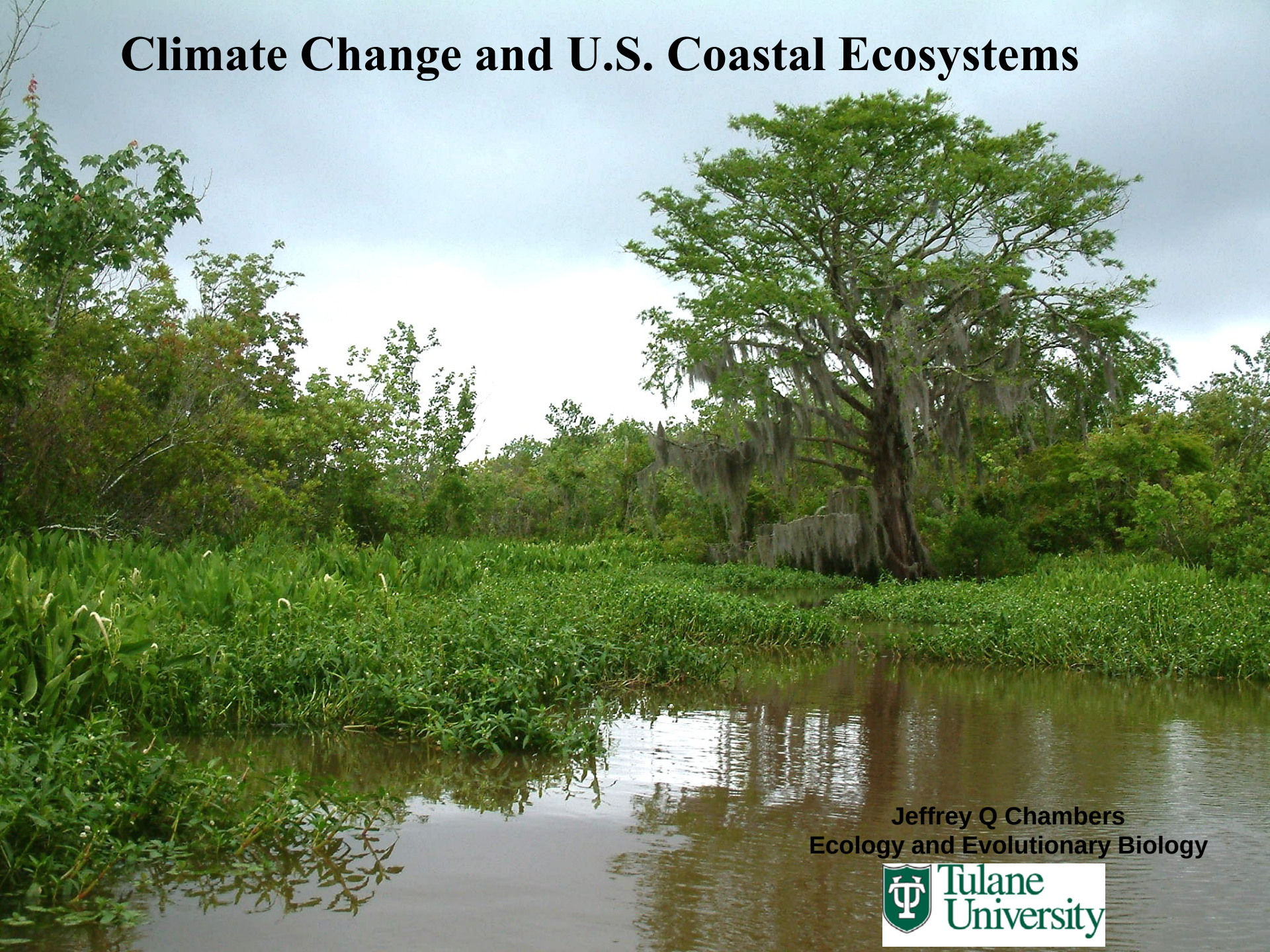
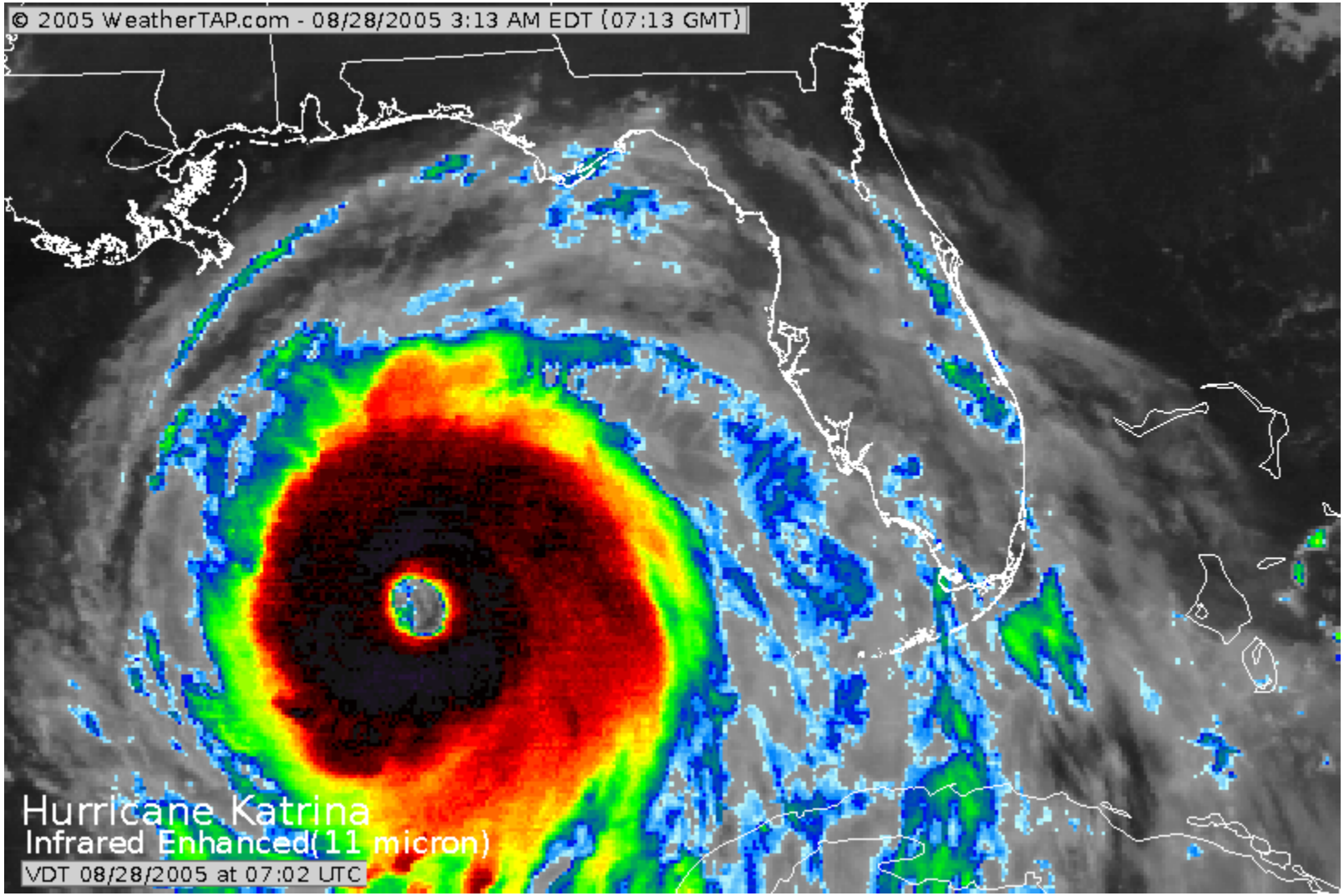
Climate Change and U.S. Coastal Ecosystems

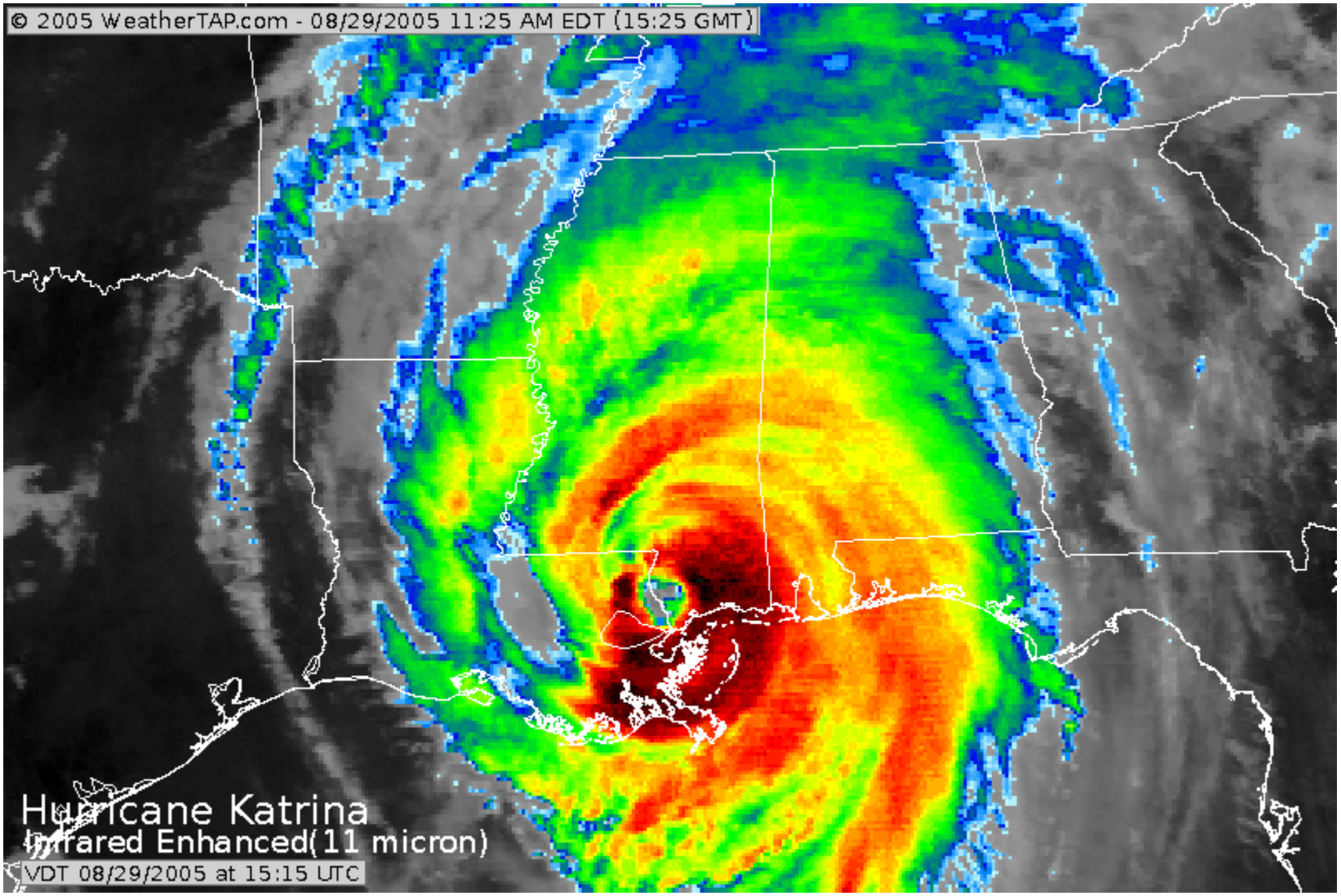


Jeffrey Q Chambers
Ecology and Evolutionary Biology
Tulane University

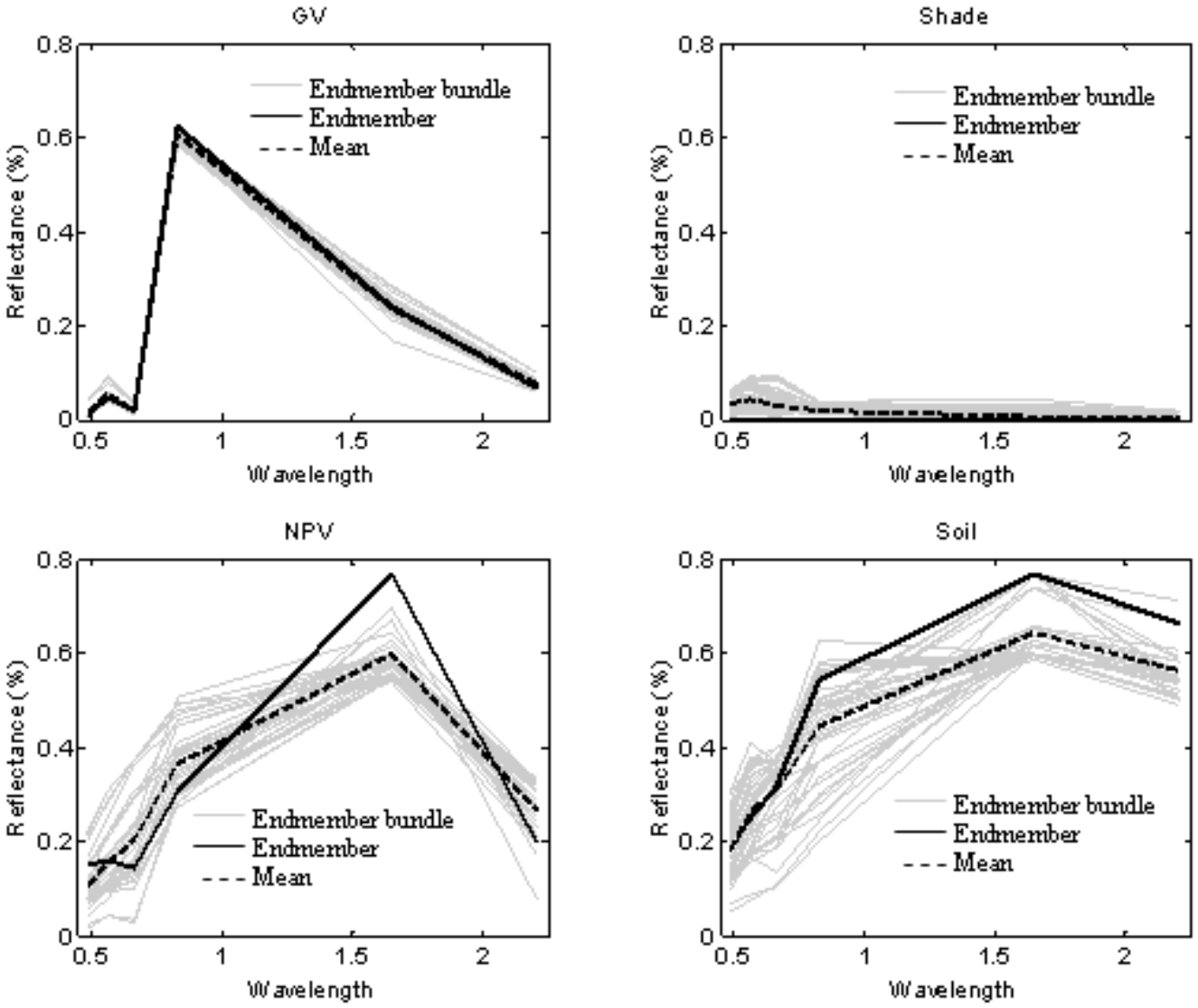
Hurricane Impacts on U.S. Coastal Forests

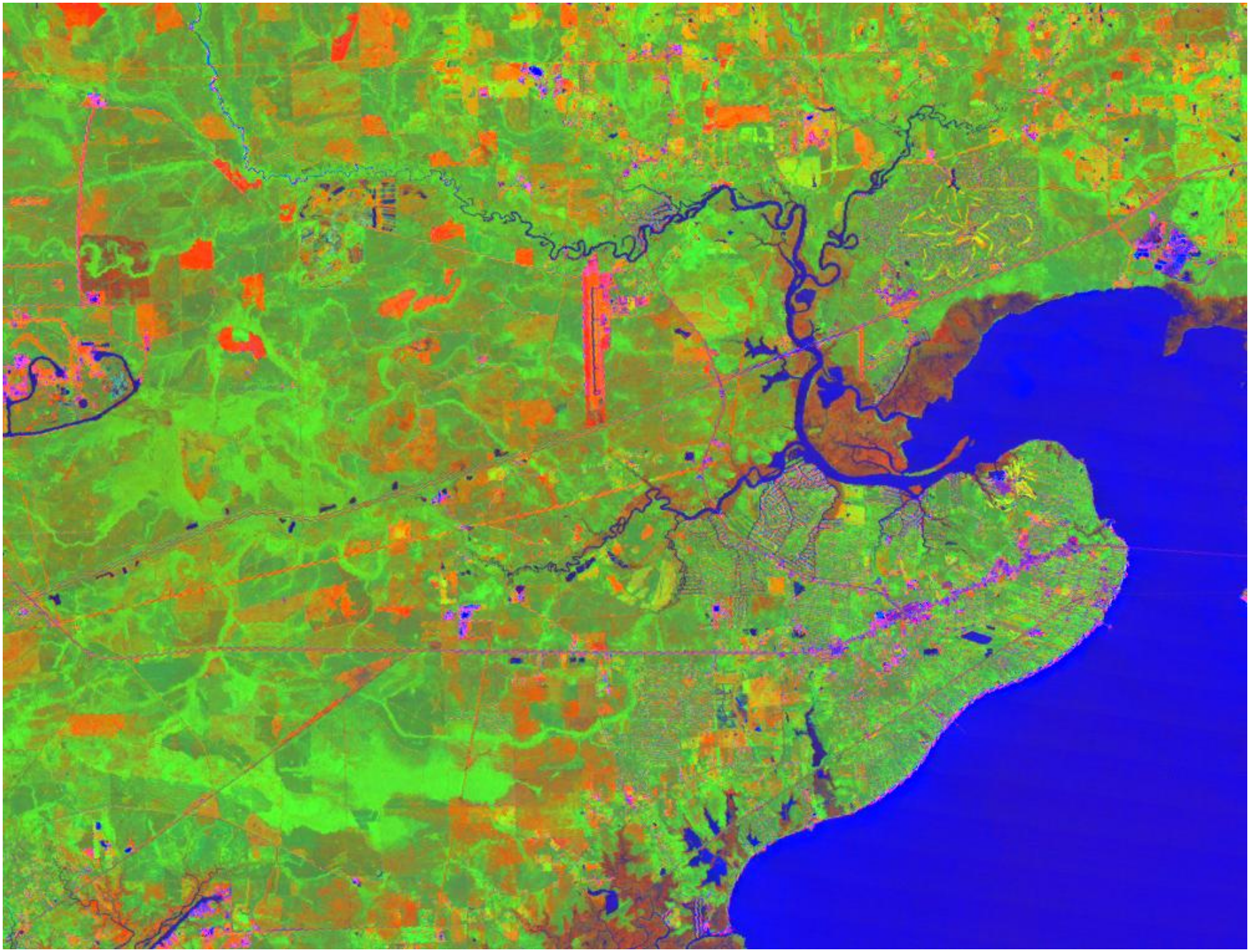


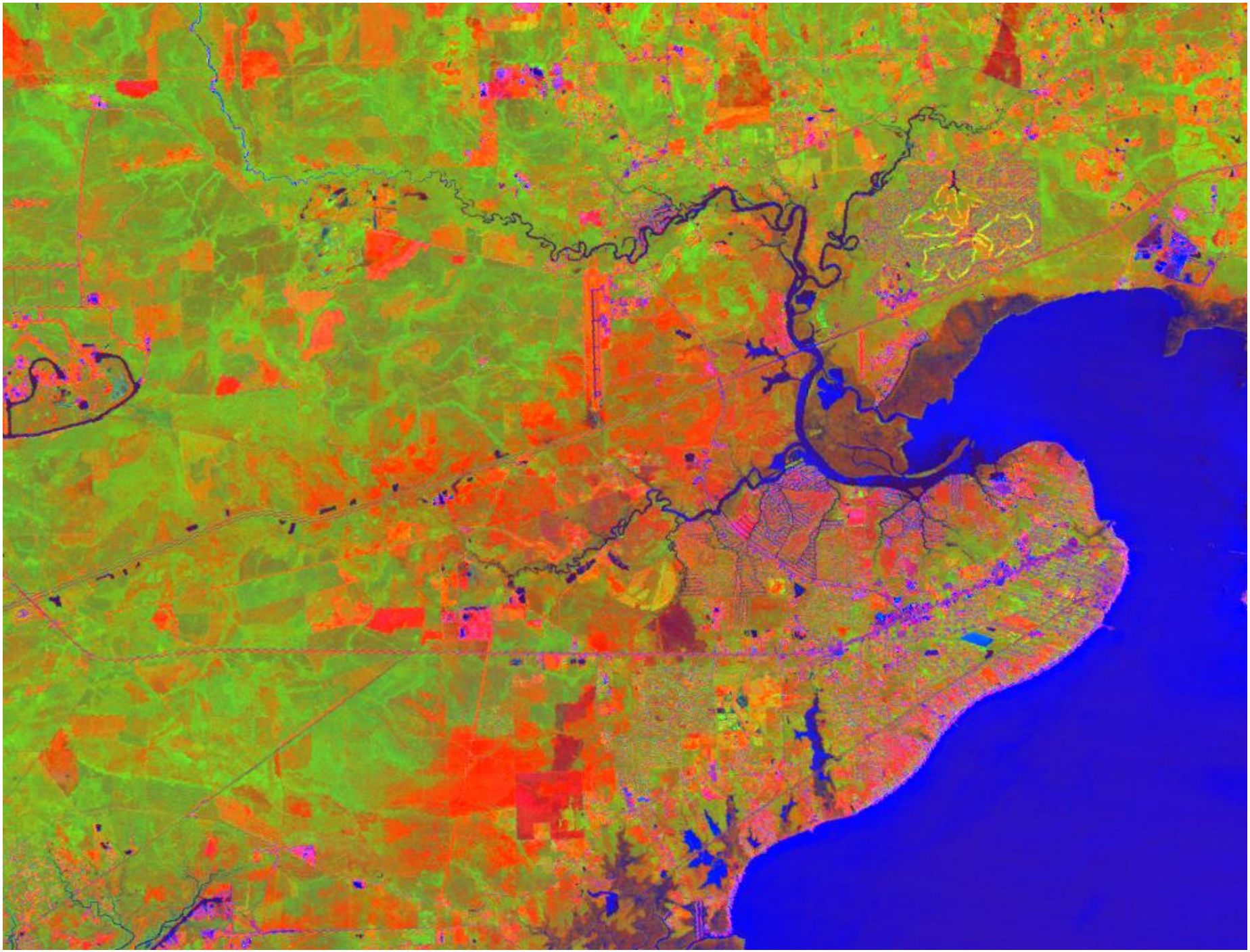
National Institute for Climatic Change Research (NICCR) Coastal Center project

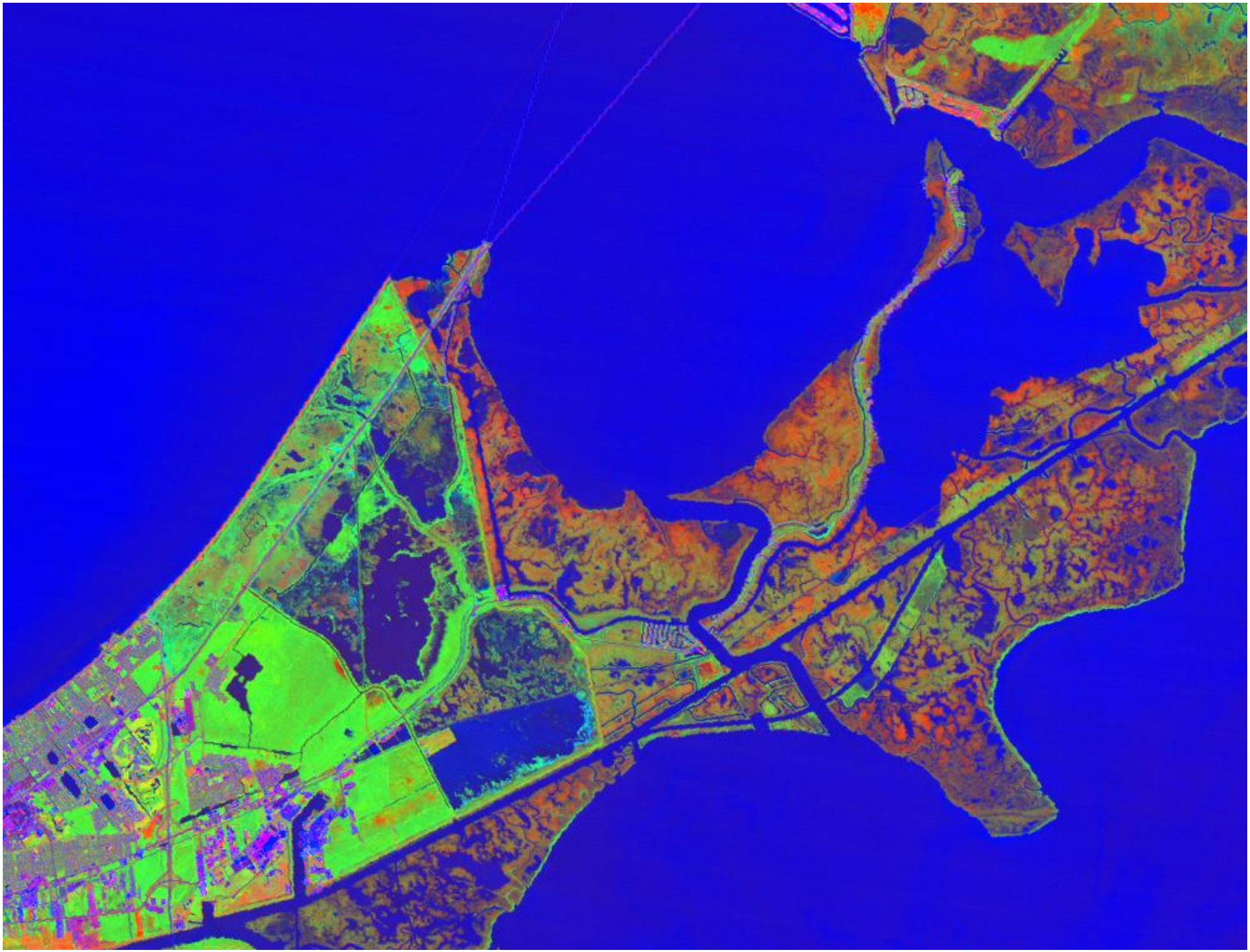

© 2005 WeatherTAP.com - 08/29/2005 11:25 AM EDT (15:25 GMT)
Hurricane Katrina
Infrared Enhanced(11 micron)
VDT 08/29/2005 at 15:15 UTC

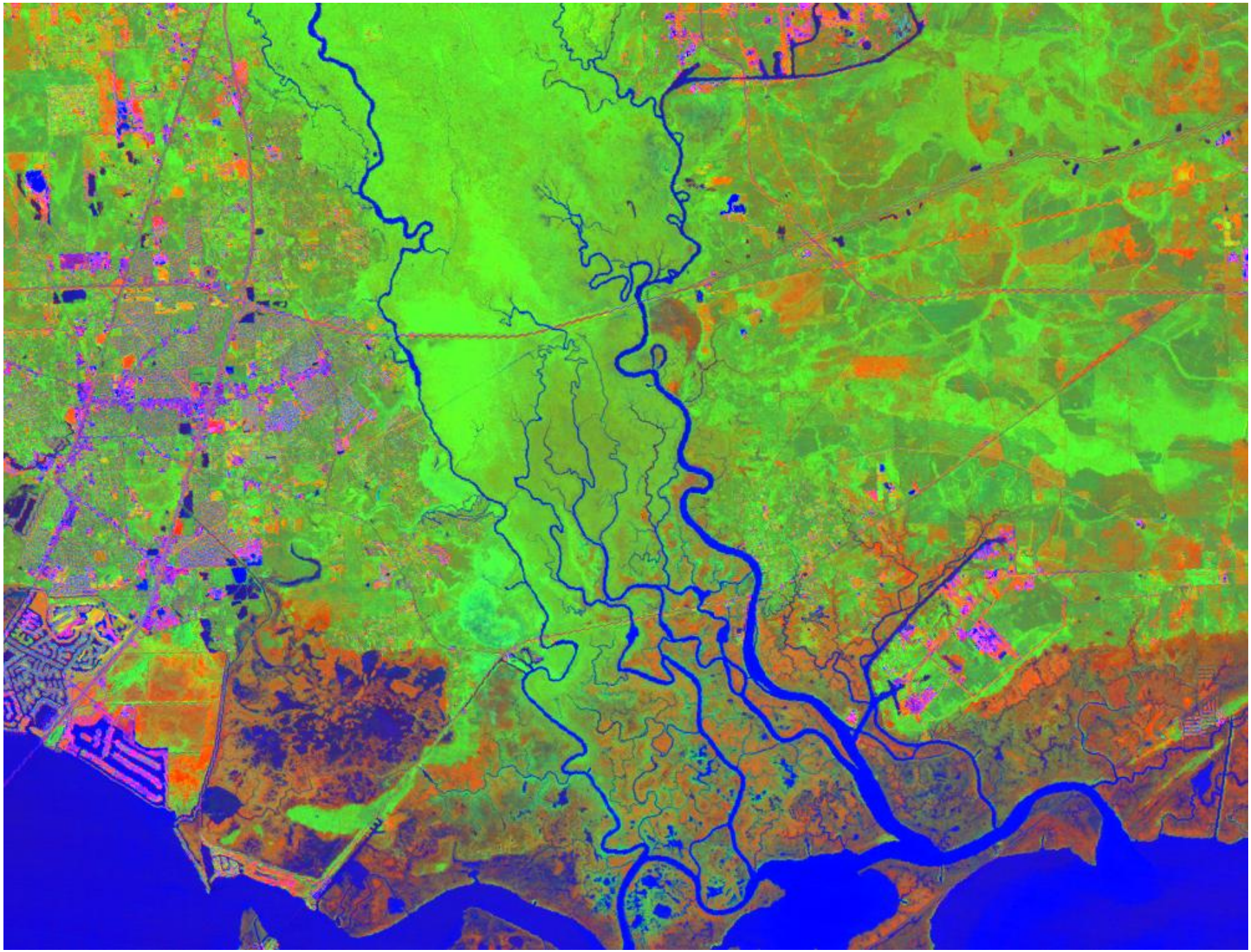
Generic Image Endmembers

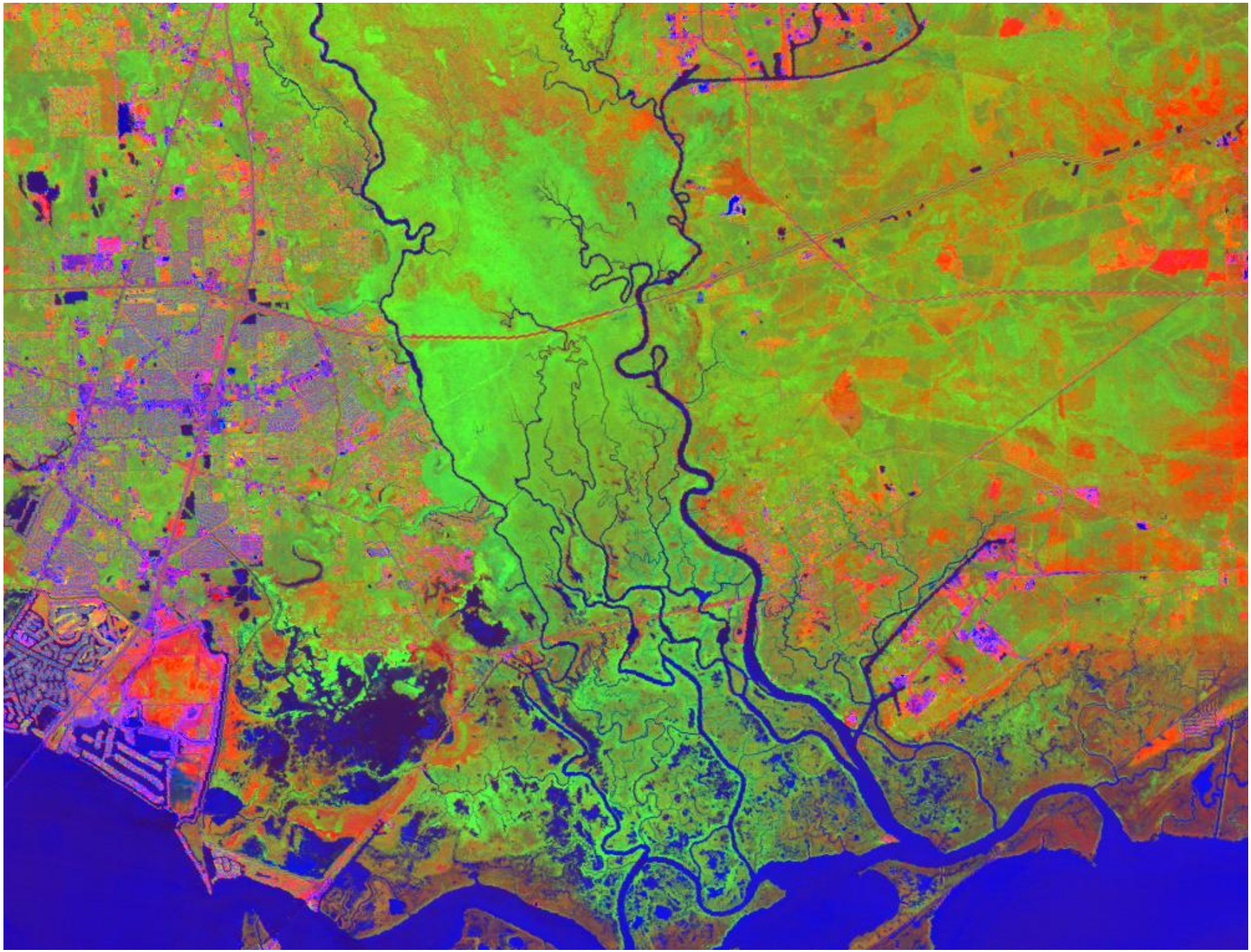






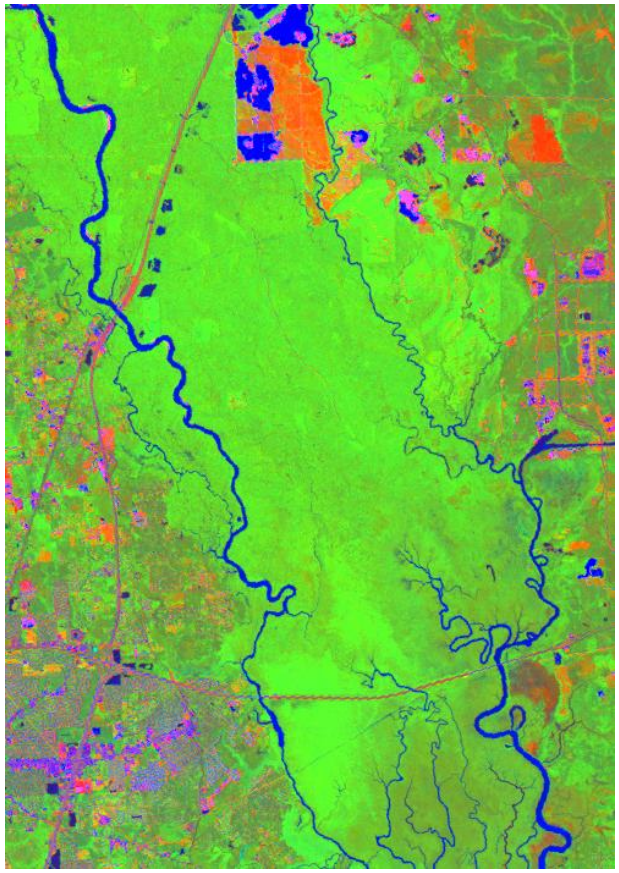




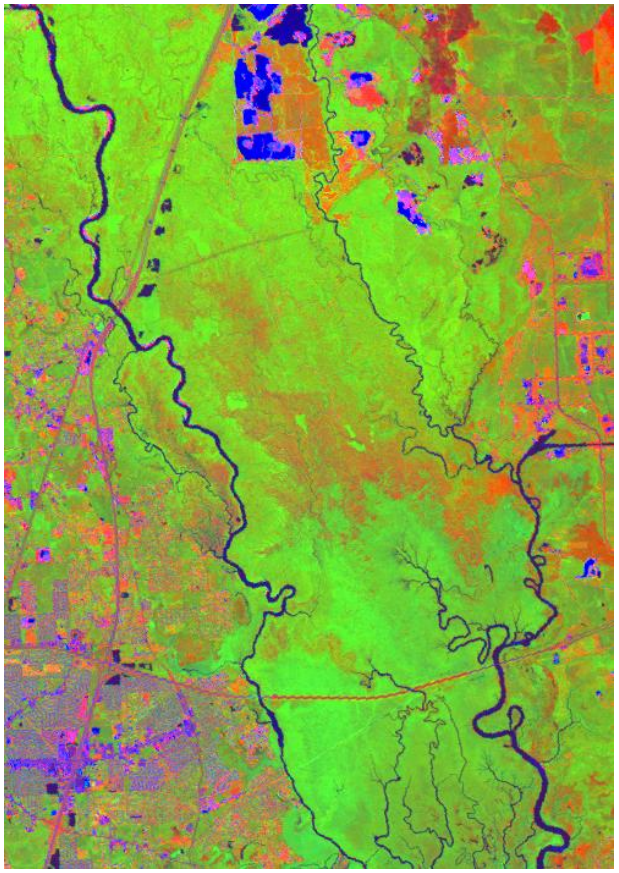


Hurricane Katrina Impact in the Pearl River Basin

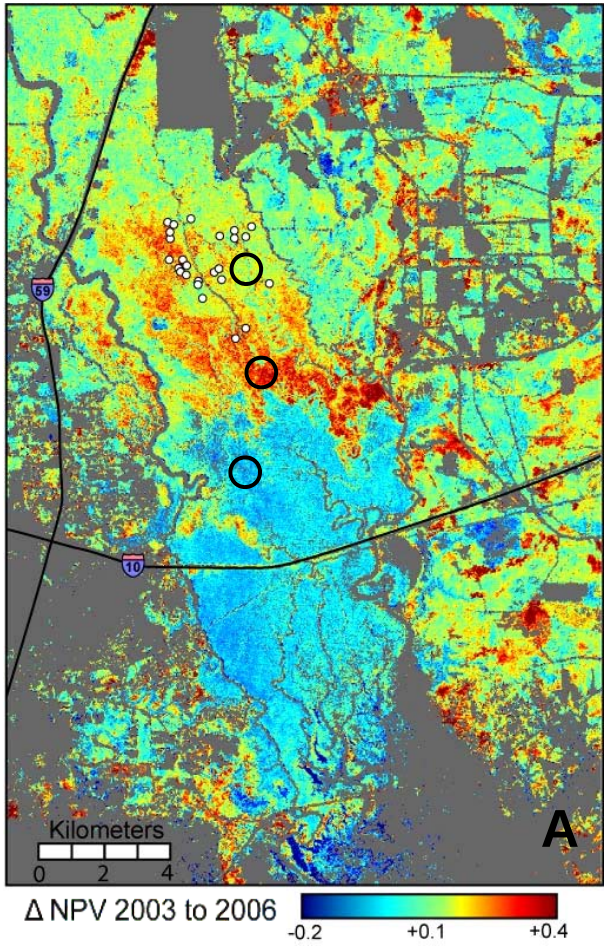
Pre-Katrina: GV, NPV, Soil+



Post-Katrina: GV, NPV, Soil+

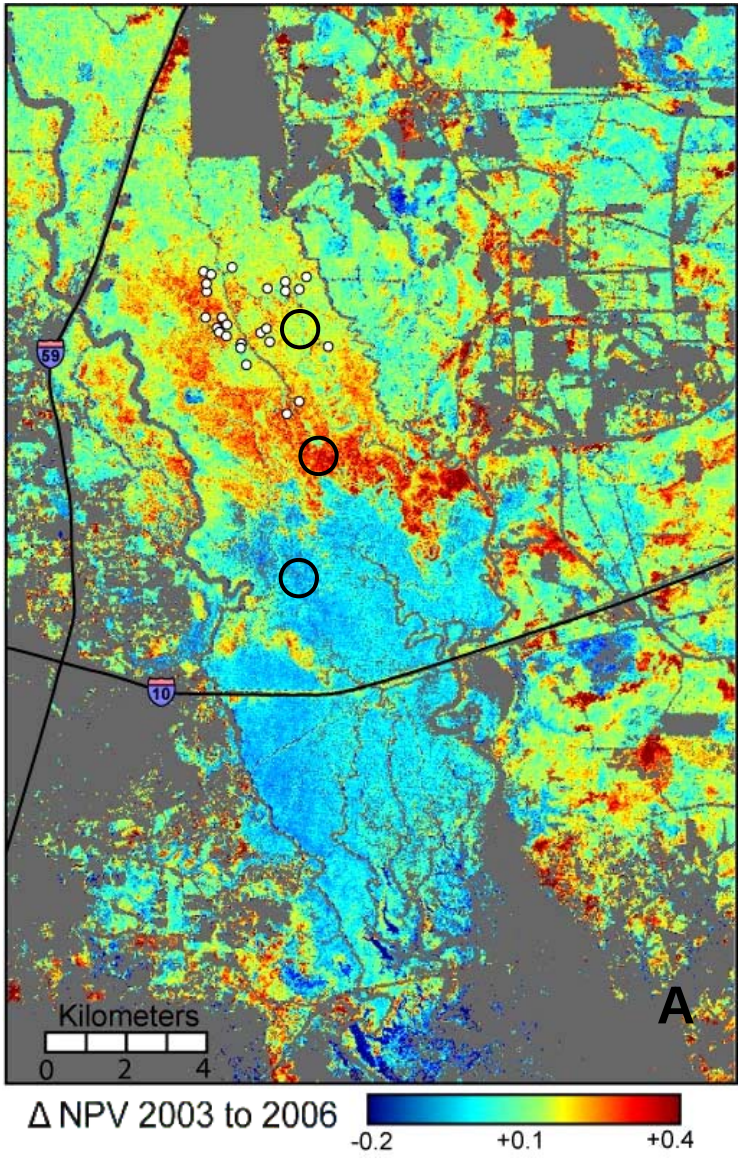


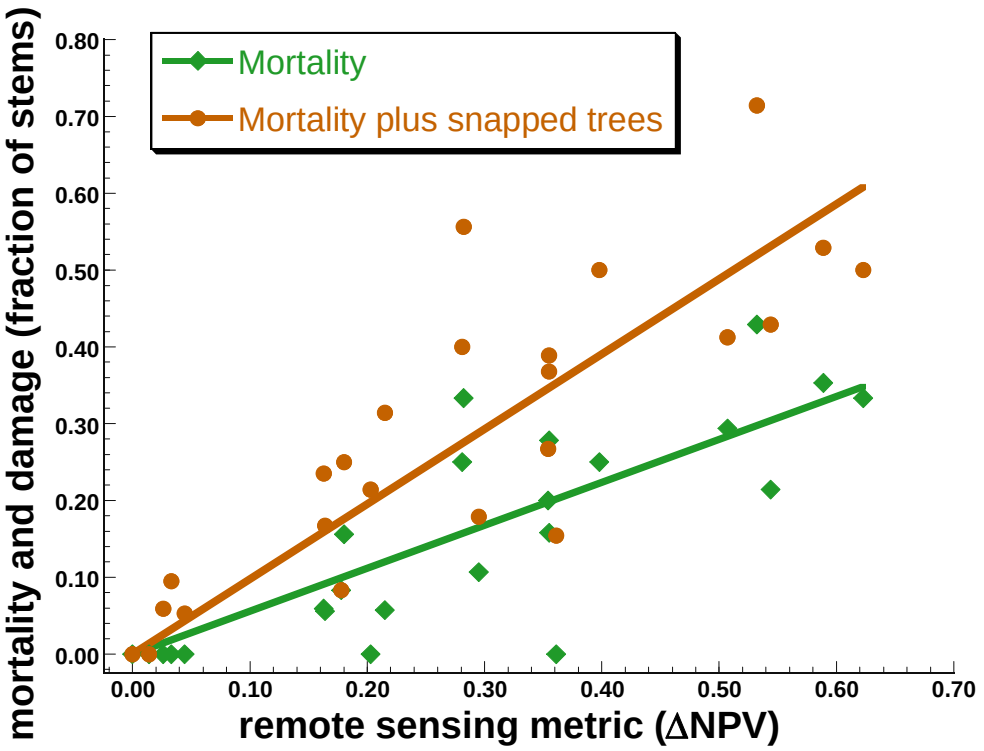
ΔNPV: change in wood, CWD, and litter reflectance



Stratified random sampling of hurricane tree mortality impact using ΔNPV

Mapping hurricane Katrina impact at a regional scale: linking field ecology and remote sensing



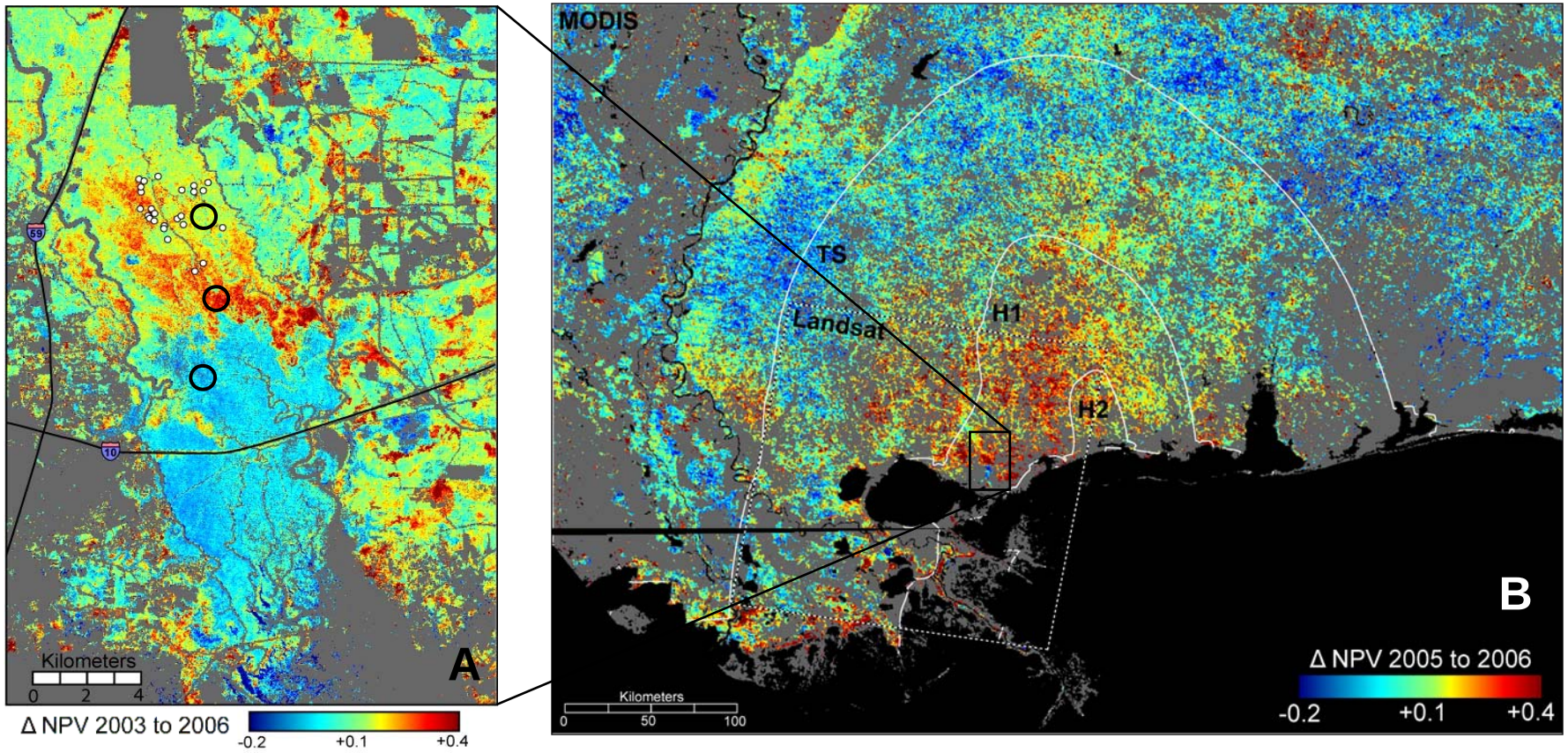


Stratified random sampling of hurricane tree mortality impact using ΔNPV

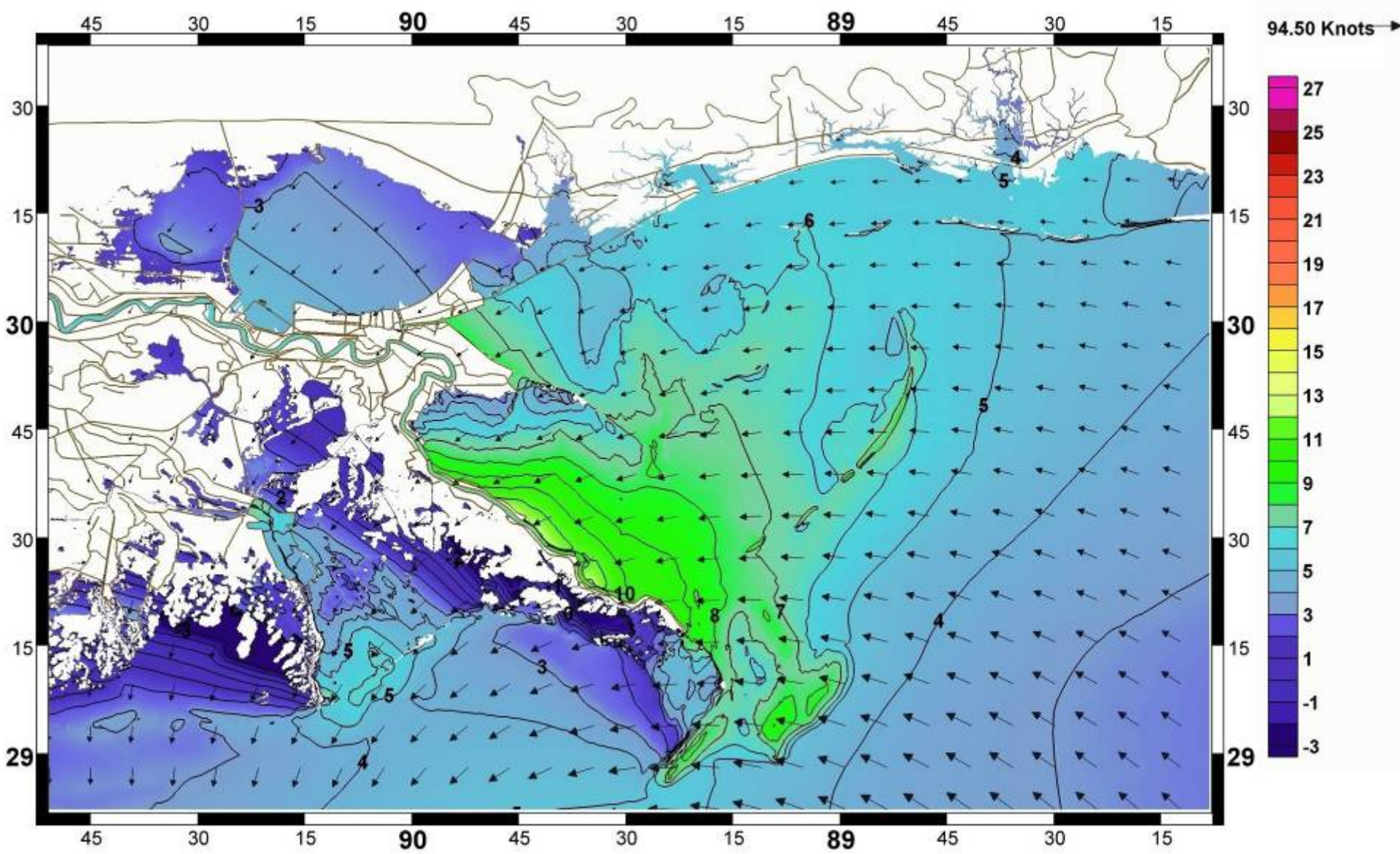
Hurricane Katrina's Carbon Footprint on U.S. Gulf Coast Forests

Jeffrey Q. Chambers,[1*] Jeremy I. Fisher,[1,2] Hongcheng Zeng,[1] Elise L. Chapman,[1]
David B. Baker,[1] George C. Hurtt[2]

www.sciencemag.org SCIENCE VOL 318 16 NOVEMBER 2007



- **320 million trees dead or severely damaged – 100 Tg C of dead wood**
- **Annual net U.S. forest tree carbon sink = 100 Tg C**
- **Novel biological climate feedback hypothesis: Increasing CO_2, stronger storms, more dead trees, elevated ecosystem respiration, increasing CO_2.**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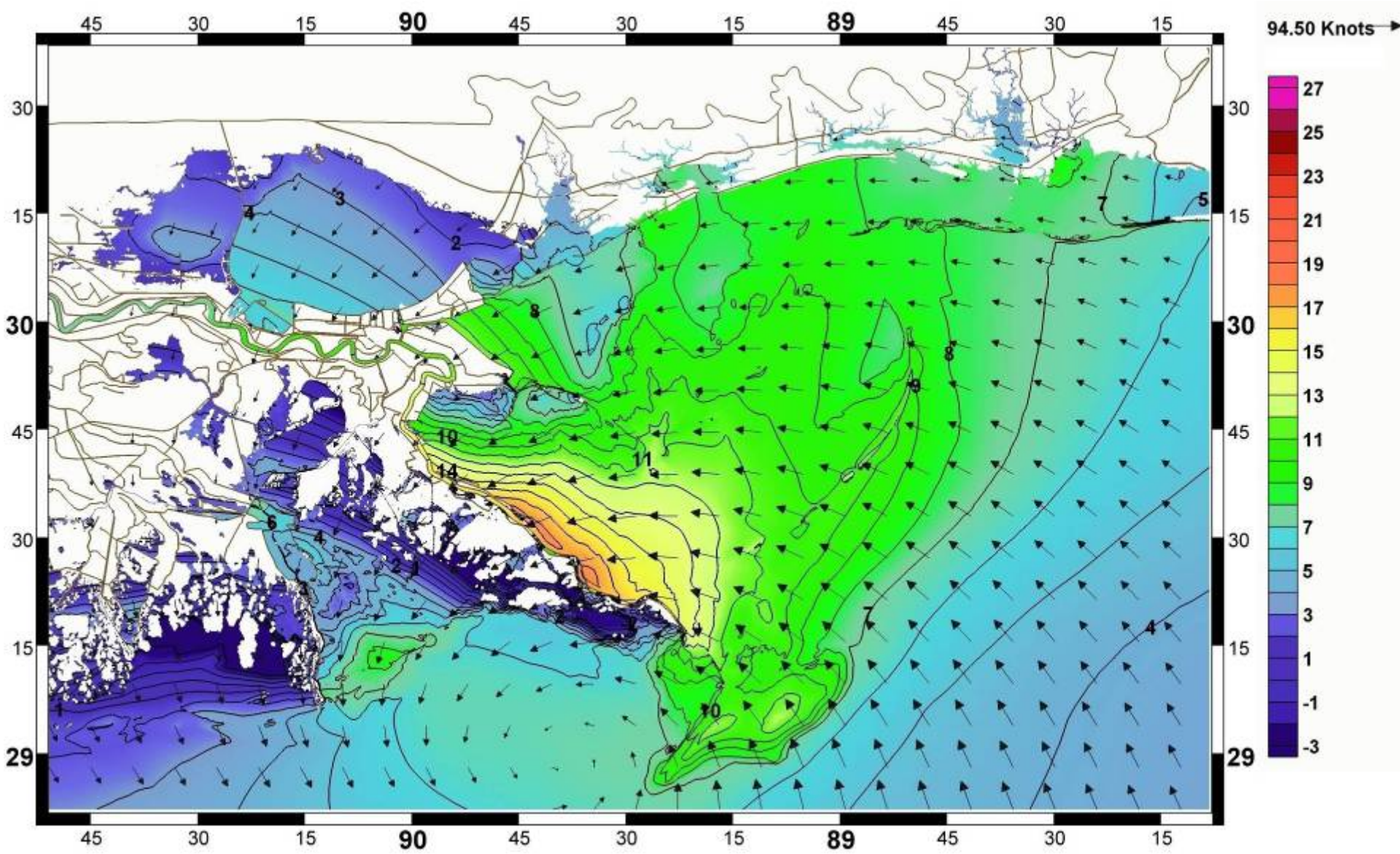
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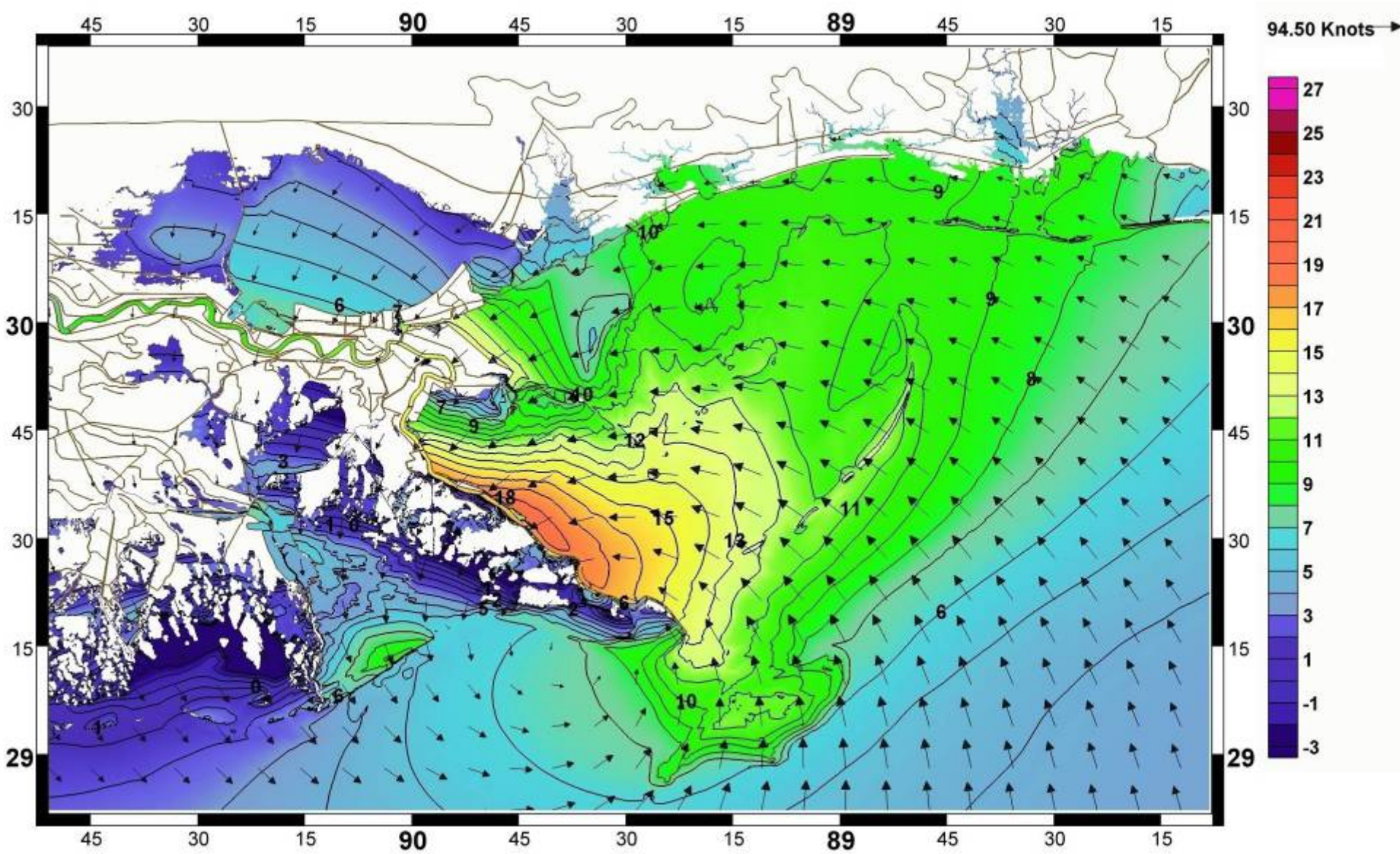
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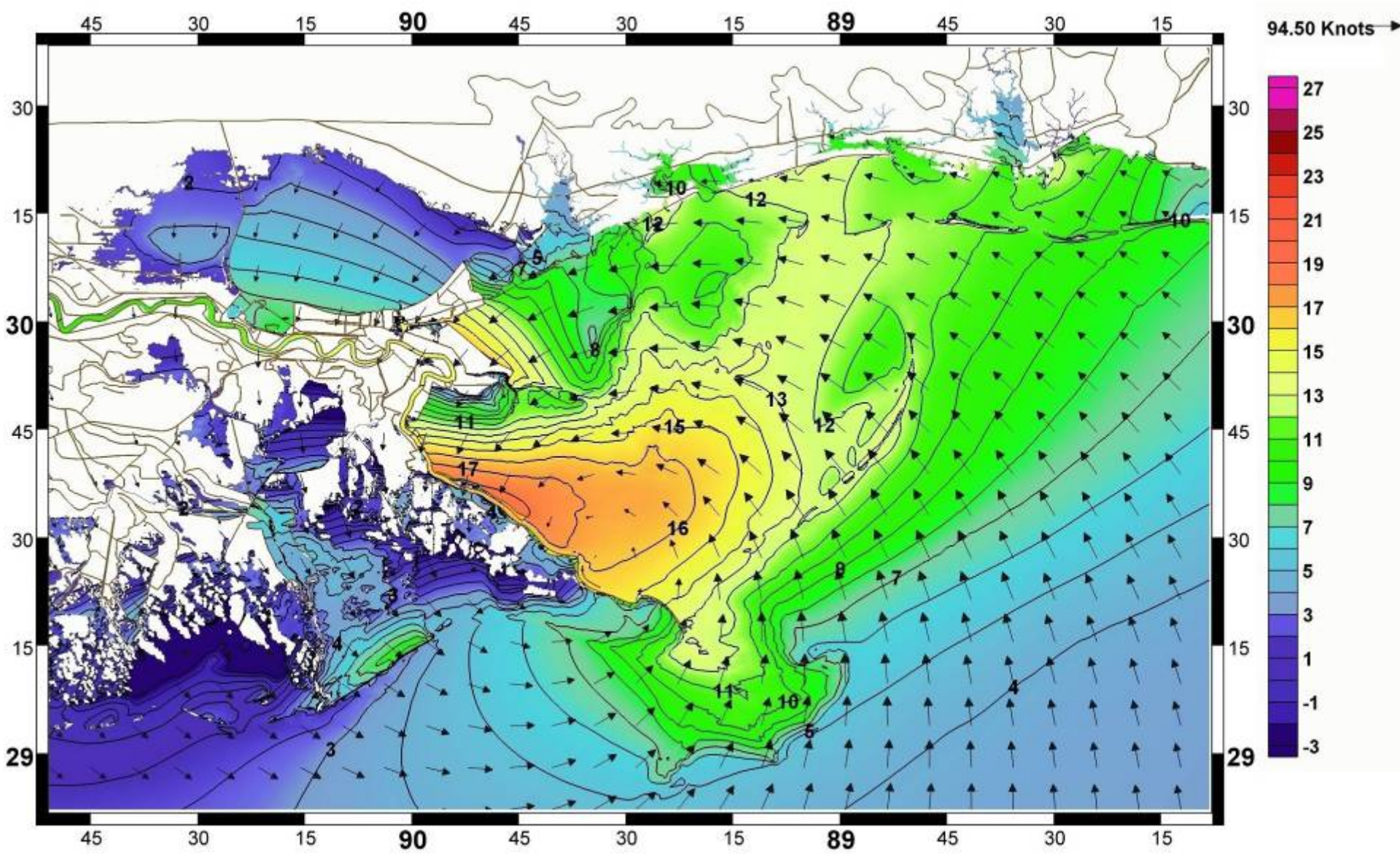
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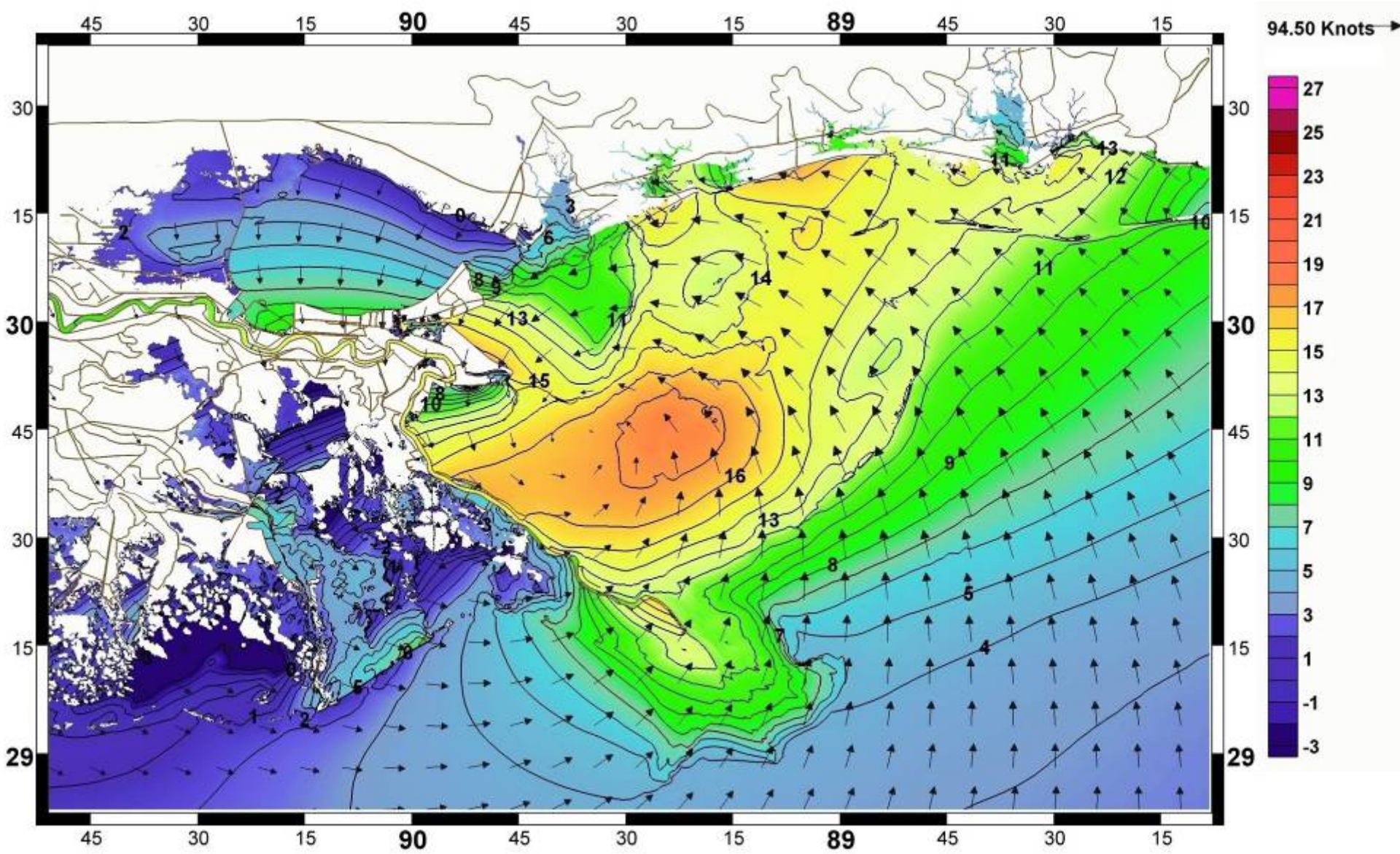
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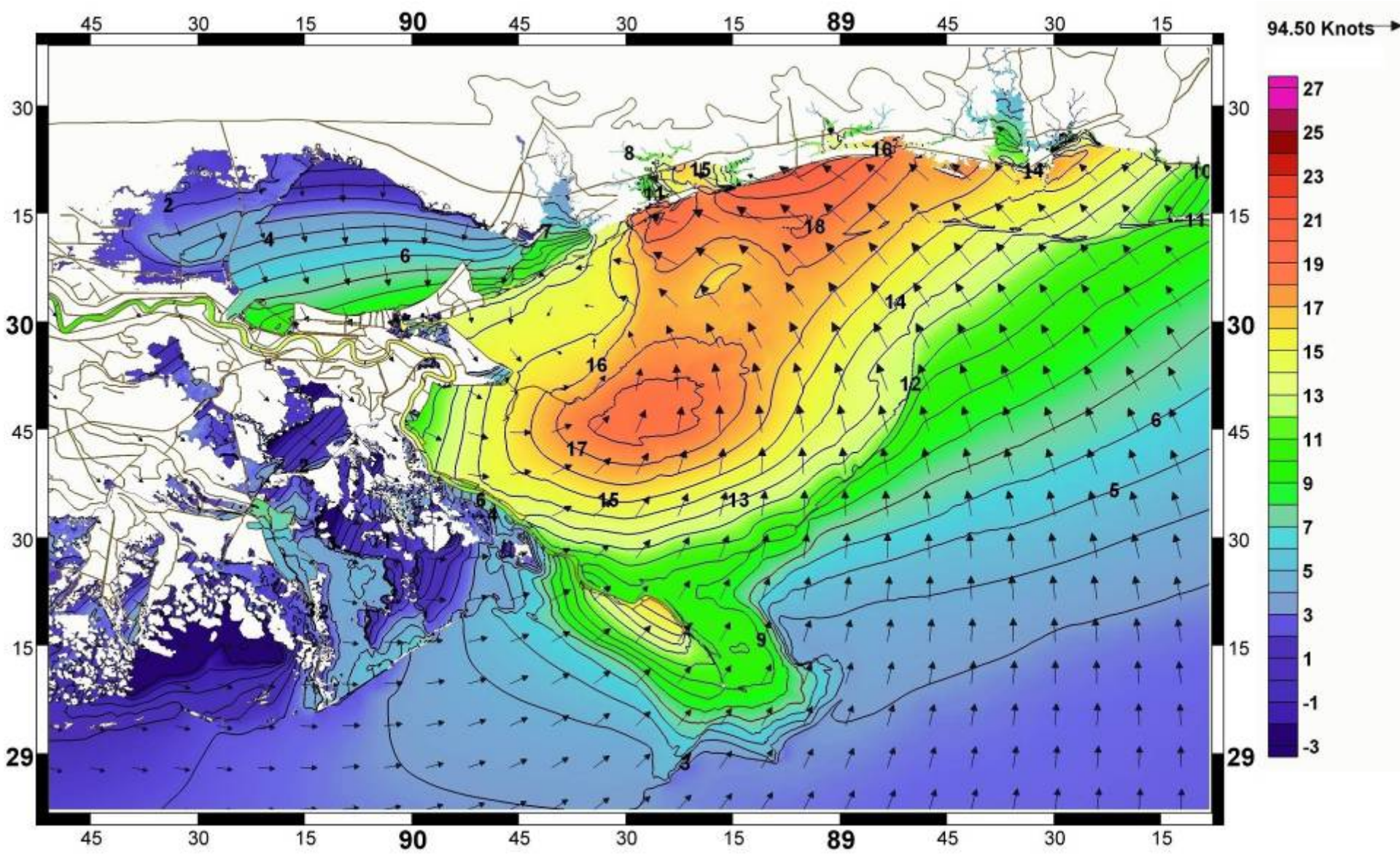
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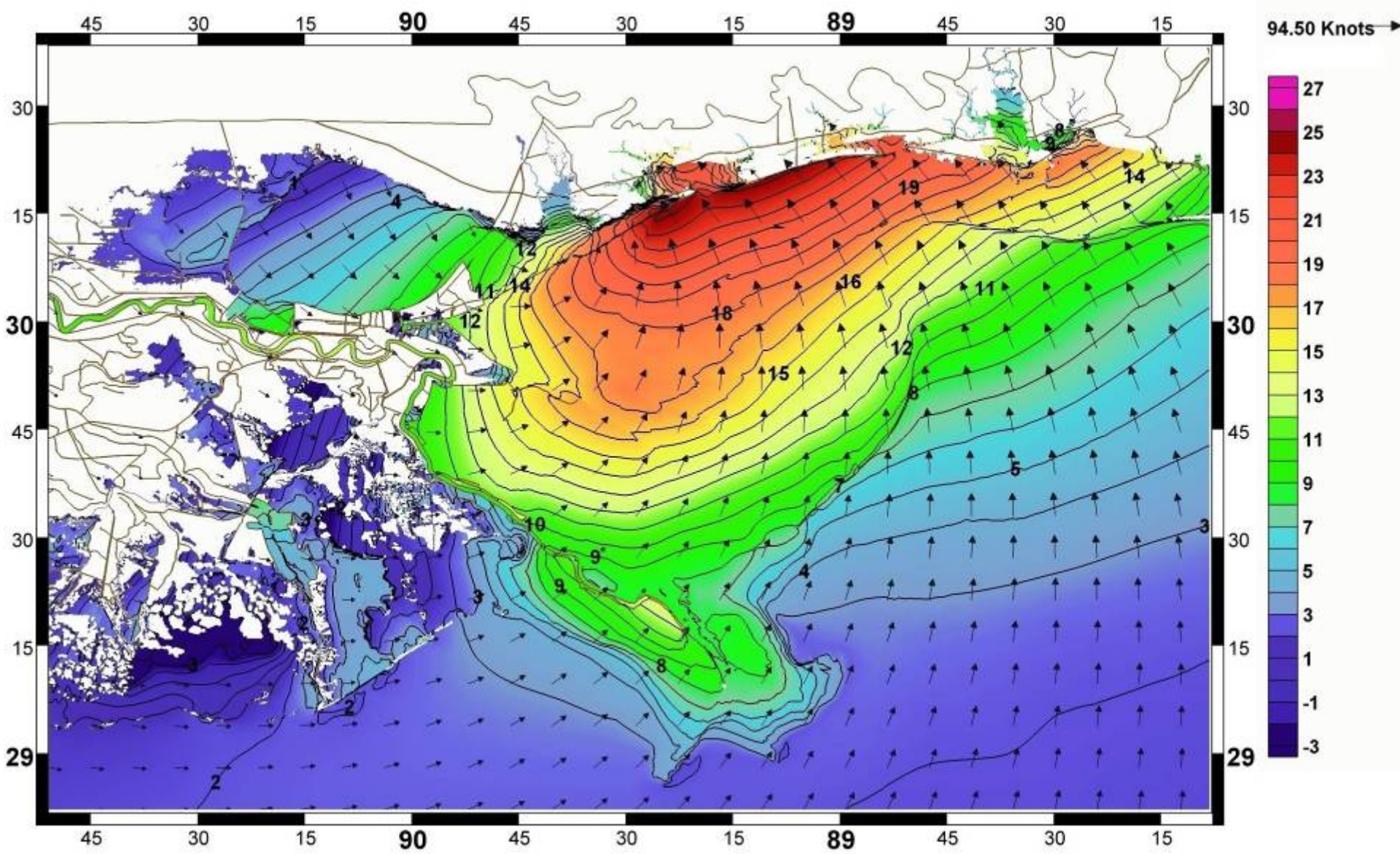
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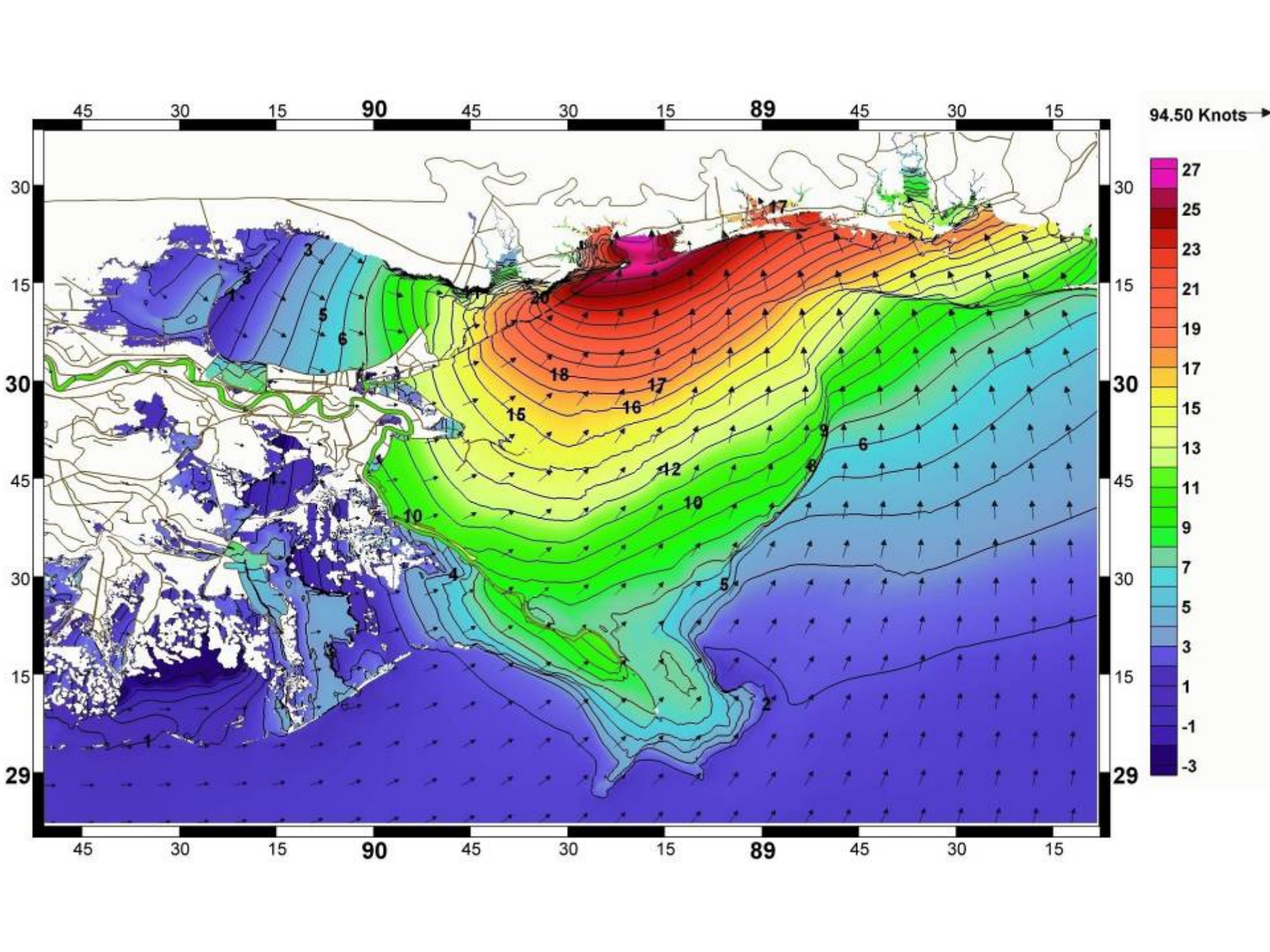
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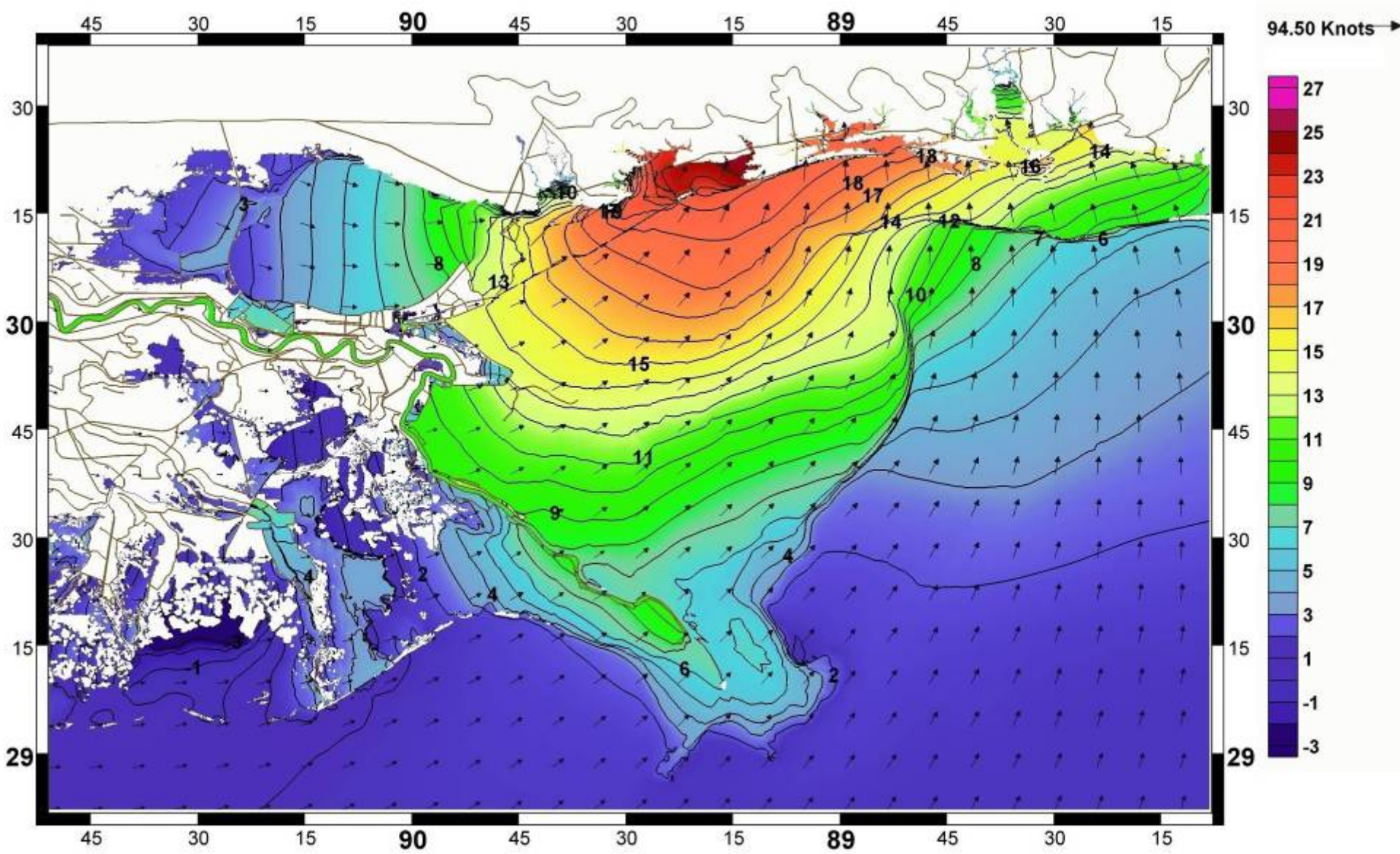
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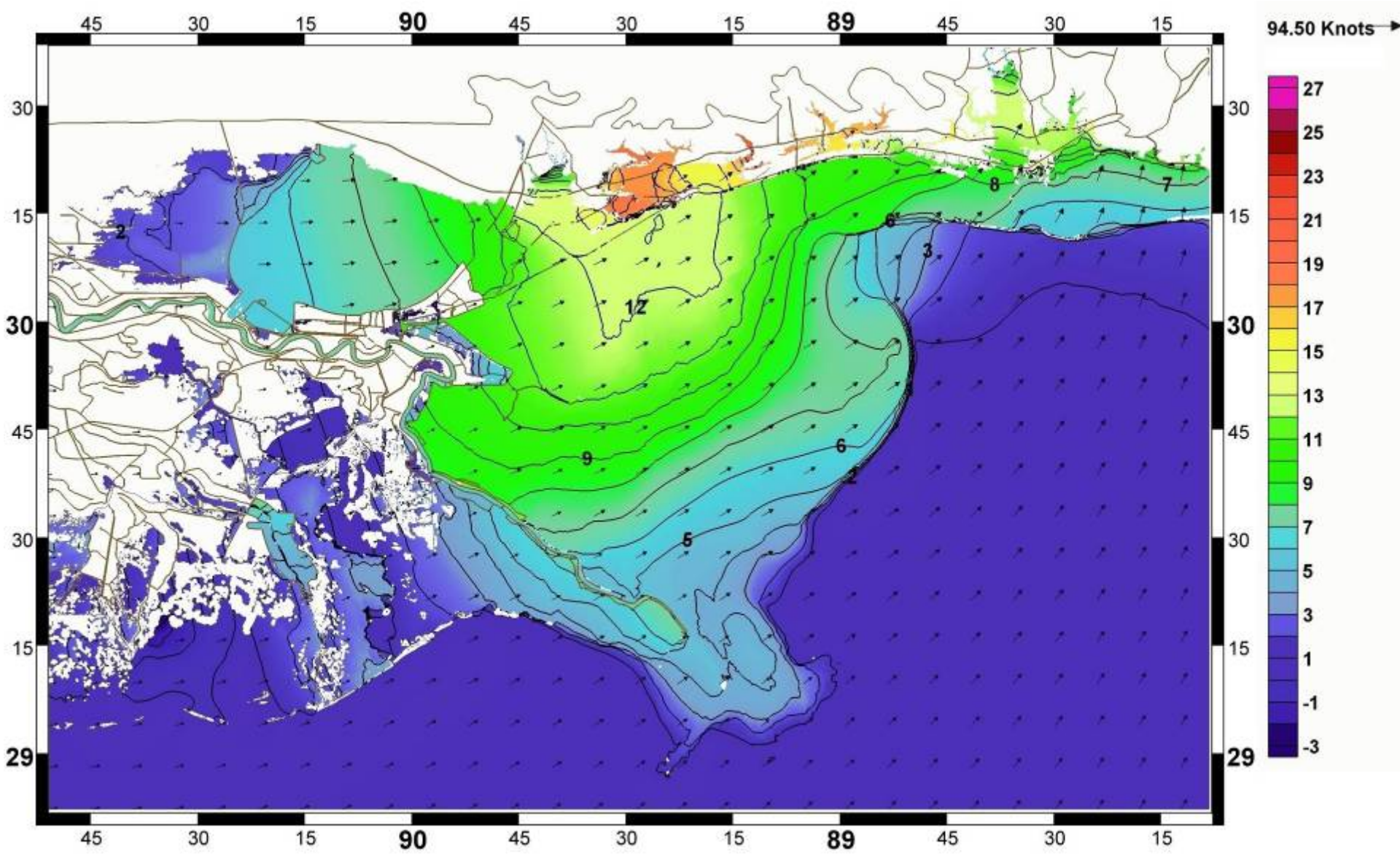
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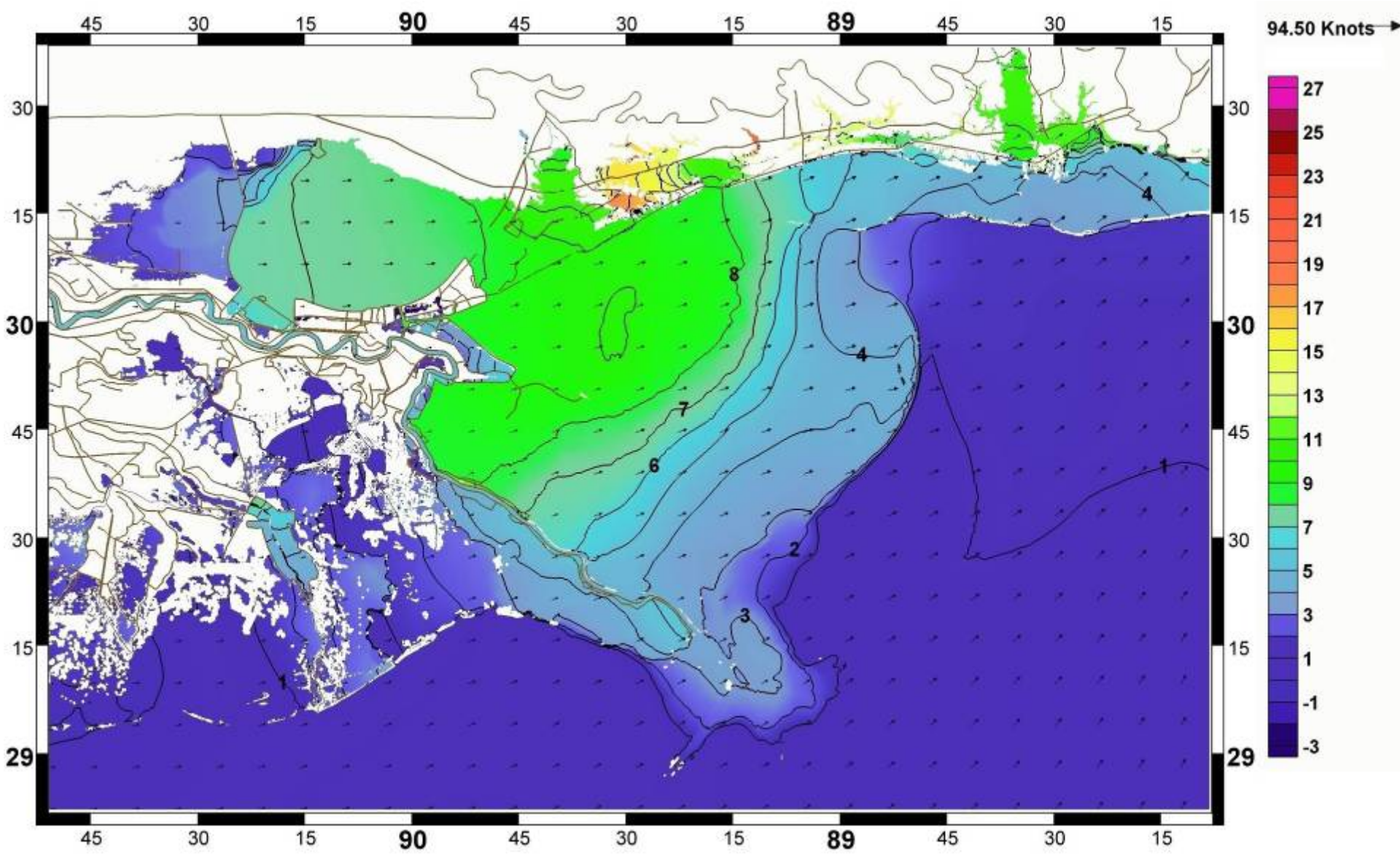
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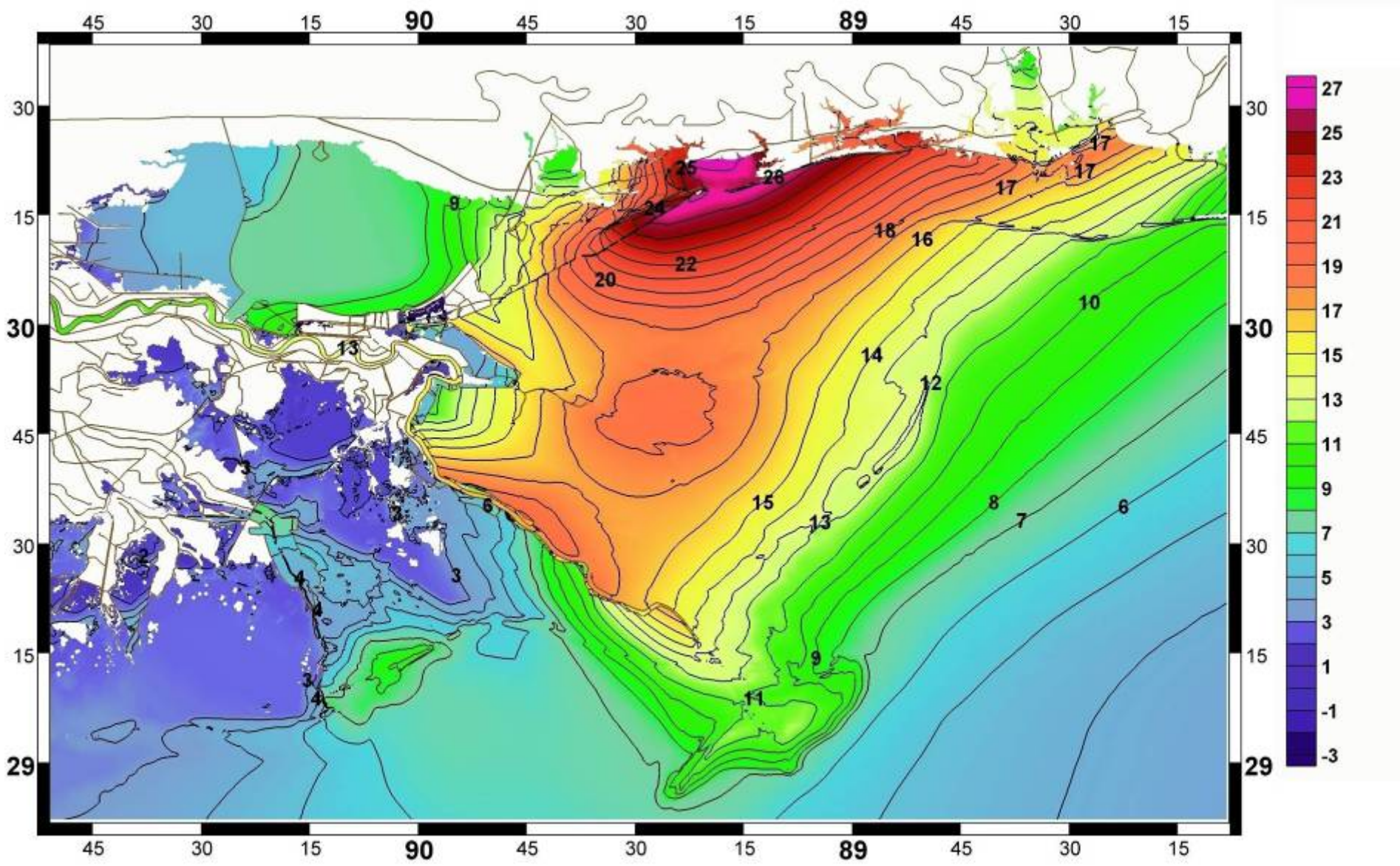
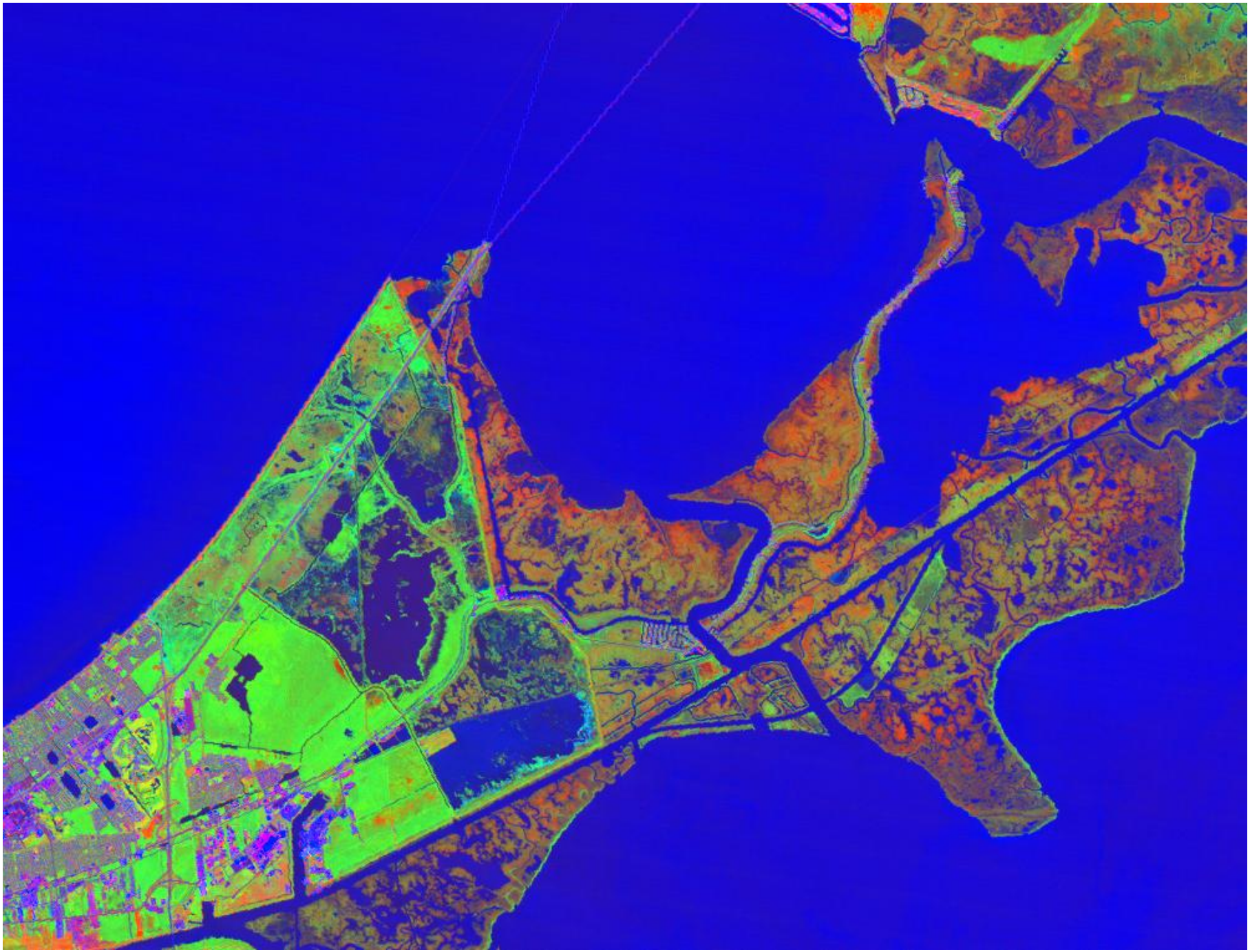
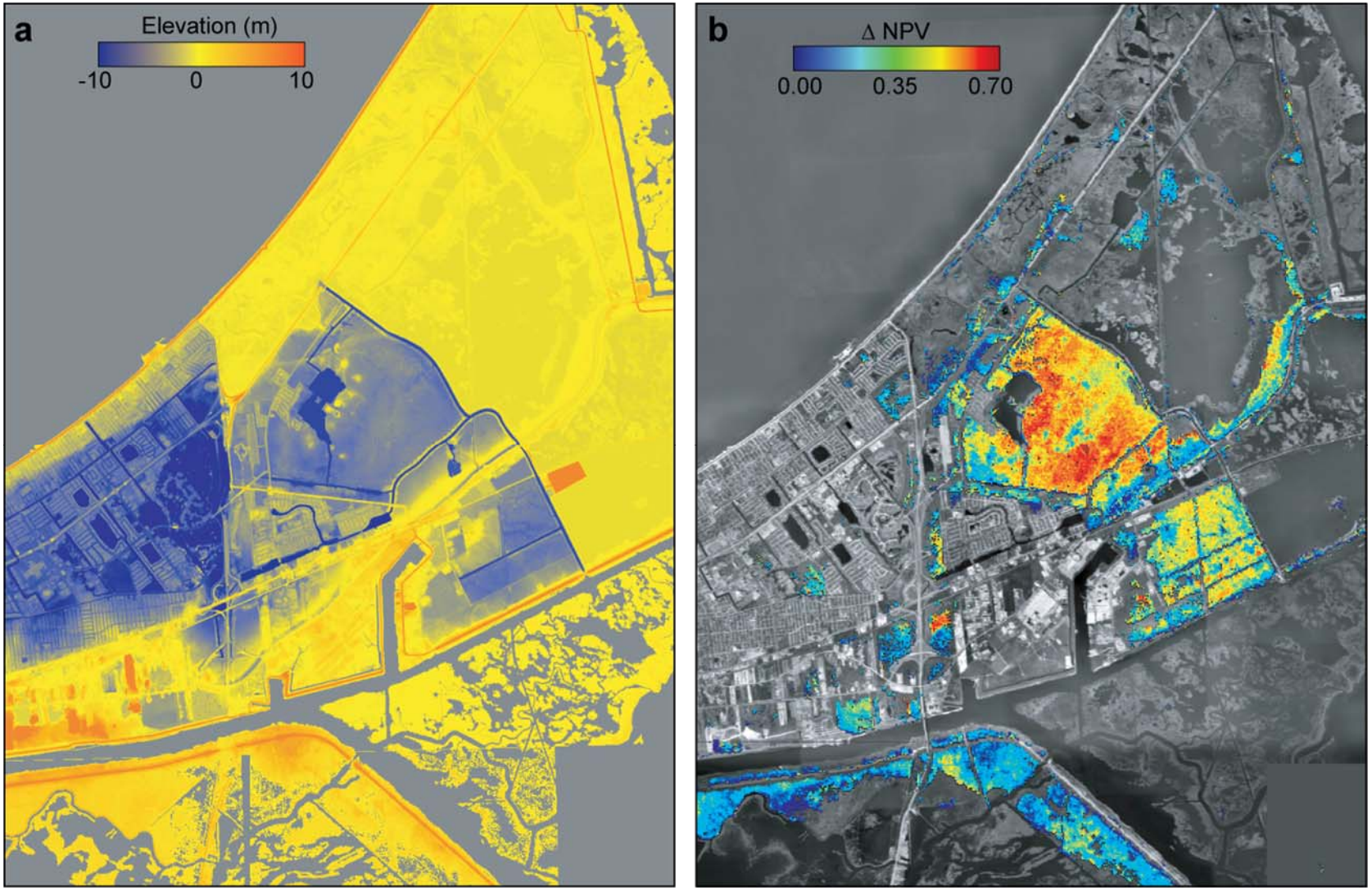
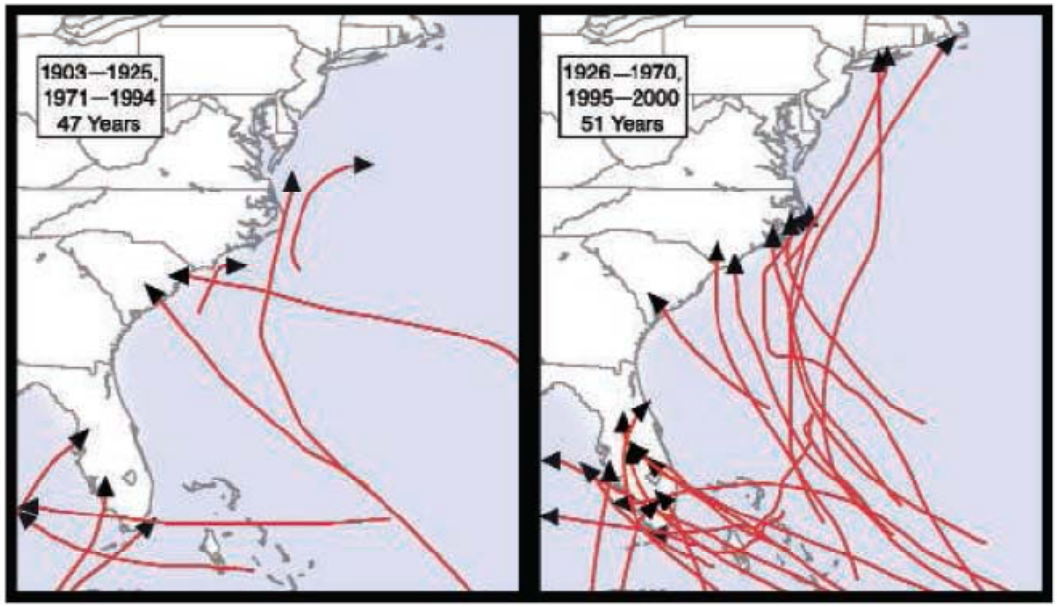
Maximum Surge Values (ft)

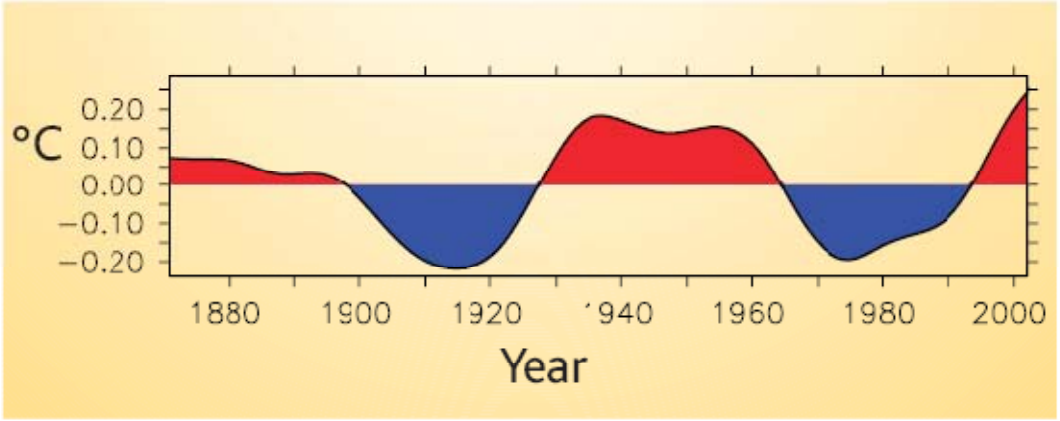





a
Elevation (m)
-10
0
10
b
Δ NPV
0.00
0.35
0.70



Bad warmth. The AMO's warm years favor more U.S. hurricanes (*right*).



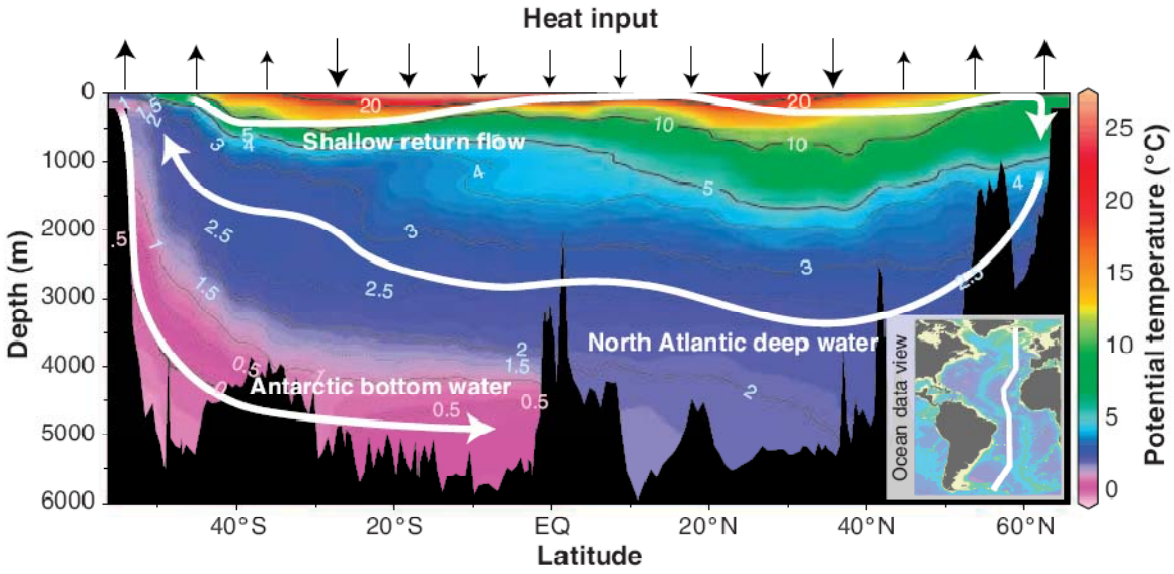
Wobbly ocean. North Atlantic temperatures have wavered up and down at a roughly 60- to 80-year pace.

Warming the World's Oceans

Gabriele C. Hegerl and Nathaniel L. Bindoff

Rising greenhouse gas concentrations in the atmosphere are trapping more infrared radiation near Earth's surface. This extra radiation is expected to warm Earth's surface and lower atmosphere, but observations indicate that most of the heat is transported into the oceans (see the figure). On page 284 of this issue, Barnett *et al.* (*1*) substantially strengthen the evidence that human activities are indeed warming the world's oceans.

Observations have shown that 84% of the total heating of the Earth system since the 1950s is in the oceans (*2*). This increased ocean heat content has led to thermal expansion of the ocean, contributing at least 25% of the global sea-level rise observed over the same period (*3*). Ocean warming may also



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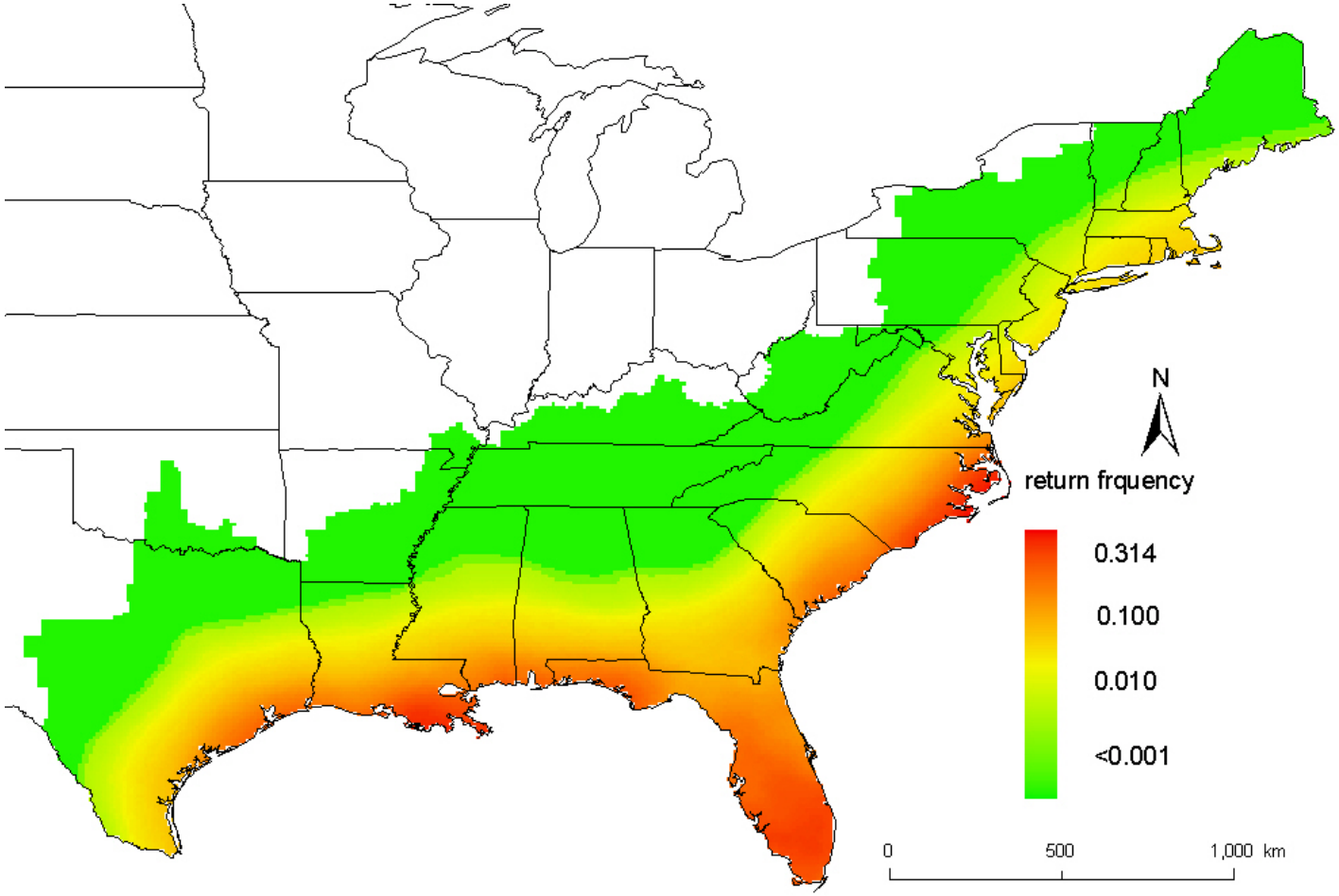
Impacts of tropical cyclones on U.S. forest tree mortality and carbon flux from 1851 to 2000

Hongcheng Zeng[a,1], Jeffrey Q. Chambers[a], Robinson I. Negrón-Juárez[a], George C. Hurtt[b], David B. Baker[a], and Mark D. Powell[c]

www.pnas.org/cgi/doi/10.1073/pnas.0808914106



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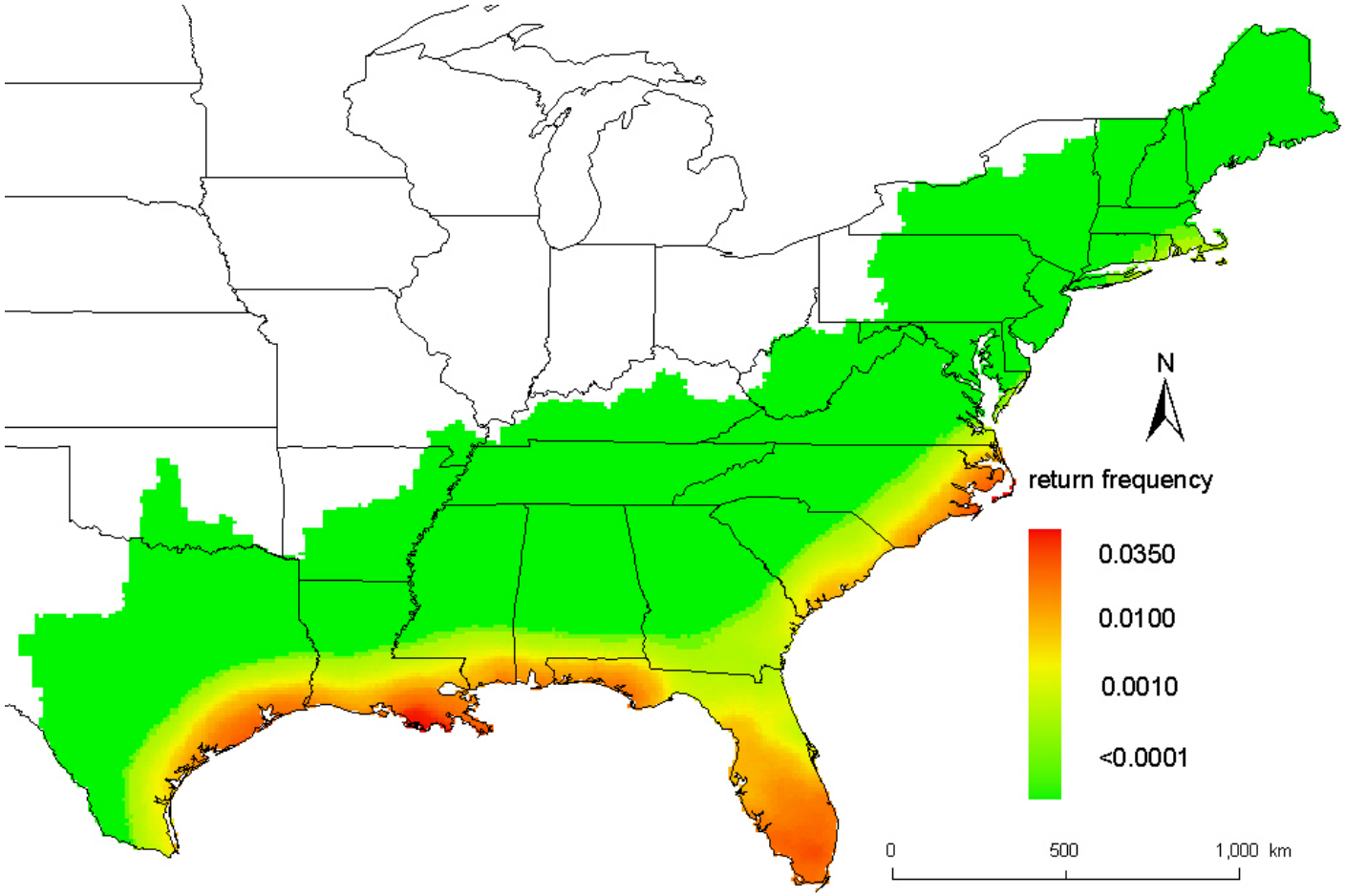


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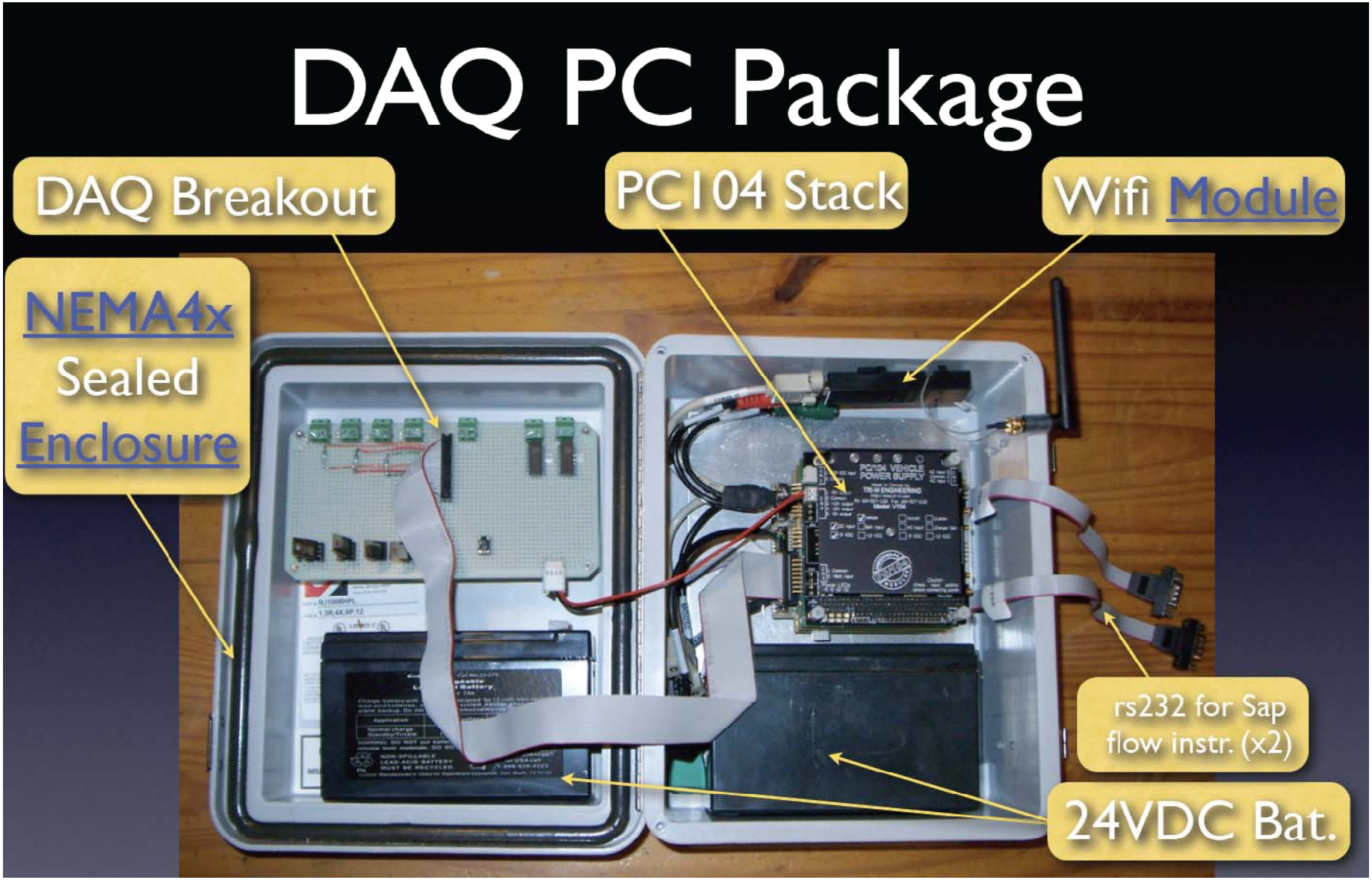


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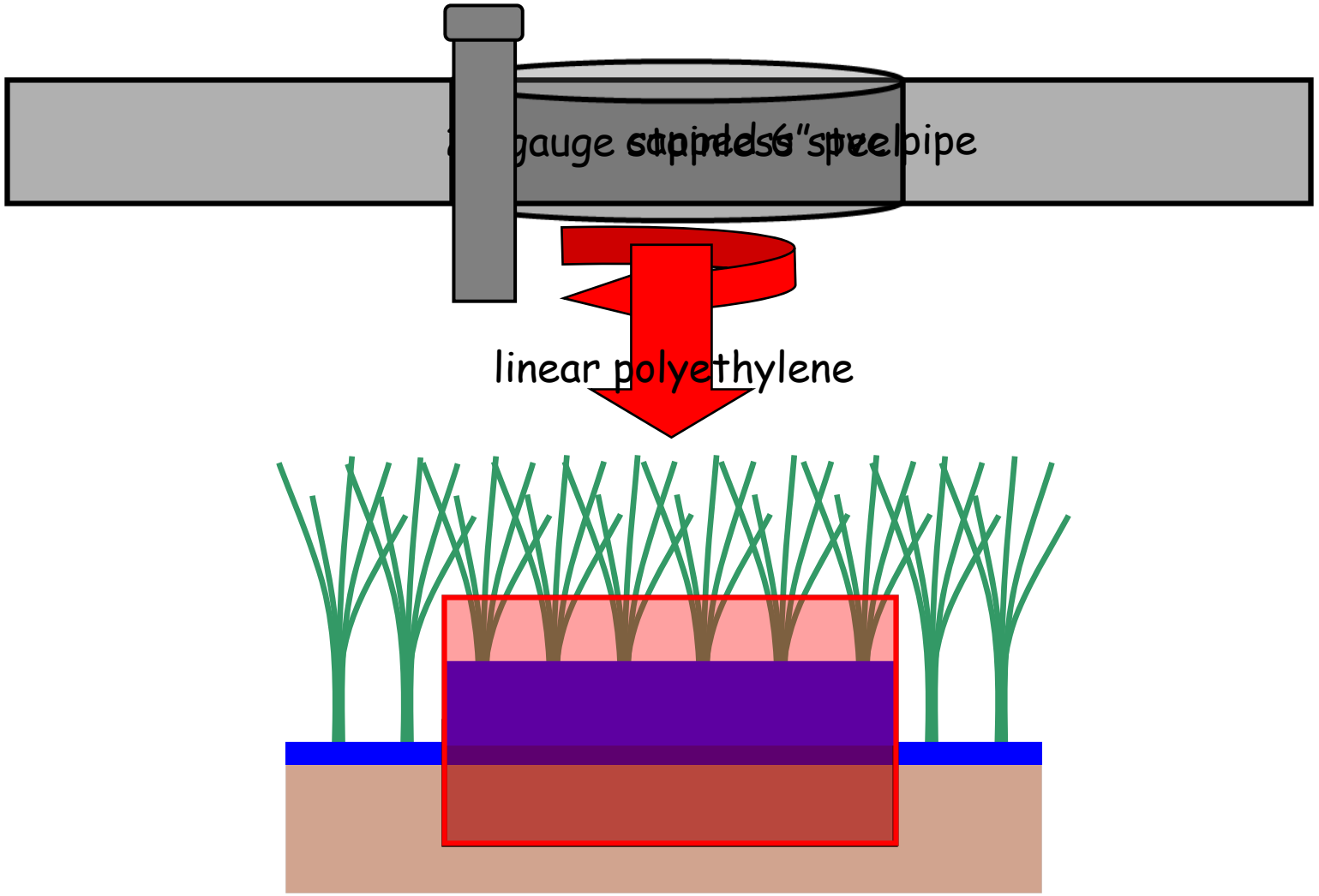
Alligator Road
Armadillo Road
Wild Boar Road
Teal Road
Mallard Road
995
© 2008 Tele Atlas
©2006 Google


gauge stainless steel
linear polyethylene

Summary

- **Hurricane Katrina caused death and severe structural damage to ~320 million trees over an area the size of Maine.**
- **Katrina produced a "dead wood" flux equivalent to the net carbon gain by all U.S. forests in one year.**
- **LEAG-funded effort (yet to be published) to separate the effects of wind and storm surge in explaining variability in coastal forest disturbance variability.**
- **NICCR experiment to explore effects of storm surge and sea level rise on coastal ecosystems (forested wetlands and marshes)**
- **LEAG-funded project to explore how flooding height and salinity effects species composition within the enclosures**

Robinson Negron-Juarez, Hongcheng Zeng, Theryn Henkel, Tom Shannon,
Elise Chapman, Jeremy Fisher, Dave Baker, George Hurtt, Joannes Westerink

DOE National Institute for Climatic Change Research

NASA

Tulane University

Long-Term Estuary Assessment Group

University of Notre Dame

University of New Hampshire
Institute for the Study of Earth, Oceans, and Space