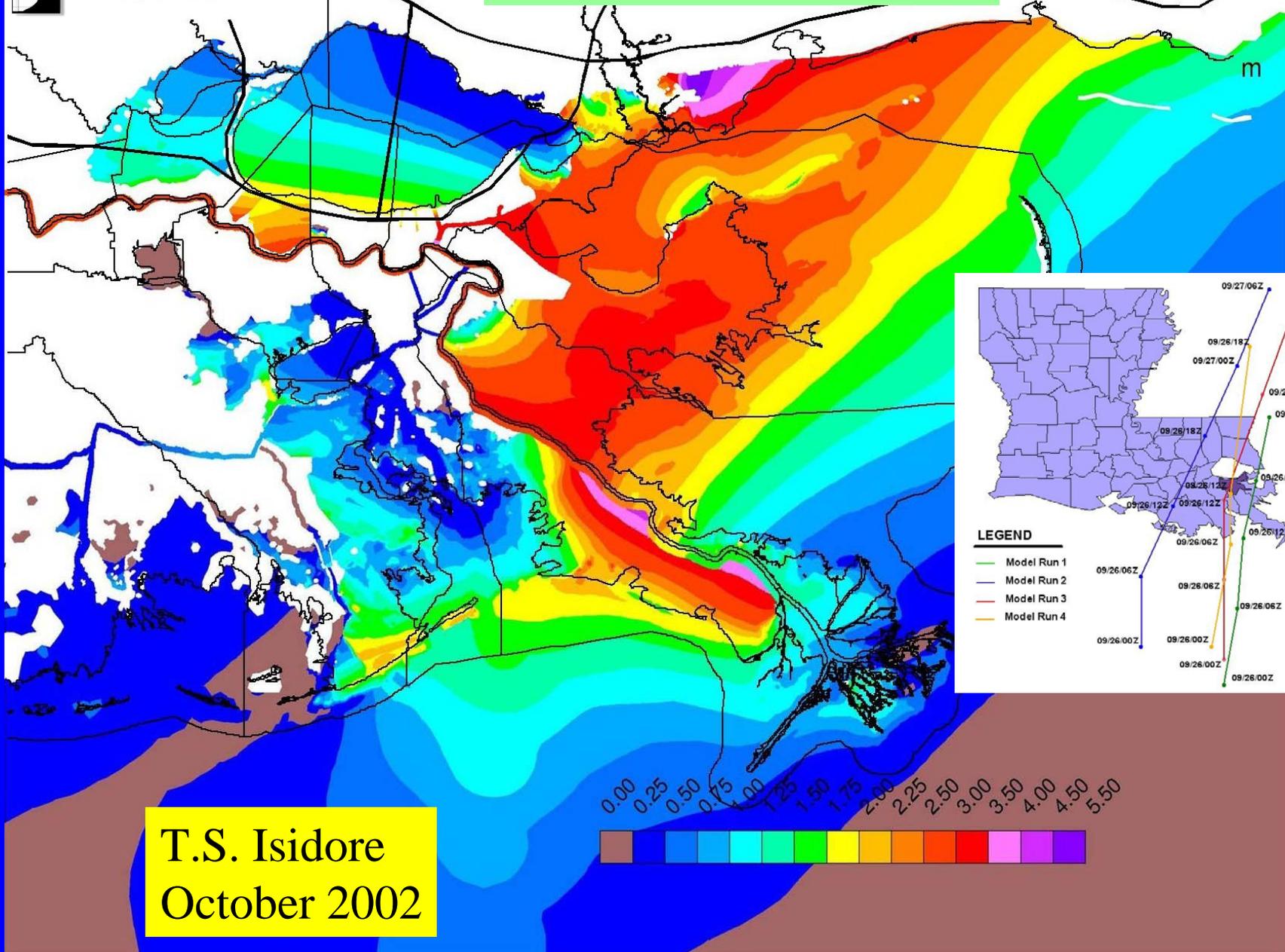
ADCIRC Surge Forecast Accuracy as Katrina Approached

Zone			Forecasts: Hours to Louisiana Landfall					
West to East	No. Obs.	HWM (SE)	51	45	39	24	9	(-27)
Lake West	5	2.20 (0.48)	2.16	1.66	2.30	2.24	1.94	2.71
		RMSE	0.34	0.62	0.37	0.30	0.38	0.66
		<i>% Error</i>	15	20	15	15	17	12
Jefferson	4	2.45 (1.02)	2.49	2.10	2.94	3.14	2.60	3.73
		RMSE	0.37	0.34	0.28	0.23	0.26	0.34
		<i>% Error</i>	15	14	12	9	11	14
Orleans Metro	20	3.63 (0.43)	1.99	2.28	2.73	3.40	2.77	3.49
		RMSE	1.69	1.39	0.99	0.35	0.92	0.33
		<i>% Error</i>	47	38	27	10	25	9
East Orleans	9	4.18 (0.50)	2.76	2.90	3.43	4.06	3.35	4.18
		RMSE	1.57	1.41	0.99	0.45	1.02	0.63
		<i>% Error</i>	38	34	24	11	24	15

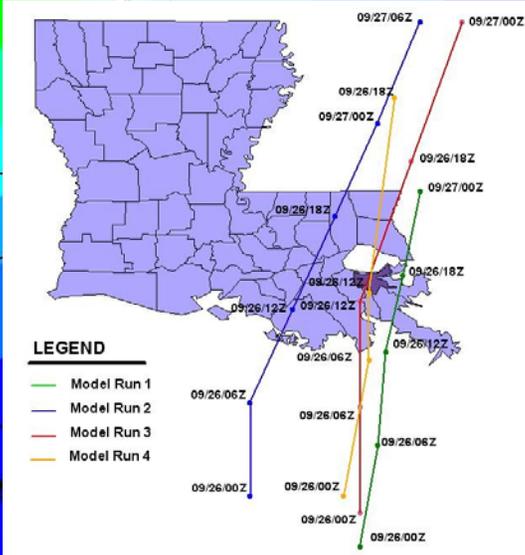


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Model Run 1 - Track 25 km EAST of New Orleans, winds 110 mph.



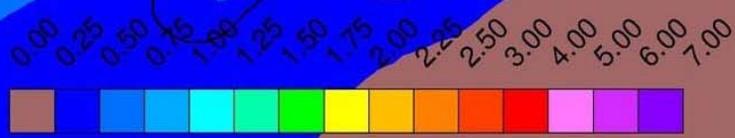
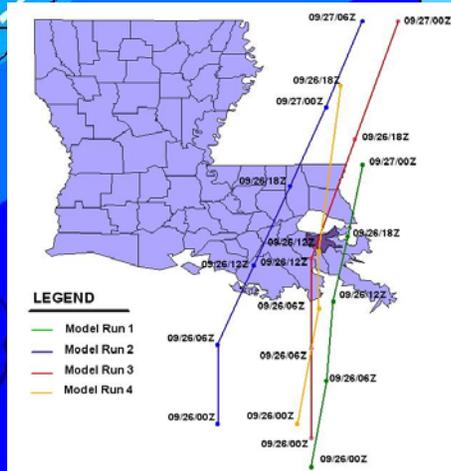
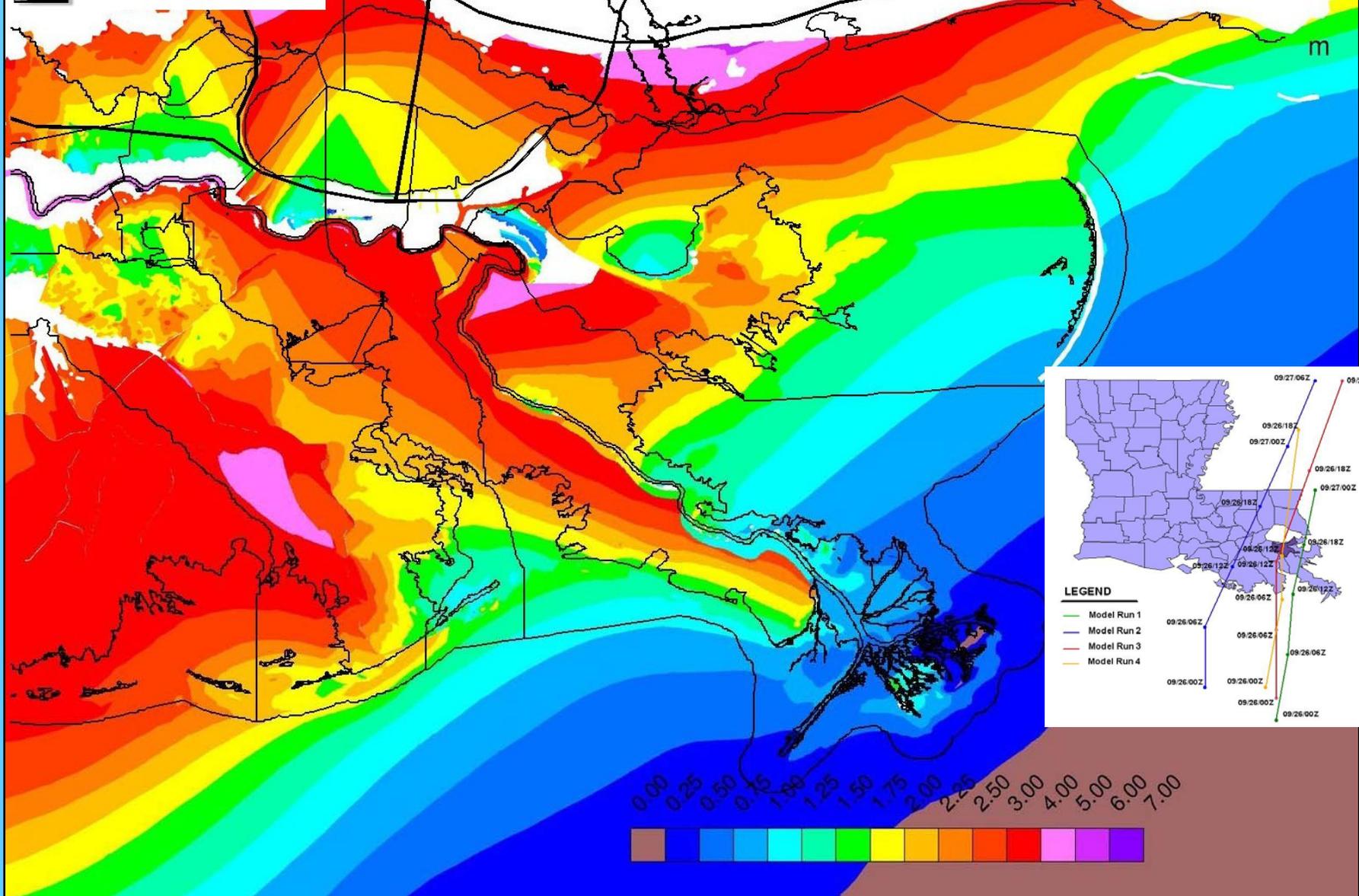
T.S. Isidore
October 2002



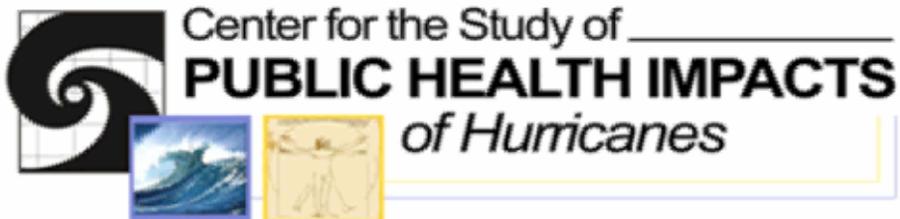


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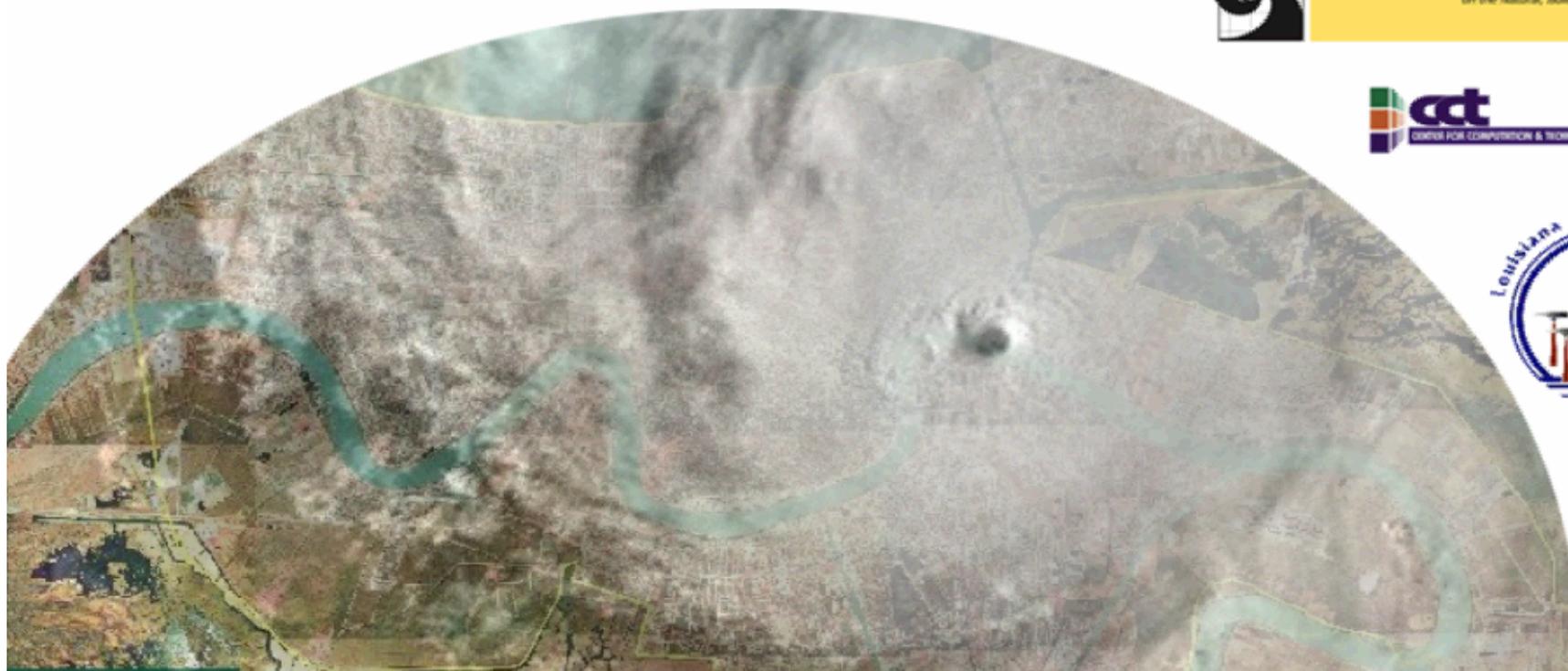
Model Run 2 - Track **OVER** New Orleans, winds 90 mph



T.S. Isidore October 2002

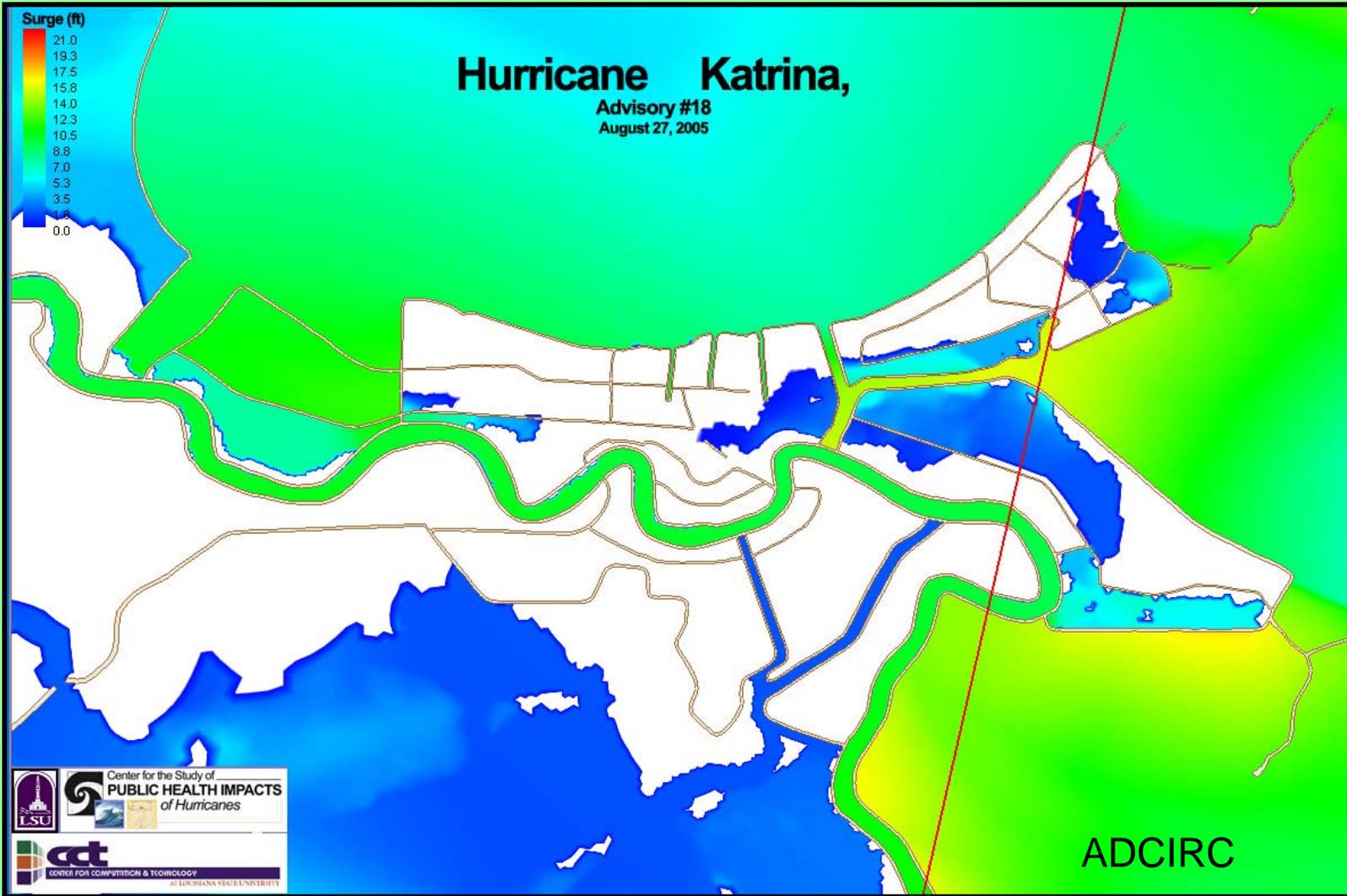


ADCIRC
Simulation



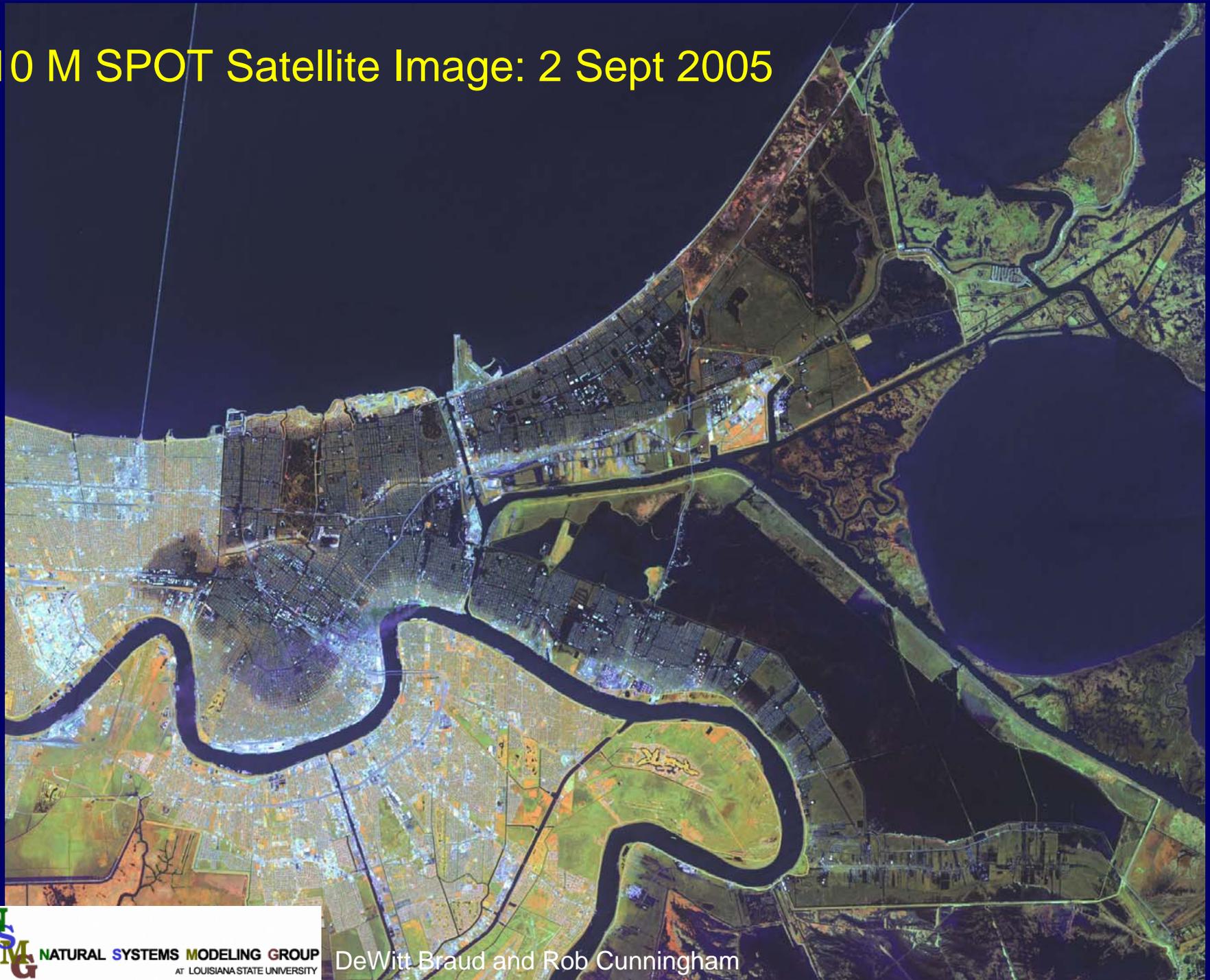
This research has been supported by the Louisiana Board of Regents through the Millennium Trust Health Excellence Fund Contract HEF (2001-06)-01

Advisory 18, Submitted Saturday 2200



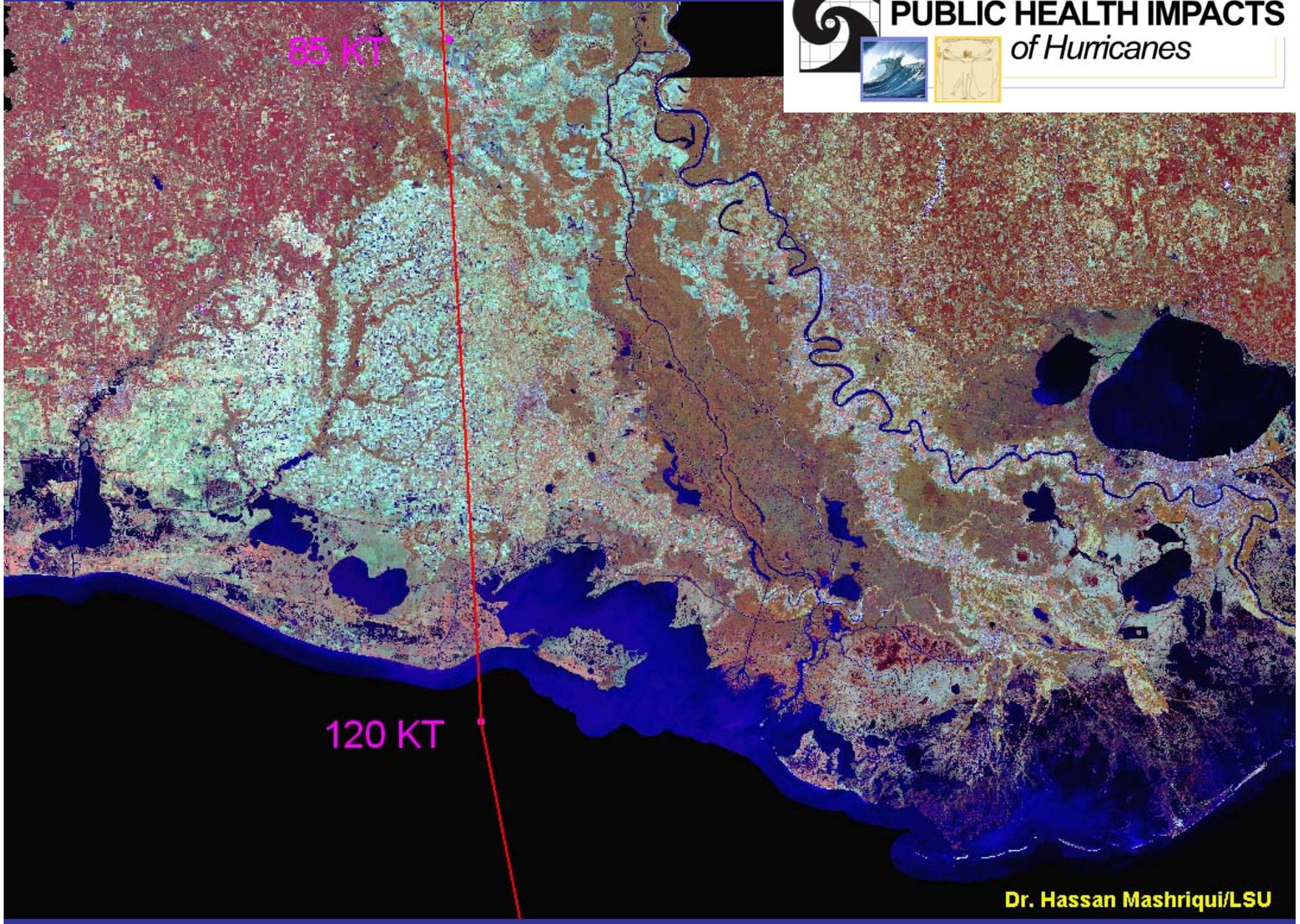
“New Orleans Will Flood”

10 M SPOT Satellite Image: 2 Sept 2005

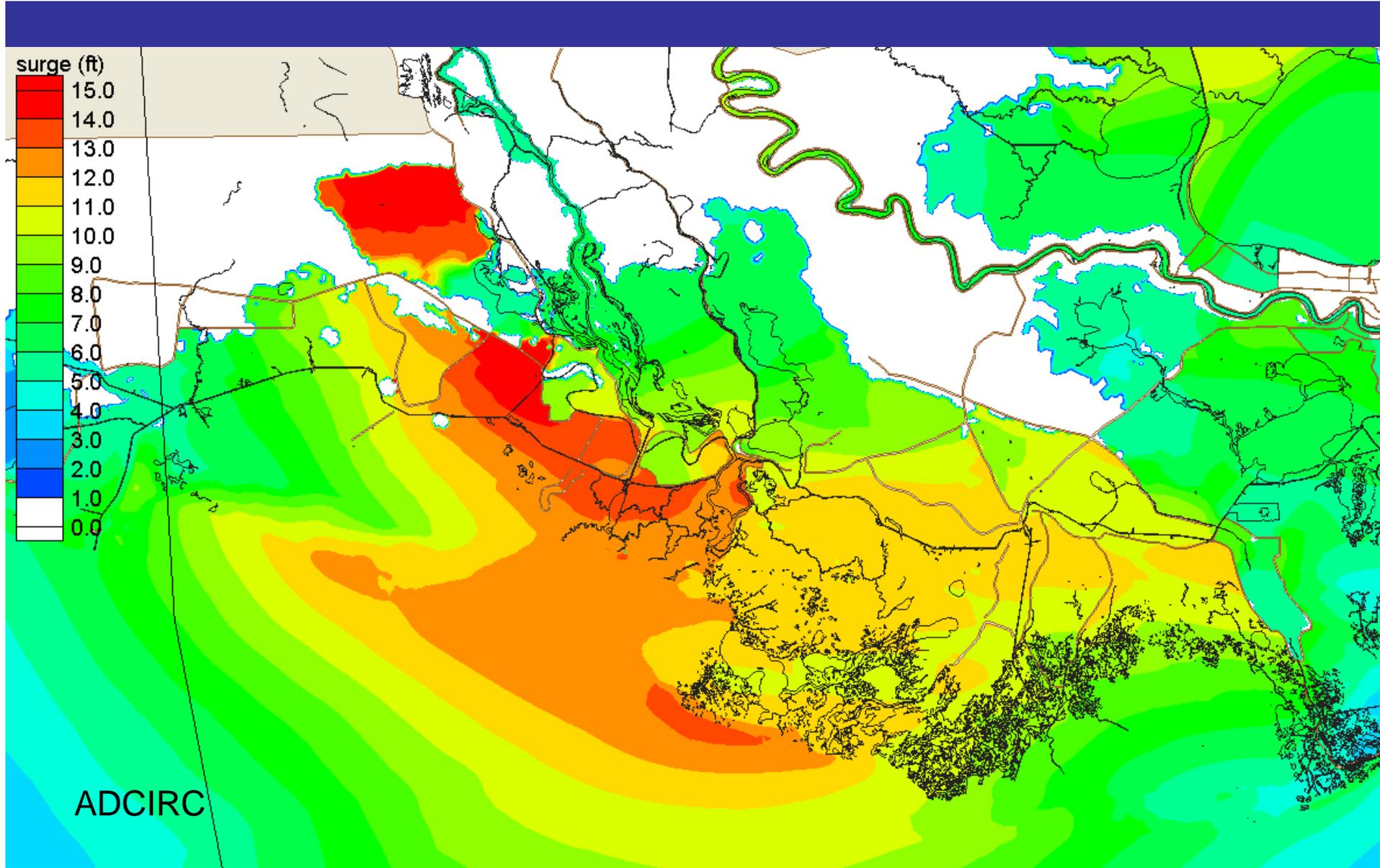




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of Hurricanes



Dr. Hassan Mashriqui/LSU

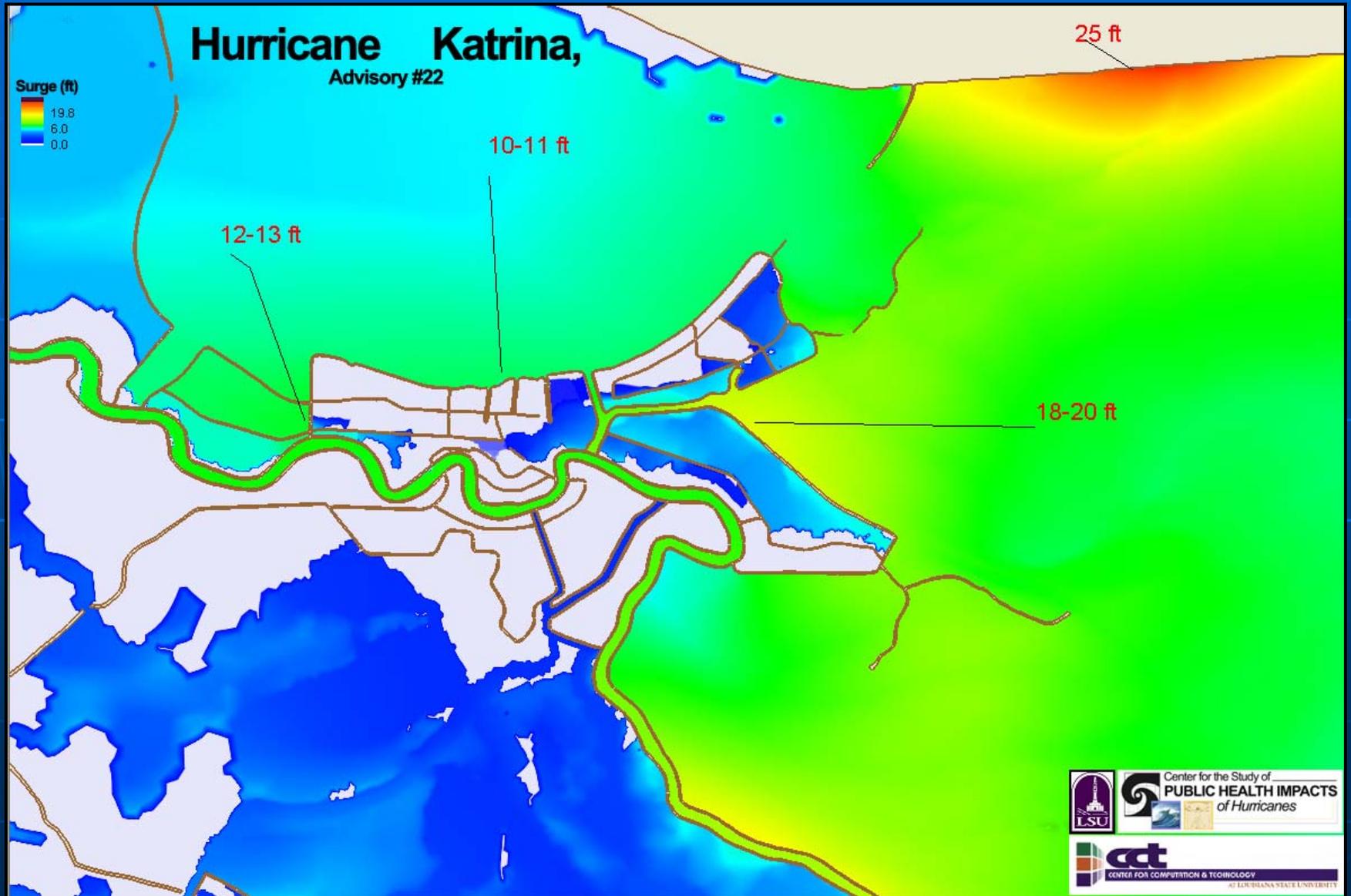


ADCIRC

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of Hurricanes

Dr. Hassan Mashriqui/LSU

If Levees Had Held



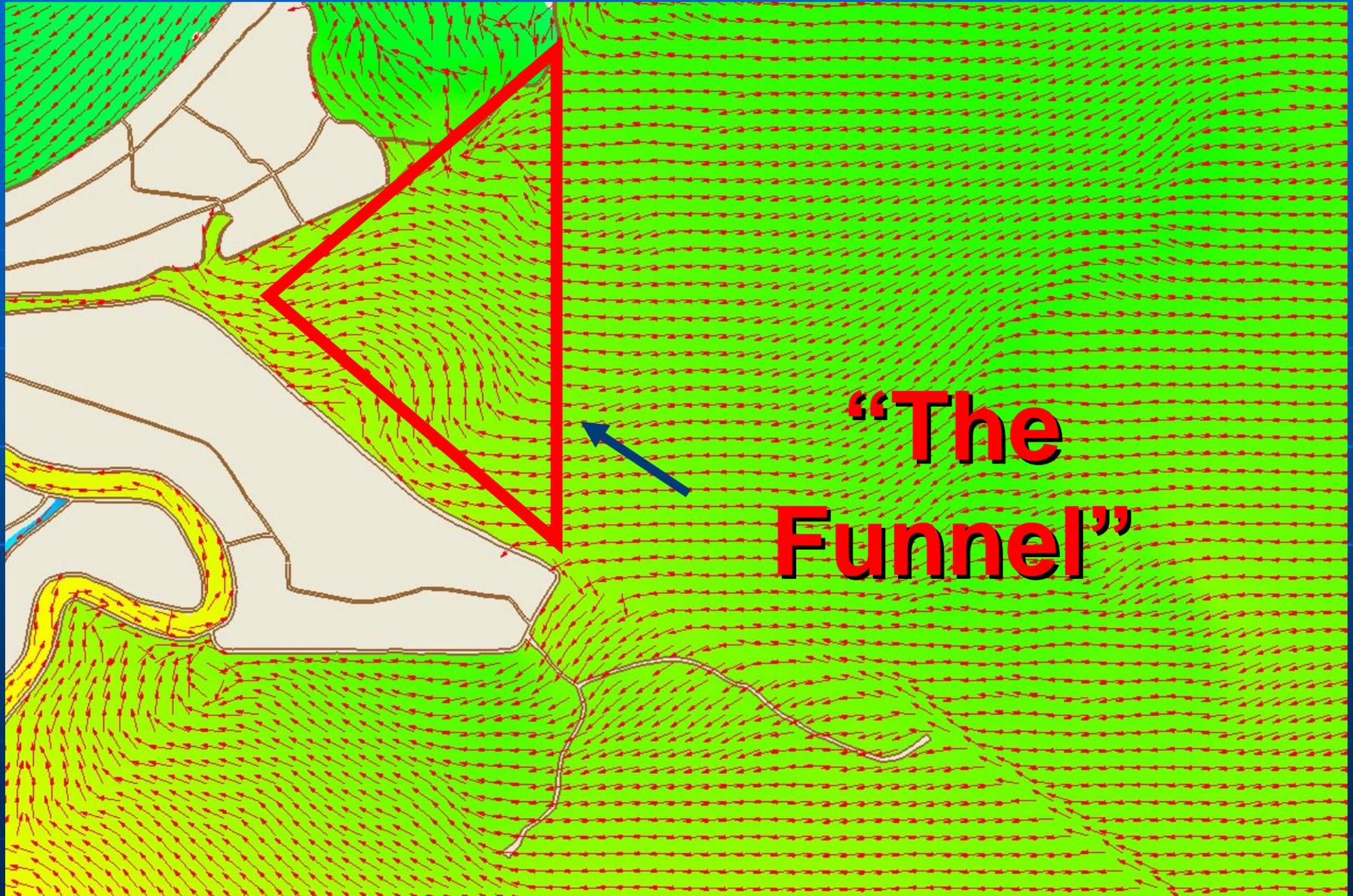
OVERTOPPING IS SURVIVABLE BUT BREACHES ...

Zone	Mean Flooded Land Elevation NAVD88(m)	Mean Water Surface Elevation NAVD88(m)	Mean Depth of Flooding (m)	Flooded Area (ha)	Percent of Area Flooded	Volume of Flood (m ³)	Percent Flood Volume
Observed Flooding from Overtopping and Breaches							
Orleans Metro	-0.53	0.91	1.44	8,521	100	122,367,327	100
East Orleans	-1.75	-0.46	1.29	6,091	100	78,539,845	100
St. Bernard	0.75	3.66	2.91	8,325	100	241,977,351	100
Total All Sources				22,937	100	442,884,523	100
Forecast Flooding from Overtopping							
Orleans Metro	-1.67	-1.07	0.60	2,458	29	14,888,742	12
East Orleans	-2.20	-1.54	0.66	3,685	60	24,361,620	31
St. Bernard	-0.15	0.41	0.56	3,383	41	18,861,091	8
Total Overtopping				9,526	42	58,111,453	13
Estimated Flooding from Breaches							
Orleans Metro			0.84	6,063	71	107,478,585	88
East Orleans			0.63	2,406	40	54,178,225	69
St. Bernard			2.35	4,942	59	223,116,260	92
Total Breaches				13,411	58	384,773,070	87

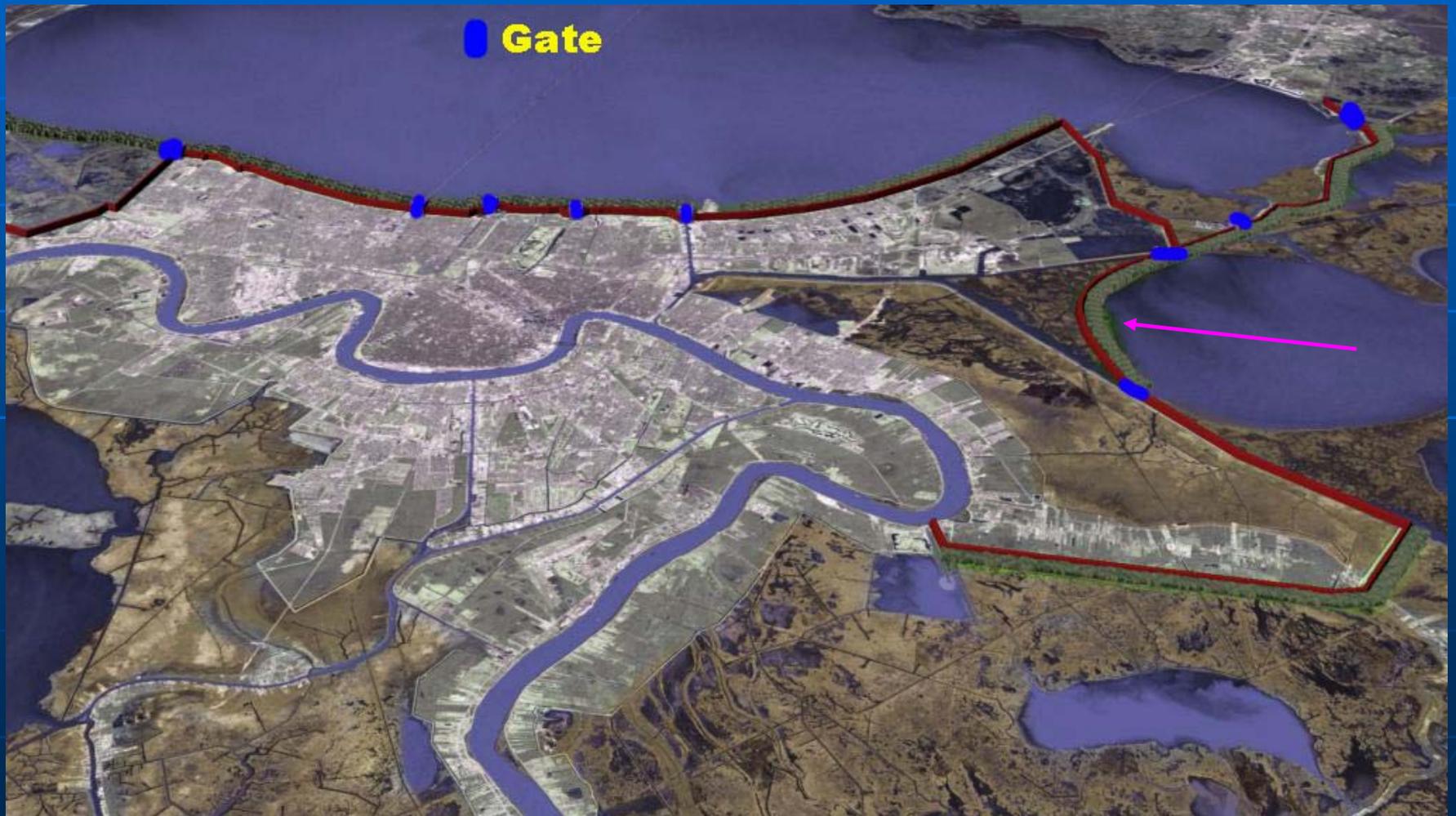
Threats to New Orleans, 9th ward



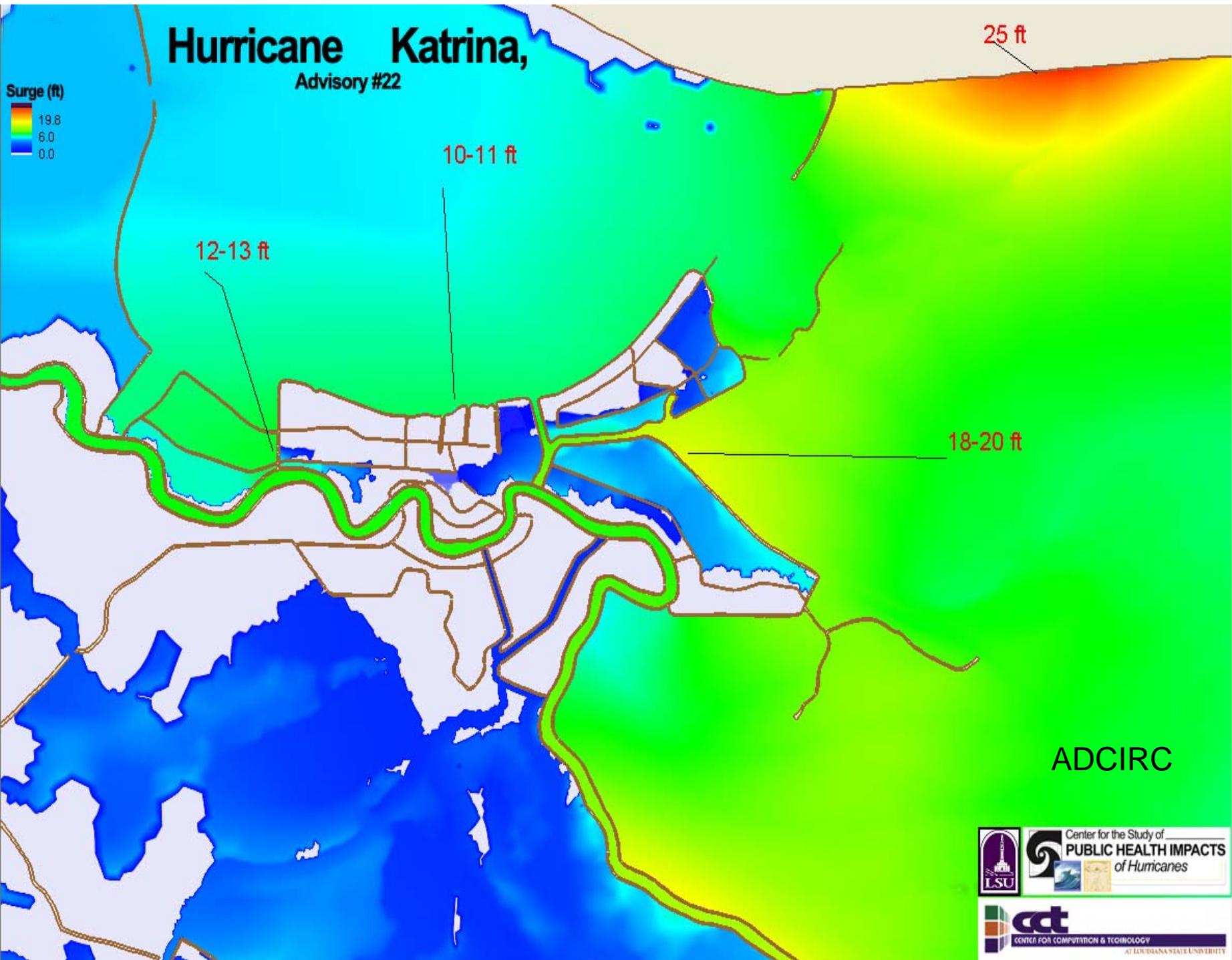
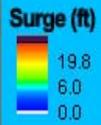
Threats to New Orleans, 9th ward



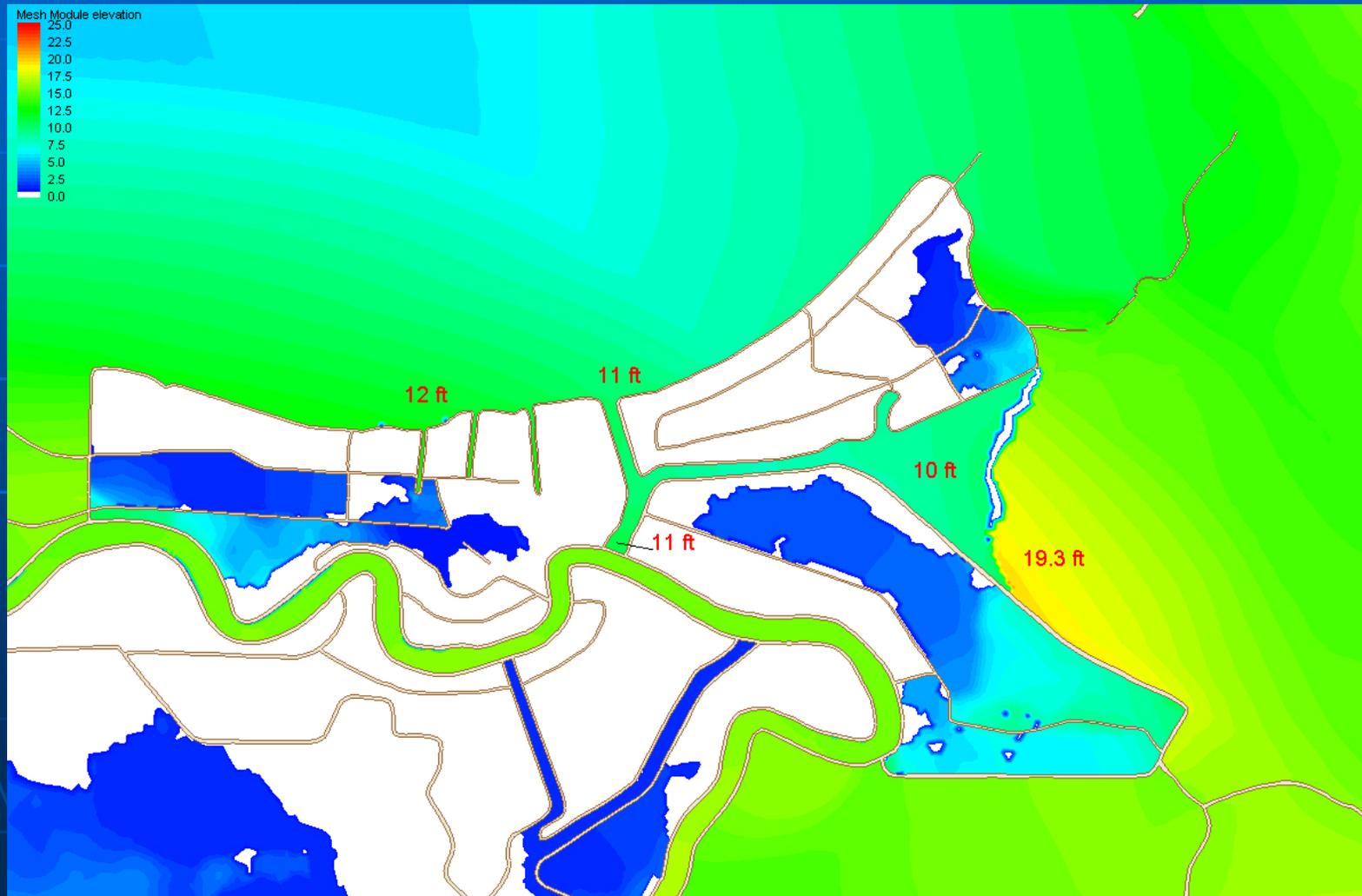
Reduced “Funnel” Levees with Wetlands



Hurricane Katrina, Advisory #22



Katrina + Curved Levee - Less Surge



Wetlands & the Levees



The Difference Between This...

1 mile West of Paris Rd.



And This...



IS THIS!

Propose a barrier levee – wetland – barrier island solution

- **Barrier levee located across coast such that significant wetlands seaward, pathway crosses reasonable soils**
 - **Barrier levee leaky, navigation and sediment delivery channels**
 - **Barrier levee backed by service/navigation channel, extension of GIWW**
 - **Barrier levee such that evacuations not needed.**
-
- **Wetland creation, focus on large scale diversions**
 - **Reconnection of Bayou Lafourche**
 - **Large-scale diversion from Atchafalaya River into Terrebonne marshes**
 - **Wetland creation to be mitigation for barrier levee**

**Barrier Island creation by mining offshore shoals
and near shore sand deposits**













Verkeer en Waterstaat
Rijkswaterstaat
Bouwdienst Rijkswaterstaat
4



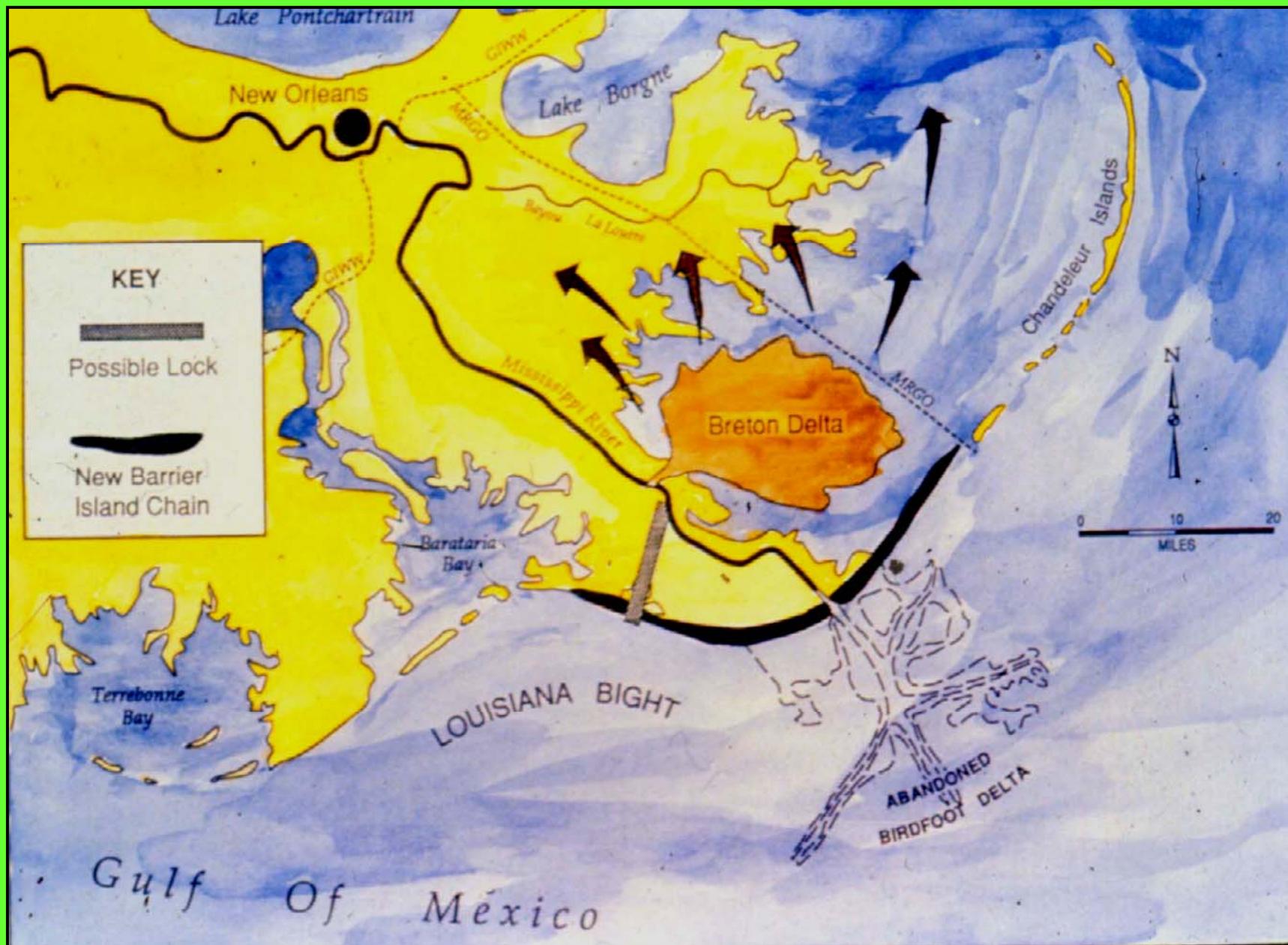






A concept for an artificial barrier could be a passive sea wall consisting of 3 segments cut by two navigation channels located at the entrance to Lake Pontchartrain. The purpose would be to substantially reduce storm surges that enter the lake threatening New Orleans and the North Shore.

LOUISIANA'S FOURTH DELTA



Proposed Coastal Restoration and Protection

January 2006

Prepared by
 Louisiana State University
 Louisiana Geological Survey
 LSU Center for the Study of Public Health Impacts of Hurricanes



Adapted from
 The Official Map of Louisiana 2000
 Louisiana Department of Transportation & Development

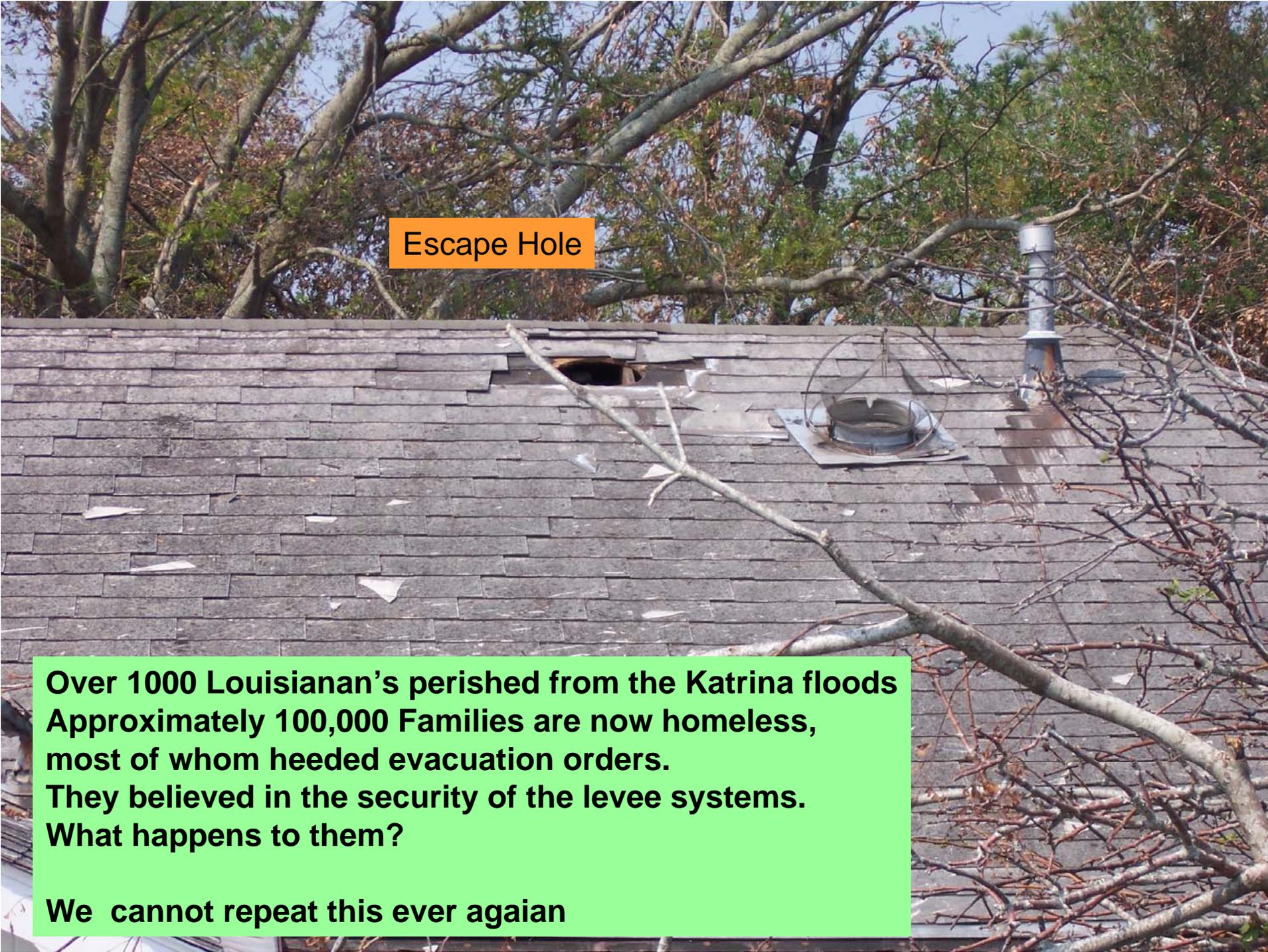


- Key**
- Barrier Levees
 - Waterway
 - ◆ Gated Structure
 - Butterfly Gate
 - - - Canals
 - Diversions
 - ↪ Sediment
 - Barrier Islands



Conclusions

- The Netherlands surge protection system is an excellent model for Louisiana
- We need to act now, need to be bold, need to assume some risk
- ADCIRC surge model a great planning tool, need for ecological assessment models amongst others. Models are extremely valuable planning tool.
- Choose some short-term big picture projects and move on these – expediate the implementation process. Take info from Lake Pontchartrain Levee, Morganza to the Gulf, lower Atchafalaya Evaluation studies and integrate. Do not fall into trap of studying to death.- We know enough to act now.

A photograph showing a grey shingled roof with a significant hole in the center. To the right of the hole is a metal vent pipe. The roof is surrounded by bare tree branches and some green foliage. An orange box with the text "Escape Hole" is positioned above the hole.

Escape Hole

**Over 1000 Louisianan's perished from the Katrina floods
Approximately 100,000 Families are now homeless,
most of whom heeded evacuation orders.
They believed in the security of the levee systems.
What happens to them?**

We cannot repeat this ever again

Thanks

- Hassan Mashriqui – “Team Louisiana”
- Secretary Johnny Bradberry – Louisiana Department of Transportation and Development
- Louisiana Board of Regents – HEF Center Program
- Thanks to Dennis Woltering and WWL-TV New Orleans