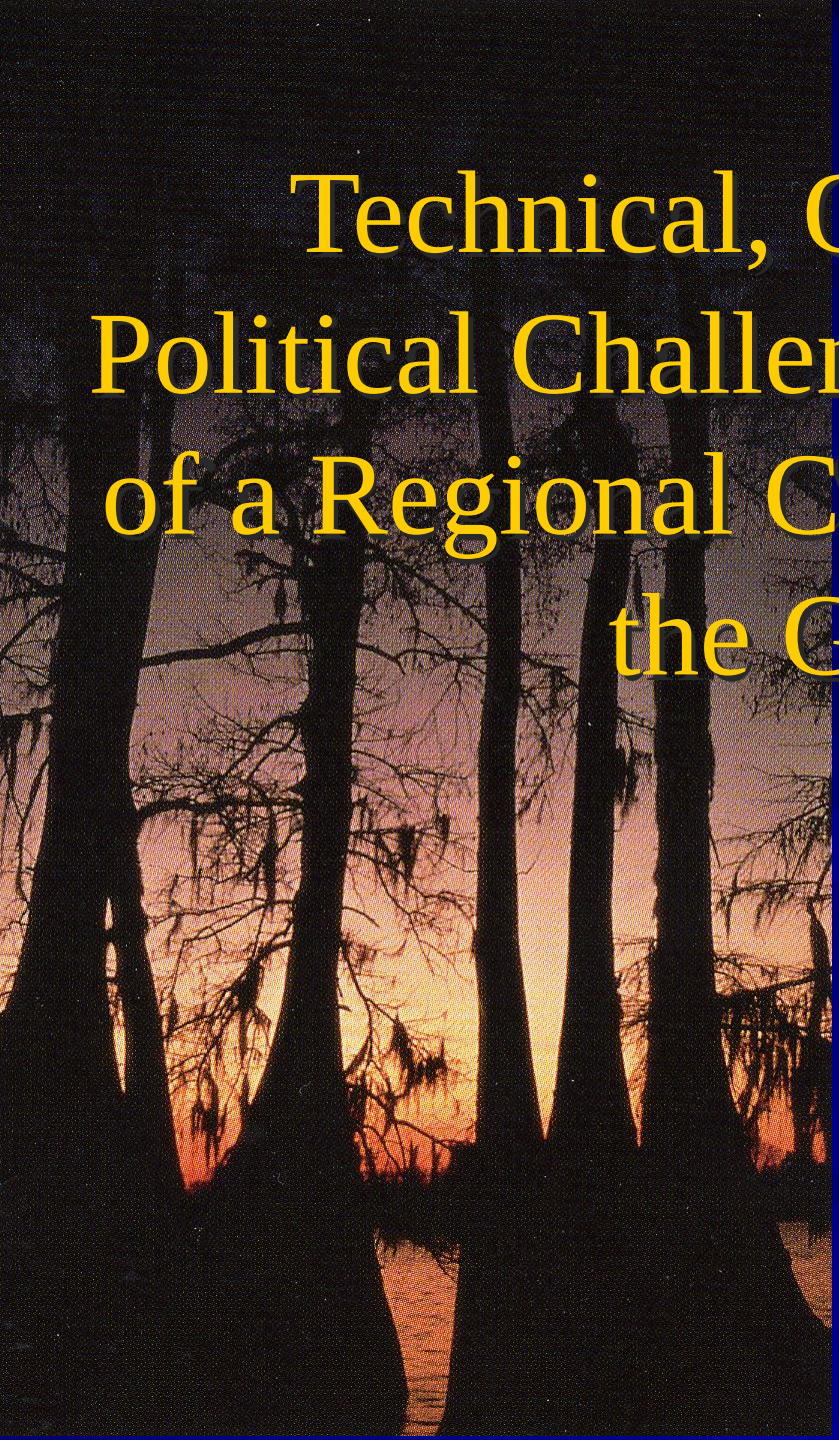

Technical, Operational, and Political Challenges to Development of a Regional CORS Network along the Gulf Coast

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Center for GeoInformatics
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Talking Points

A regional CORS network is vital to the economies, safety, and survival of states of the Gulf Coast.

WHY? The Gulf Coast is the site of the largest natural disaster in the 21st century. It is the result of mainly natural land subsidence and is exacerbated by eustatic sea level rise.

→Example, >15,000 squ. km of land in Louisiana will be fall below sea level by 2100.

SO WHAT?

Subsidence has ruined the state's system of elevation control. Highways are being designed and built using wrong elevations. Flood zone maps are inaccurate, slab elevations are off, elevations of evacuation roads and levee tops are wrong. The scientific paradigm underpinning plans to mitigate land loss is faulty.

Talking Points (cont.)

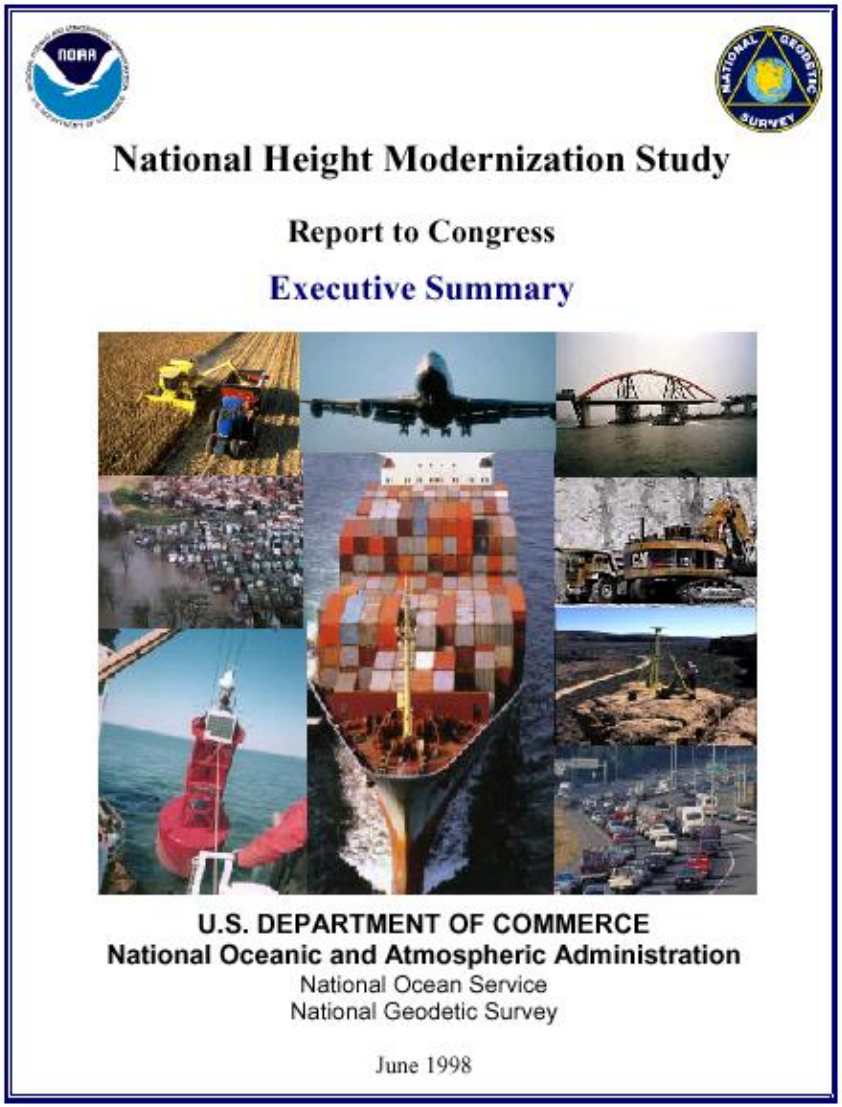
WHAT IS BEING DONE? New system is based on CORS. Re-establishment of correct elevations in the region has difficult technical, operational, and political challenges that have to be overcome.

Technical→ Establishing and maintaining orthometric heights on CORS antennas.

Operational→ Field methods that will achieve desired precision under local weather conditions.
Communications at remote sites.

Political→ $$
→ Agency inertia
→ Some people don't want correct elevations.
→ Some agencies and people don't want the science paradigm overturned.

3-D Positioning in LA is messed up



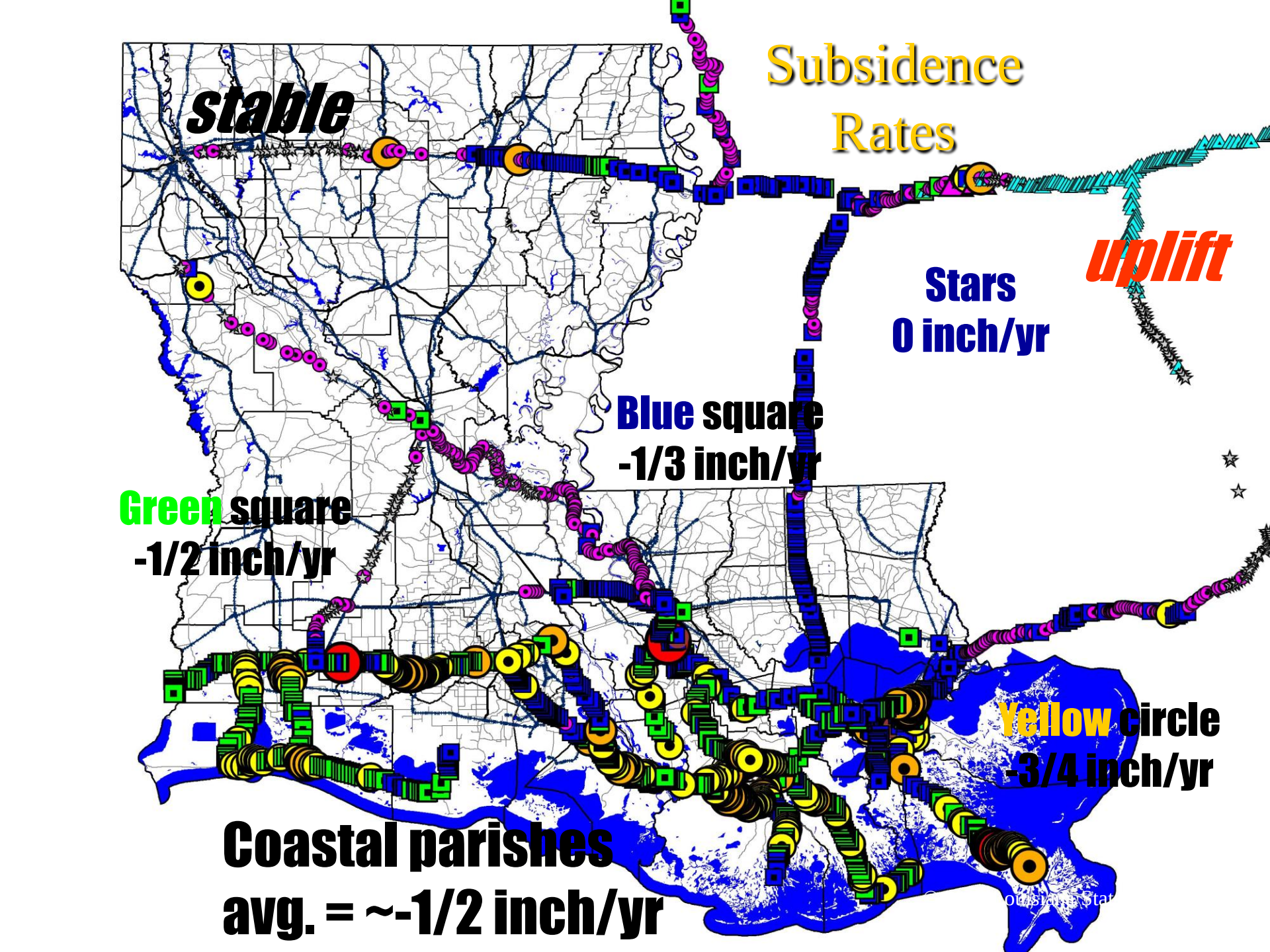
NOAA told Louisiana in 2001 that the system we use to measure elevations is,

"inaccurate and obsolete."

Technical Challenges

→Vertical and horizontal control networks have been corrupted by subsidence.

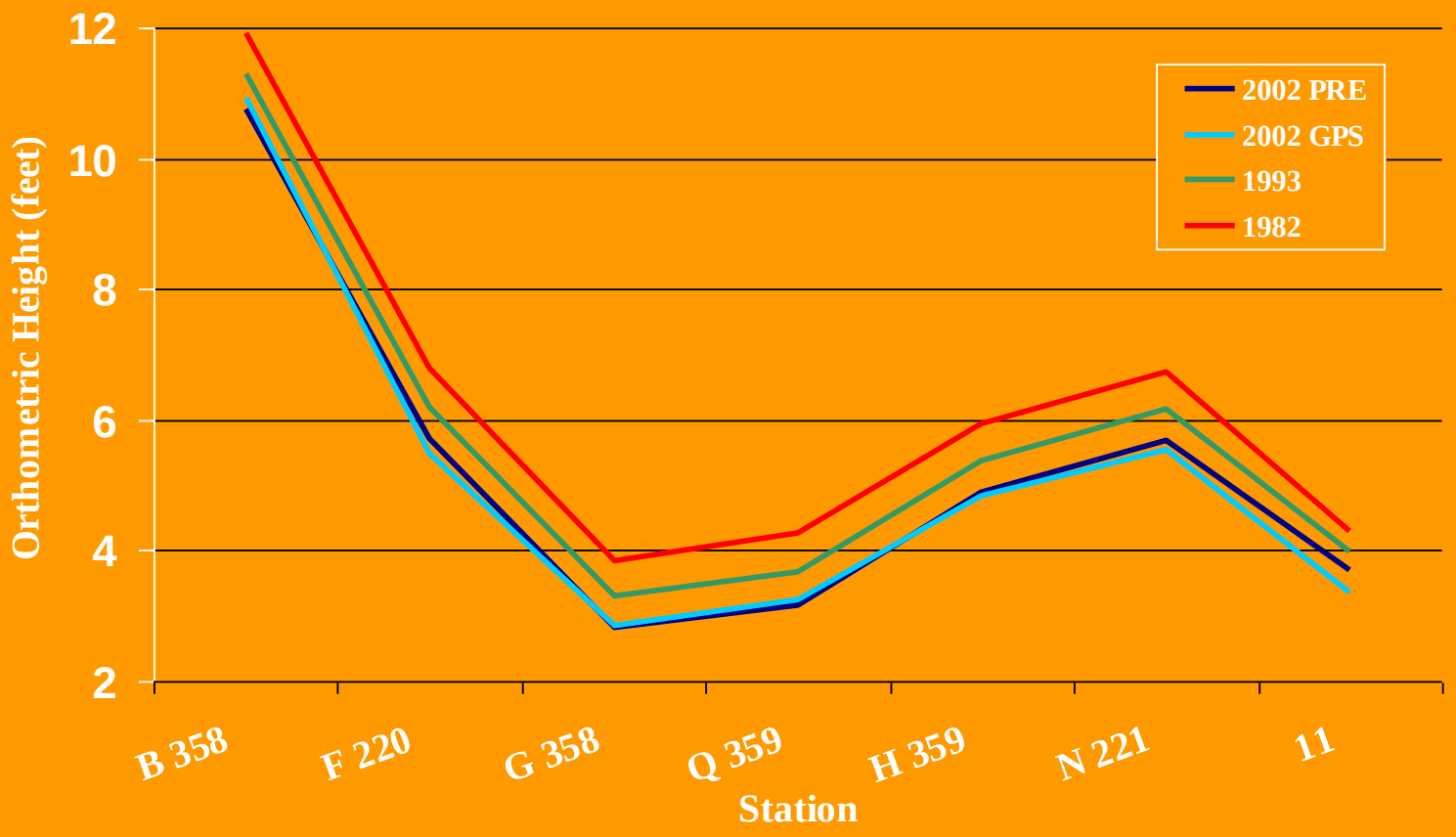
→Establishing and maintaining orthometric heights on CORS antennas.


Subsidence Rates
stable
uplift
Stars
0 inch/yr
Blue square
-1/3 inch/yr
Green square
-1/2 inch/yr
Yellow circle
-3/4 inch/yr
Coastal parishes
avg. = ~-1/2 inch/yr

RACELAND to GRAND ISLE

1982, 1993, 2002 Observed Heights

2002 Predicted Heights



Practical Implications of Changing Elevations

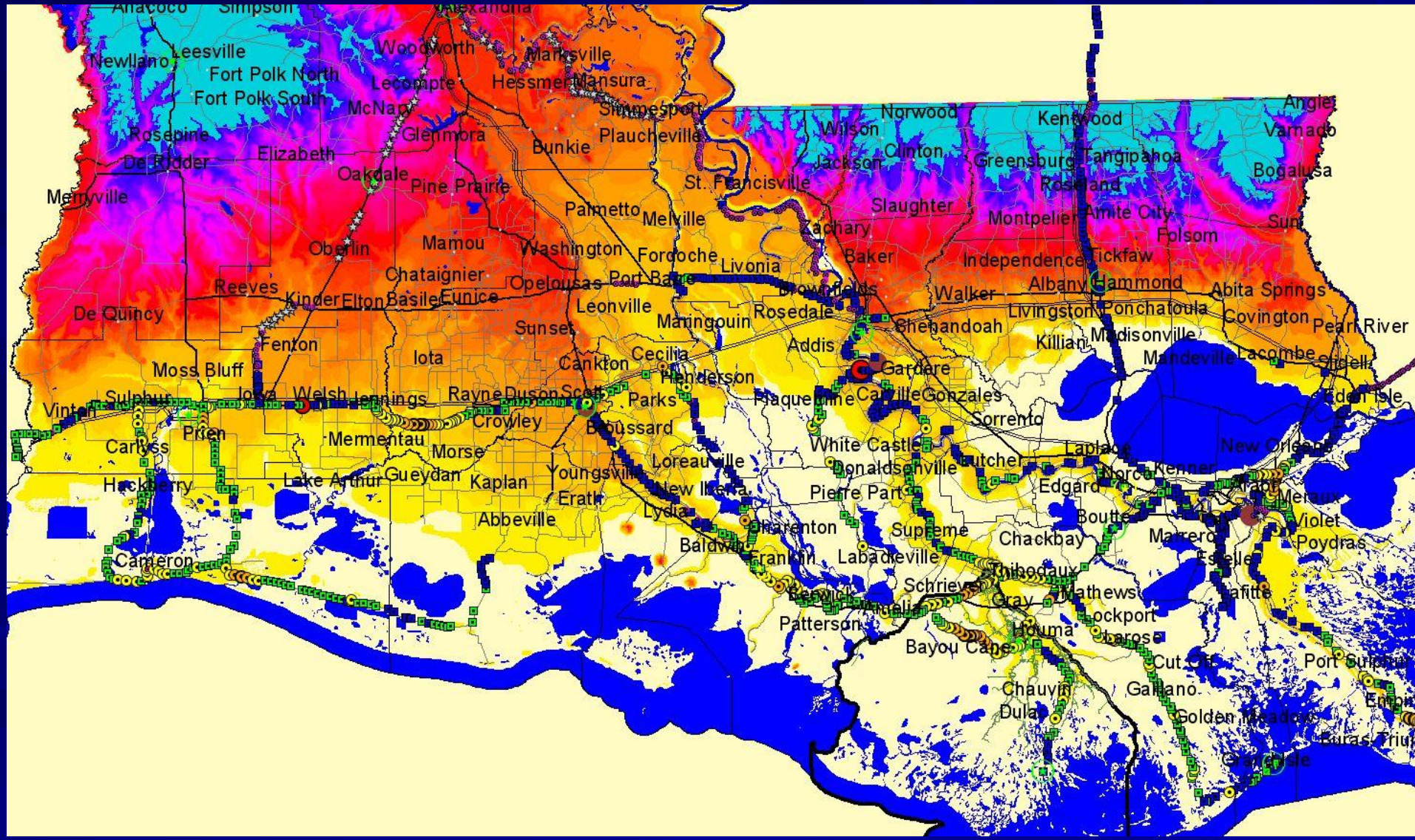
→Most areas of coastal parishes will lost by 2075. It is worth ~$140B + revenue.

→Nothing can be built to a correct elevation. Levees, highways, etc.

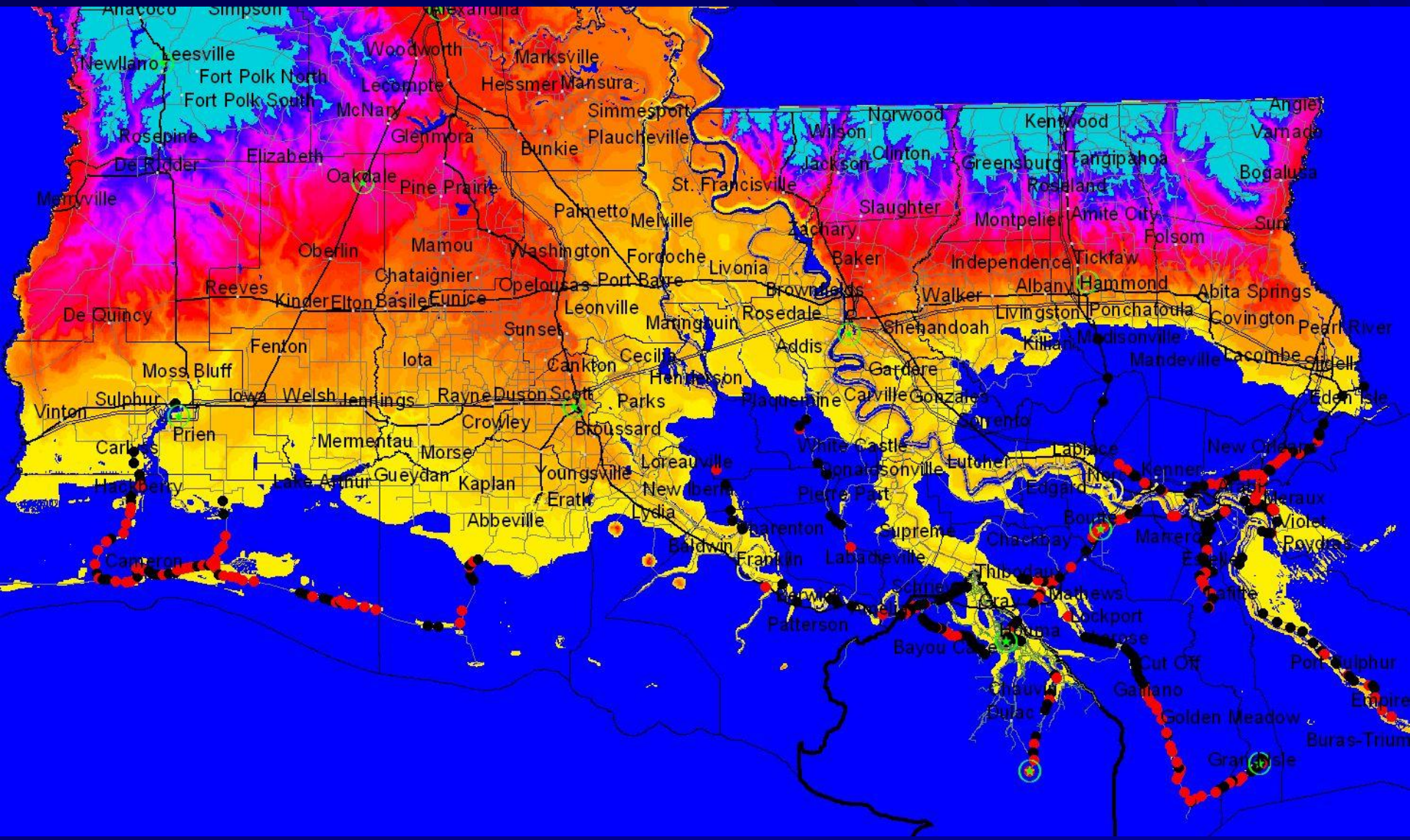
→Maps and coastal charts are wrong.

→Levees are lower because of subsidence.

Today


Anacoco
Simpson
Alexandria
Newllano
Leesville
Woodworth
Marksville
Fort Polk North
Lecompte
Hessmer
Mansura
Fort Polk South
McNary
Simmesport
Norwood
Kentwood
Angie
Rosepine
Glenmora
Bunkie
Plaucheville
Wilson
Varnado
De Ridder
Elizabeth
Jackson
Clinton
Greensburg
Tangipahoa
Oakdale
Pine Prairie
St. Francisville
Roseland
Bogalusa
Merryville
Palmetto
Melville
Slaughter
Montpelier
Amite City
Zachary
Folsom
Sun
Oberlin
Mamou
Washington
Fordoche
Livonia
Baker
Independence
Tickfaw
Chataignier
Port Barre
Albany
Hammond
Abita Springs
Reeves
Kinder
Elton
Basile
Eunice
Opelousas
Brownfields
Walker
Livingston
Ponchatoula
Covington
De Quincy
Leonville
Maringouin
Rosedale
Shenandoah
Madisonville
Pearl River
Sunset
Addis
Killian
Mandeville
Lacombe
Fenton
Iota
Cankton
Cecilia
Gardere
Moss Bluff
Henderson
Sulphur
Iowa
Welsh
Jennings
Rayne
Duson
Scott
Parks
Plaquemine
Carville
Gonzales
Vinton
Crowley
Sorrento
Prien
Mermentau
Broussard
White Castle
Carlyss
Morse
Loreauville
Donaldsonville
Kenner
Hackberry
Lake Arthur
Gueydan
Kaplan
Youngsville
New Iberia
Pierre Part
Edgard
Erath
Lydia
Boutte
Abbeville
Supreme
Chackbay
Violet
Baldwin
Franklin
Labadieville
Poydras
Cameron
Thibodaux
Schriever
Mathews
Patterson
Gray
Houma
Bayou Cane
Cut Off
Port Sulphur
Chauvin
Galliano
Dula
Golden Meadow
Grand Isle

2075 assuming nothing is done



How do you fix a reference system?

Traditional method:

- → *run geodetic levels from a known point to benchmarks.*
- → *$1000-$2000/km. 10,000 benchmarks in Louisiana.*
- → *benchmarks must be recalibrated if they move more than 2cm. Viability lasts a few years in many areas.*

LSRC method:

- → *analyze all previous NGS 1st order leveling data.*
- → *calculate velocities and model 2004 elevations.*
- → *validate predicted elevations with new observations.*
- → *build a CORS network.*
- → *transfer elevations from updated benchmarks to CORS antennas using GPS leveling.*

Steps to Self-Sustaining Height Mod

→Analysis of NGS 1st order leveling data to compute vertical velocities and predicted 2004 NAVD88 elevations. Validate with GPS observations that are part of a network. Of 10,000 benchmarks in LA, only a few hundred will have updated elevations. These define the Louisiana Base Network (LBN).

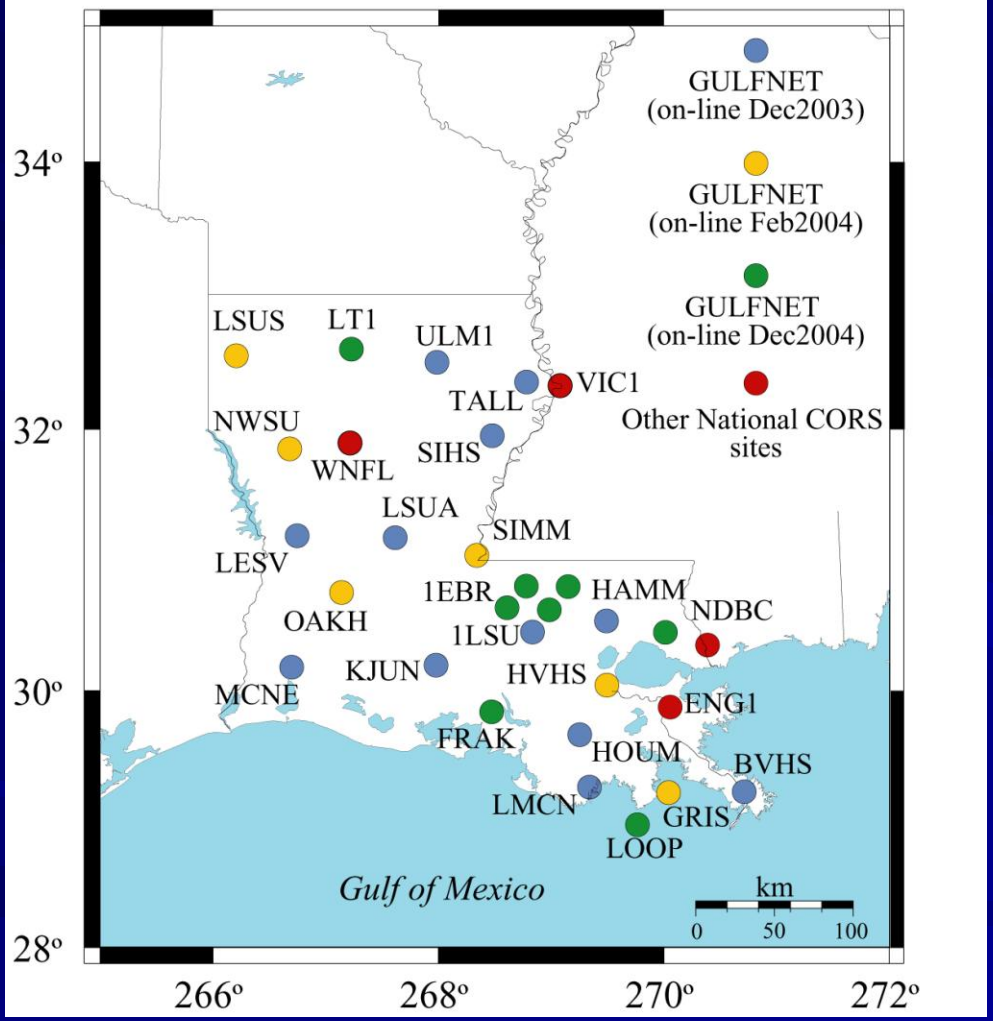
→The role of LBN is to allow for periodic calibration of GULFNET using static surveys and starting points for local projects.

→Creation of regional density GULFNET. Cities will have high density. Transfer NAVD88 elevations from LBN to CORS. Virtual benchmarks are possible within 10 km from CORS. LBN will be maintained to provide local POBs for local height modernization.

LSRC
Louisiana Spatial Reference Center

GULFNET National CORS Stations in Louisiana

C⁴G
Center for GeoInformatics



GULFNet CORS

Phase 1—
Regional network completed.

Phase 2—
City densification

Phase 3—
Regional chains of CORS completed

Operational Challenges

→Monumentation.

→Atmospheric conditions.

→Communication issues.

Monumentation schema developed for arid environments don't work in south Louisiana

All GULFNet CORS are on pile-driven buildings, some that extend down 250 ft

or

older (>40 years) buildings that have settled.

Political Challenges

Surprisingly, there are many groups and individuals that don't want correct elevations.

→ Some surveyors who don't want to move to GPS.

→ Private land owners who don't want hear that their property is actually in the flood zone.

→ A few federal and state agencies and scientists involved in coastal restoration that have reputations and budgets that will be adversely affected because of new insights.

Fortunately, the political pressure for accurate elevations is growing from:

→people who live along the coast.

→consumers and towns who are tired of flooding.

→professional groups.

→US Army Corps of Engineers.

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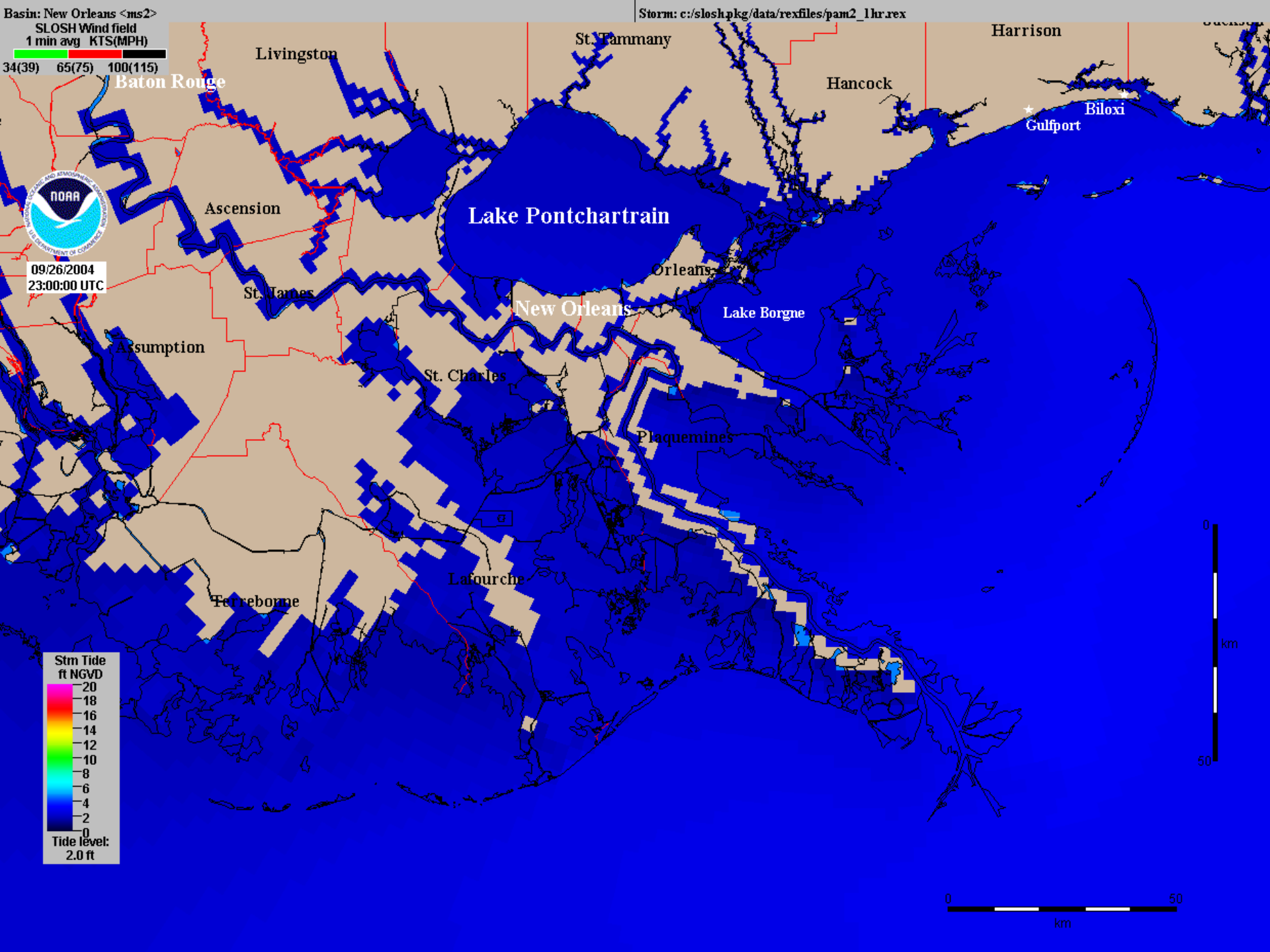
"Elevation is our salvation from inundation"
Let's finish by looking at what a CAT 2 Hurricane will do to New Orleans. Remember: the levees were built at elevations to withstand a CAT 3.


Basin: New Orleans <ms2>
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SLOSH Wind field
1 min avg KTS(MPH)
34(39) 65(75) 100(115)
Livingston
St. Tammany
Harrison
Baton Rouge
Hancock
Biloxi
Gulfport
Ascension
Lake Pontchartrain
Orleans
St. James
New Orleans
Lake Borgne
Assumption
St. Charles
Plaquemines
Lafourche
Terrebonne
09/26/2004
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Stm Tide
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8
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Tide level:
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km