Marine Environmental

(Ocean Circulation, Wave, Atmosphere and Marine Ecosystem)

prediction system for the South Atlantic Bight and Gulf of Mexico (SABGOM) in support of Ecological Forecasting efforts

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SECOORA

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

NASA

NSF

USGS science for a changing world

GULF OF MEXICO RESEARCH INITIATIVE

Coastal Circulation and Ecosystem Nowcast/Forecast System for the South Atlantic Bight and Gulf of Mexico

Marine Weather | Ocean Wave | Ocean Circulation | Marine Ecosystem | Model Validation | Ensemble

84-Hour Nowcast Forcast

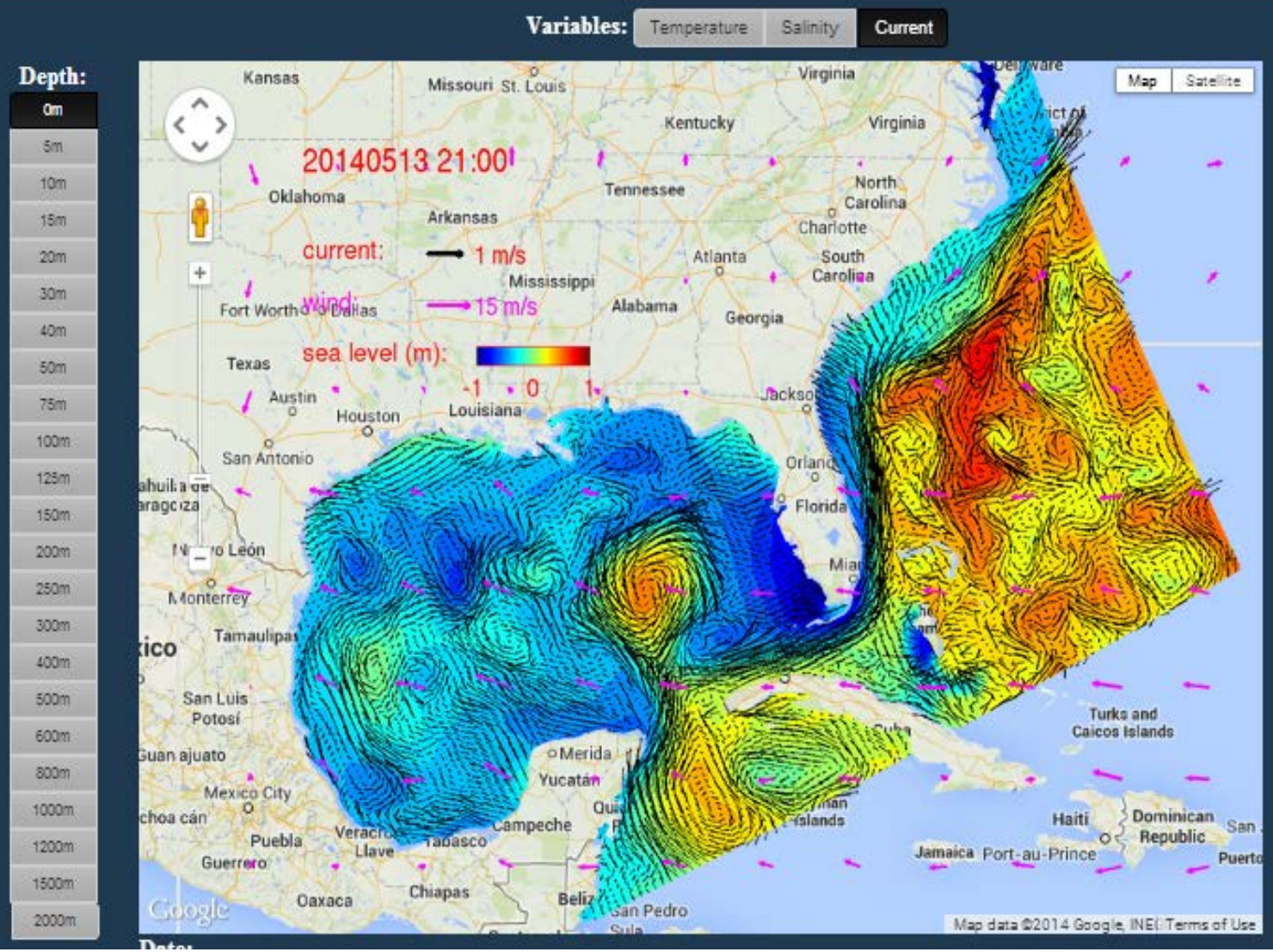
- Marine Weather (WRF)
- Ocean Wave (SWAN)
- Ocean Circulation (ROMS)
- Marine Ecosystem

+

- Model Validation
- Ensemble

Coastal Circulation and Ecosystem Nowcast/Forecast System for the South Atlantic Bight and Gulf of Mexico

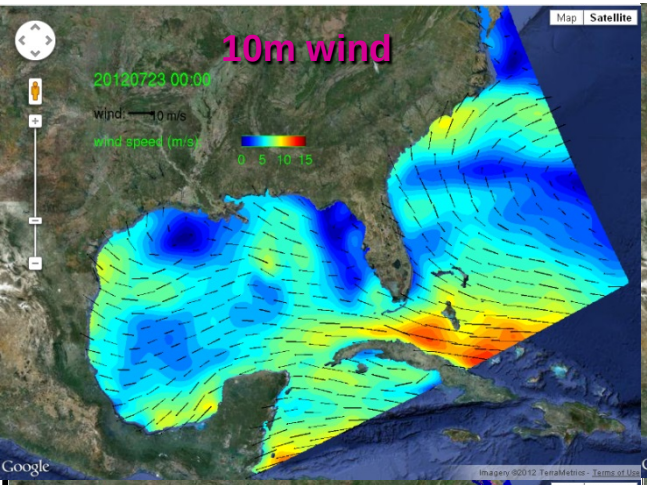
Marine Weather | Ocean Wave | Ocean Circulation | Marine Ecosystem | Model Validation | Ensemble | Tools/Data



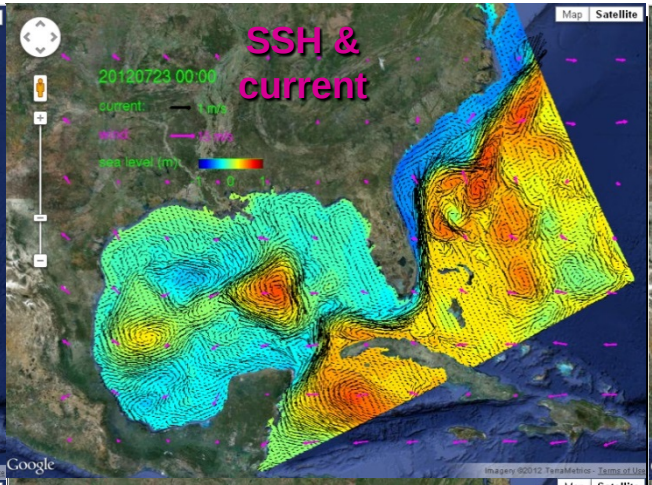
SABGM website: http://omgarch1.meas.ncsu.edu:8080/ocean-circulation/

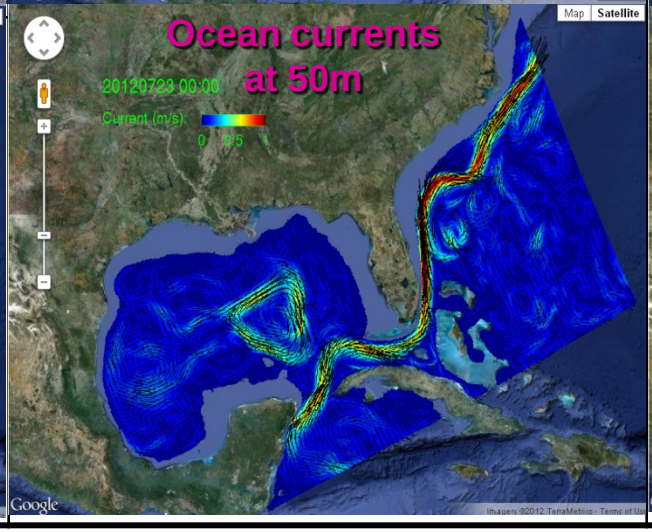
Daily Nowcast and Forecast of Marine Environmental Conditions

Marine Weather & Ocean Wave

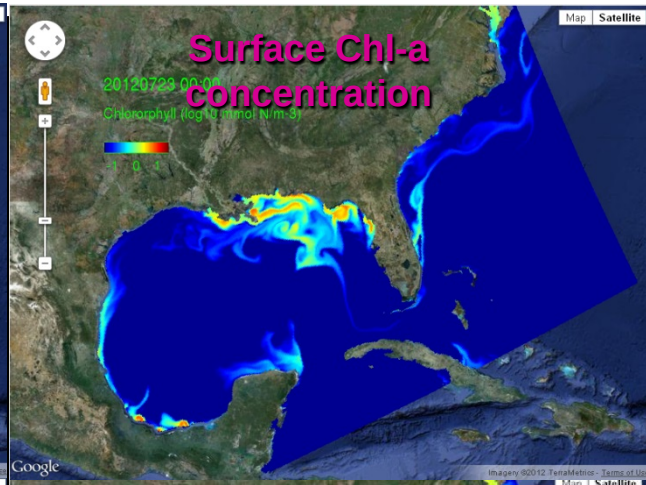


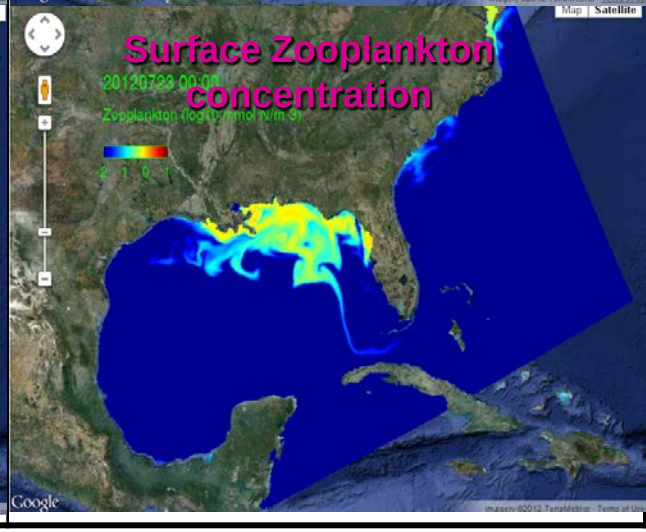
Ocean Circulation





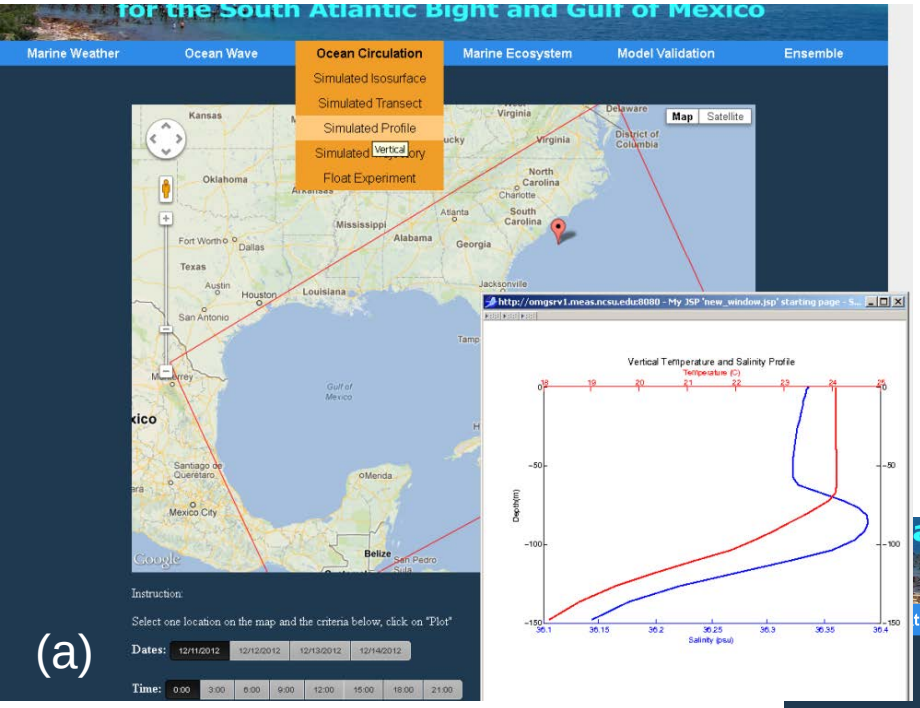
Marine Ecosystem

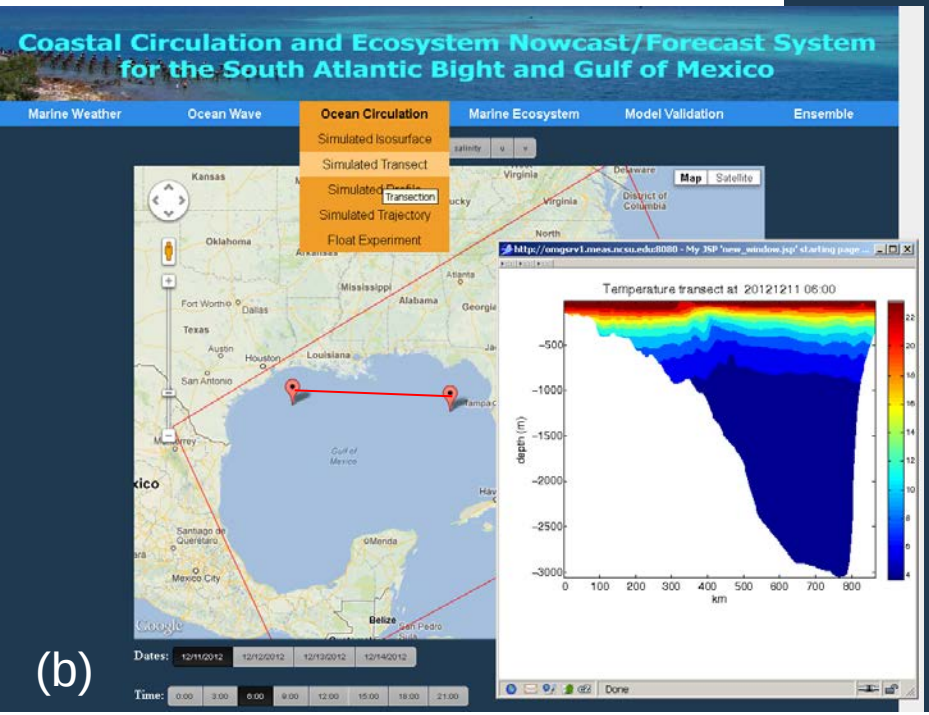


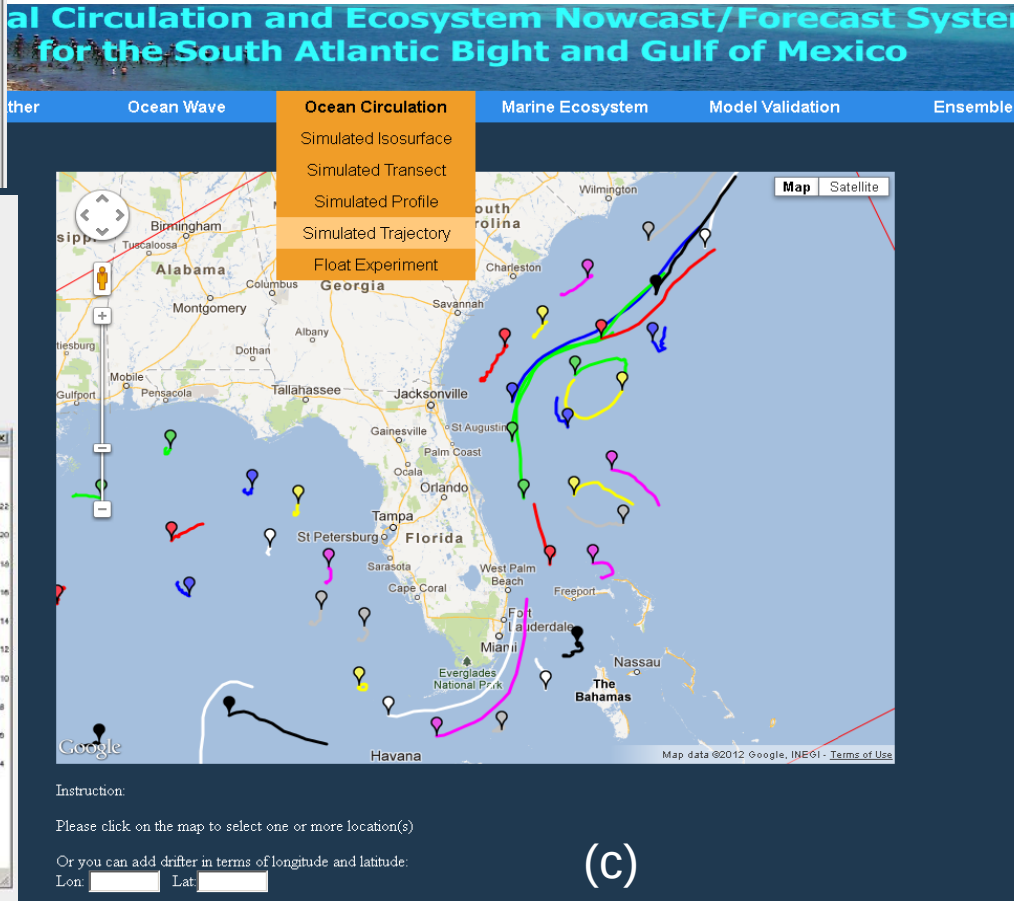


Online user-defined functions

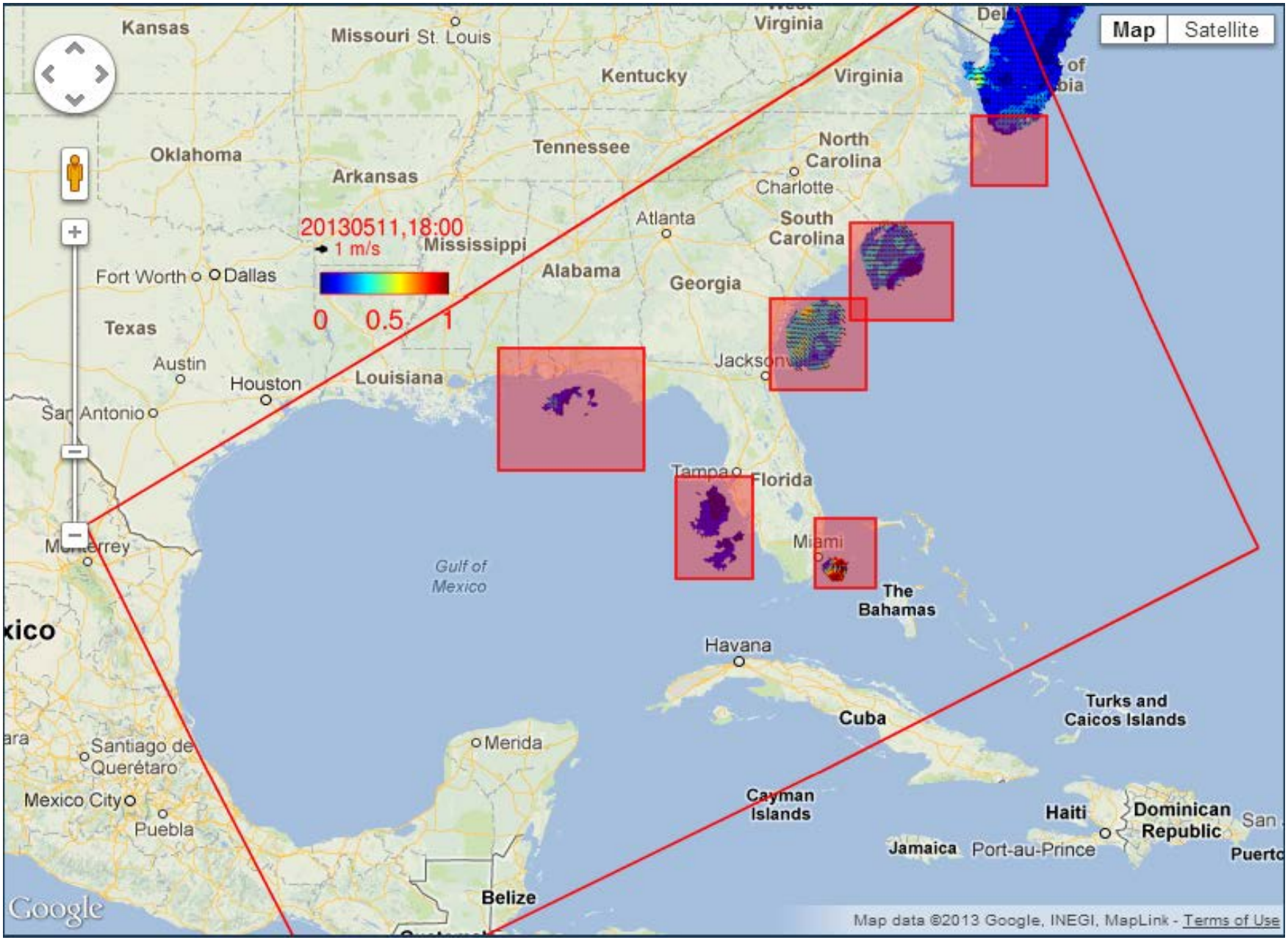
a) virtual mooring profile (T/S/V)
b) virtual transect (T/S/V)
c) 84-hour virtual drifter trajectory



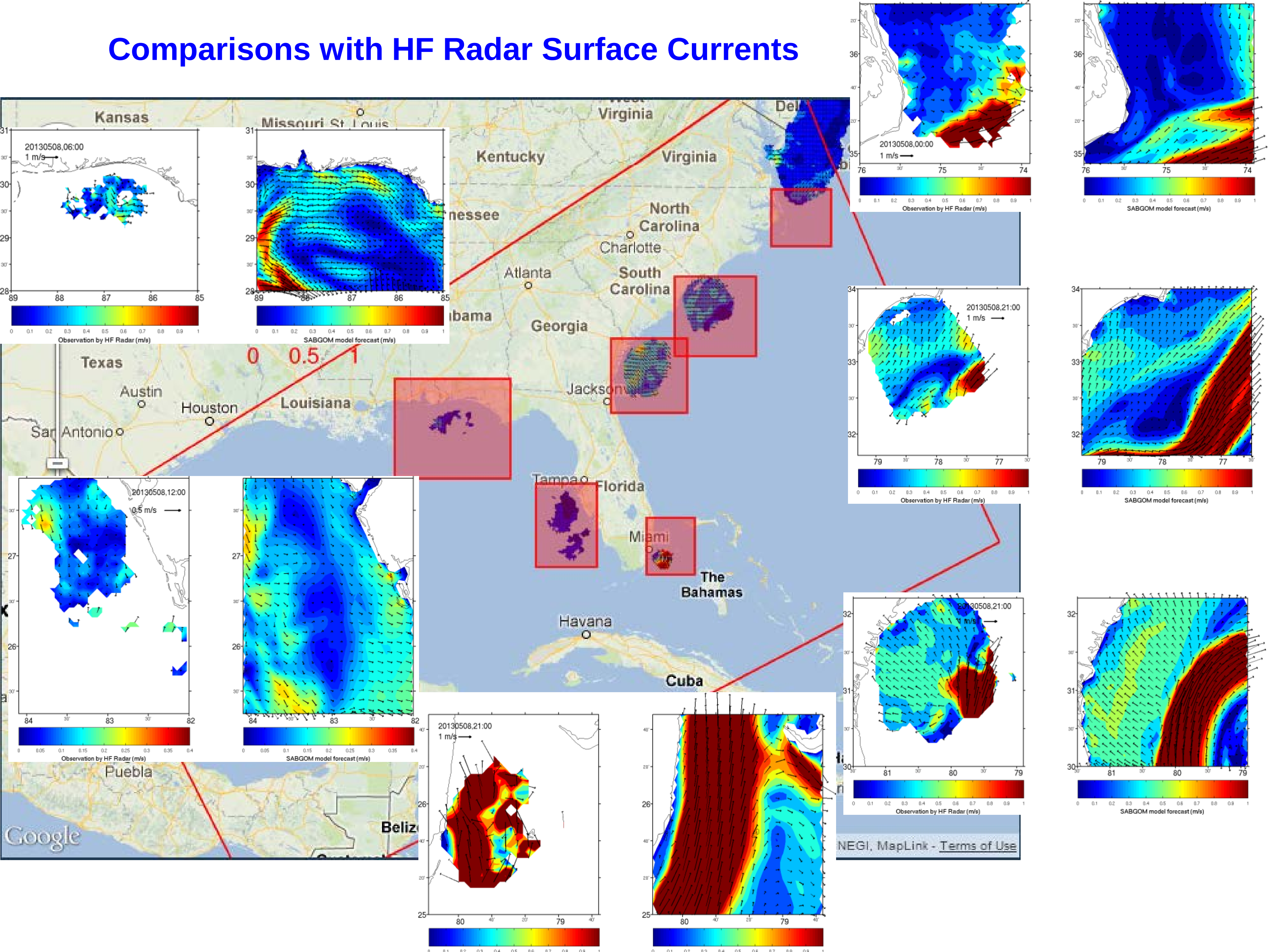




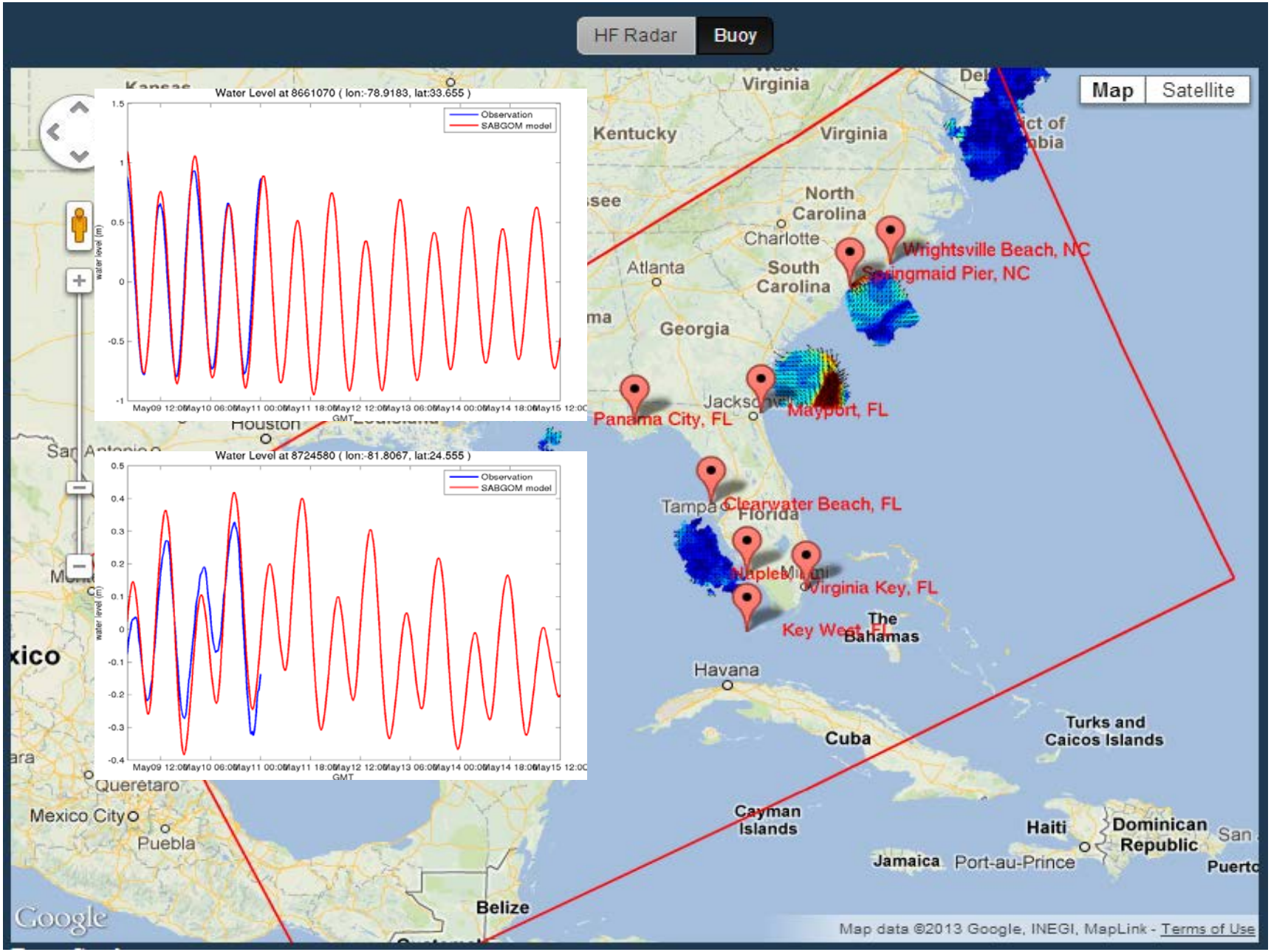
Online Skill Assessment: Comparisons with HF Radar Surface Currents

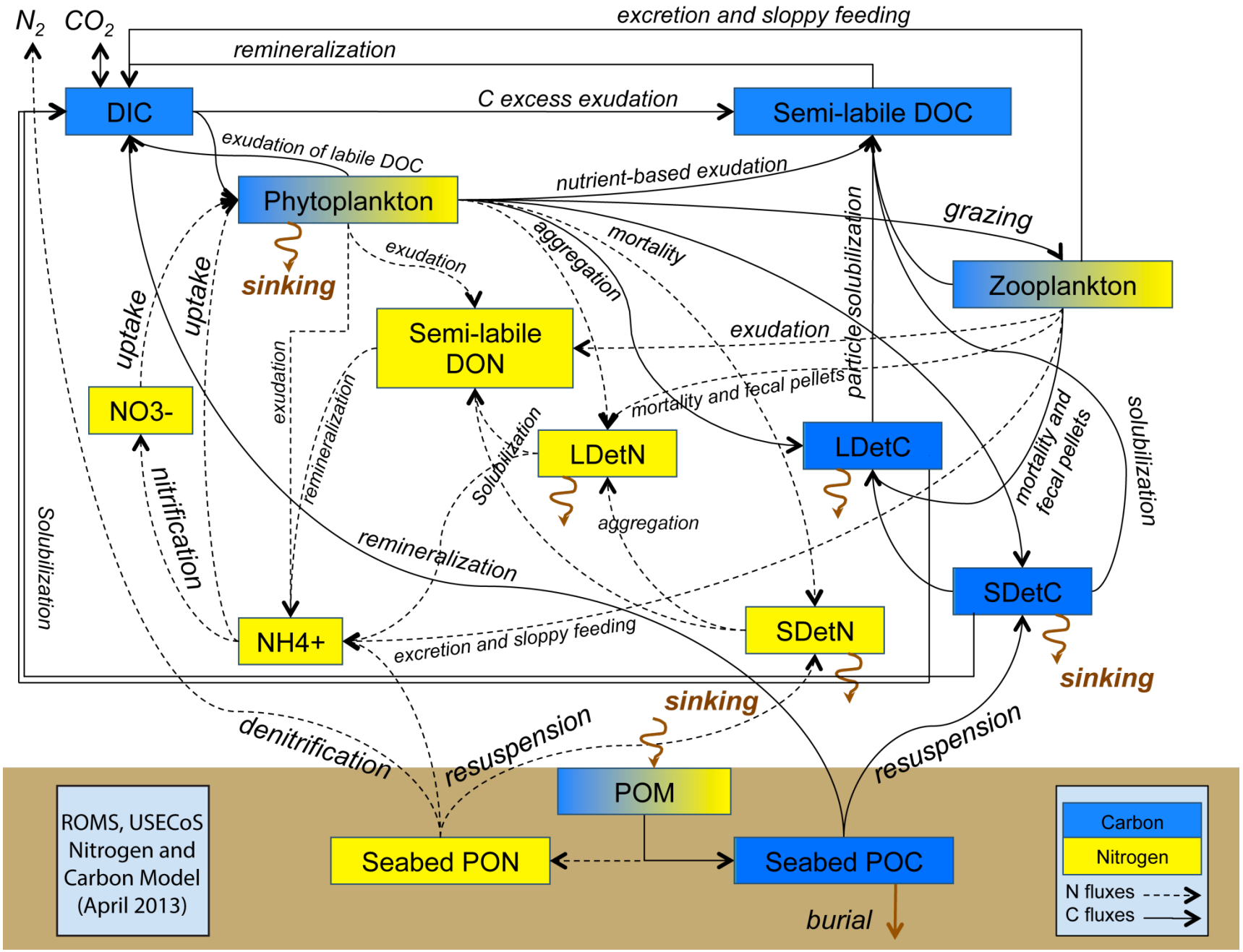


Comparisons with HF Radar Surface Currents



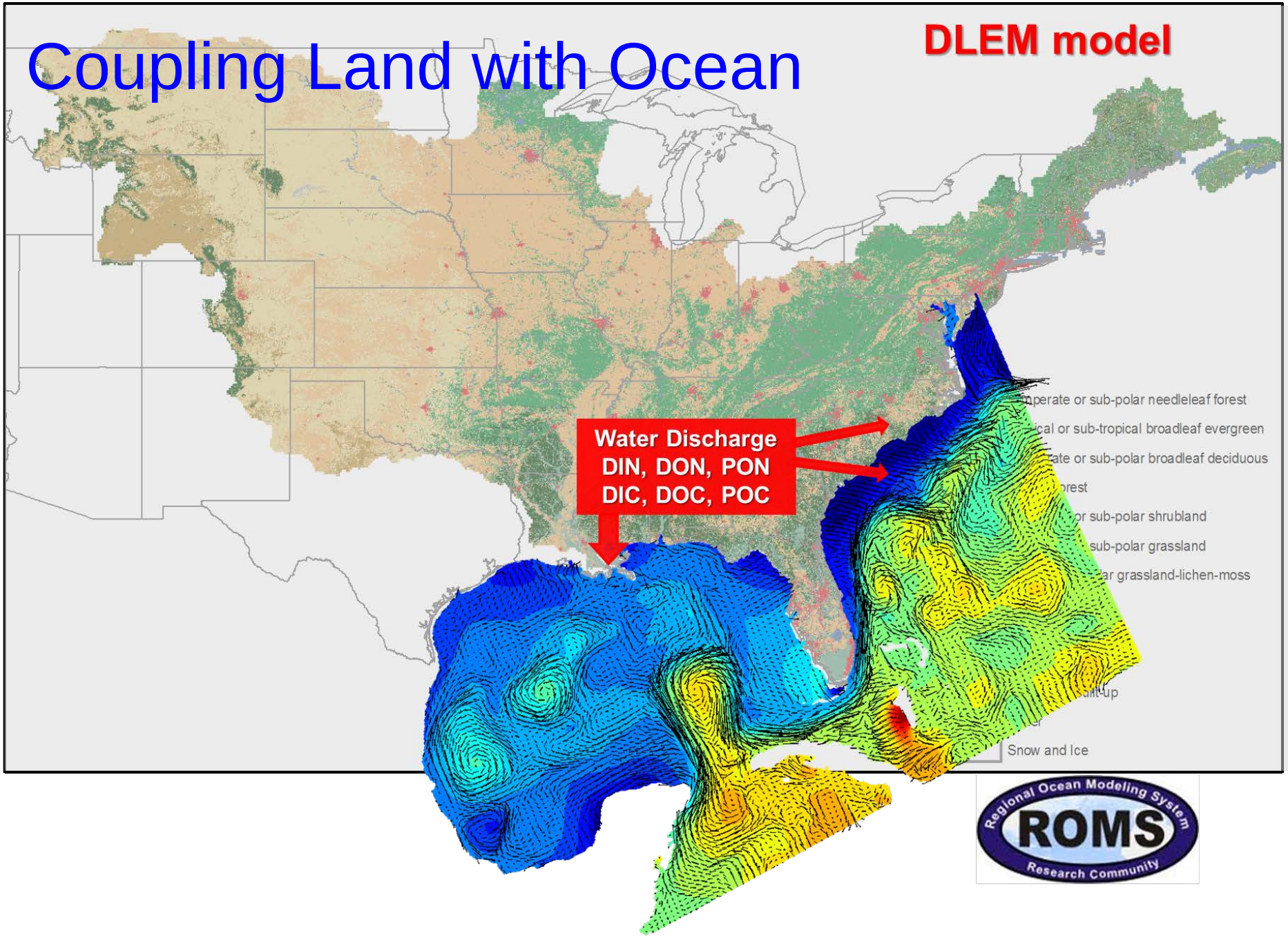
Online Skill Assessment: Comparisons with NOS Sea Level Observations





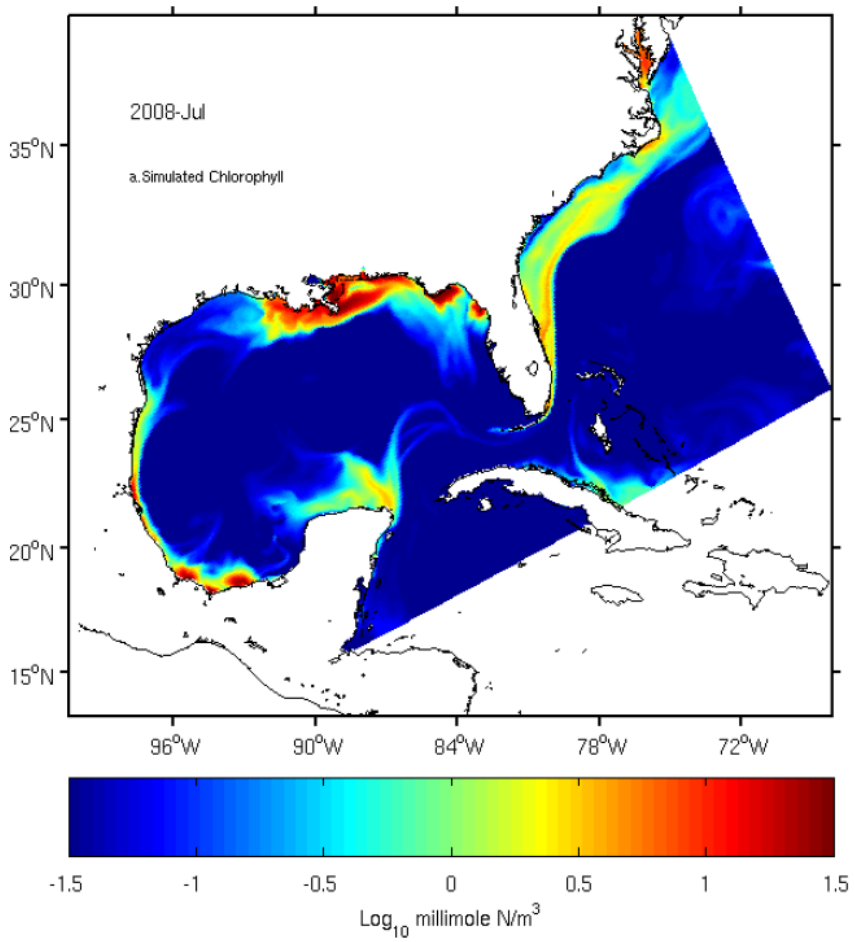
Fennel et al., 2006, Fennel et al., 2009, Hoffman et al., 2011

Coupling Land with Ocean

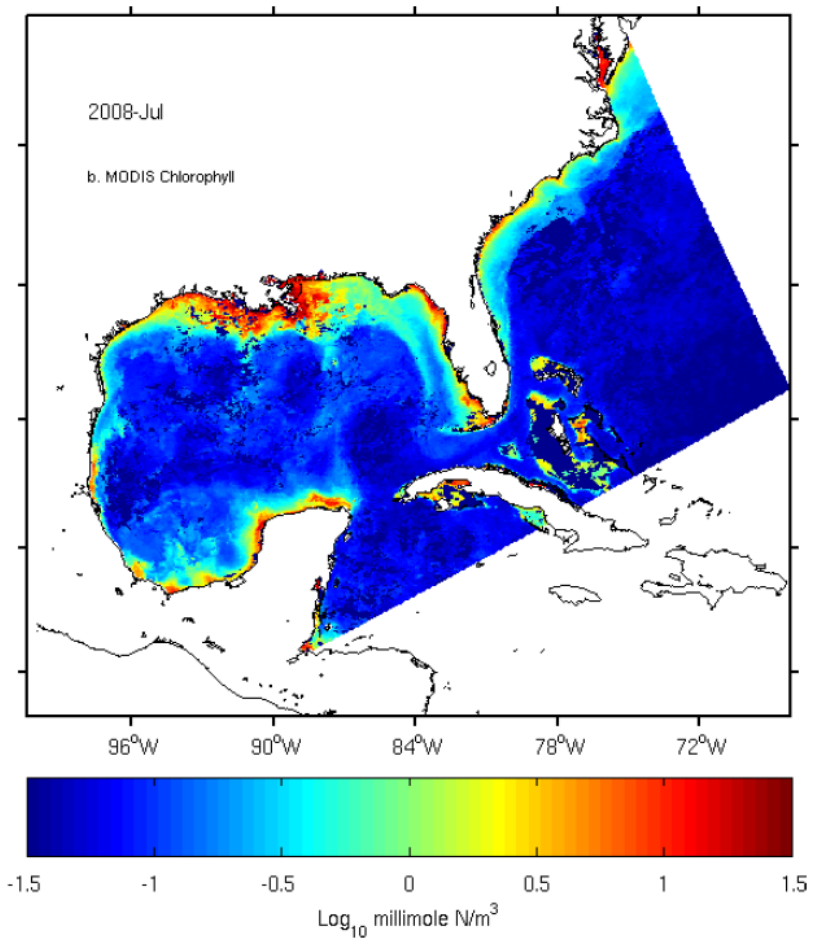


Monthly Surface Chl-a Comparison

SABGOM

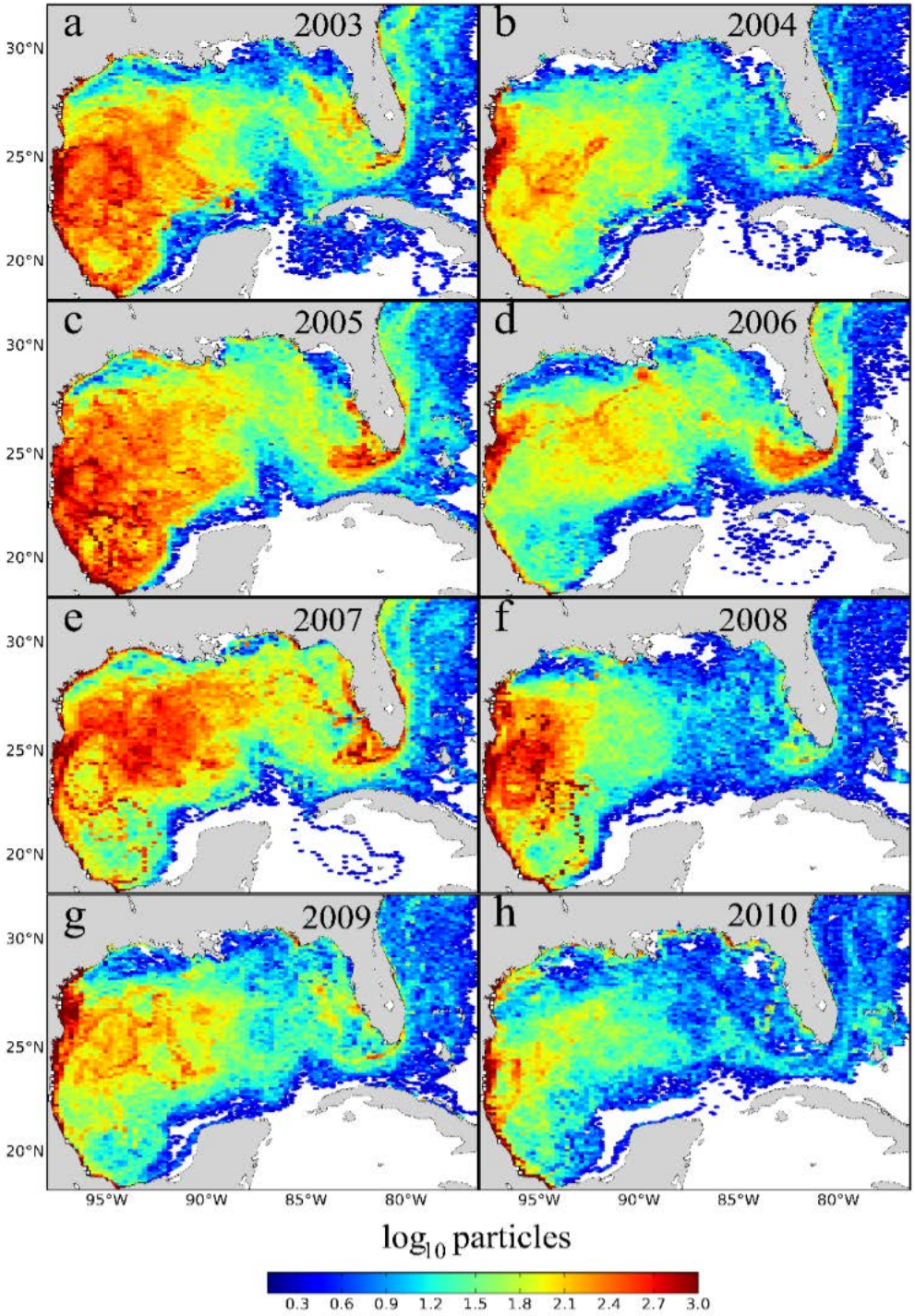


MODIS



Other variables: NO_3, NH_4, Primary Production, Phytoplankton, Zooplankton, TIC, Alkalinity, pCO2, CO2-airsea, Oxygen

Xue, He, Fennel et al. (2013)



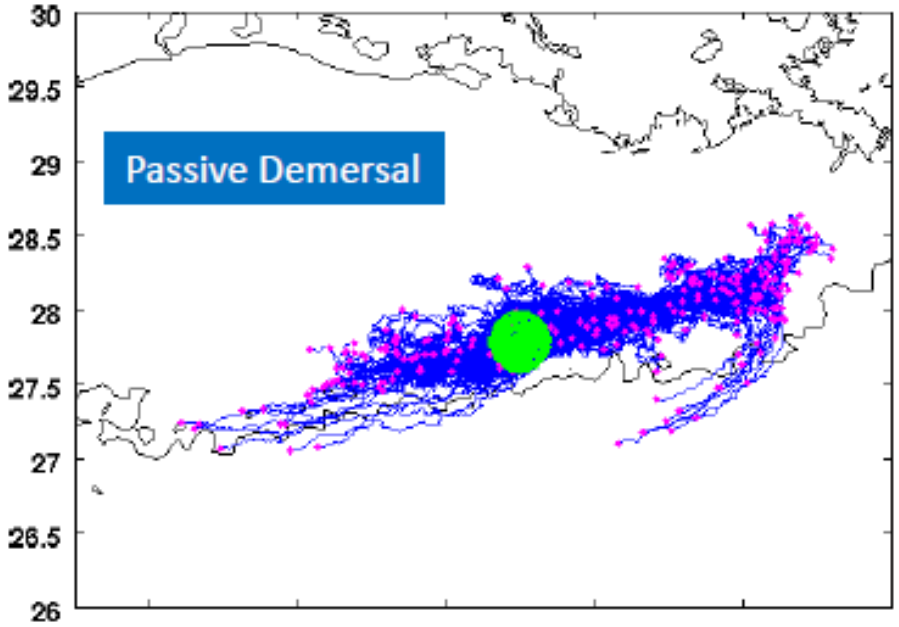
Predicted early oceanic-stage Kemp's ridley turtles in the Gulf of Mexico

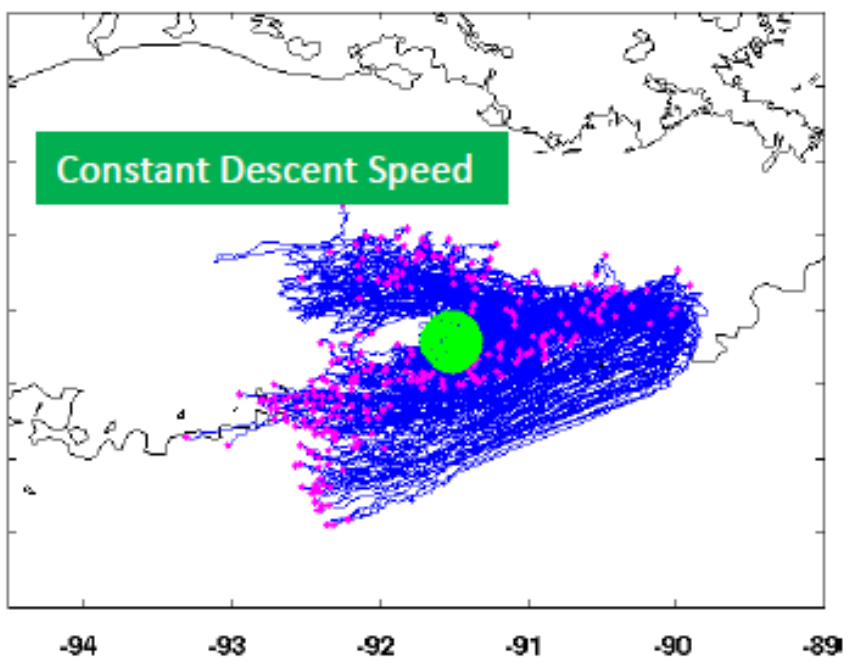
The information is used to estimate the early survival of this endangered turtle species, which nests almost exclusively in the western Gulf of Mexico

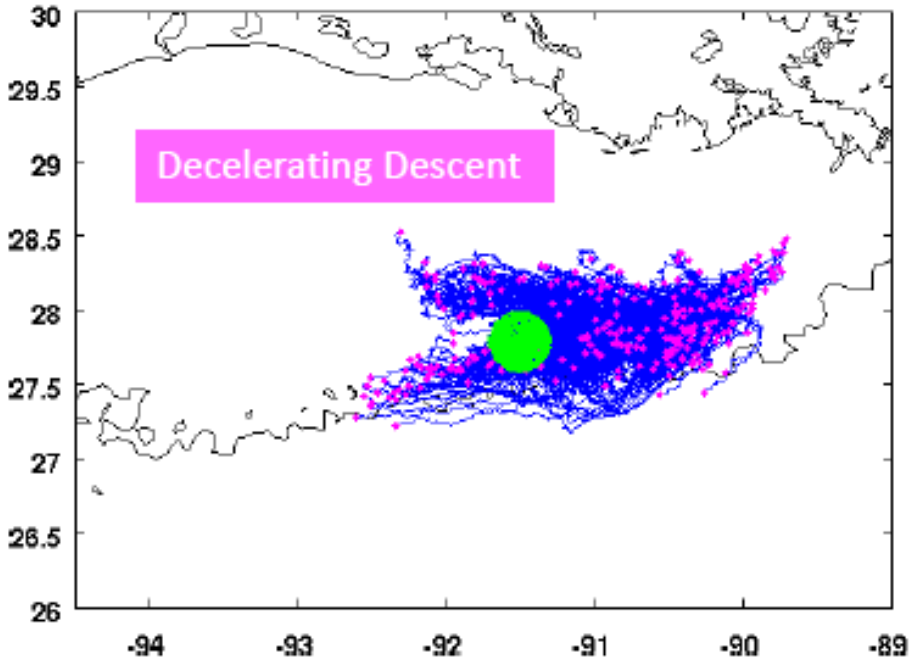
Putman and He (2013)

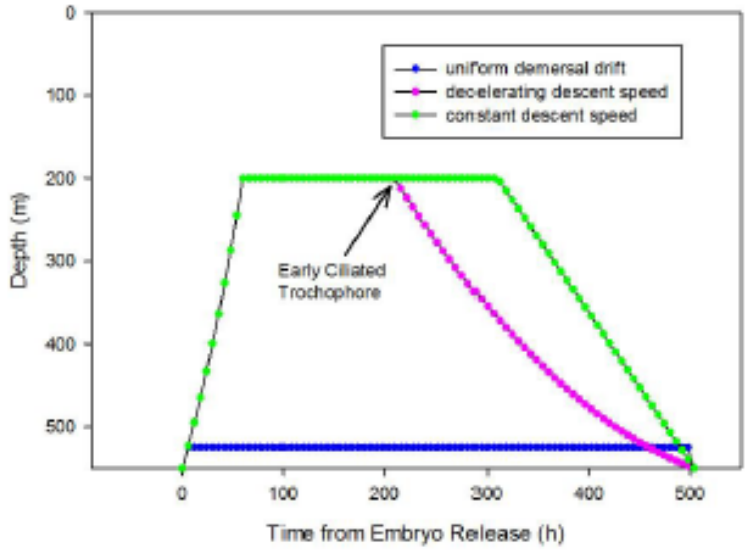
Putman et al. (2013)

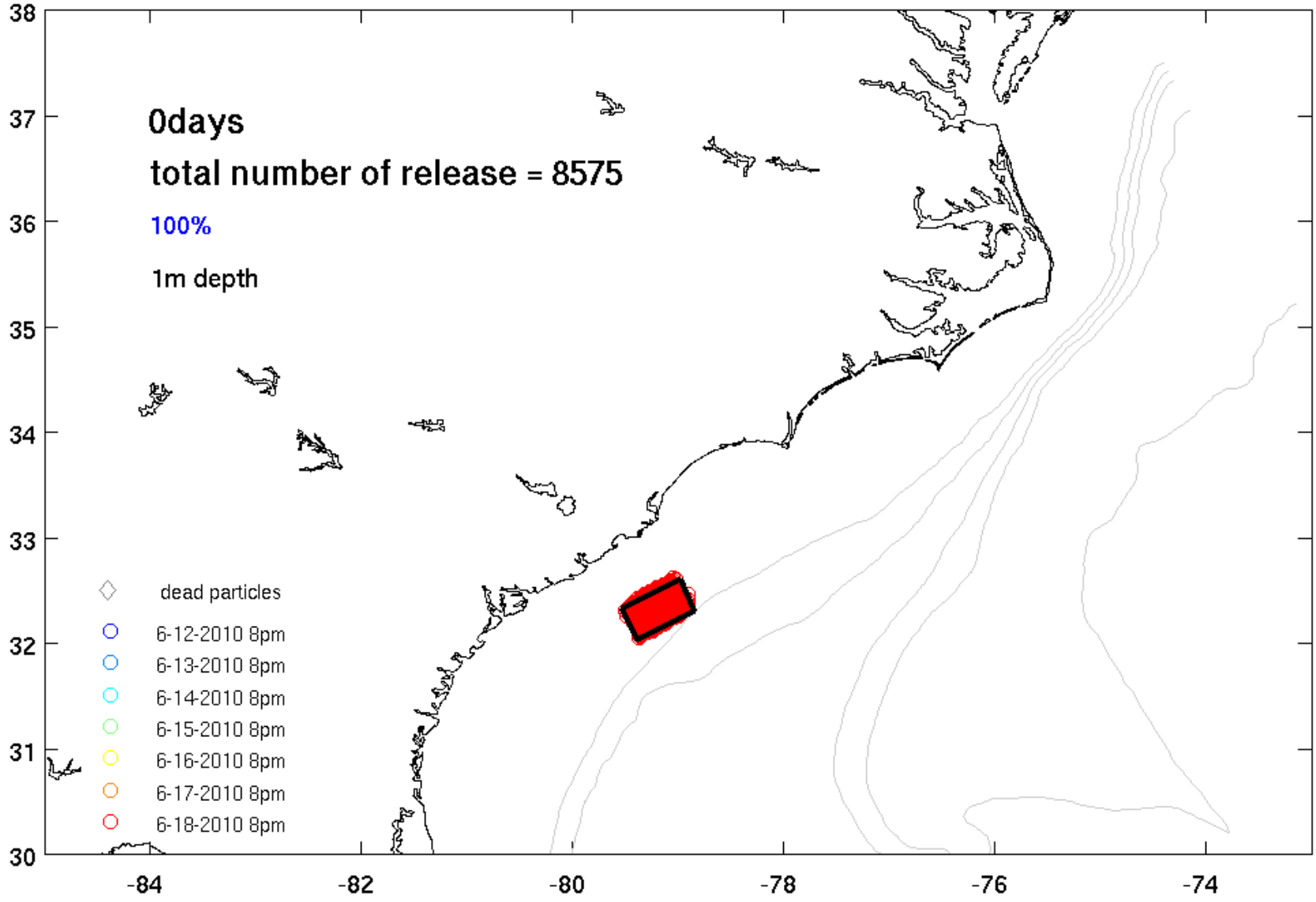
Modeling Lamellibrachia Luymesi distribution










0days
total number of release = 8575
100%
1m depth
dead particles
6-12-2010 8pm
6-13-2010 8pm
6-14-2010 8pm
6-15-2010 8pm
6-16-2010 8pm
6-17-2010 8pm
6-18-2010 8pm
38
37
36
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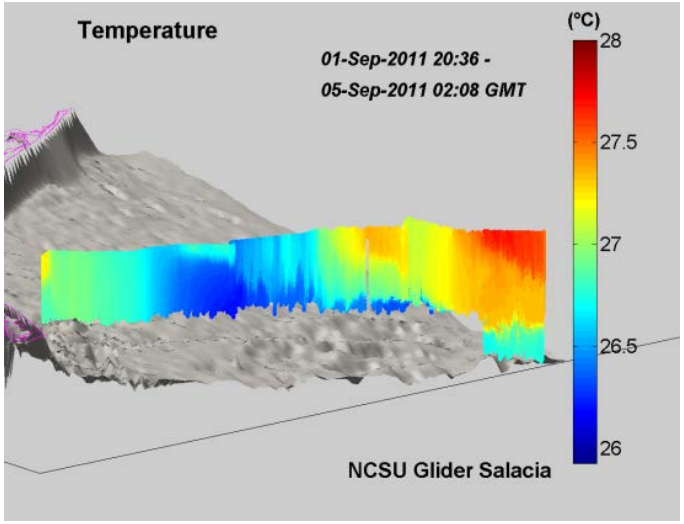
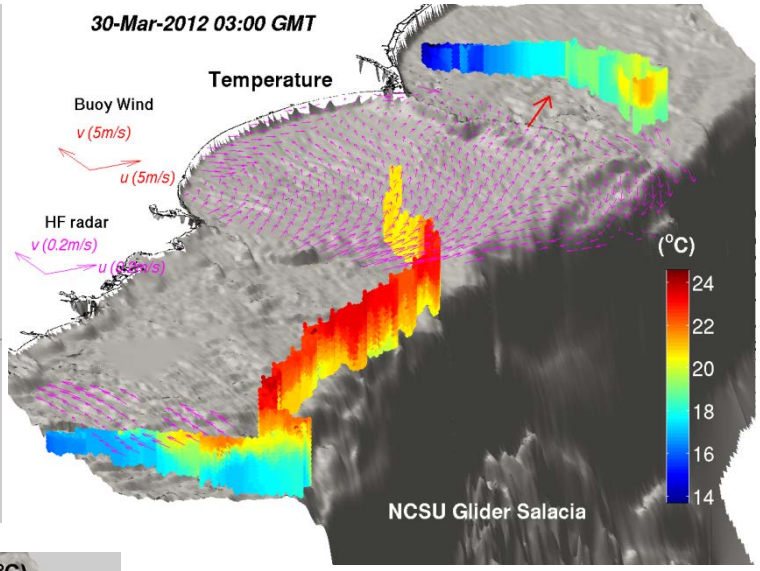
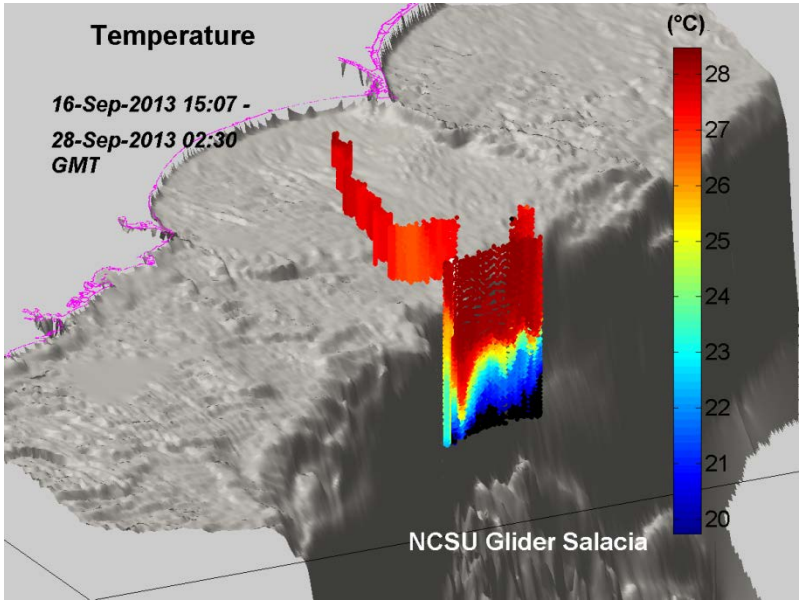
32
31
30
-84
-82
-80
-78
-76
-74

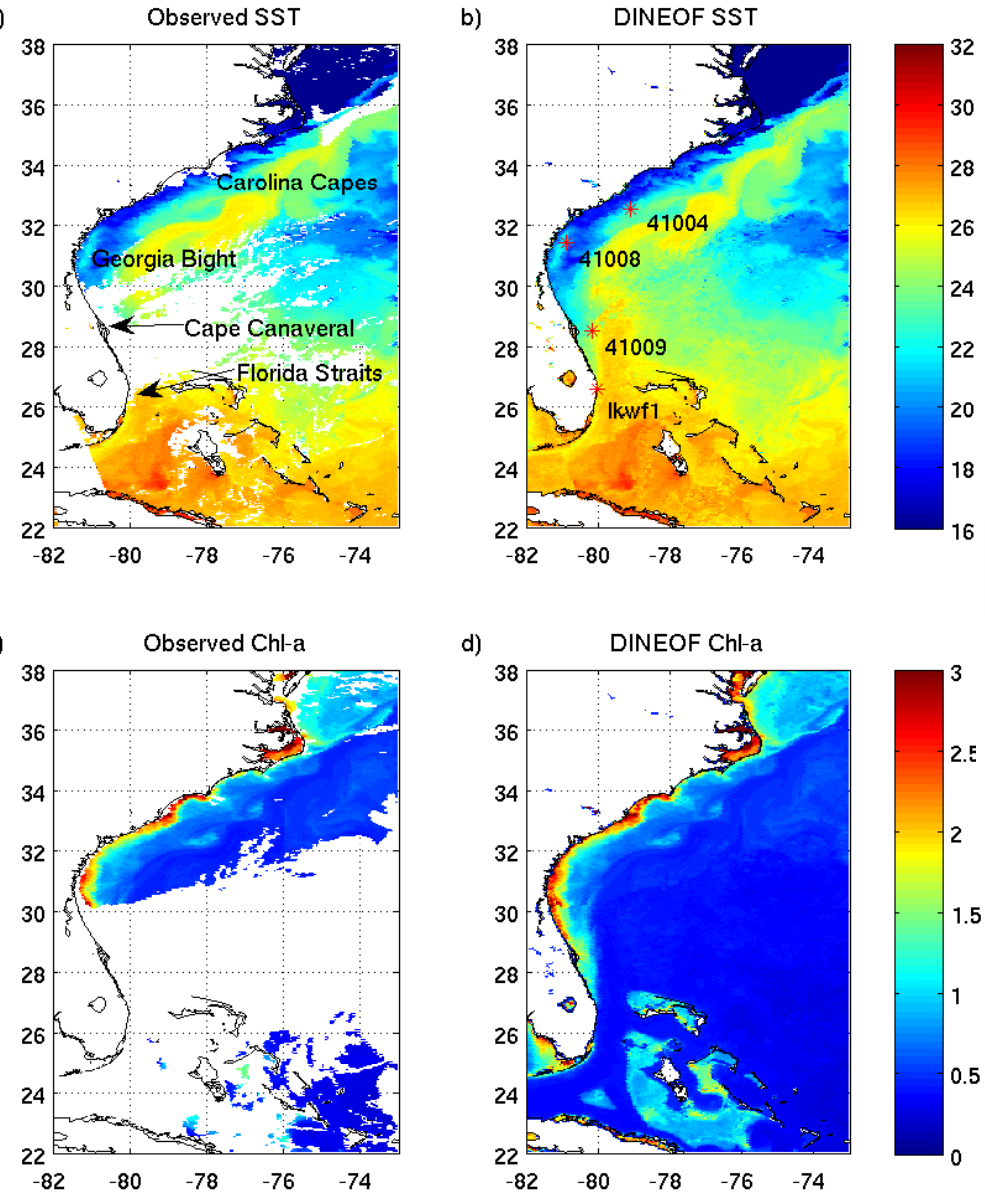


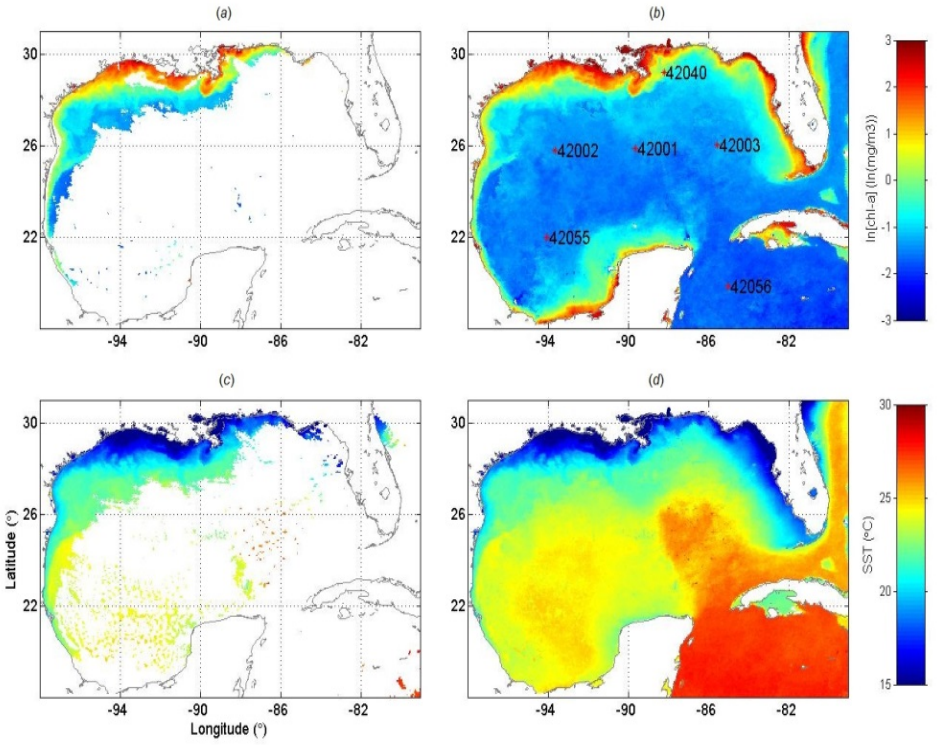




- Vemco hydrophone receivers attached to the glider
- use sounds to track locations of species and their abundance
- Key Species: Right Whales, tiger sharks, Atlantic sturgeon, Atlantic Salmon

EOF based Daily Cloud–free SST and Chl-a reanalysis





Period: 11 years (2003- 2013)

Miles, Moore and He (2009);
Miles and He (2010);
Zhao and He (2012)
Shropshire, Li and He (2014)

NC STATE UNIVERSITY

Summary

- Marine Environmental Nowcast Forecast System for the Gulf of Mexico and South Atlantic Bight
  - ❑ baroclinic ocean circulation (T/S/V/sea level)
  - ❑ ocean wave (height and direction)
  - ❑ marine meteorology (U10, SLP, air temp, etc)
  - ❑ marine ecosystem (NO_3, NH_4, phytoplankton, Zooplankton, TIC, Alkalinity, pCO2, Oxygen)
  - ❑ Hindcast solution available since 2003
- Value added product
  - ❑ online model skill assessment
  - ❑ online user defined virtual mooring, virtual transect, virtual drifter trajectory simulations
  - ❑ model ensembles and data assimilation
  - ❑ seasonal forecast and regional downscaling of climate scenarios
- Glider based hydrography and marine species observations
  - ❑ in situ, subsurface, AUV and acoustic technology
- Cloud-free satellite data reanalysis
  - ❑ daily SST and chl-a data since 2003

NOAA Ecological Forecasting Service Priorities:

- ➢ Harmful Algal Bloom
- ➢ Hypoxia
- ➢ Pathogens
- ➢ Habitat/Species Distribution

Thank You !

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SABGOM site: http://omgsrv1.meas.ncsu.edu:8080/ocean-circulation