



Super-Regional Testbed for Improving Forecasts of  
Environmental Processes for the U.S. Atlantic and  
Gulf of Mexico Coasts

# Shelf Hypoxia Team Activities

John Harding  
Northern Gulf Institute  
NGI Annual Meeting  
18 MAY 2011 @1345





## IOOS Testbed Team Structure

8 members

### Testbed Management

Don Wright, SURA

Doug Levin, NOAA/IOOS

Liz Smith, SURA

25 members

### Cyber Infrastructure

Eoin Howlett, ASA

### Testbed Advisory Evaluation Group

Rich Signell, USGS

21 members

### Estuarine Hypoxia

Chesapeake Bay

Carl Friedrichs, VIMS

20 members

### Shelf Hypoxia

Gulf of Mexico

John Harding, NGI

17 members

### Coastal Inundation

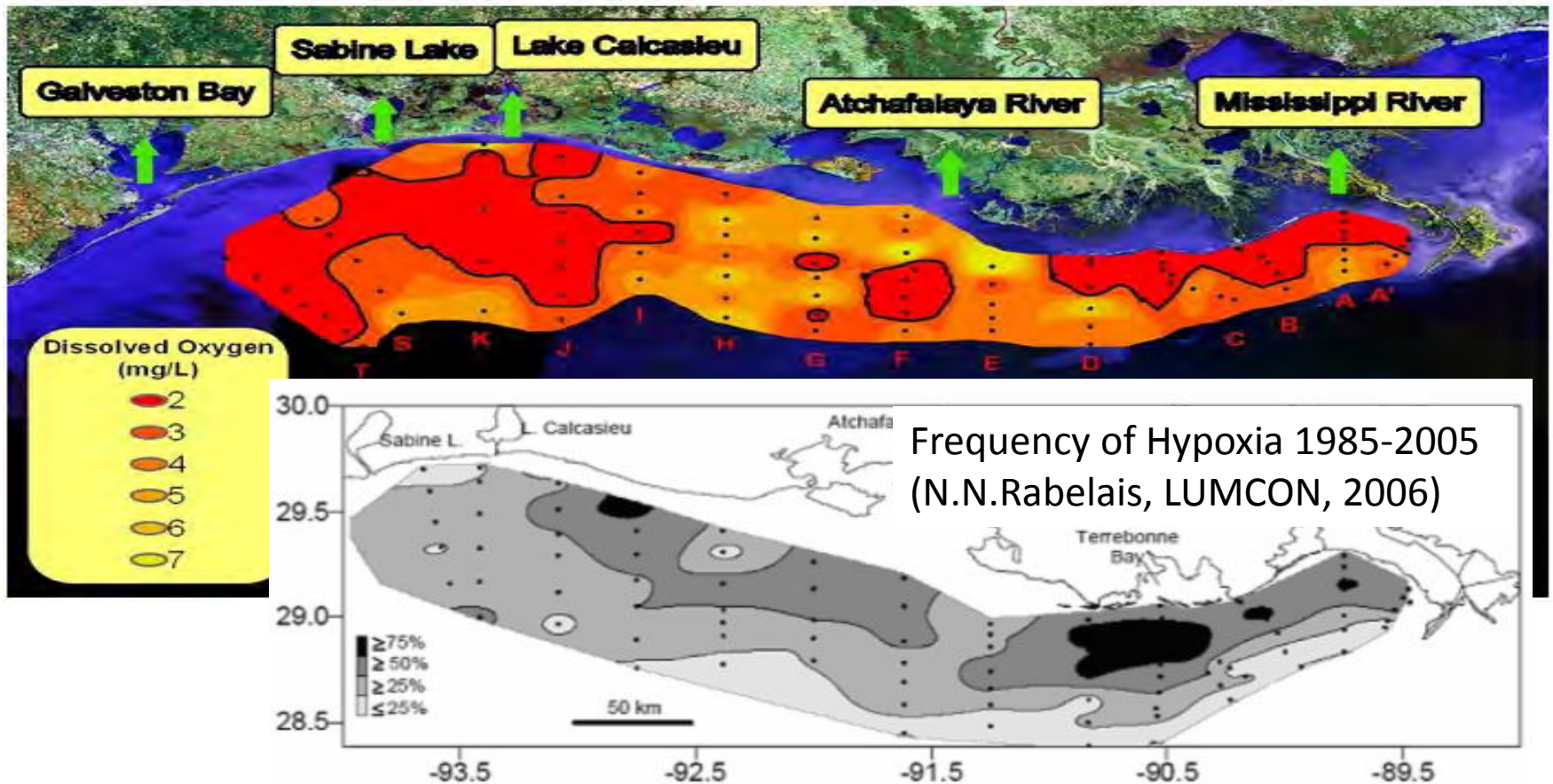
Gulf and East Coast

Rick Luettich, UNC-CH

<http://testbed.sura.org/>

# 2010 LUMCON Cruise Data Compared to 1985-2005 Frequency of Occurrence

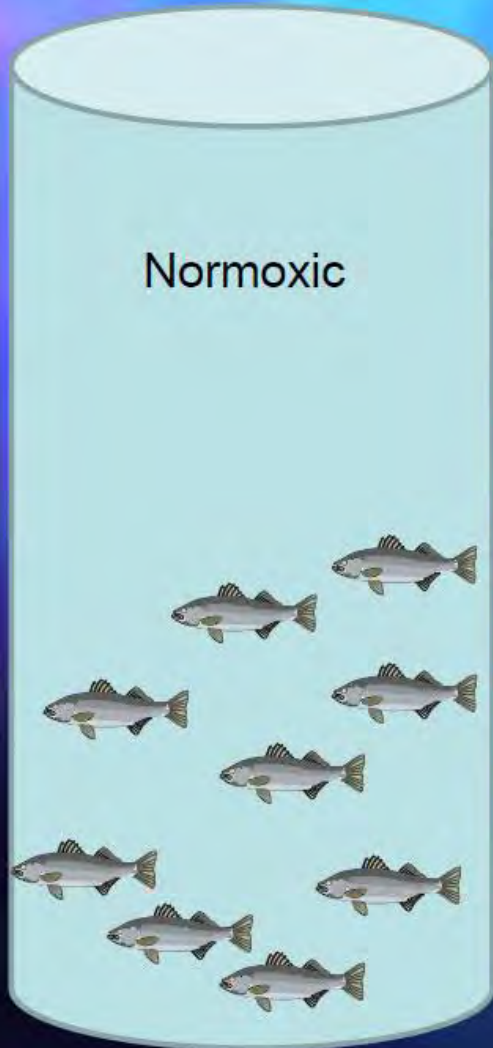
Annual Shelfwide Cruise: July 24 - 31, 2010



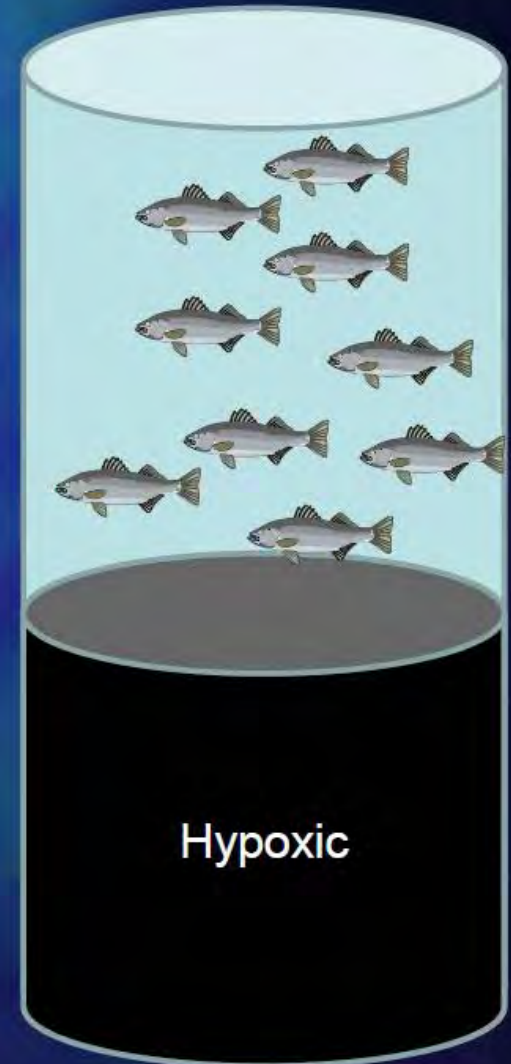
Top image courtesy of LUMCON: <http://www.gulfhypoxia.net/Overview/>



# Hypoxia and Pelagic Fish



- **Alter spatial distribution**
- **Restrict vertical migrations**
- **Move to areas of poorer habitat quality (e.g. less food, change in temperature)**
- **Increased predator concentration**
- **Increased vulnerability to predation (e.g. increased light?)**



# Source of Nutrient Rich Fresh Water

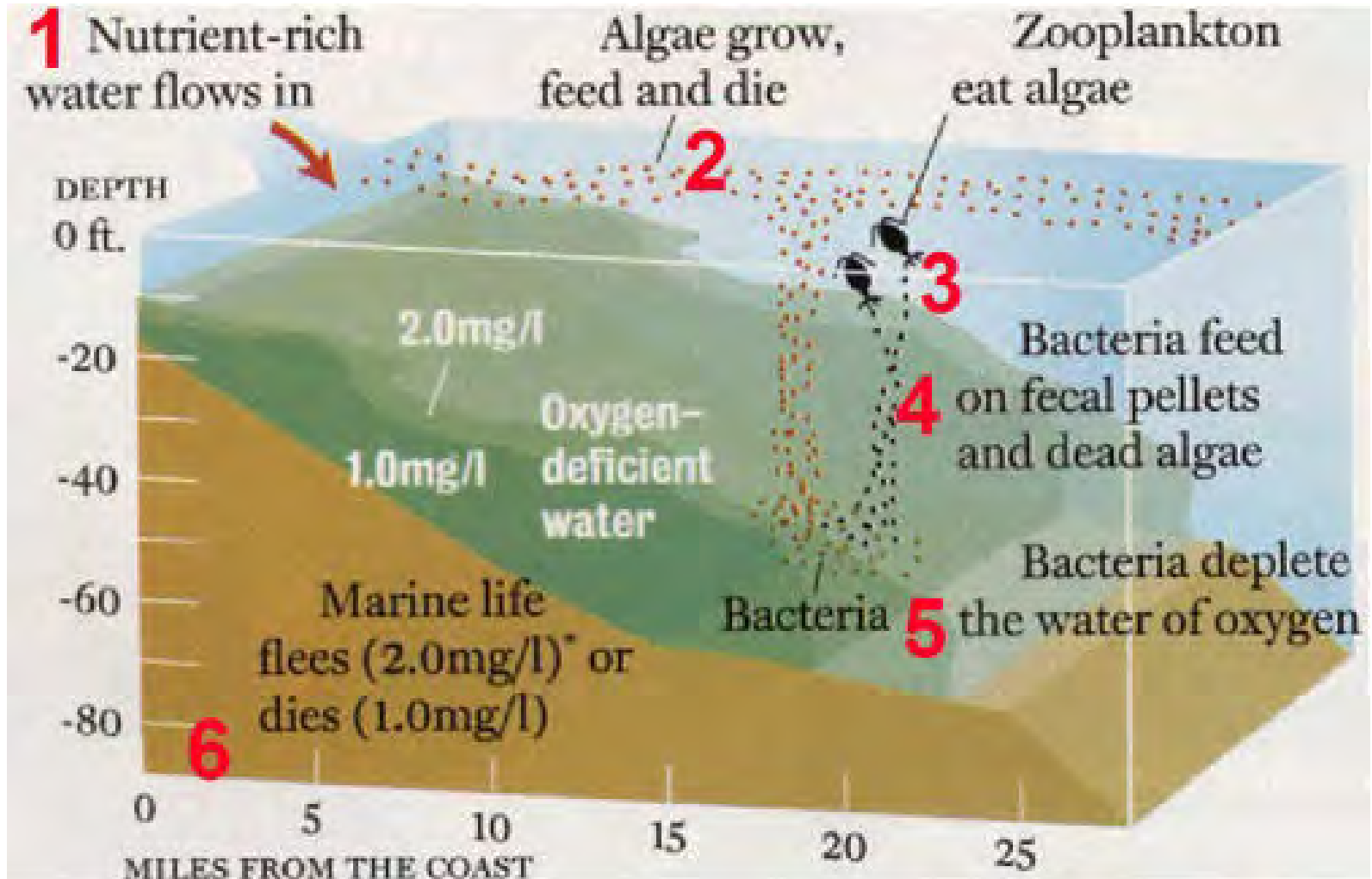
## Mississippi River Basin

41% of Lower 48 Drainage, 90% of Gulf Fresh Water, 1.6M MT annual Nitrogen



Image courtesy of LUMCON: <http://www.gulfhypoxia.net/Overview/>

# Dead Zone Bio-Dynamics



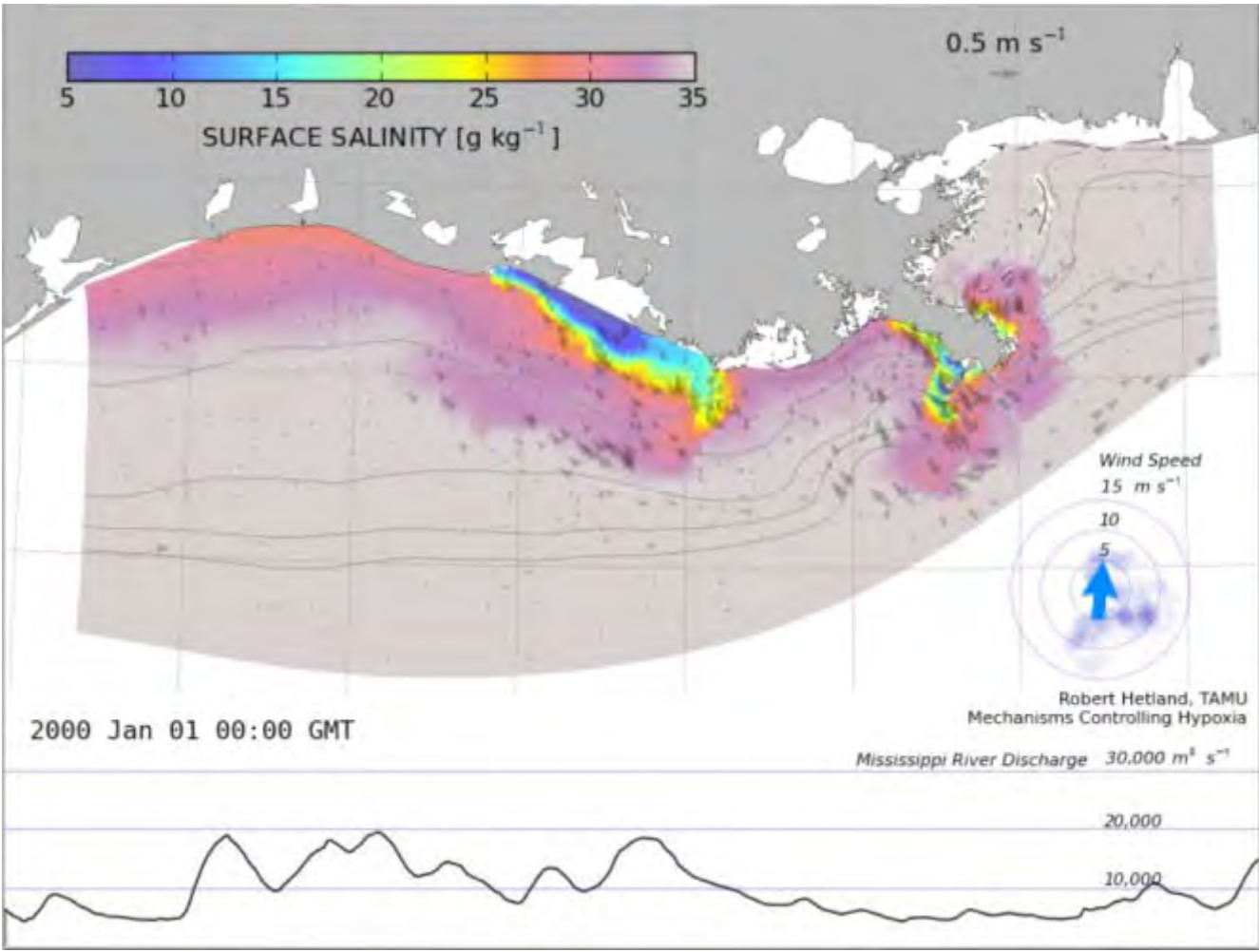
# Shelf Hypoxia Initial Focus (1-2 yr)

Challenge the CI Team to Enhance  
Academic/Operational Collaboration & Transition

- Evaluate *regional* model boundary conditions on current *coastal* hypoxia modeling in the northern GoM
- Compare NOAA and EPA Approaches to Gulf hypoxia
- Transition potential *regional* circulation component of this initial system as a baseline operational capability
- Advance transition of NGI/NCDDC Developmental Ecosystem Data Assembly Center (EDAC)



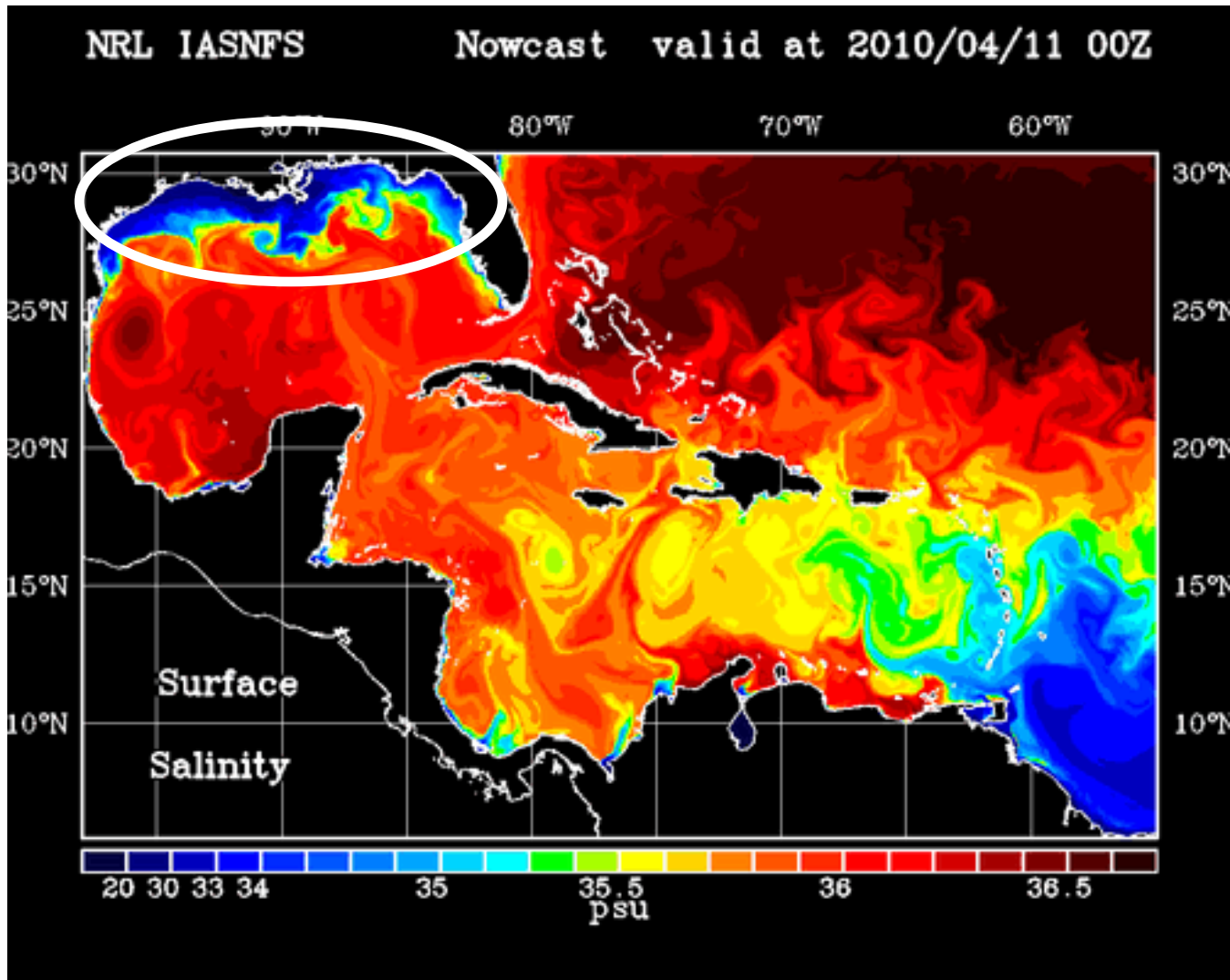
# Seasonal Area the Right Measure?



Animation courtesy of Rob Hetland , TAMU



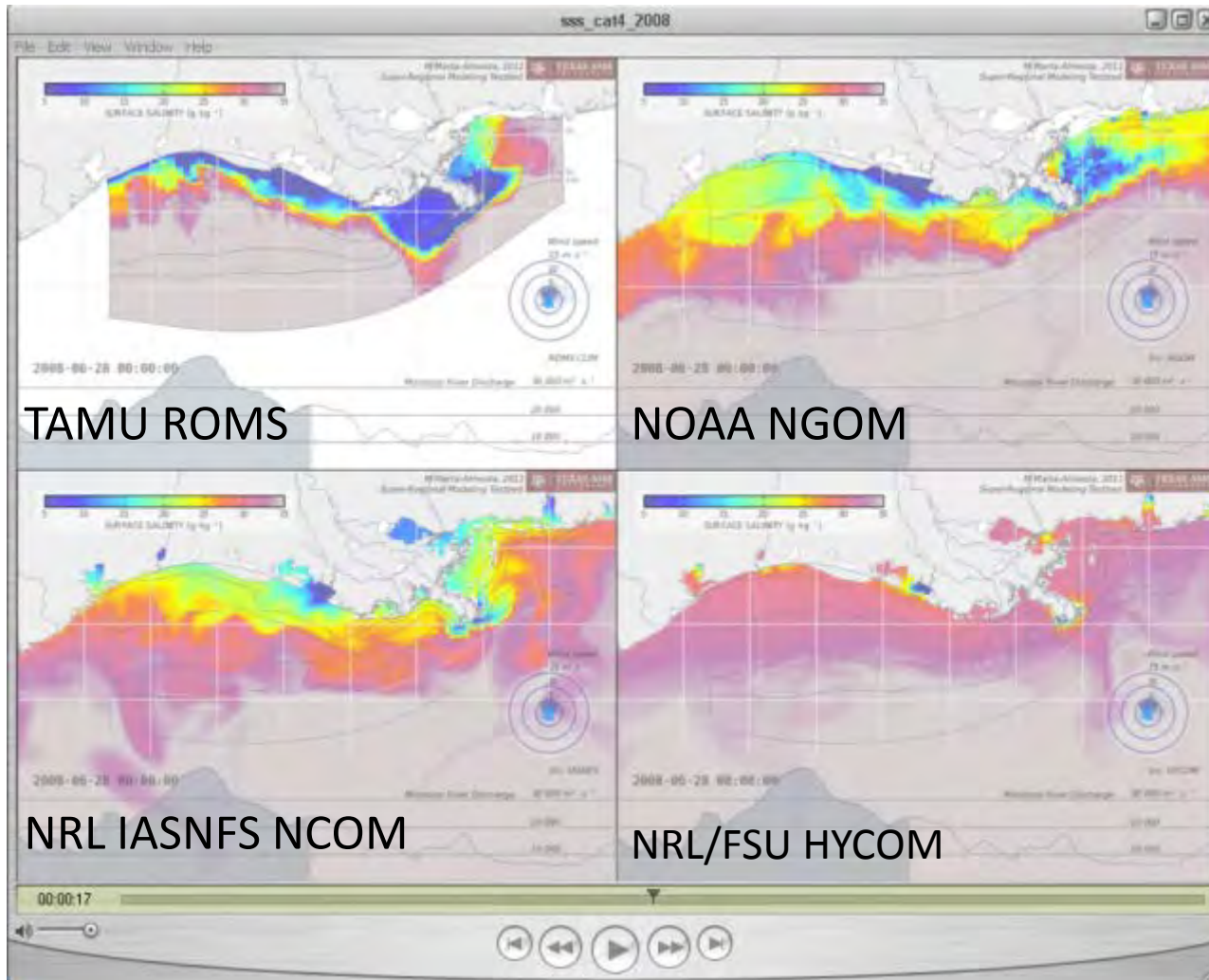
What is impact of neglect of offshore forcing?



Animation courtesy Dong Shan Ko, NRL

# Initial Hydrodynamic Comparisons

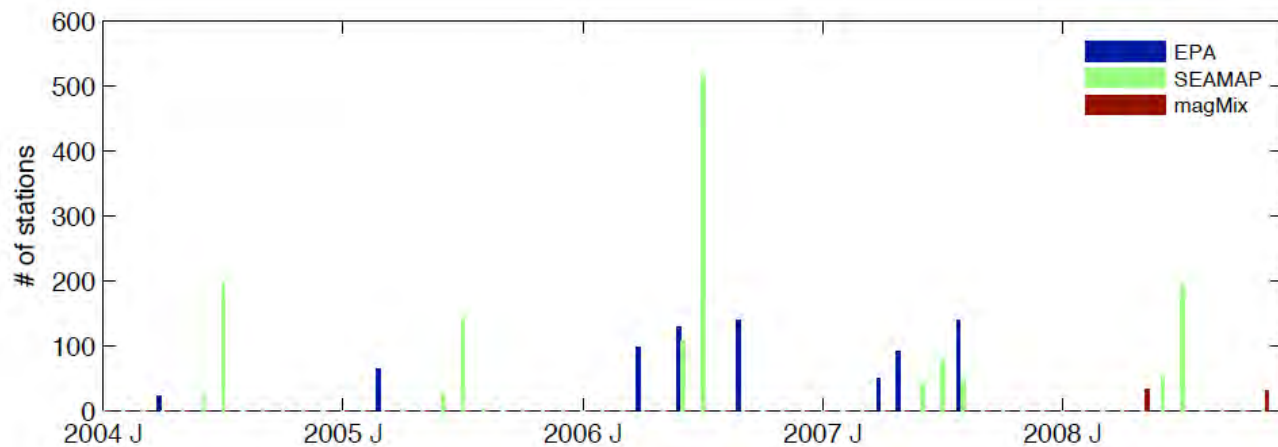
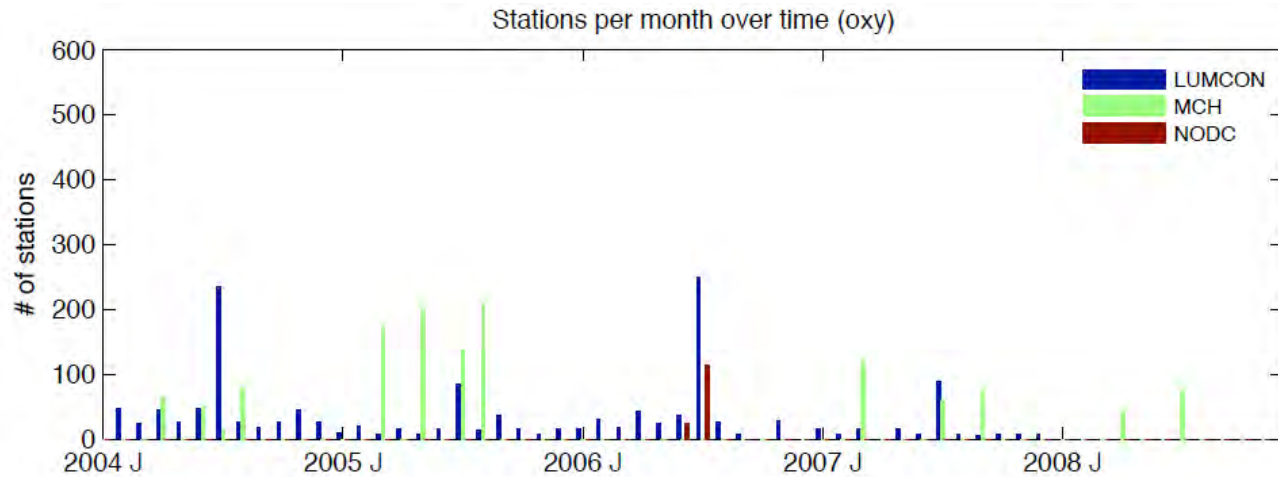
## Uncoupled



Animation courtesy Rob Hetland, TAMU

# Hypoxia Data Compilation

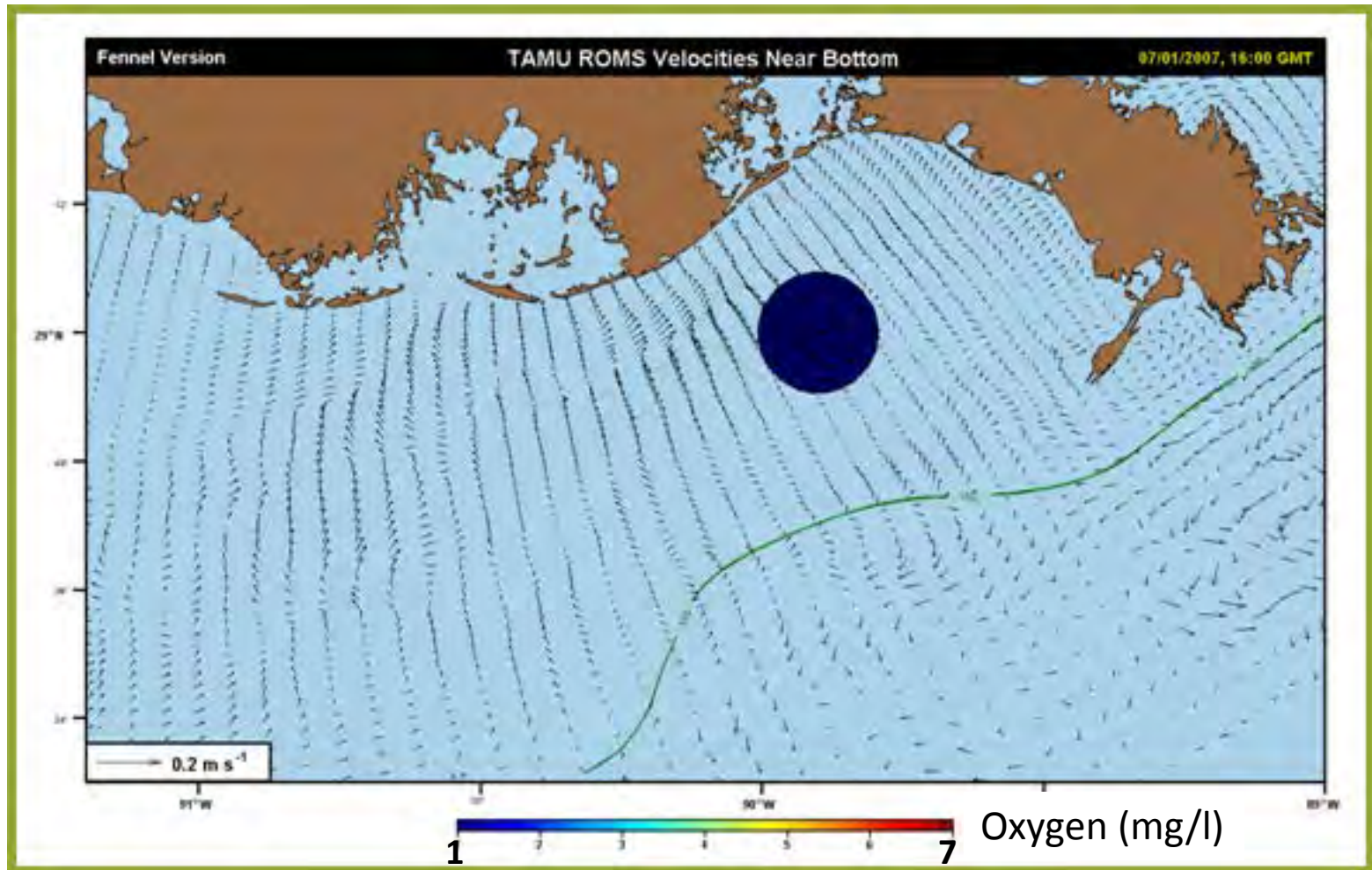
## Combined Data set for SURA and NODC



Courtesy Katja Fennel, Dalhousie University

# Where Does Hypoxic Bottom Water Come From?

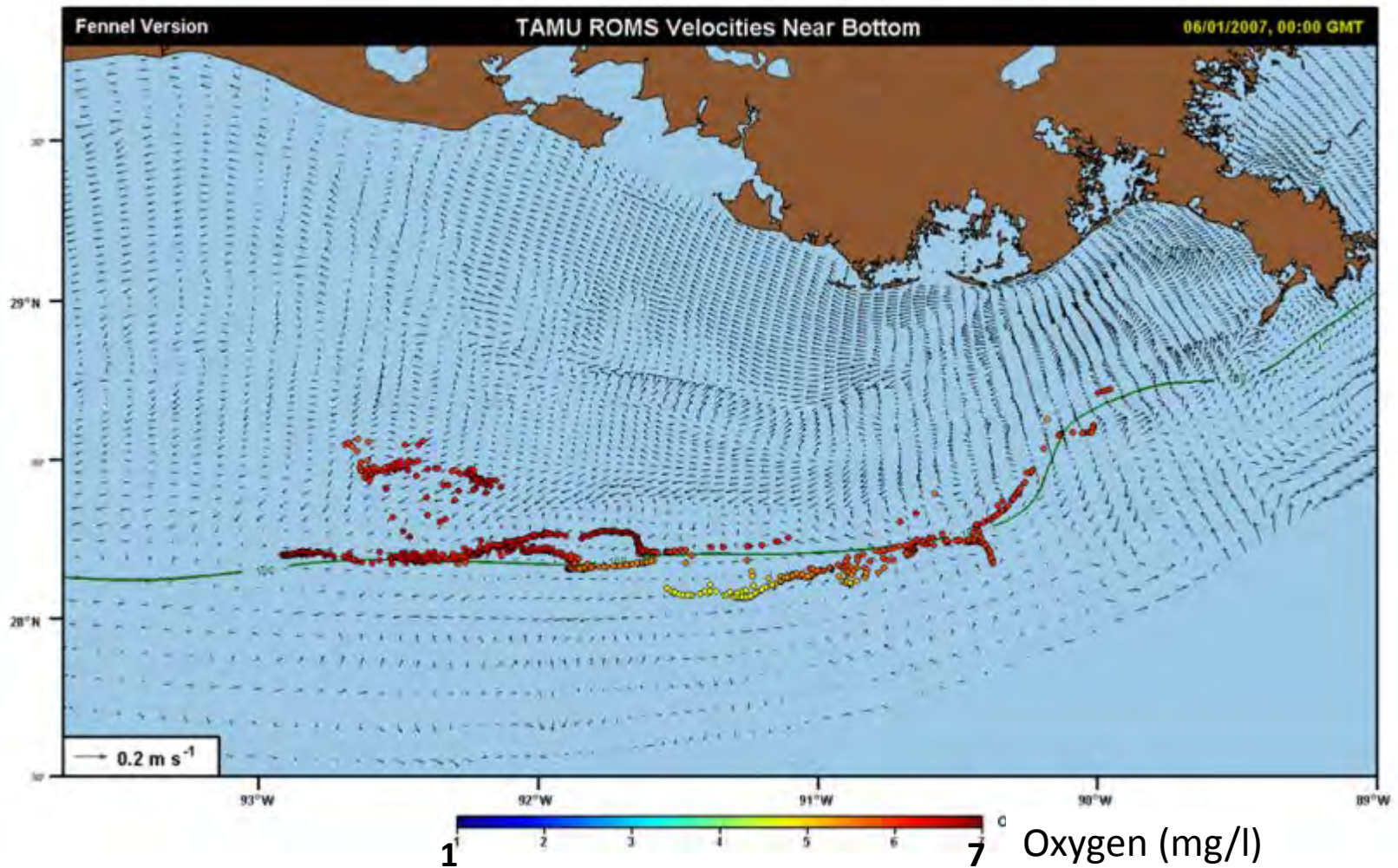
## Initial Lagrangian Tool Application



Courtesy Bruce Lipphardt, U. Delaware



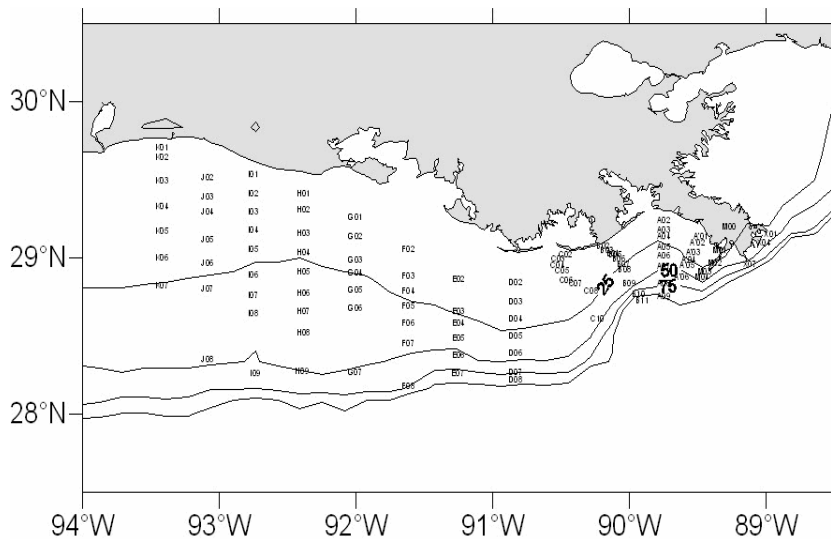
# Where Does Hypoxic Bottom Water Come From?



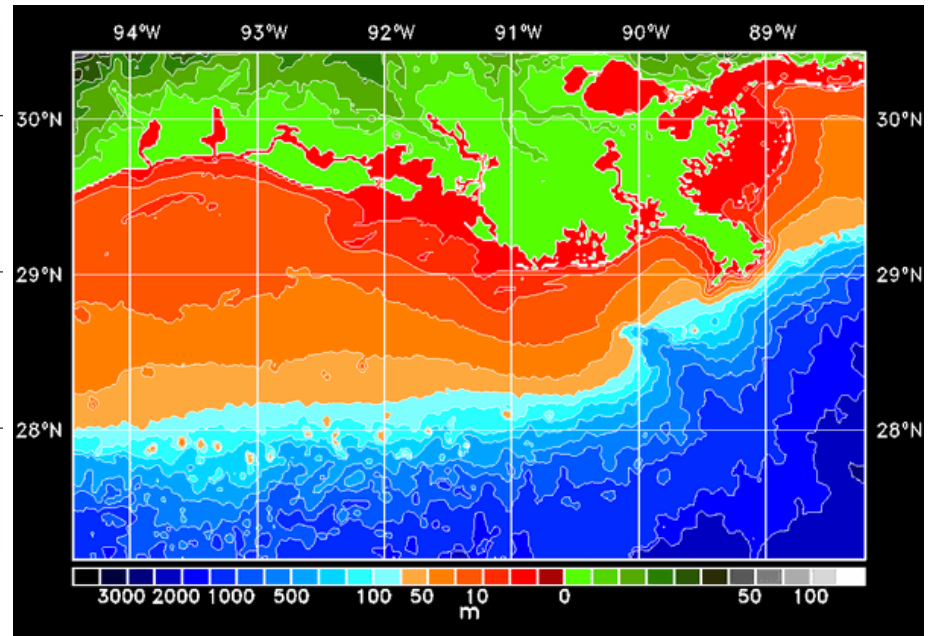
Courtesy Bruce Lipphardt, U. Delaware

# NRL Coastal Circulation Model coupled with EPA Ecosystem Model (Nested in NRL IASNFS)

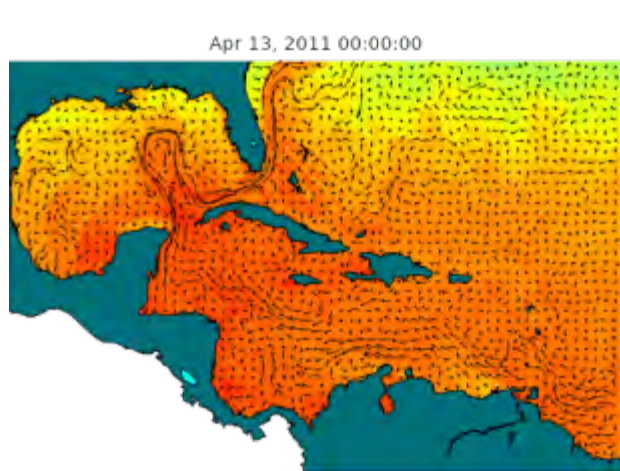
EPA Sampling Stations



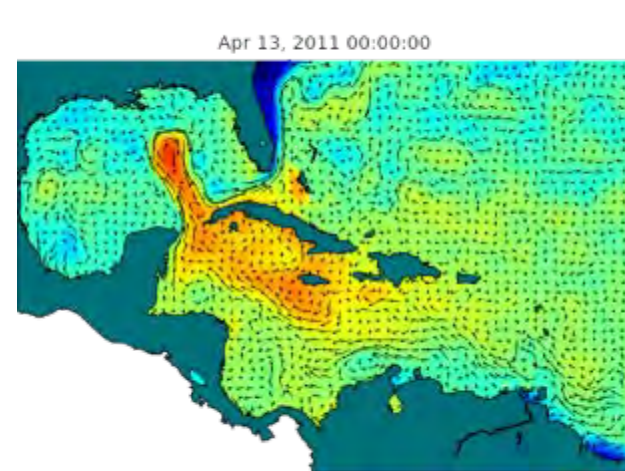
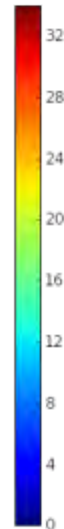
EPACOM Model Domain



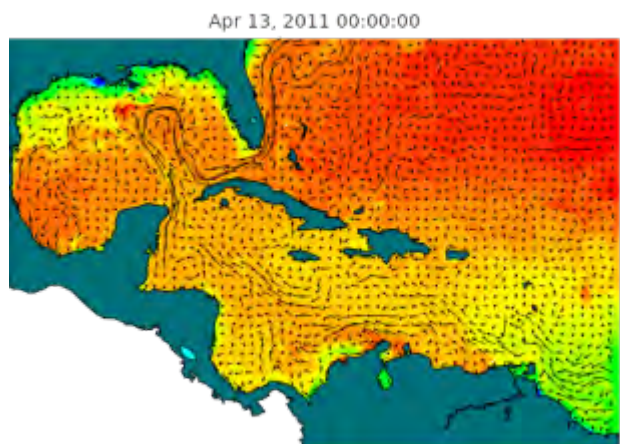
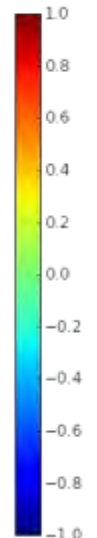
# NAVOCEANO AMSEAS Ocean Prediction System



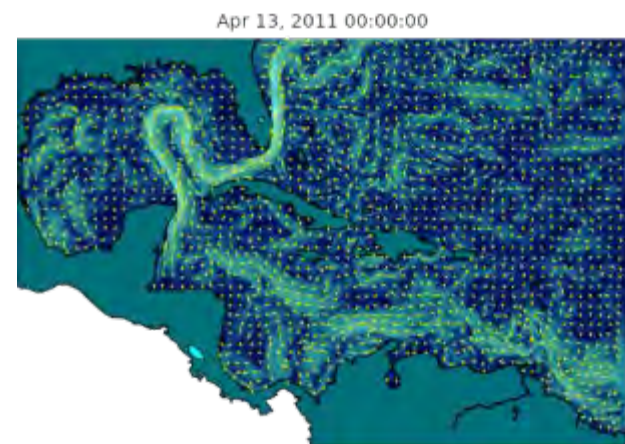
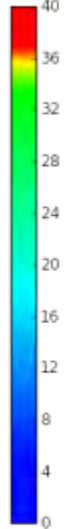
Surface Temperature



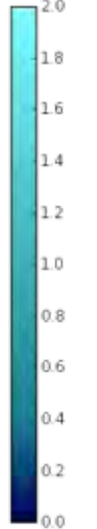
Sea Surface Height



Surface Salinity



Surface Currents



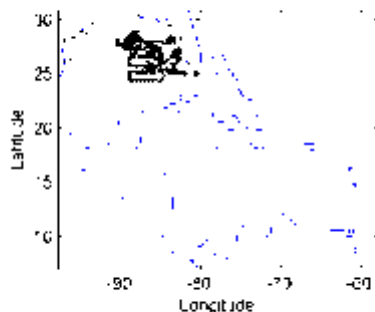


# Model Evaluations – AMSEAS-GOM – Forecast Days 1 – JUNE 2010

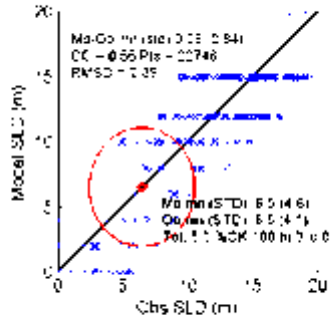
Sonic Layer Depth (SLD) and  
Temperature and Salinity  
at Surface & 100m

Courtesy Frank Bub  
(NAVOCEANO)

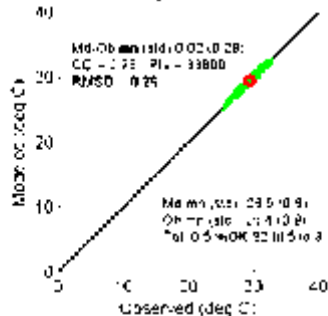
RNCOM-AMSEAS-GOM Taus 00 to 24 (41255 Pts) Between 20100601 and 20100702



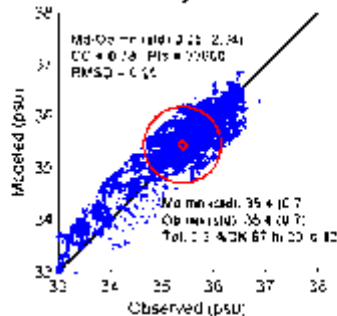
Sonic Layer Depth (SLD) (STDF: Outliers removed)



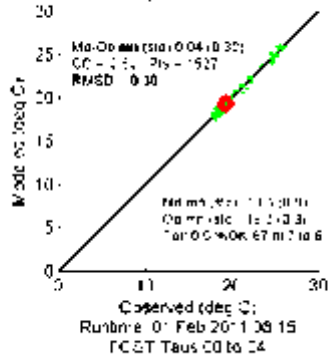
1 Temperature at 0m



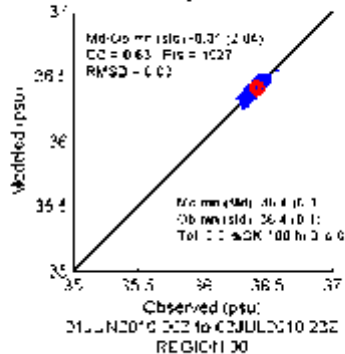
RNCOM-AMSEAS-GOM Salinity at 0m



2 Temperature at 100m



RNCOM-AMSEAS-GOM Salinity at 100m

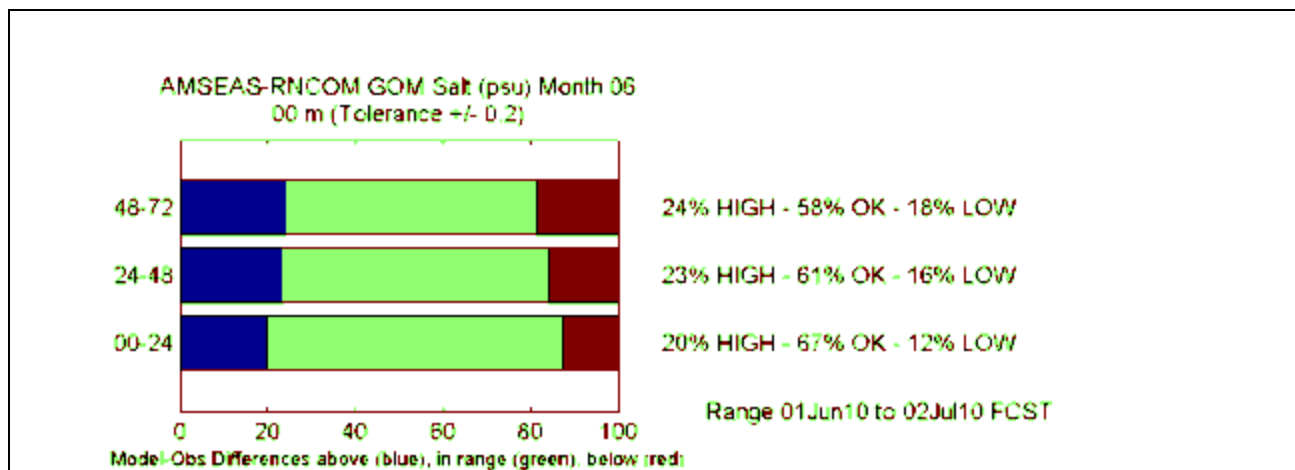
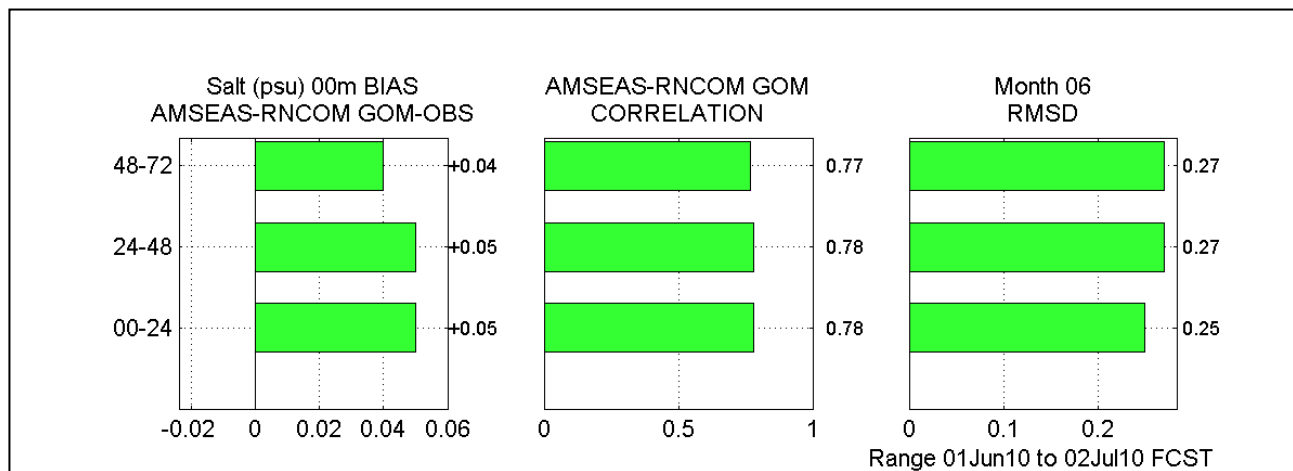




# AMSEAS-GOM-NCOM Forecast Days 1 / 2 / 3 – JUNE 2010

Bias, Correlation Coefficient, RMS Difference, Acceptable Ranges

## Surface Salinity



Courtesy Frank Bub (NAVOCEANO)

# NGI & NCDDC EDAC/ OceanNOMADS Improve Access to Gulf Data & Predictions

The screenshot shows a Mozilla Firefox browser window displaying the Northern Gulf Institute website. The browser's address bar shows the URL <http://www.northerngulfinstitute.org/edac/>. The website header includes the Northern Gulf Institute logo, a navigation menu with links for Research, Partnerships, Maps, Products, and Publications, News & Events, Data, About NGI, and Home, and several institutional logos including NOAA, LSU, and others.

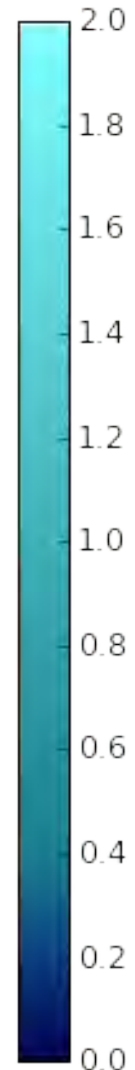
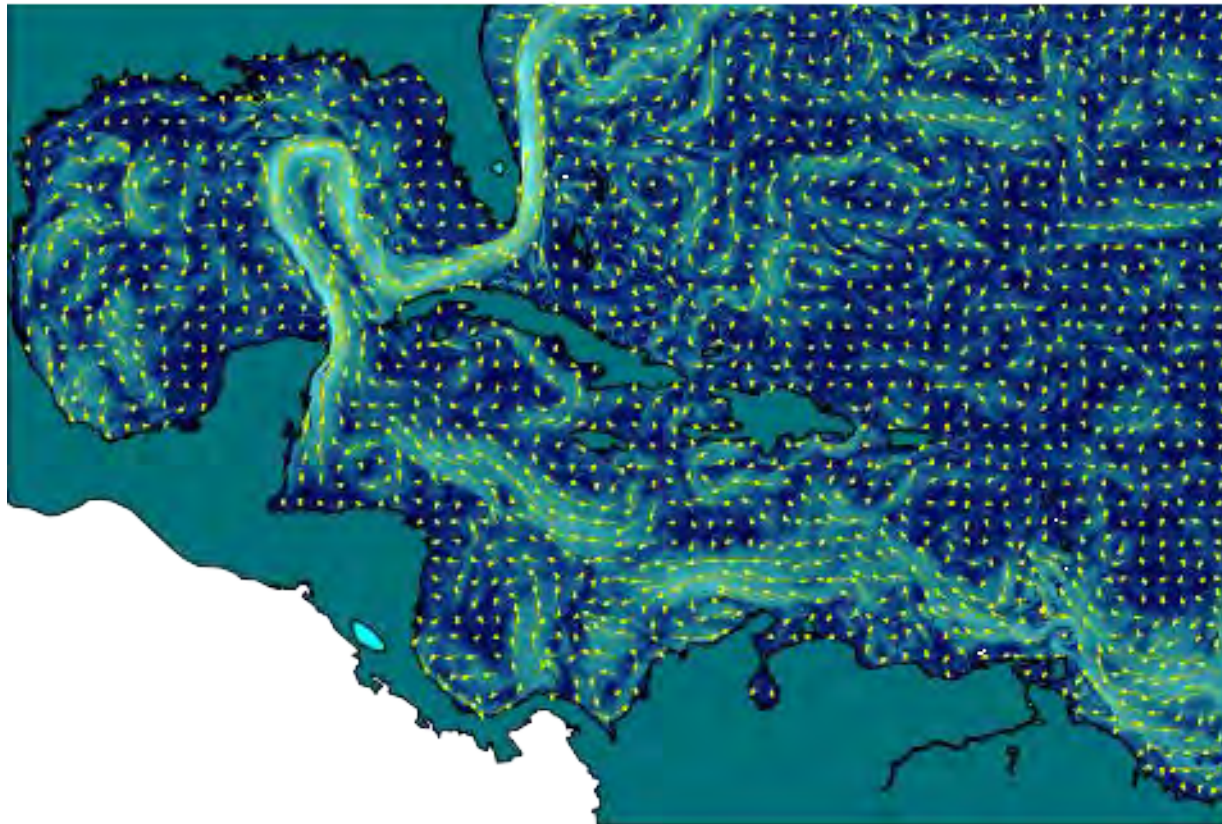
The main content area features a large map of the Gulf of Mexico with the text "NGI/NOAA Developmental Ecosystem Data Assembly Center" overlaid. To the left of the map, there is a section titled "Sea Surface Currents" with a sub-section "AmSeas Subsection" and a timestamp "May 9th, 2011 00:00:00". Below the map, the "Ecosystem Data Assembly Center" section contains text describing the center's mission and a small satellite image of the Gulf of Mexico.

On the right side of the page, there is a search bar and a sidebar with a "SEARCH" button. The sidebar contains a list of links under the heading "EDAC Home" and "OceanNOMADS", including links for "AmSeas", "U.S. East", "Global HCDM Regions", "NOAA's", "Other Areas", "Related Links", "Gulf of Mexico Data", "Gulf of Mexico Fisheries Data", "NOAA Data", "Northern Gulf Hyacinth Data", "Subaqueous Vegetation Data", "Waterbirds", "Related Links", "Other Data", "West Coast Observation System", and "Related Links". At the bottom of the page, there is a small text block: "This website is supported through funding from the national oceans & atmospheric administration" and logos for "MISSISSIPPI STATE UNIVERSITY" and "HPC".

<http://www.northerngulfinstitute.org/edac>



Apr 13, 2011 00:00:00



<http://testbed.sura.org/>  
<http://northerngulfinstitute.org/edac>