

NOAA Updates and Announcements

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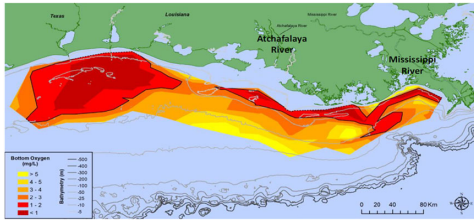
Hypoxia Task Force
Meeting
December 2021

SCIENCE SERVING COASTAL COMMUNITIES

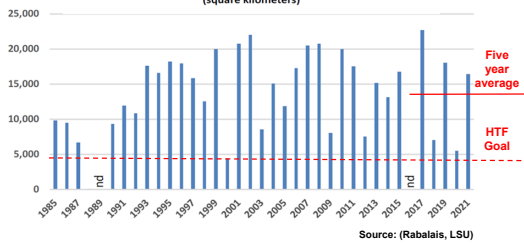
Outline

- 2021 Hypoxia monitoring cruise and retrospective analysis
- Emerging capabilities for hypoxia monitoring and modeling
- Additional Updates

Hypoxic Zone Monitoring Results and Outreach



Mid-summer Bottom-water Hypoxic Area 1985–2021 (square kilometers)



Predicted Size = 12,640 km²
 Measured Size = 16,400 km²
 5-Year Average = 13,930 km²

Forecast models within margin of error but zone larger than expected

Mid-summer extent of hypoxic zone – metric to assess progress toward HTF Coastal Goal

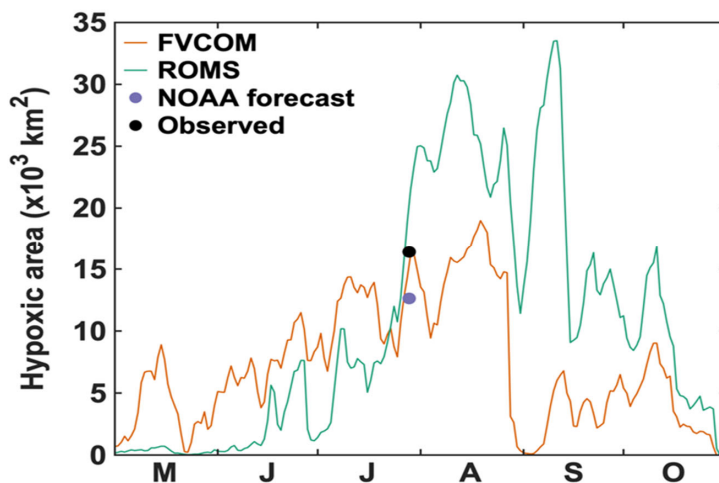
Outreach Efforts

Two Press Releases

Media teleconference held with the HTF Co-Chairs

~337 news articles written as a result

Retrospective Analysis



Source: (Fennel, Dalhousie; Justic, LSU)

Model agreement with cruise data

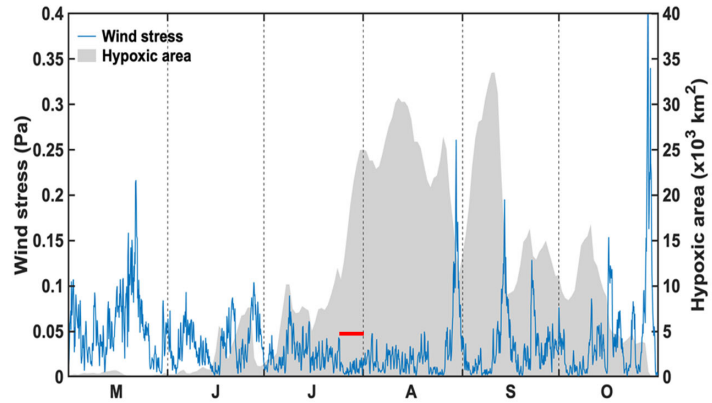
Simulated hypoxic area increased during the cruise

Large August peak predicted by one of the models

Model agreement was not as good as in previous years

Retrospective Analysis

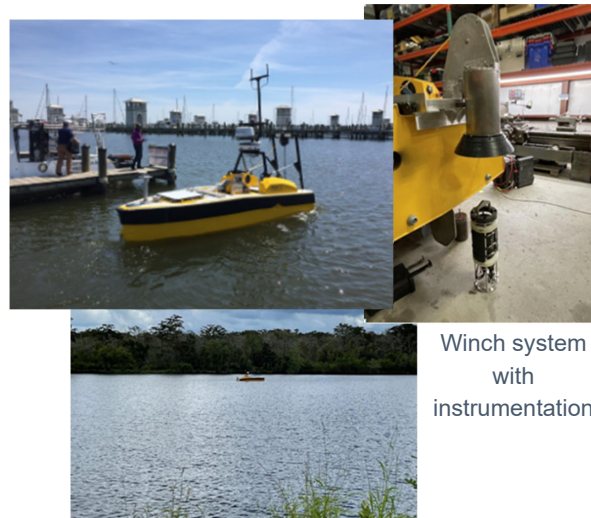
- Western part of zone was very expansive this year leading to a larger than anticipated area given the nutrient loading
- Likely causes include the extremely calm conditions around the time of the cruise and a lack of major wind events
- This is reflected in the wind fields and strength of stratification



Emerging Technologies for Hypoxia Monitoring

C-Worker 5 ASV

- Diesel powered
- Winch system to sample at bottom
- Measure in waters from 5m to 50m
- Data management system from vessel to server has been developed for data transmitted in real time
- This system has been tested on a Lake
- Offshore testing in Summer 2022



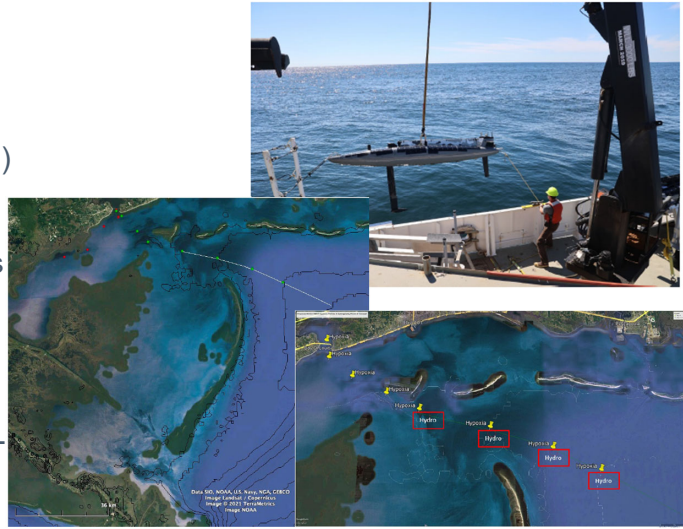
Winch system with instrumentation

<https://ioos.noaa.gov/project/ott-asv-hypoxia/>

Emerging Technologies for Hypoxia Monitoring

Triton

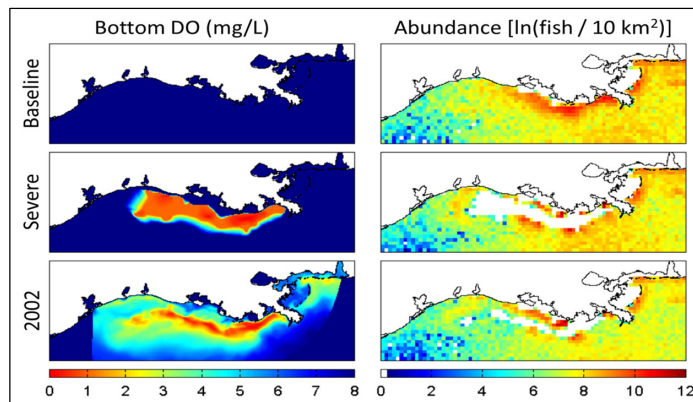
- Environmentally powered (solar)
- Surface (~3+ month endurance) and subsurface (~8+ day endurance) capabilities
- Keel with customizable sensors
- Proof of concept testing spring 2022
- Testing along transect off of Mississippi
- Comparing data with C Worker-5 to evaluate data quality



<https://oceanaero.com/technology>

Living Marine Resources Models

- NOAA has invested \$2.7M over the past 5 years to investigate the impacts of the Gulf hypoxic zone on living marine resources
- Over 20 peer-reviewed publications have been produced so far
- Next year, findings will be synthesized in an upcoming dedicated journal publication
- New capabilities have been developed such as a data visualization tool and coupled watershed coastal models



Visualization Tool: <https://demutsertlab.wordpress.com/visualizations/>

Source: (Rose, UMCES)

Watershed Game

- Hands on, facilitated activity, for participants to learn how land use affects water quality and natural resources
- Players use limited financial resources to reduce excess nonpoint source pollution
- Game includes 4 linked modules (headwater stream, lake, large river and coast)
- Audience: anyone involved in outreach or education related to water quality
- Hundreds of educators across 20 states have been trained so far (university extension, local gov't, schools, NGOs)

watershedgame.umn.edu



Thank you



Recent Hypoxia Research Efforts and Publications

Several publications have come out with implications for hypoxic zone monitoring, forecasting, economic impacts and management targets.

Wang, H., Lehrter, J., Maiti, K., Fennel, K., Laurent, A., Rabalais, N., Hussain, N., Li, Q., Chen, B., Scaboo, K.M., Cai, W-J. (2020) Benthic Respiration in Hypoxic Waters Enhances Bottom Water Acidification in the Northern Gulf of Mexico. JGR Oceans 125.

- *Severe hypoxic conditions, which correspond with less water movement, favor the accumulation of benthic respiration leading to the acidification of the bottom waters in the Gulf of Mexico hypoxic zone.*

LaBone, E., Rose, K., Justic, D., Huang, H., Wang, L. (2021) Effects of spatial variability on the exposure of fish to hypoxia: a modeling analysis for the Gulf of Mexico. Biogeosciences 18, 487-507.

- *Accurate estimation of exposure depends on both the degree of clumpiness of sublethal dissolved oxygen concentrations and the total area of sublethal dissolved oxygen. Exposure to sublethal concentrations occurred under all conditions examined regardless of the fish's ability to avoid hypoxia, including good and poor competency of fish for avoidance and allowing for vertical avoidance movement.*

Bian, Z., Tian, H., Yang, Q., Xu, R., Pan, S., Zhang, B. (2021) Production and application of manure nitrogen and phosphorus in the United States since 1860. Earth System Science Data 13, 515-527.

- *The enrichment of manure nutrients in the South Atlantic–Gulf, Mid-Atlantic, and Mississippi River basins increased the risk of excessive nutrient loading into the Gulf of Mexico and the Atlantic Ocean under extreme weather conditions.*
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