The background of the slide is a photograph of a tall, ornate building tower, likely a clock tower, reaching into a blue sky with scattered white clouds. The tower has multiple levels with arched windows and decorative elements. The image is slightly faded to allow the text to be the primary focus.

Modeling Hurricanes in the Gulf of Mexico Using ADCIRC

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Acknowledgements / Collaborators

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ADCIRC Model

- A system of computer programs for solving time dependent free surface circulation
- Applications include analysis of hurricane storm surge and flooding
- Description of physical domain and data inputs: use large domains to model basin-shelf-coastal interactions
- Scalable parallel implementation
- Finite element discretization (continuous and discontinuous Galerkin)

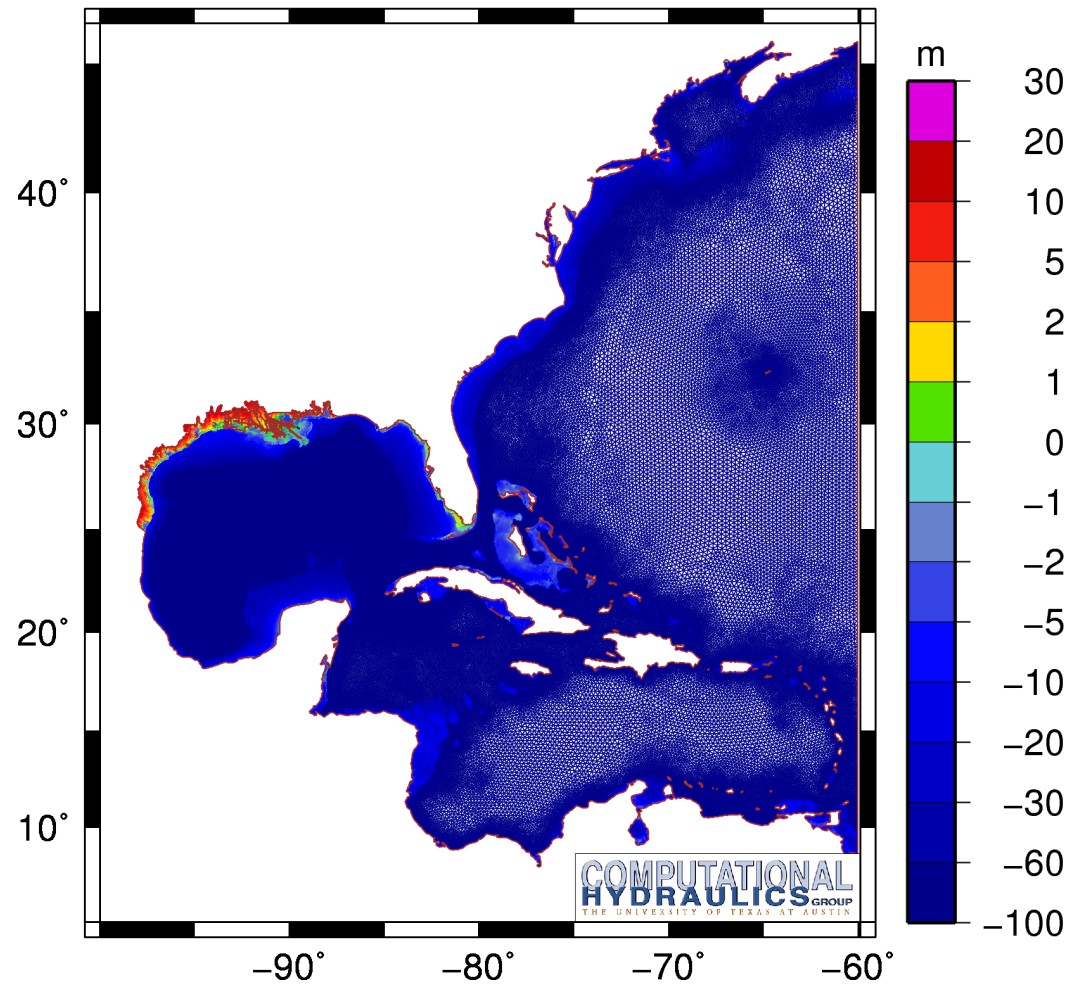
- ADCIRC Circulation model
- SWAN Wind wave model (TU Delft)
- Various wind inputs (NOAA, Whirlwinds, OWI)

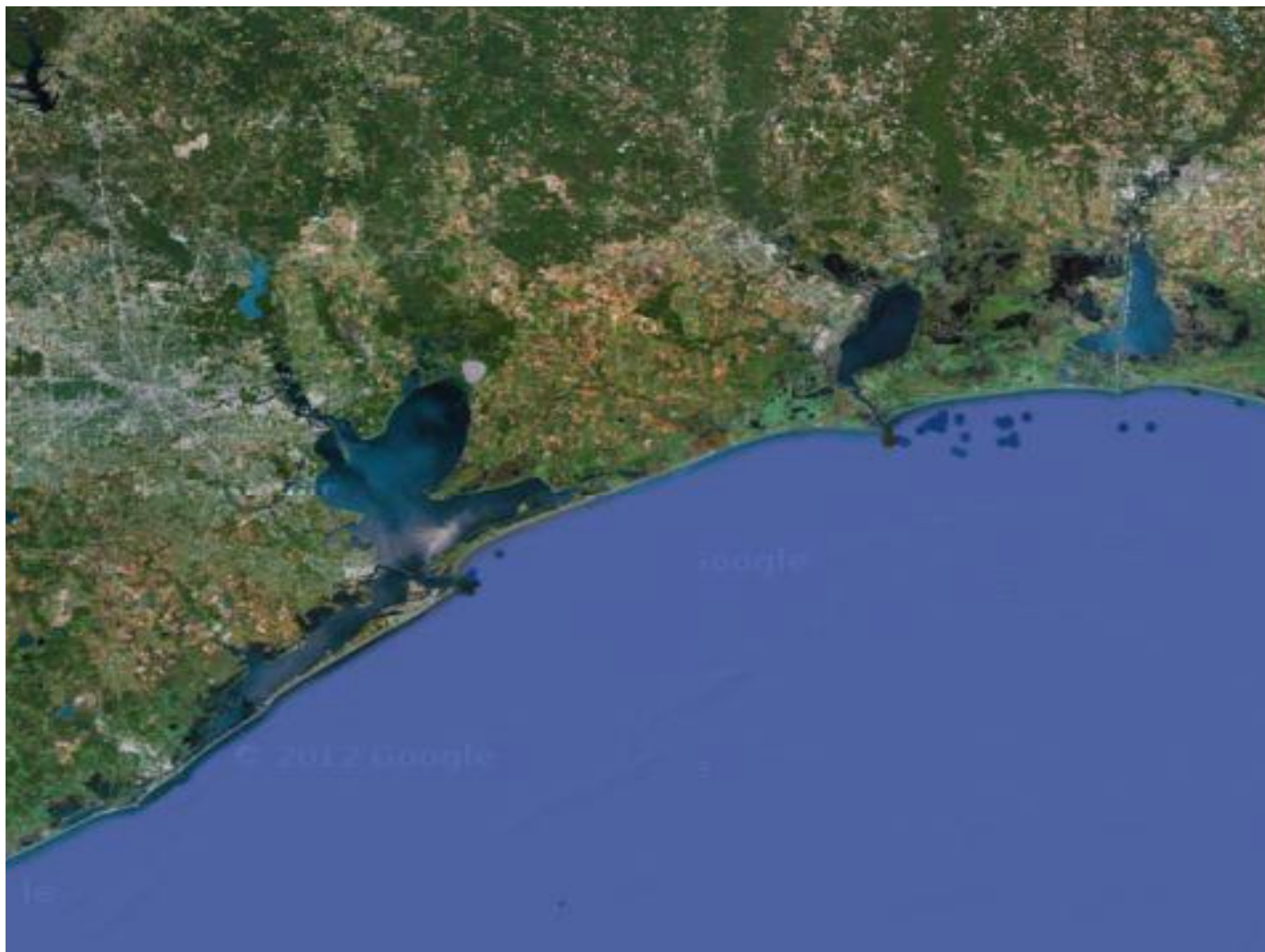
Physical Processes in ADCIRC

- Winds
- Wave-current interaction
- Tides
- Atmospheric pressure
- River flow
- Rainfall (under development)
- Wetting and drying

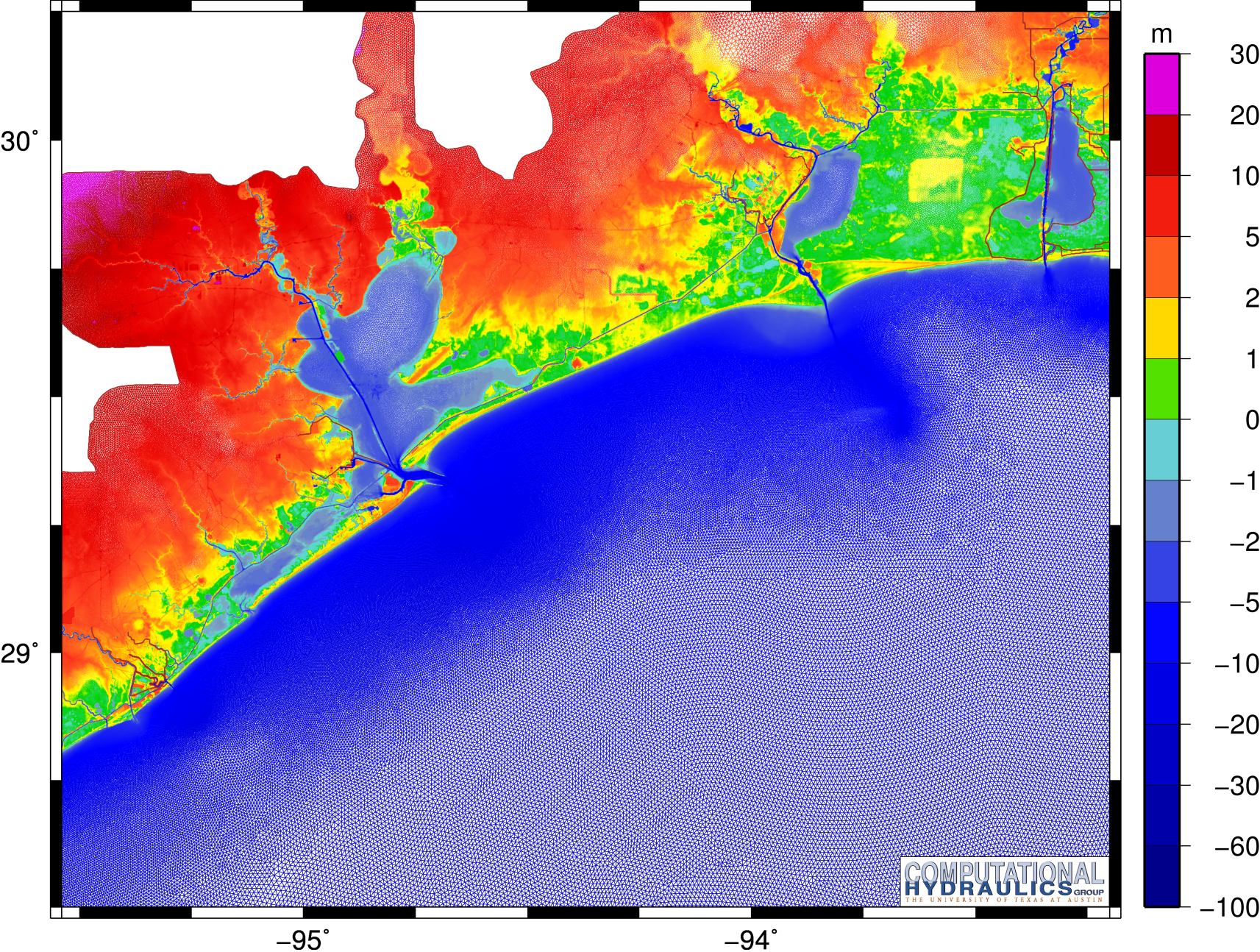


SL18v2c Grid and Bathymetry

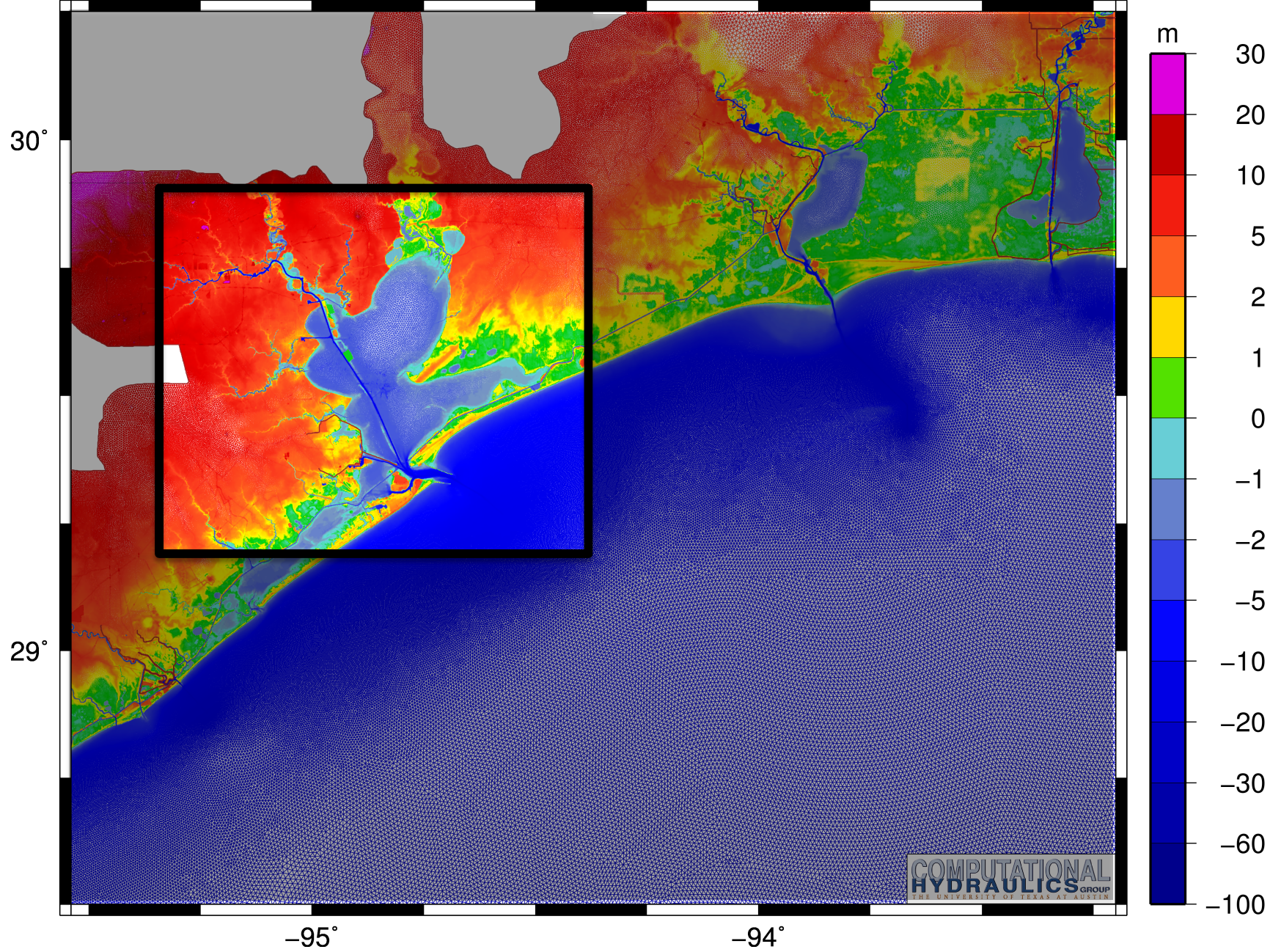




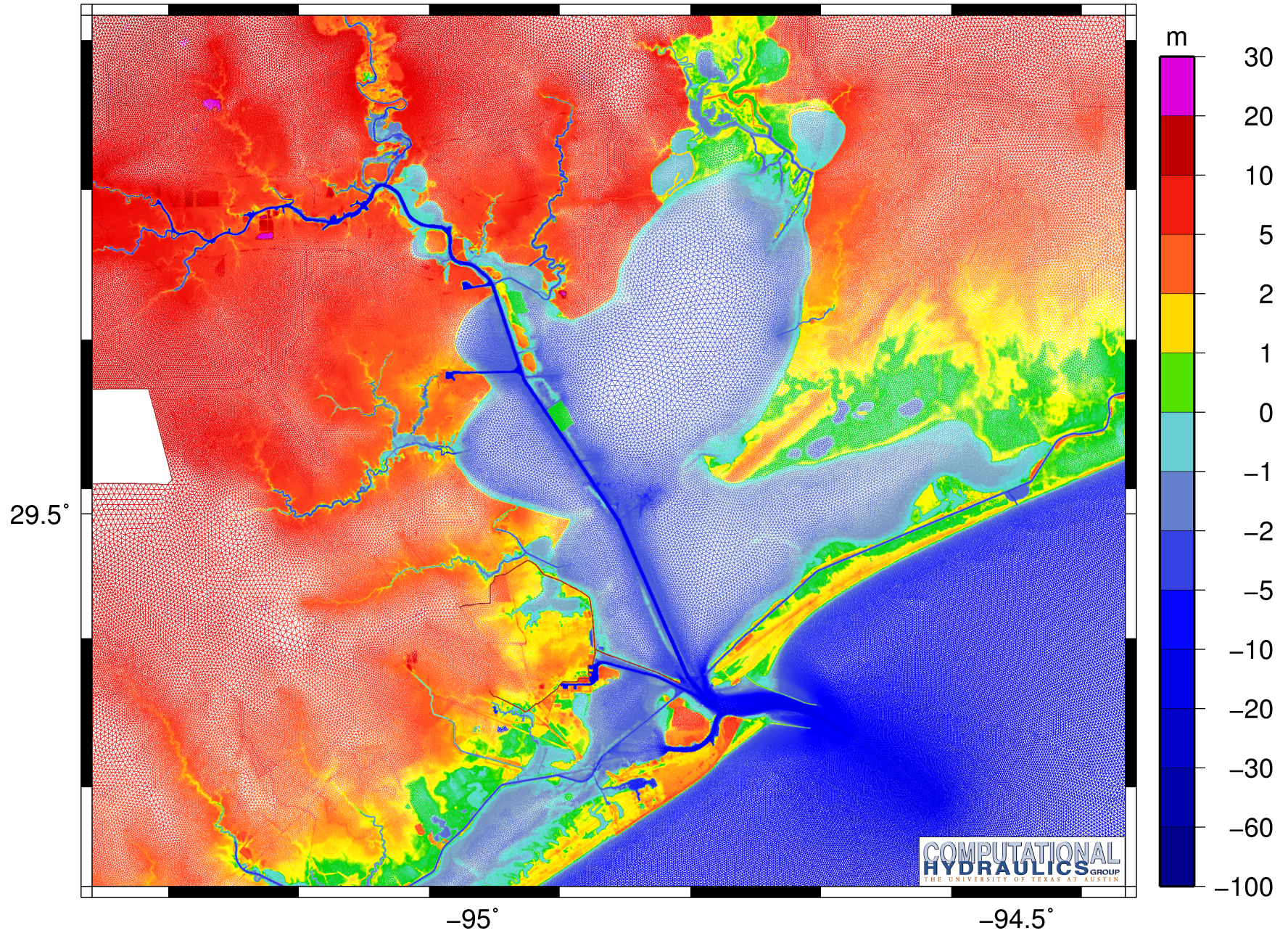
SL18v2c Grid and Bathymetry

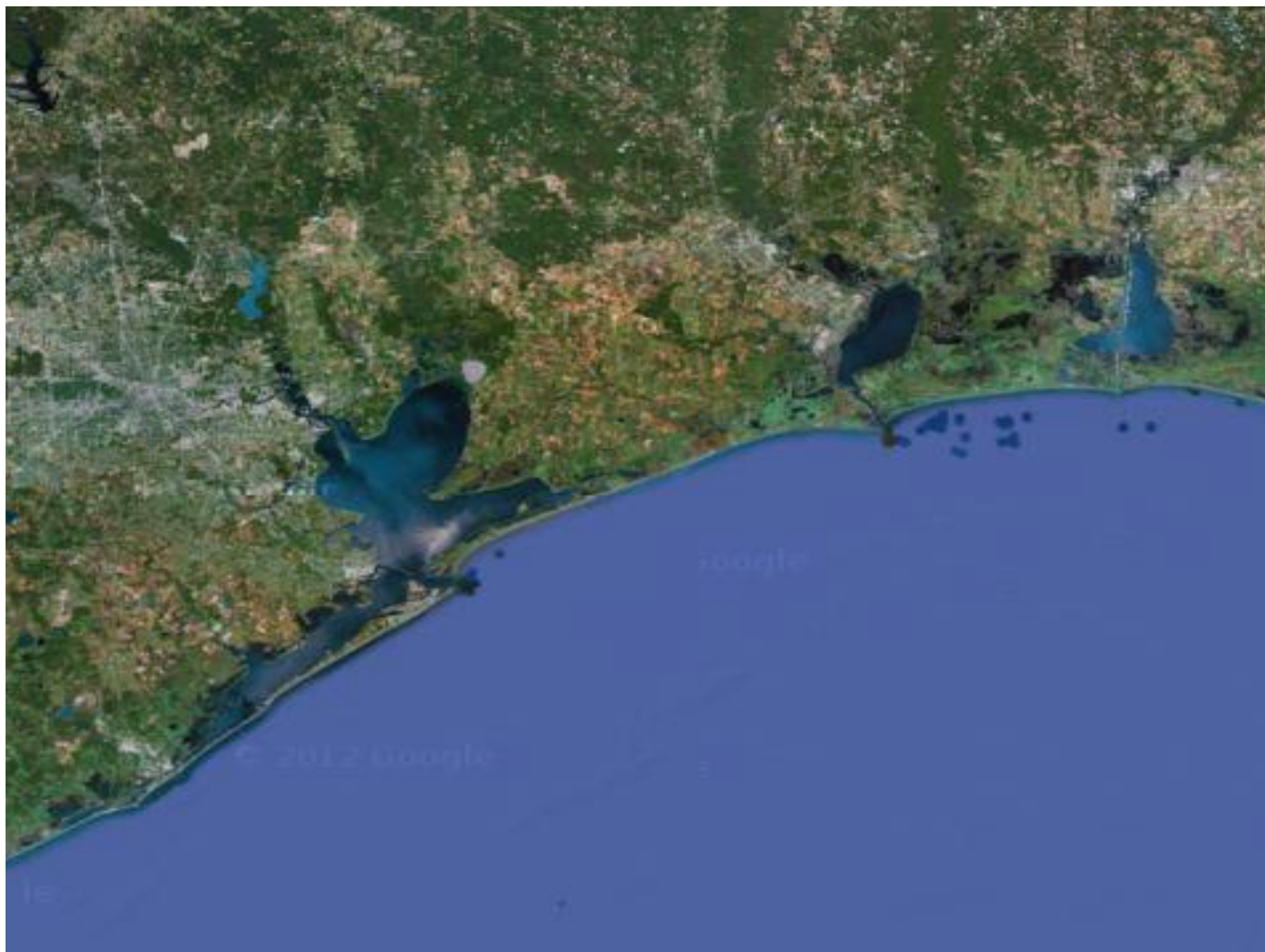


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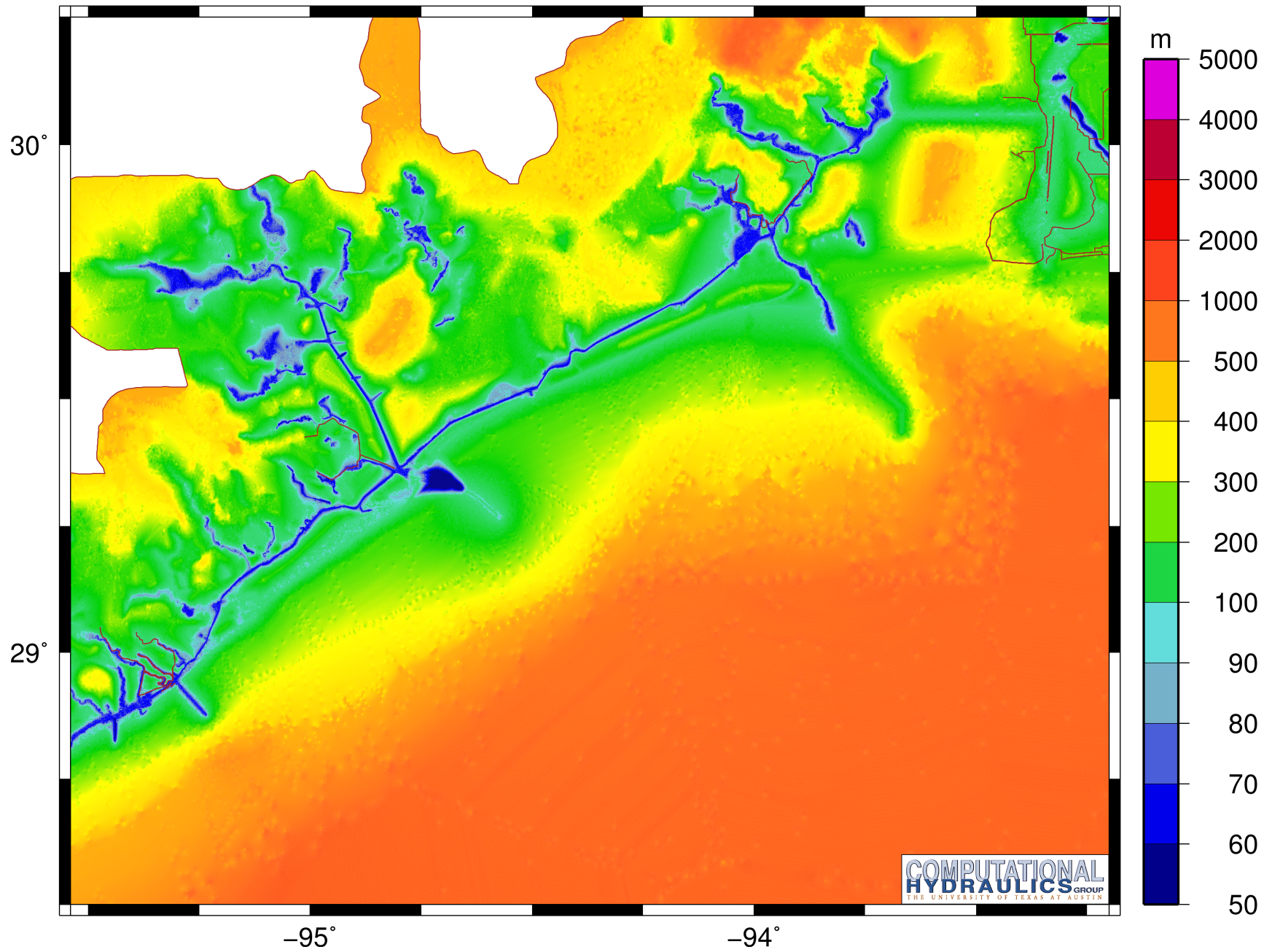


SL18v2c Grid and Bathymetry





SL18v2c Grid Element Sizes



ADCIRC Storm Surge Modeling

Hindcasting: Modeling historical hurricanes

- Evaluate inundation risk in coastal areas
High impact / low probability events in an evolving system
- Critical to design of protection and mitigation systems in order to reduce that risk

Structures may, in fact, adversely impact components of the system and increase the risk of flooding in some areas

Explore impact of proposed systems of dikes, levees, gates and environmental mitigation strategies

ADCIRC Storm Surge Modeling

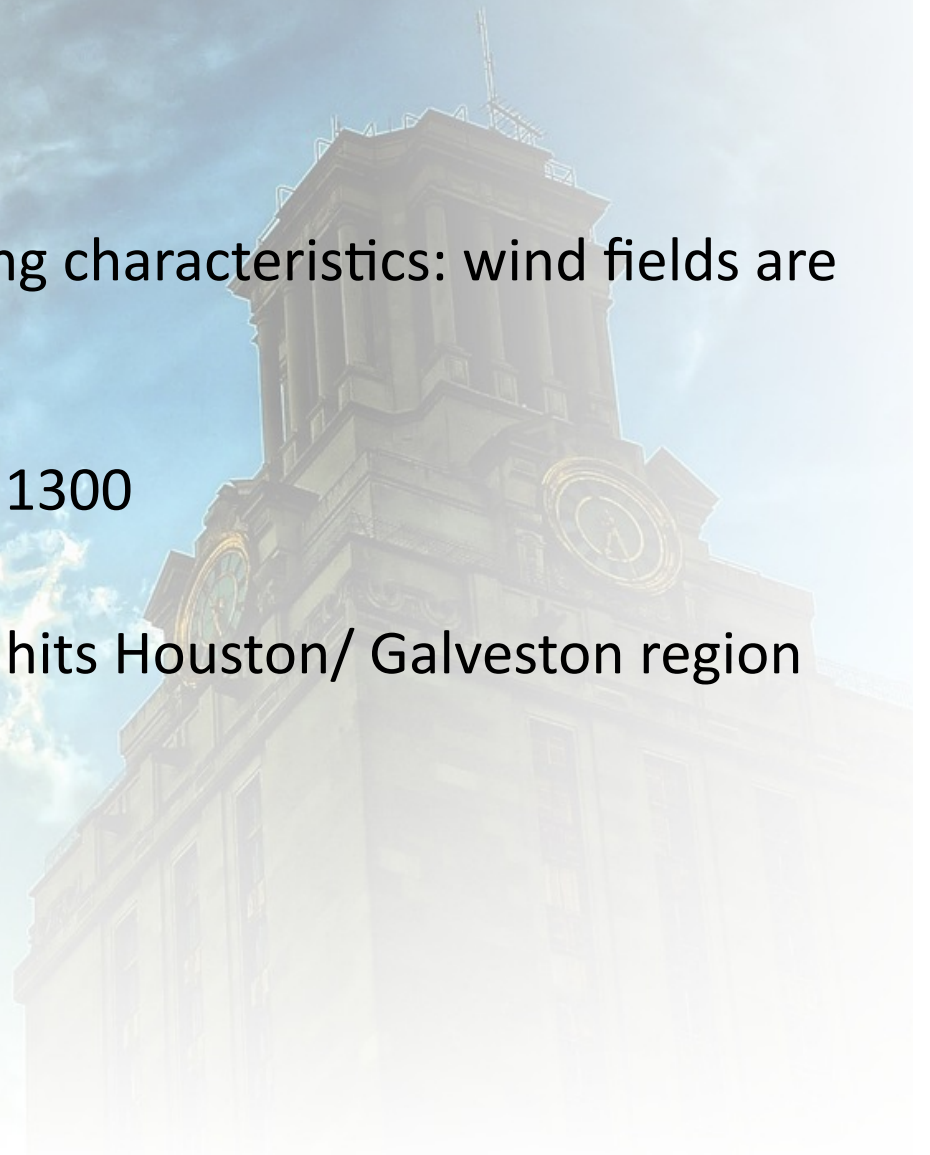
Forecasting: Modeling real time hurricanes

- ADCIRC Surge Guidance System (ASGS)
- Fully operational for TX and LA as of 2009
- Predict winds, storm surge and flooding associated with a hurricane currently in the Gulf region
 - Based on storm advisory updates from National Hurricane Center
 - Generate wind and pressure fields using a parametric wind model
 - Automated, real time system that generates results in a timely and accurate manner for use by emergency management personnel

ADCIRC Storm Surge Modeling

Modeling synthetic hurricanes

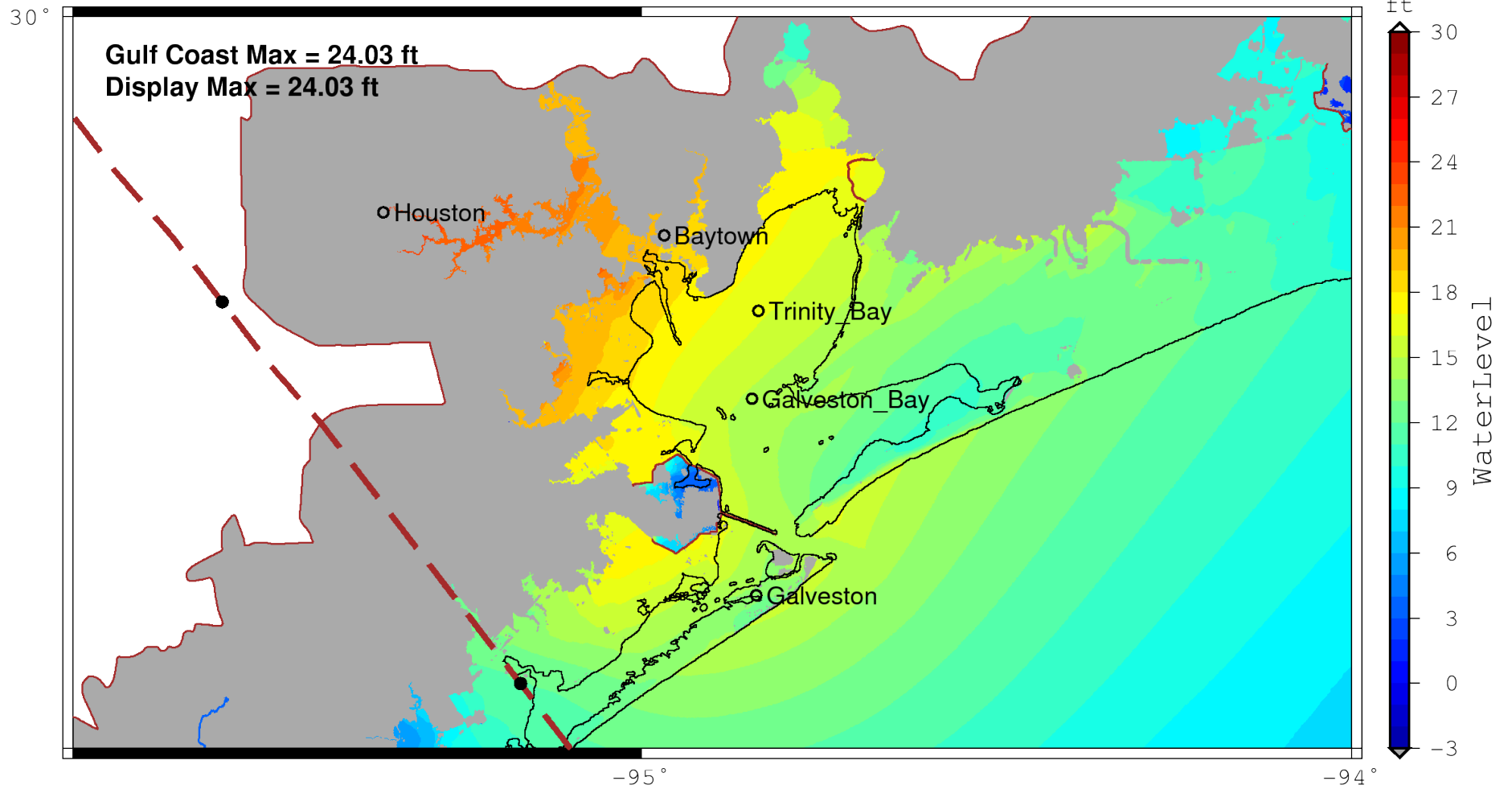
- Hypothetical storms with varying characteristics: wind fields are synthetically constructed
- Year 2094: start time is 26 July, 1300
- Storm begins in Gulf Coast and hits Houston/ Galveston region



TX_FEMA

Storm 089

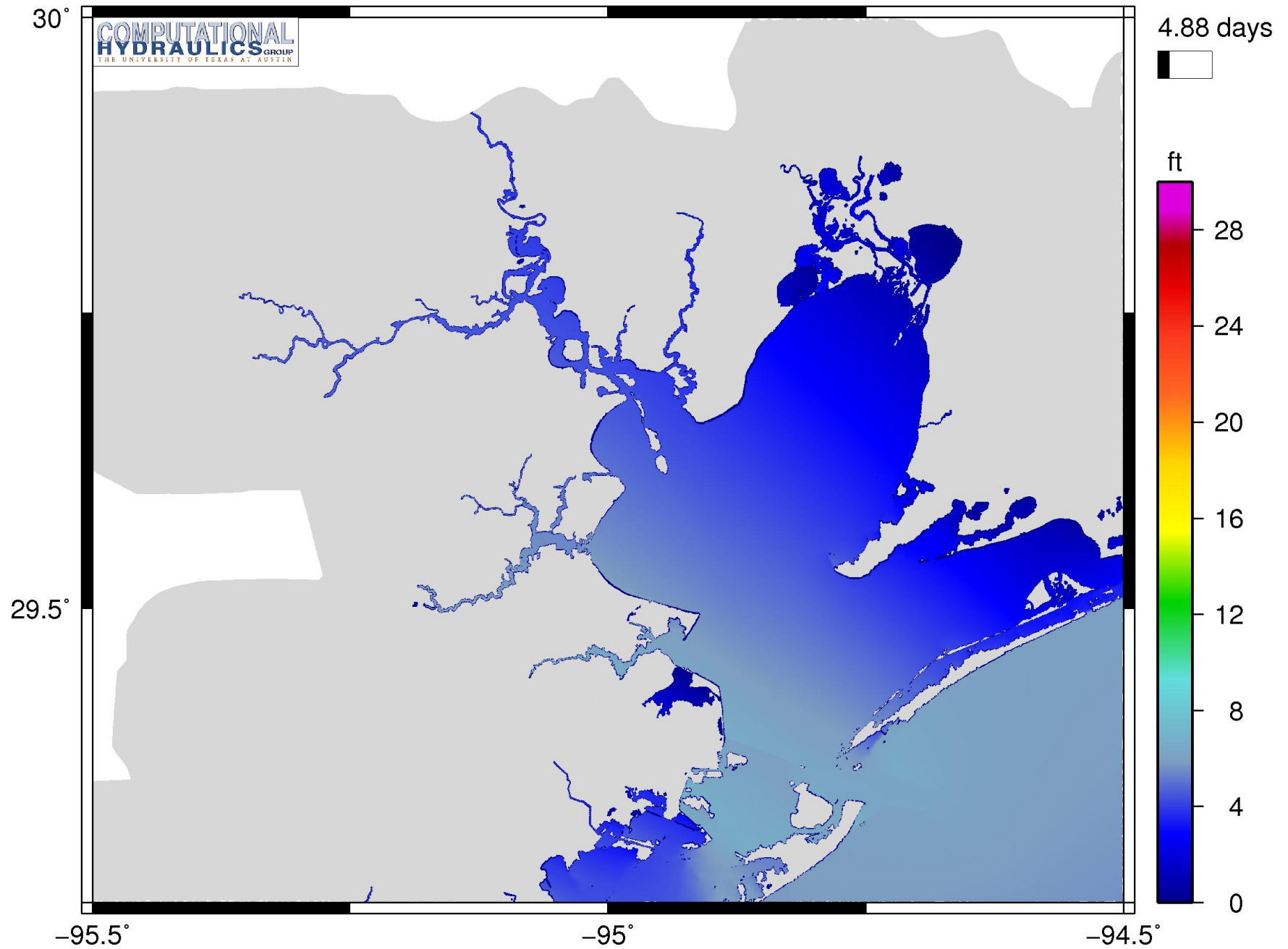
Max. Water Level (Ft)



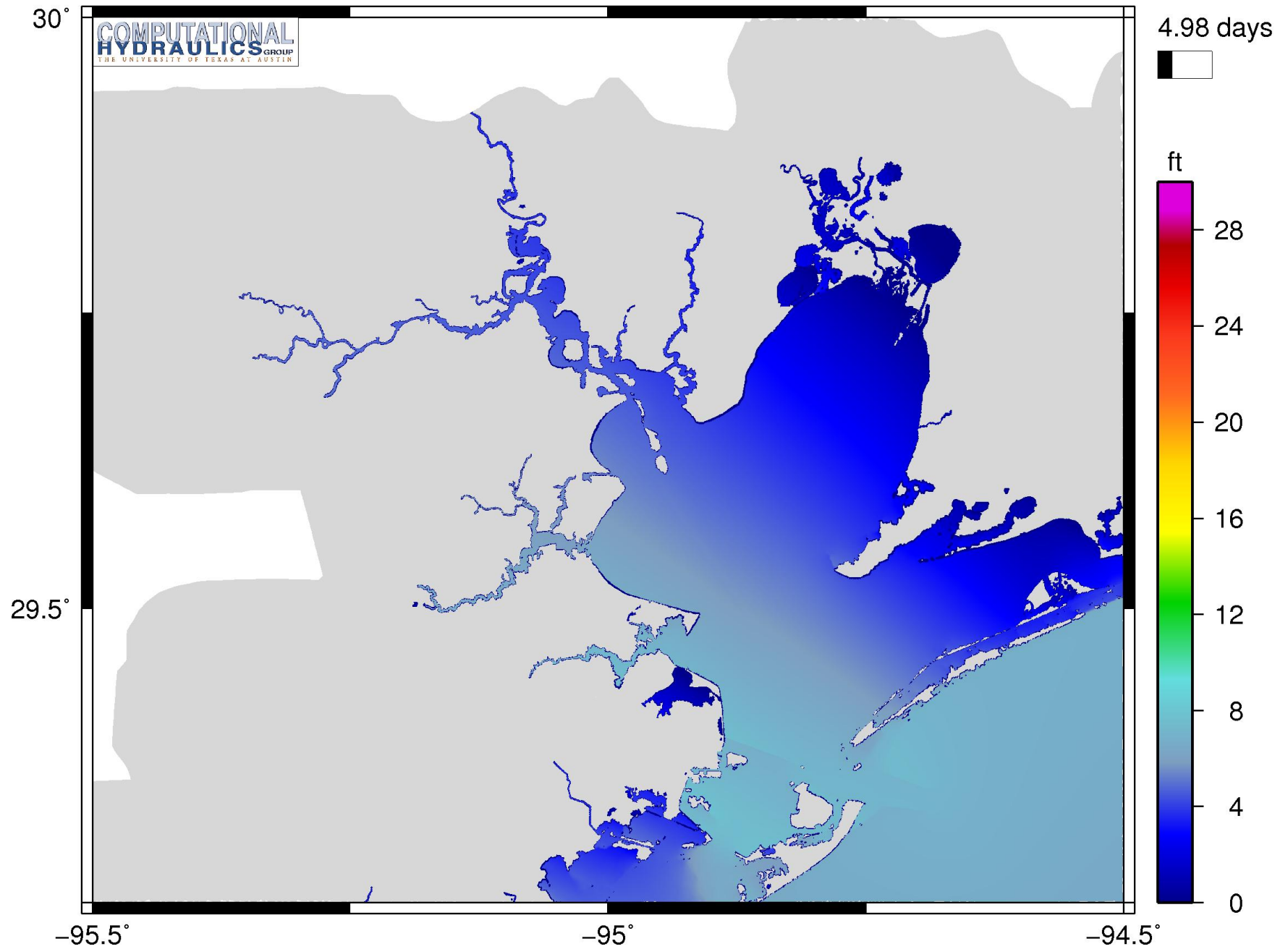
GM 2011 May 24 14:22:23

Courtesy: Jay Ratcliff

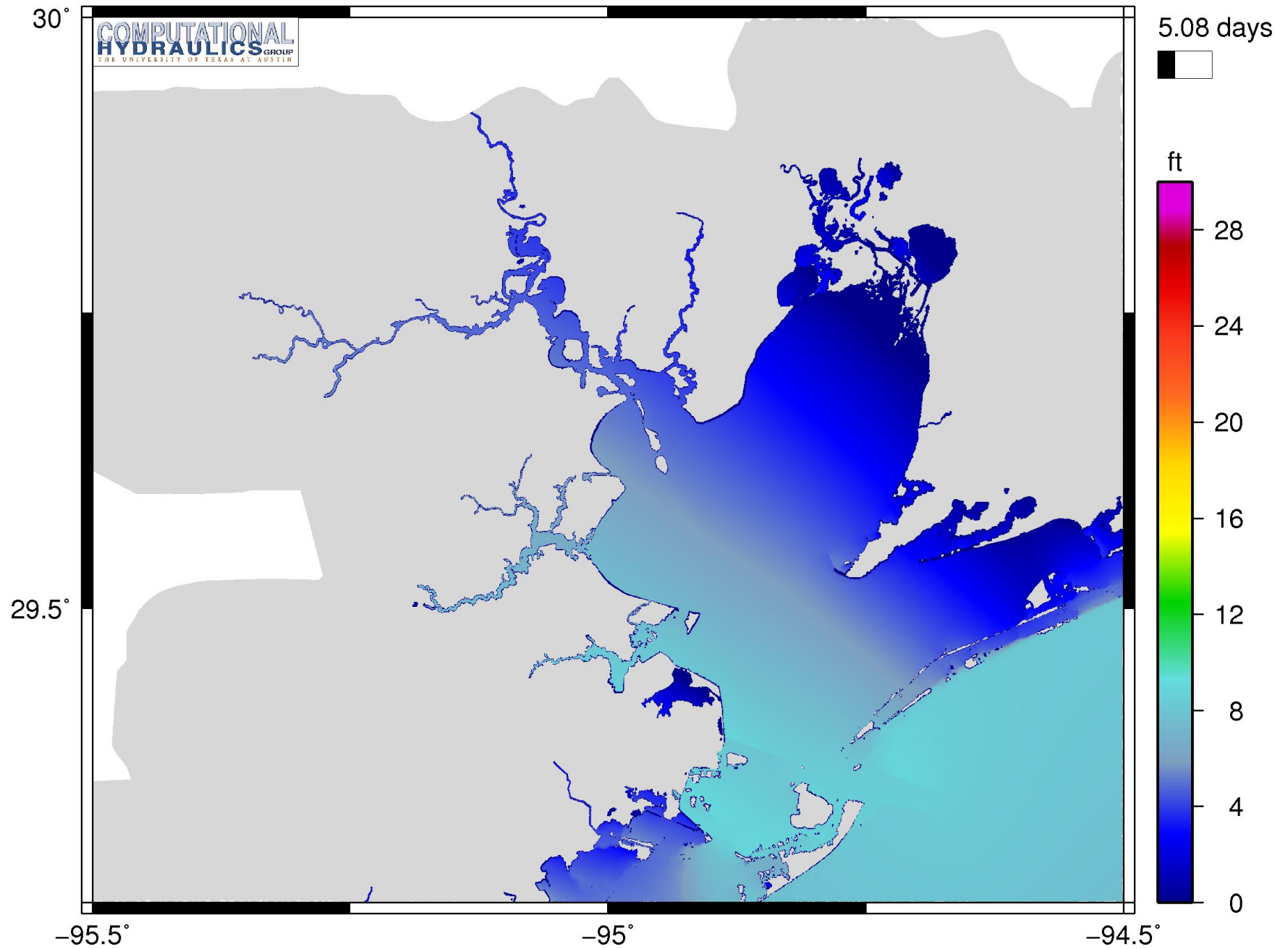
Synthetic Storm 089



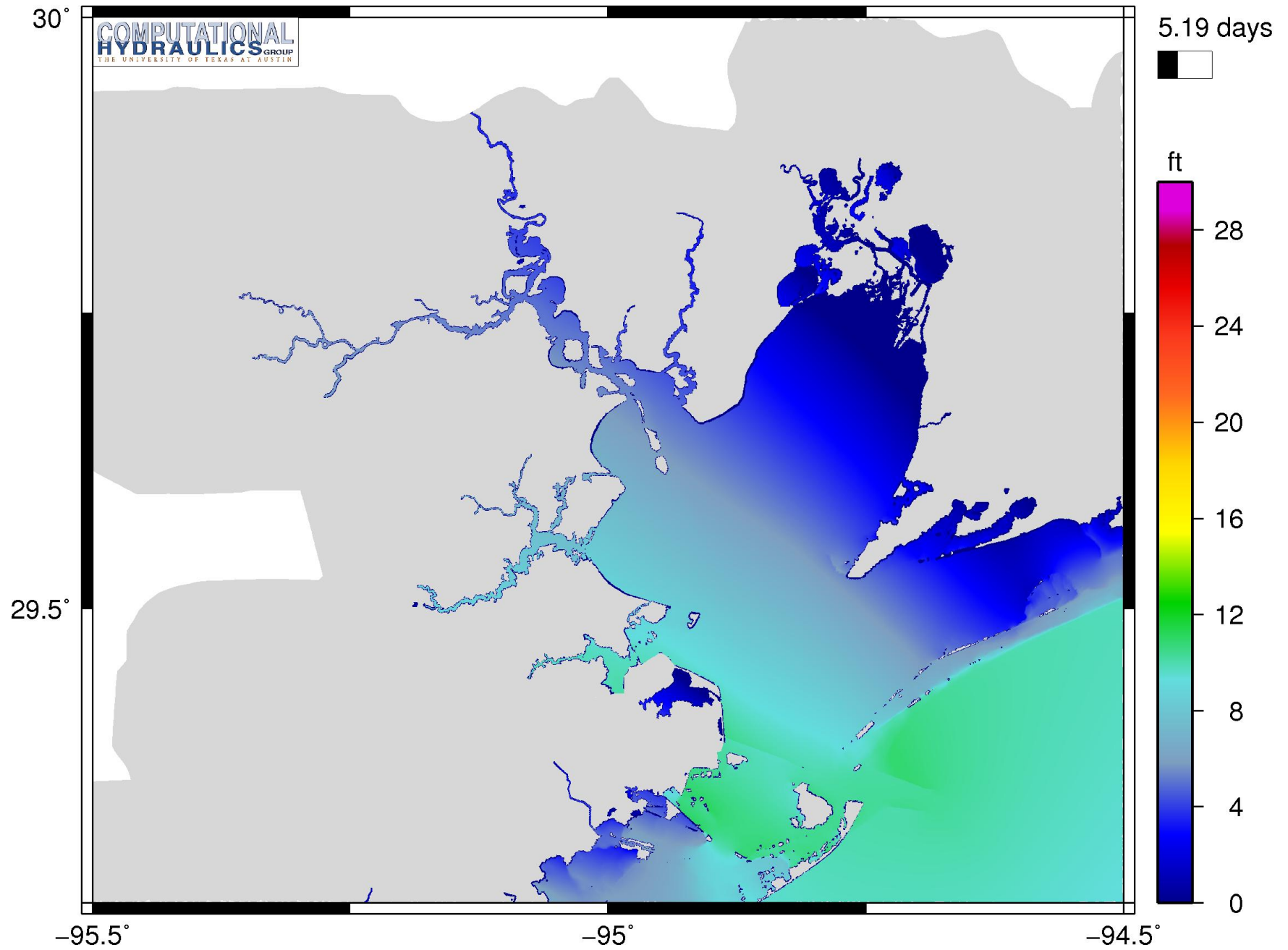
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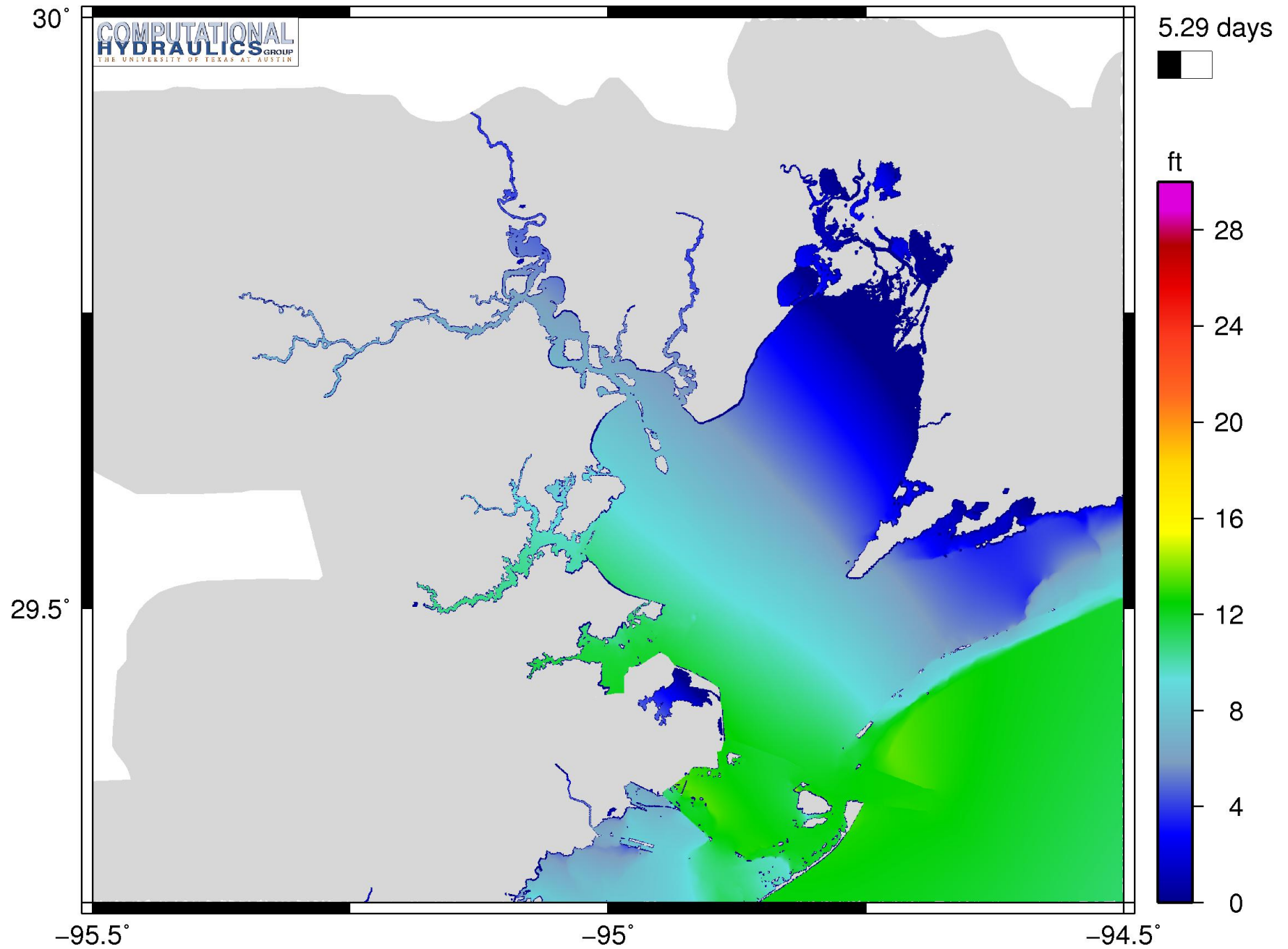
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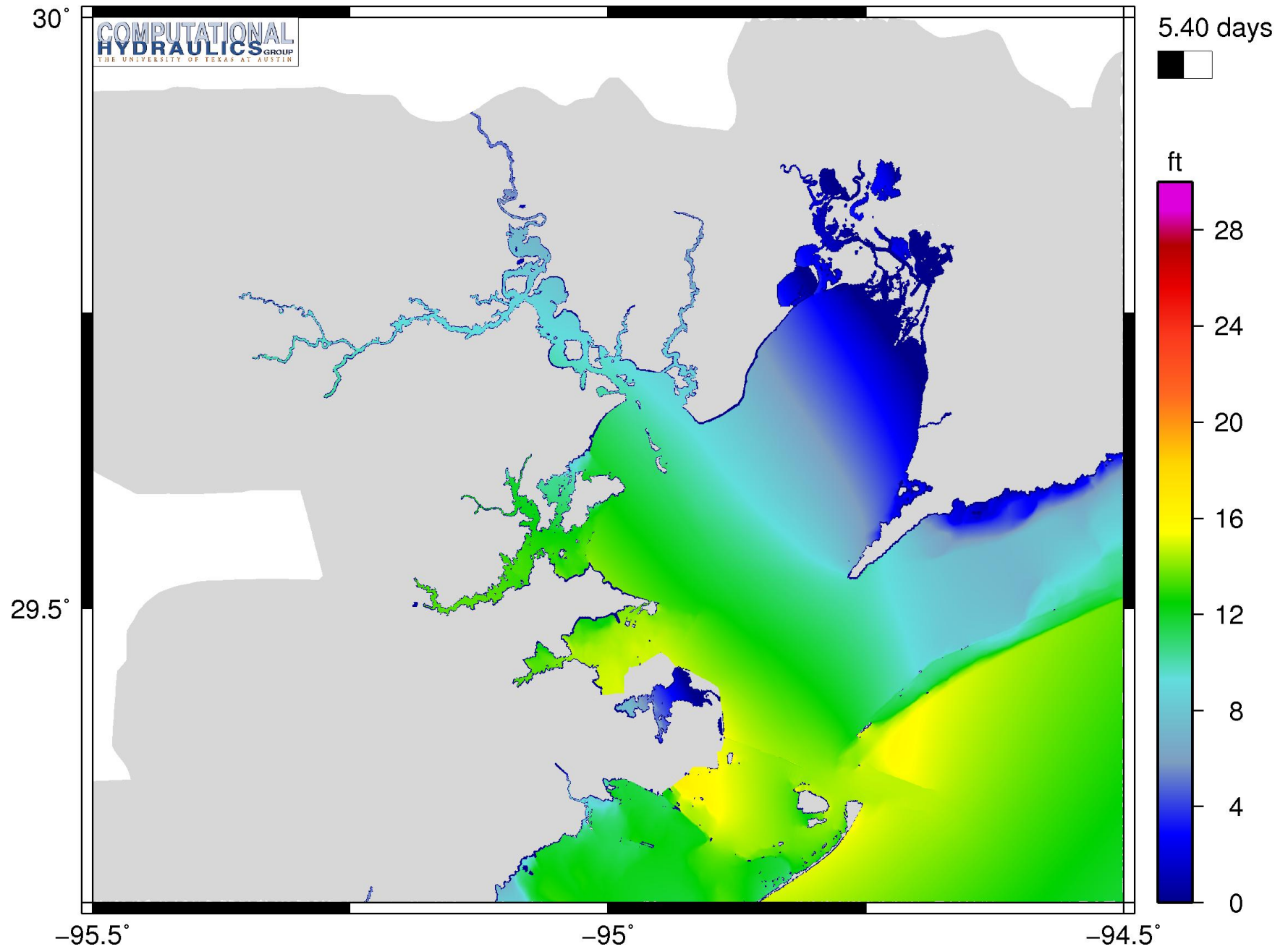
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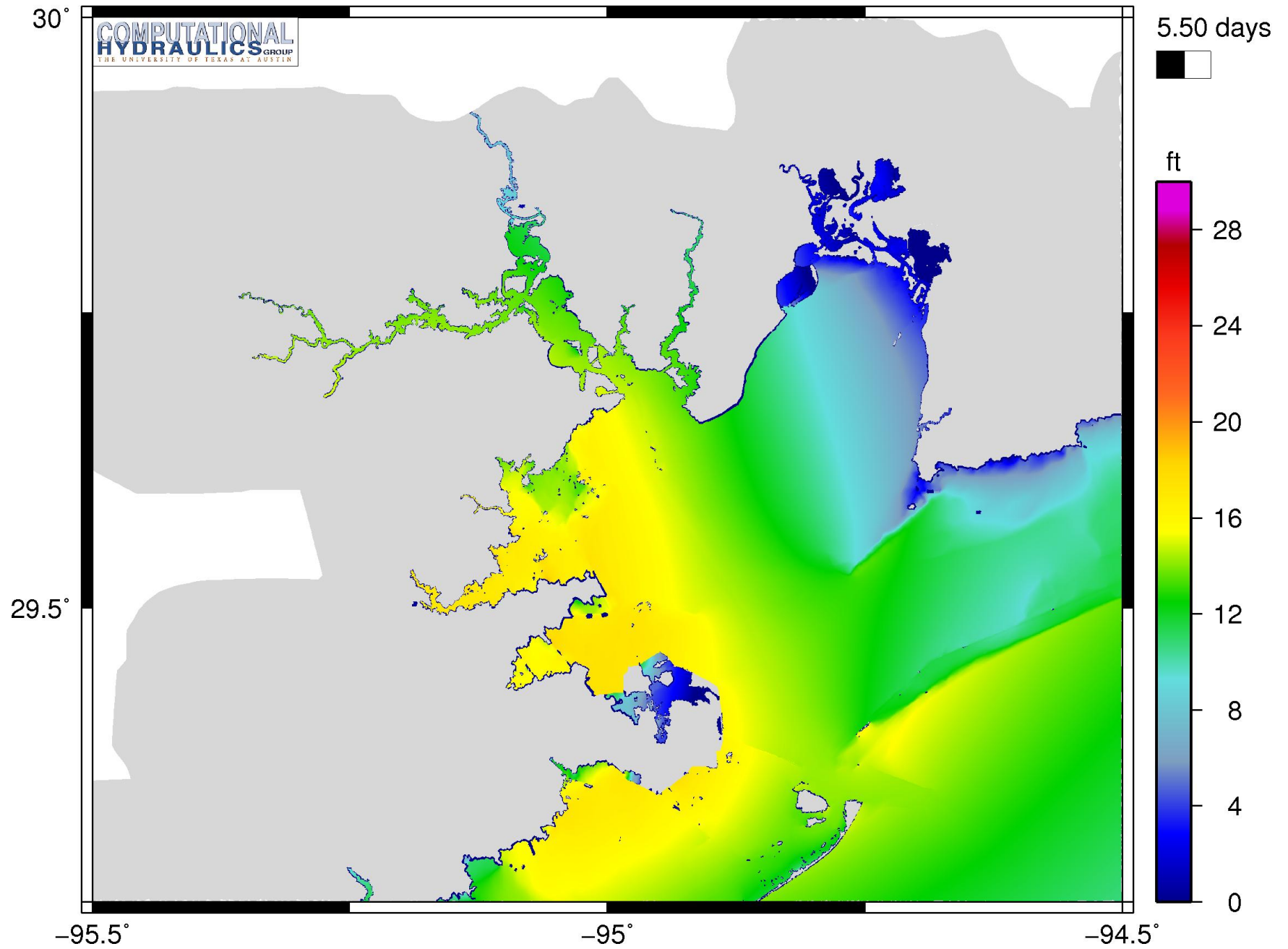
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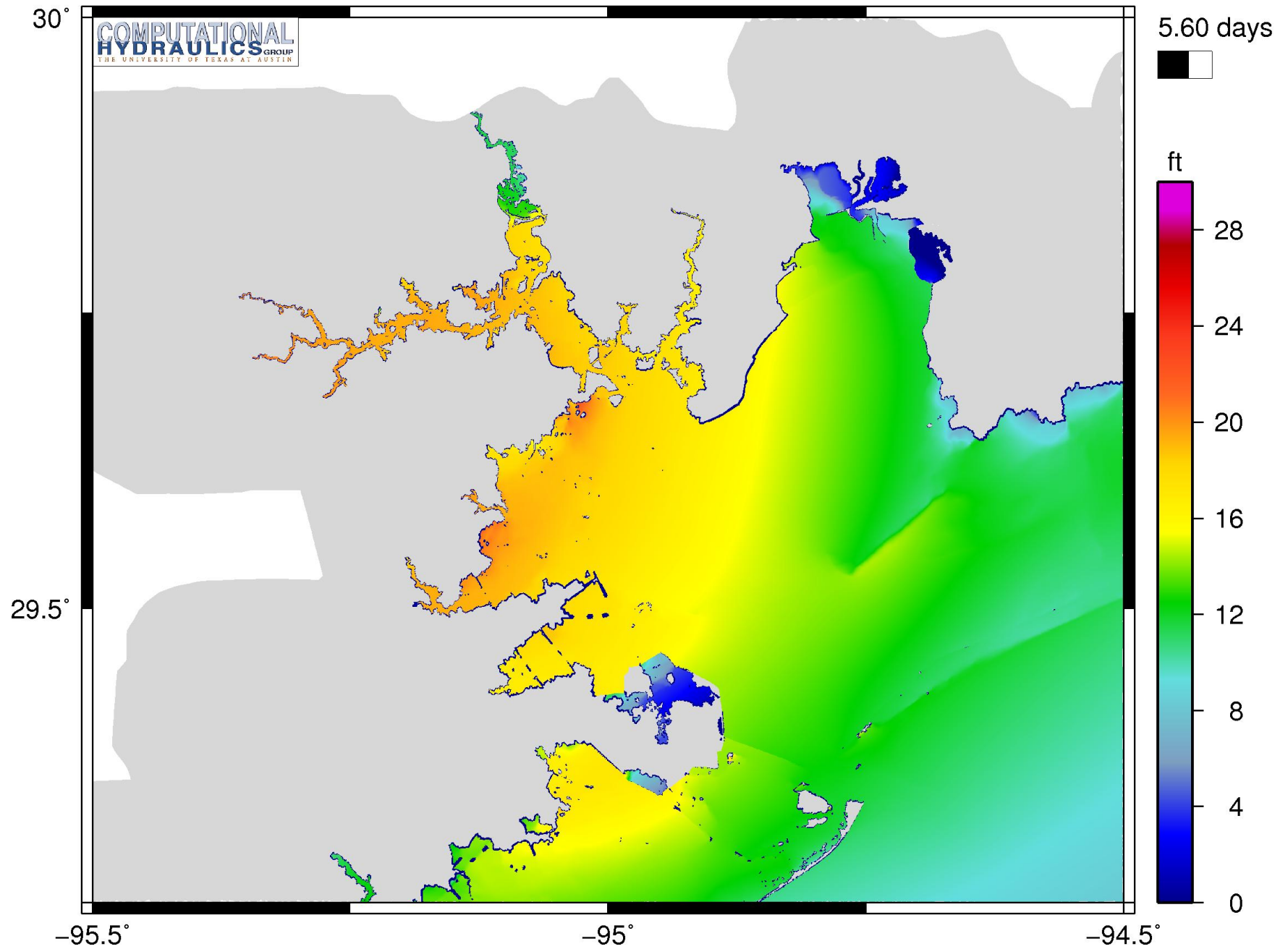
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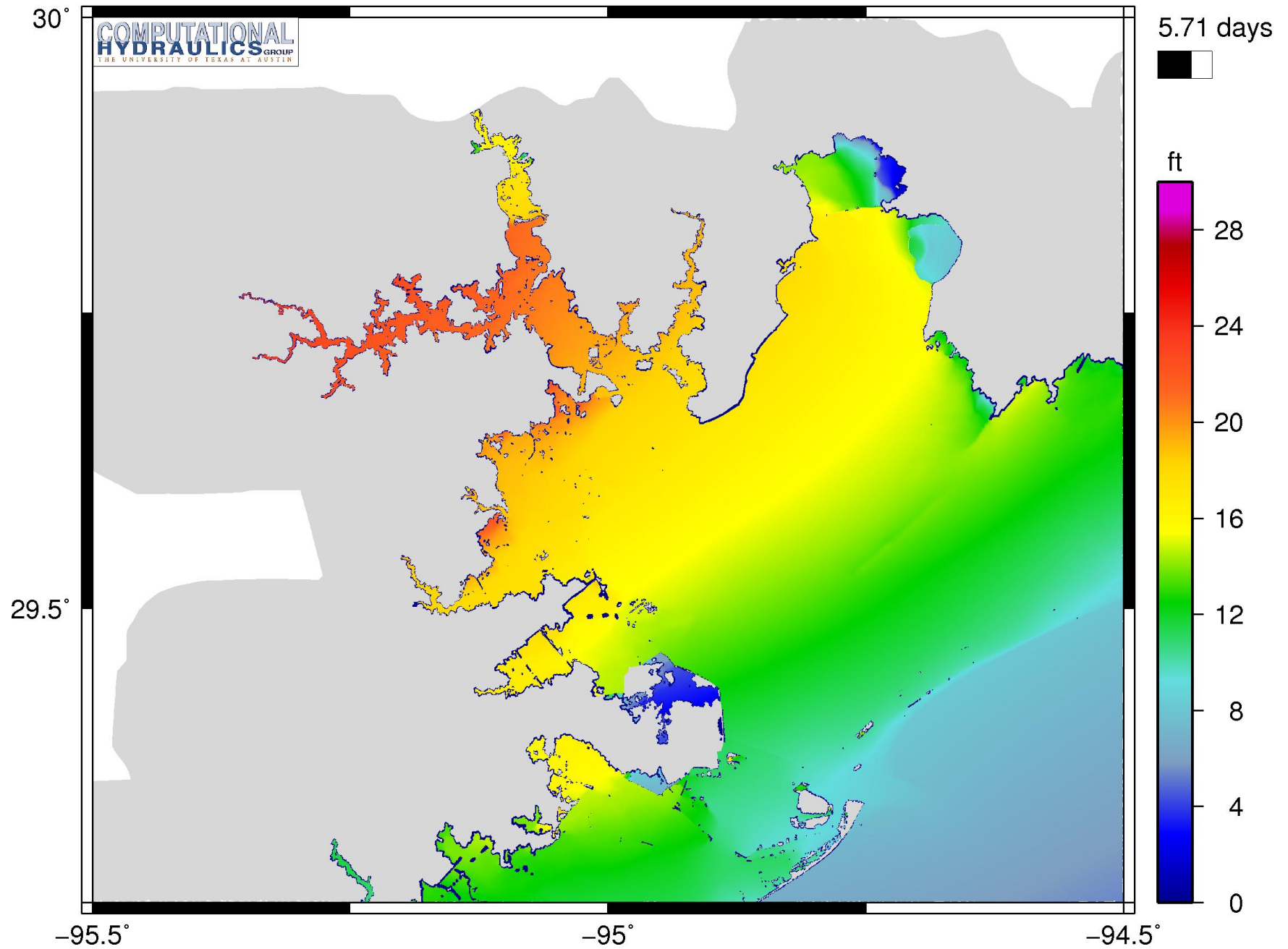
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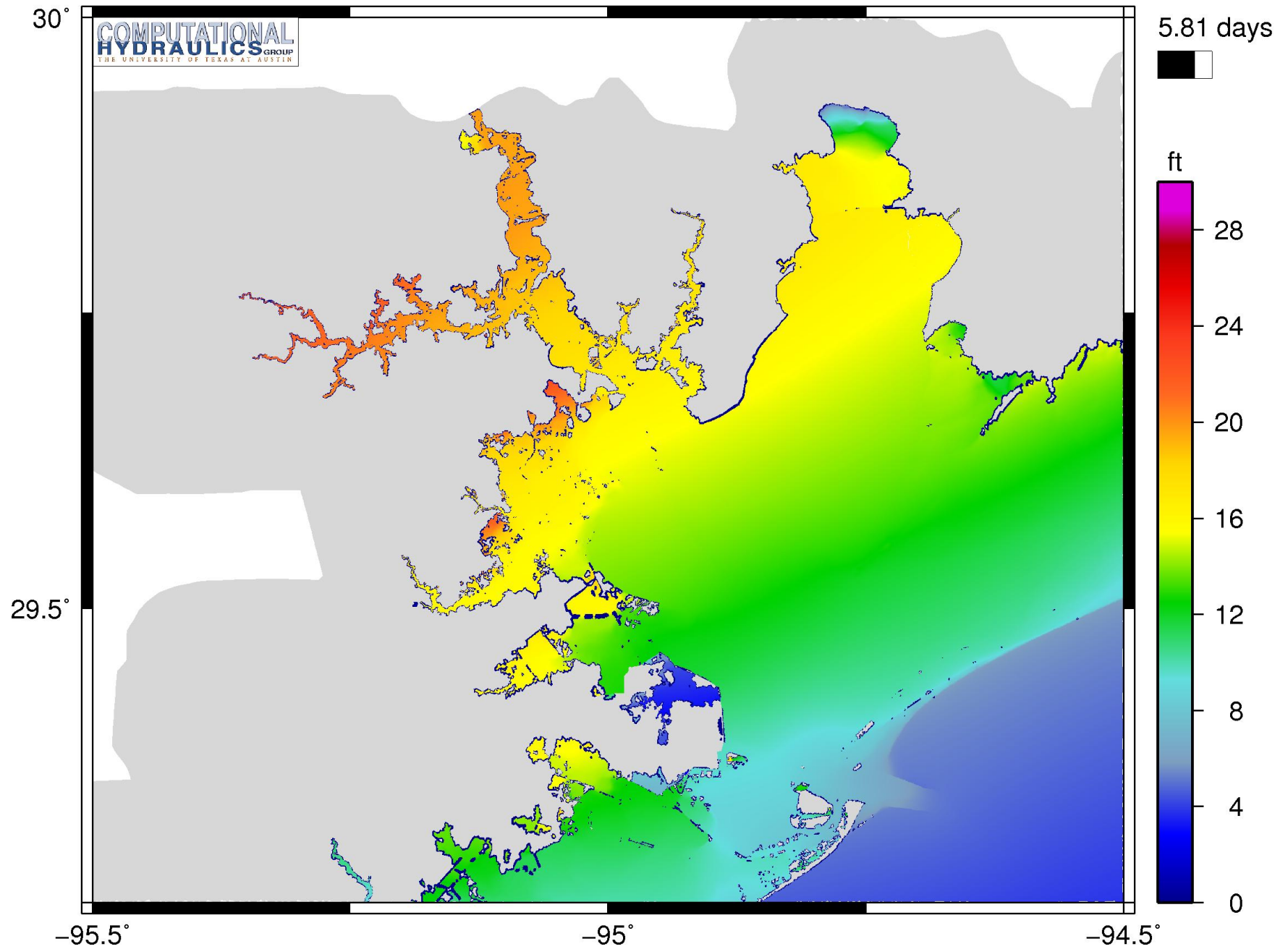
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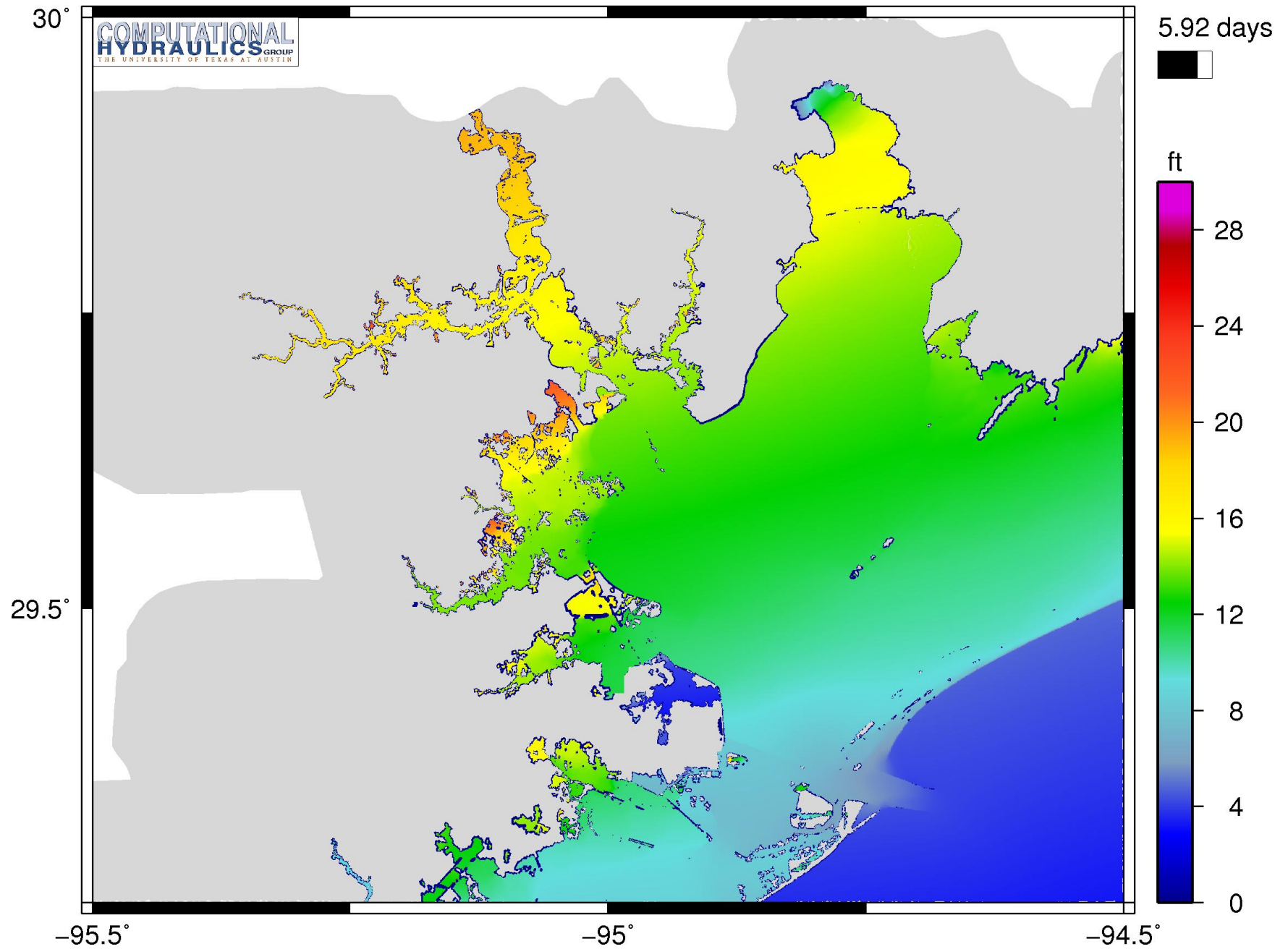
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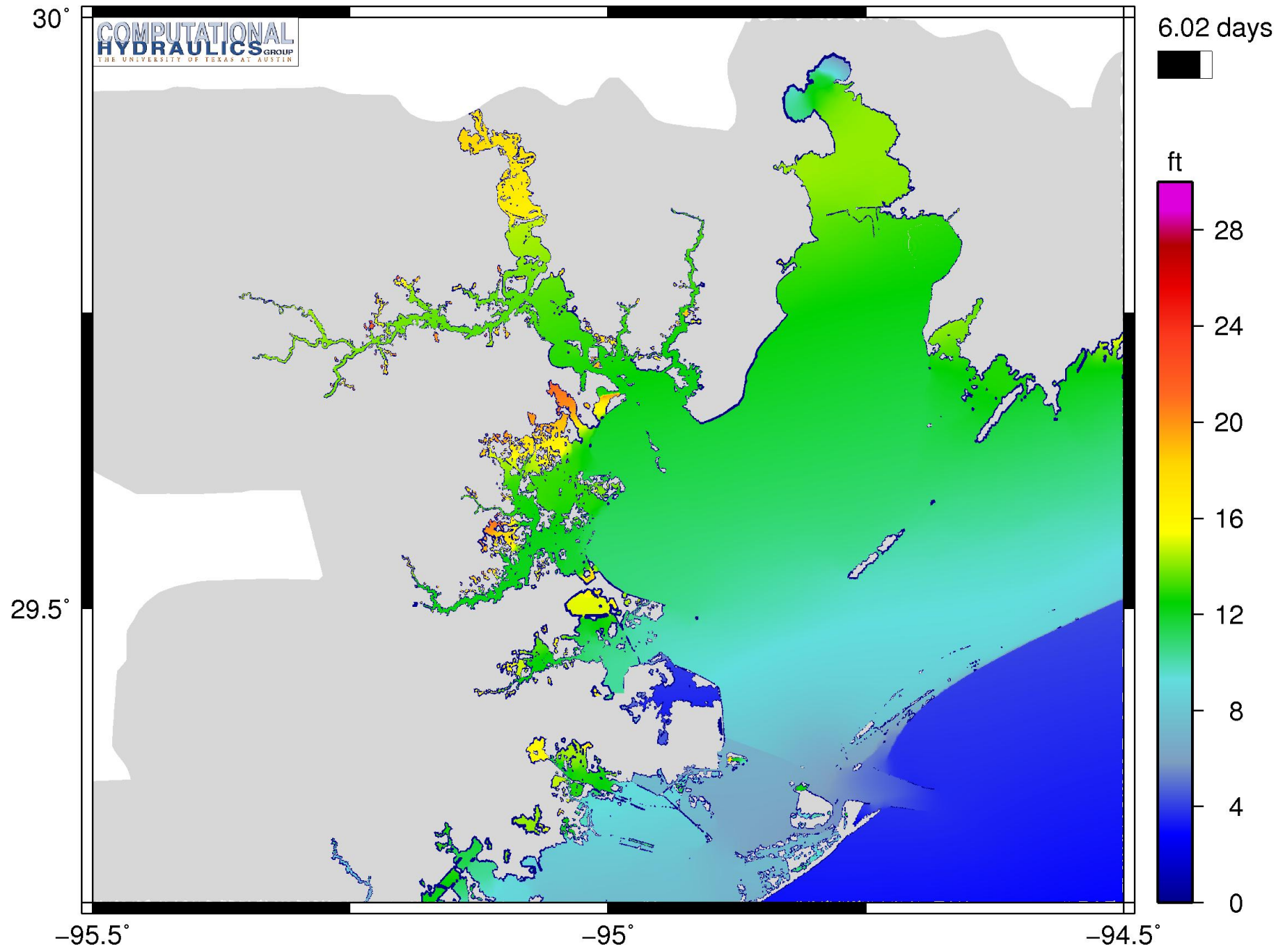
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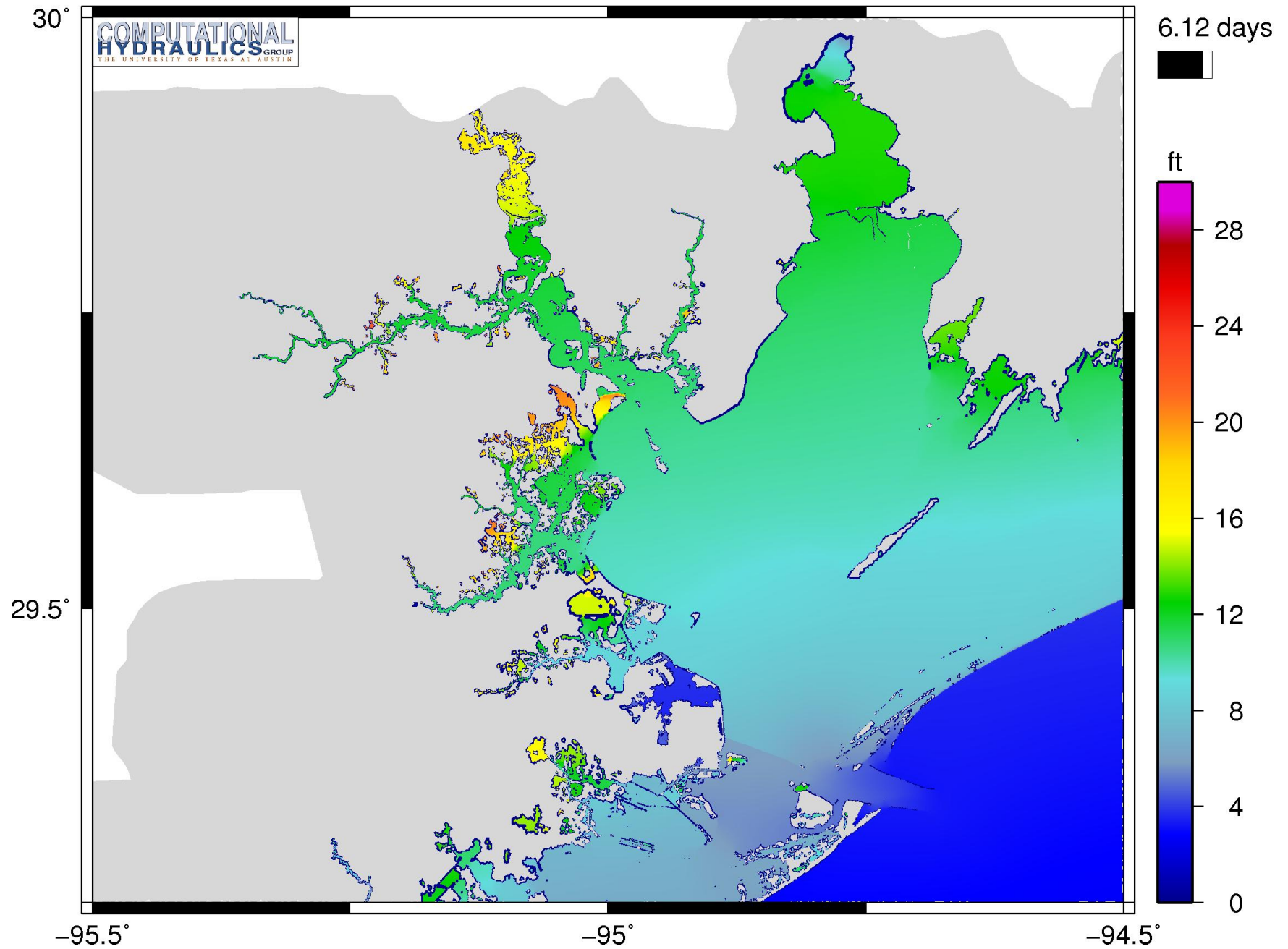
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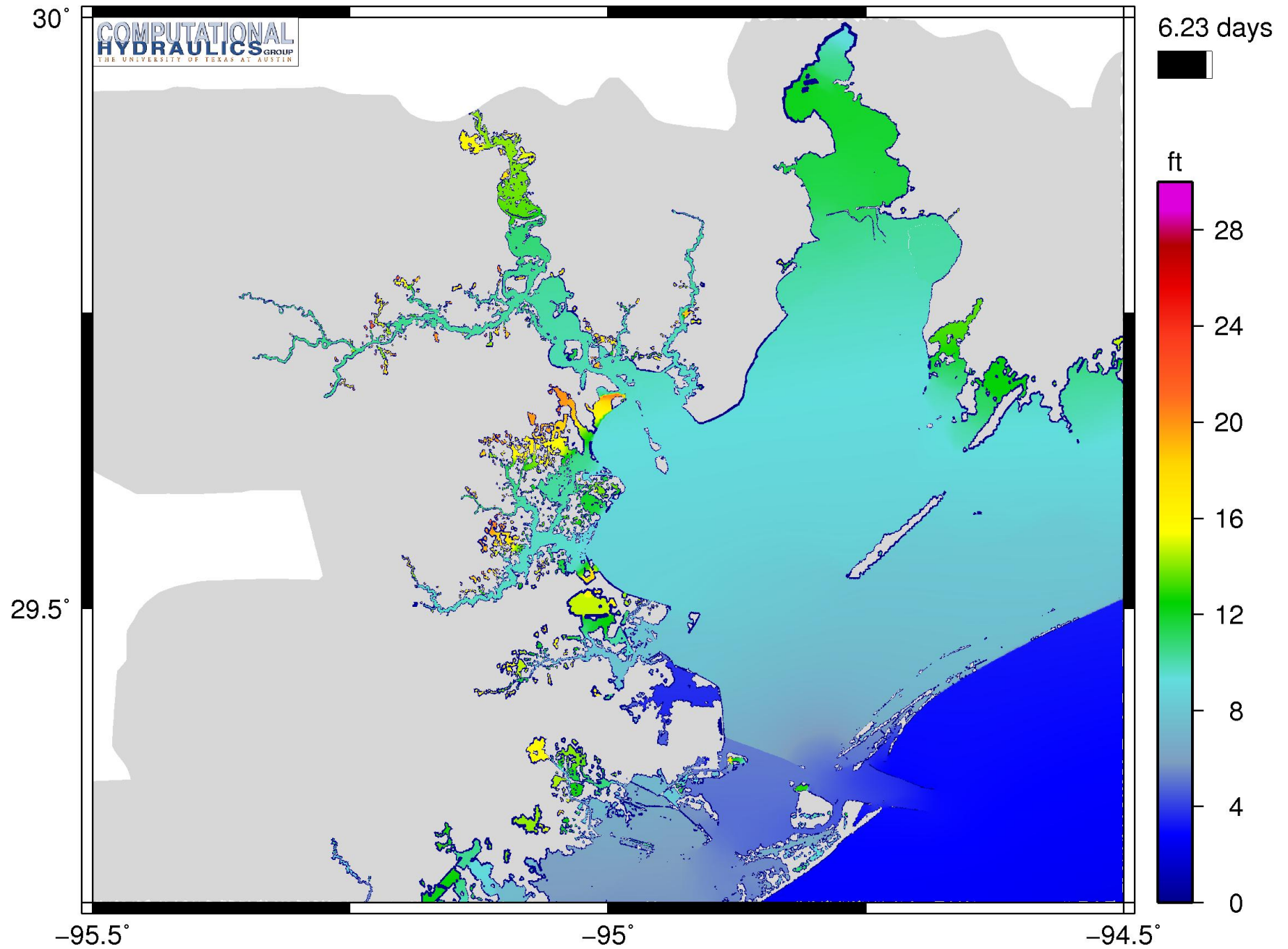
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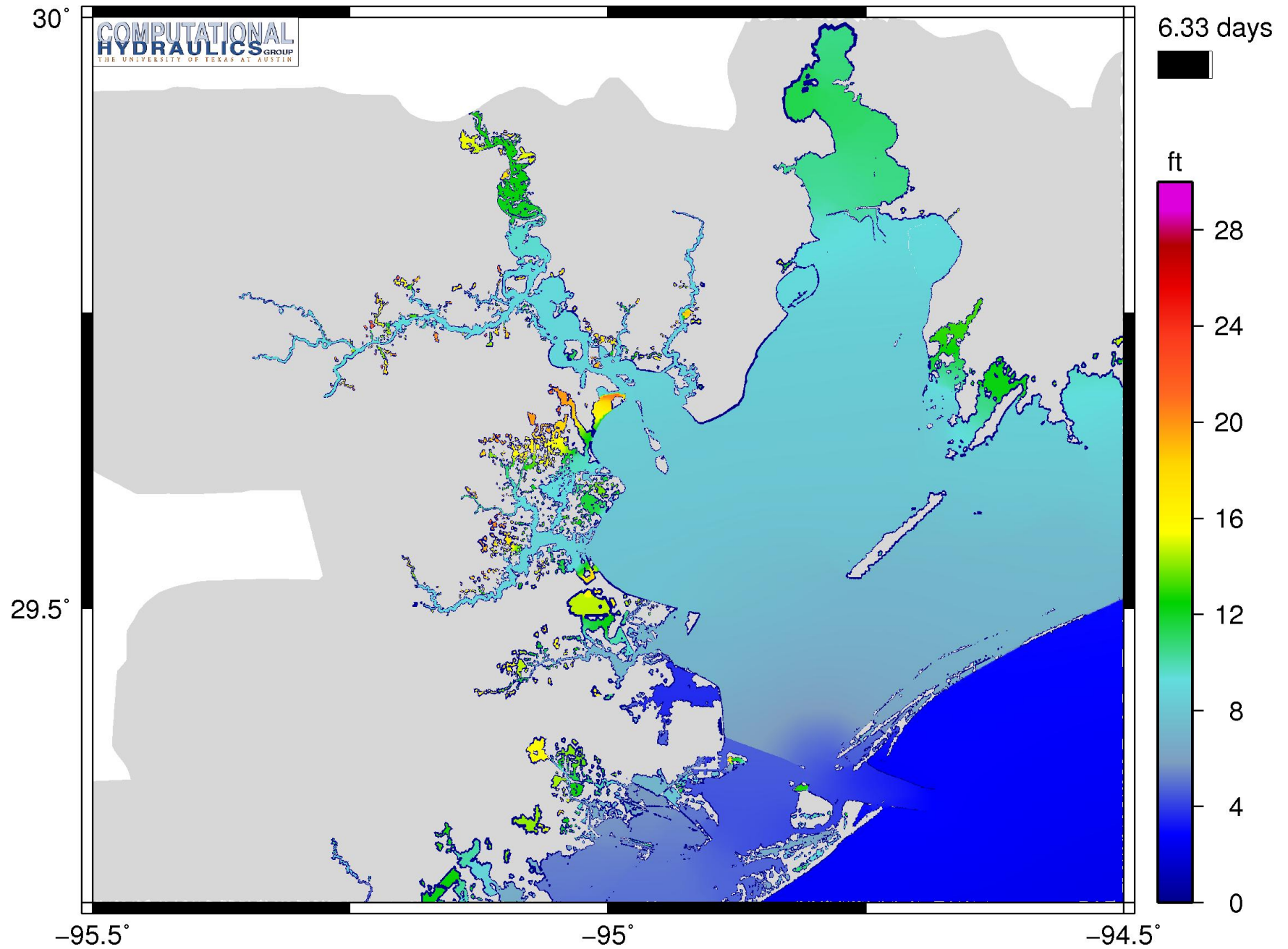
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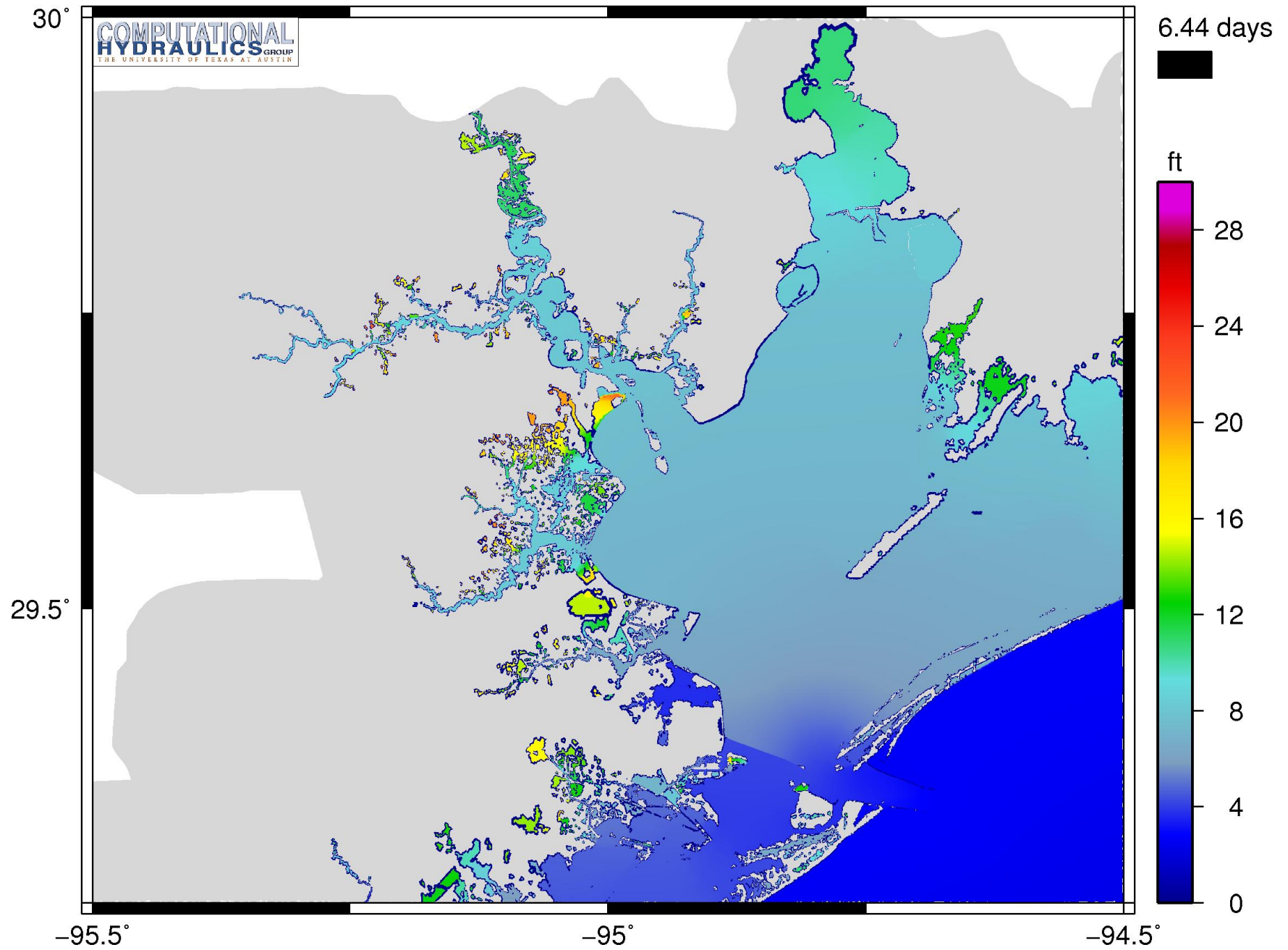
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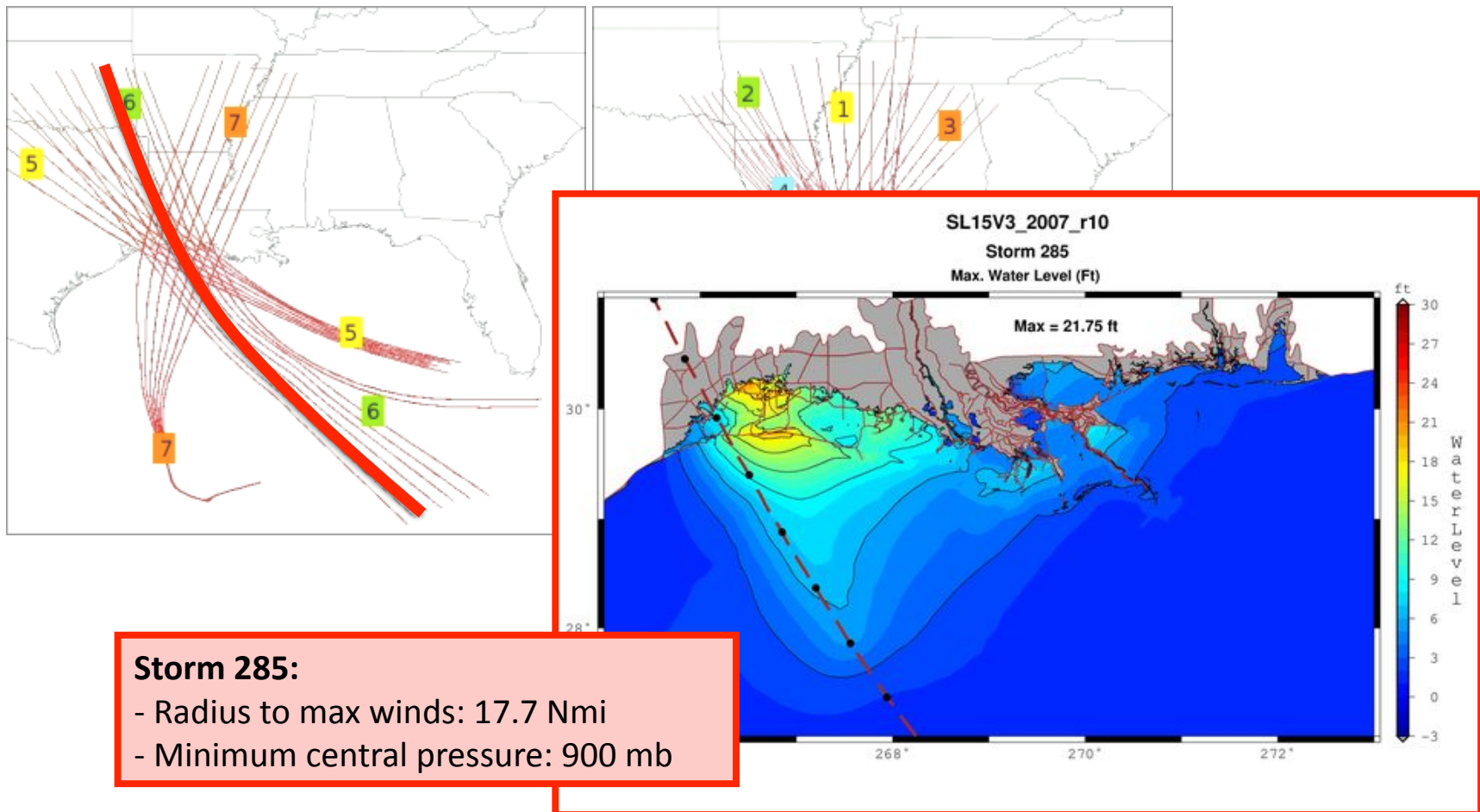
Synthetic Storm 089



Application: Flood Insurance Rate Maps: FEMA

Joint Probability Method with Optimal Sampling (JPM-OS)

- Hypothetical storms with varying characteristics.
- Use results to develop 100yr flood maps.



Courtesy: Casey Dietrich

For more information

- ADCIRC development group www.adcirc.org
- Computational Hydraulics Group at UT Austin
www.ices.utexas.edu/~clint/chg_website

