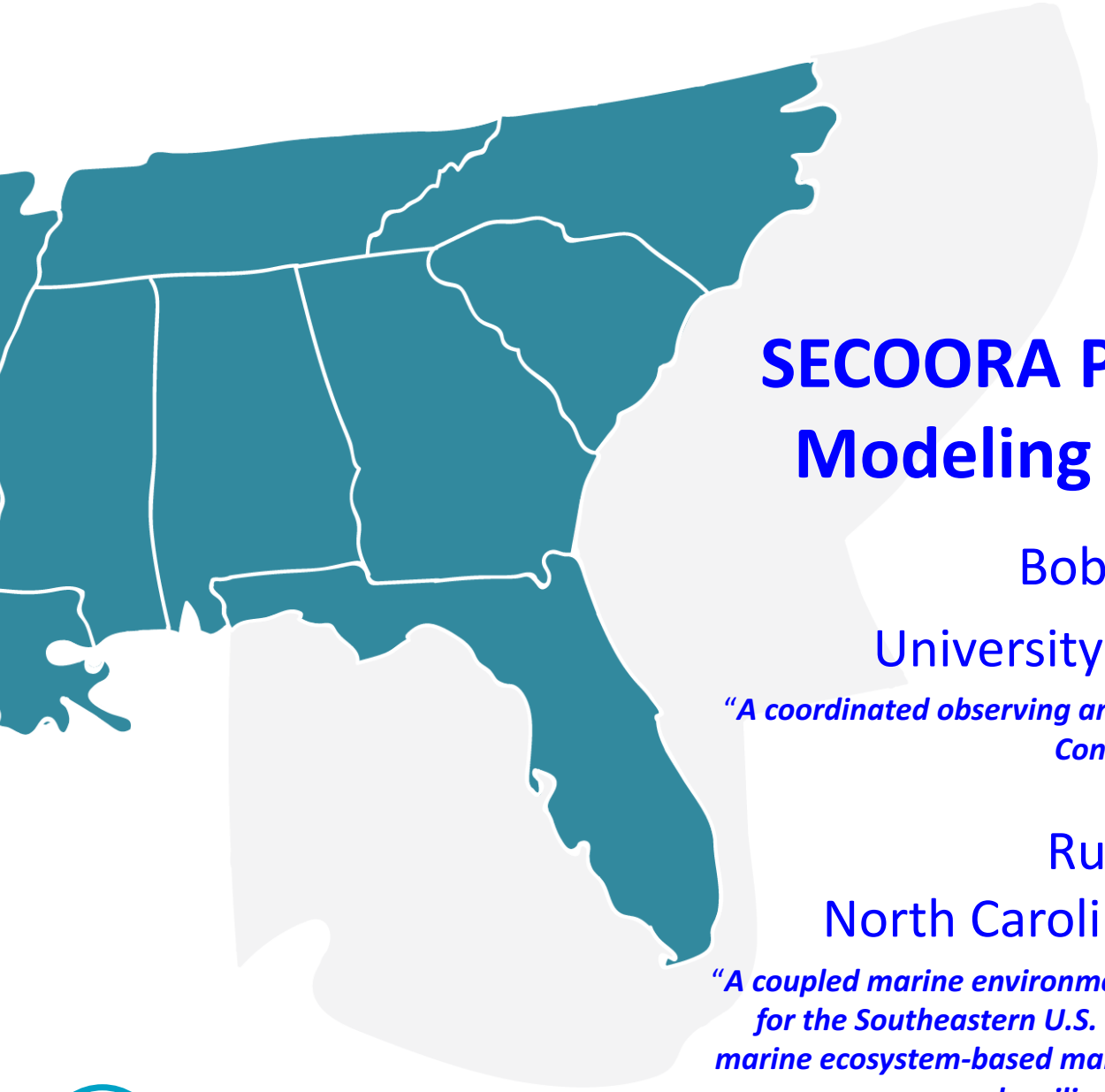


10-Year Anniversary

SECOORA

SECOORA Project Updates: Modeling and Prediction

Bob Weisberg

University of South Florida

"A coordinated observing and modeling system for he west Florida Continental shelf"

Ruoying He

North Carolina State University

"A coupled marine environmental assessment and prediction system for the Southeastern U.S. coastal ocean in support of effective marine ecosystem-based management, efficient marine operations, and resilient coastal community"

IOOS
Integrated Ocean Observing System

www.secoora.org
#secoora2017

West Florida Coastal Ocean Model (WFCOM)

- WFCOM is designed to downscale from the deep-ocean, across the continental shelf and into the estuaries by nesting the unstructured grid FVCOM in the structured grid Gulf of Mexico HYCOM.
- Resolution varies from ~8 km along the open boundary to 150 m in the estuaries.
- The WFCOM domain is designed to benefit from HYCOM data assimilation (constraining the deep-ocean/WFS interactions); without which deep-ocean errors along the open boundary would render the WFS simulations less than useful.
- Daily, automated Nowcast/Forecasts are posted on the web and distributed to NOAA GOODS via THREDDS.
- Recent published societal and ecological applications include: How Deepwater Horizon oil arrived on northern Gulf beaches, Origins and pathways of water upwelled onto the WFS, Season prediction of K. brevis red tide, Solving the gag grouper recruitment conundrum. More generally, we have shown that there exists a certain spatial order to ecological observations on the WFS and this spatial order is associated with the coastal ocean circulation.

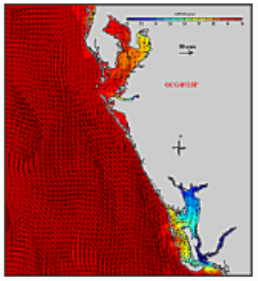
http://ocgweb.marine.usf.edu/Models/FVCOM/fvcom_index.html

Tampa Bay and Charlotte Harbor Regions

Hindcast Nowcast 24 hr Forecast 48 hr Forecast

2017	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2016	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2015	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2014	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2013	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2012	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2011	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2010	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

Months shaded in blue have dates available. Click on month.

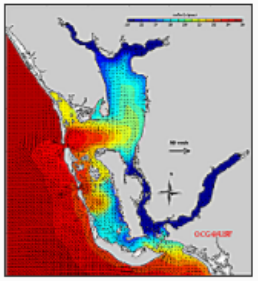


Charlotte Harbor Region

Hindcast Nowcast 24 hr Forecast 48 hr Forecast

2017	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2016	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2015	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2014	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2013	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2012	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec

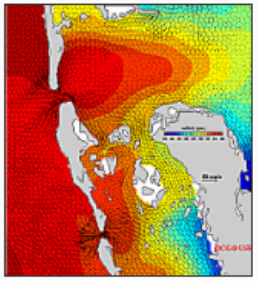
Months shaded in blue have dates available. Click on month.

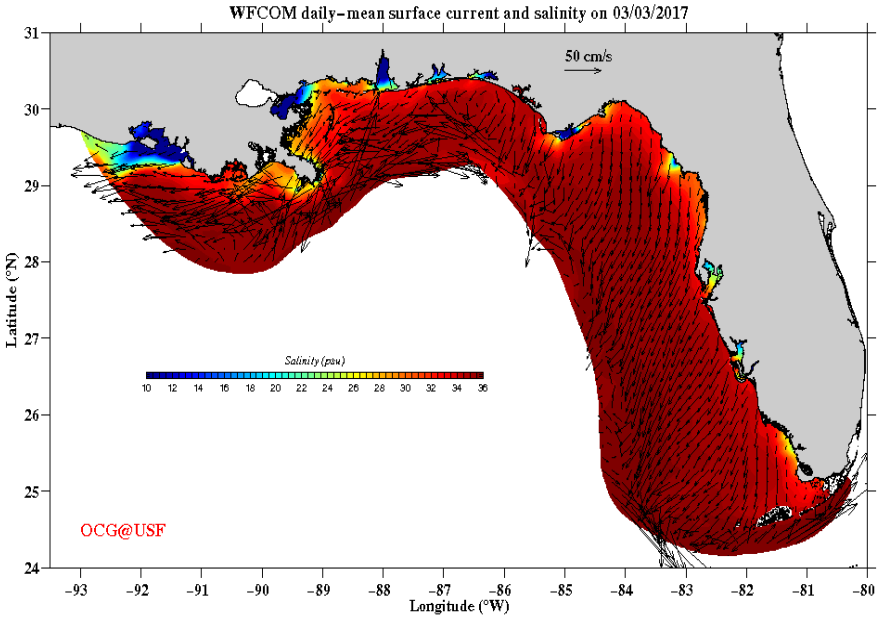


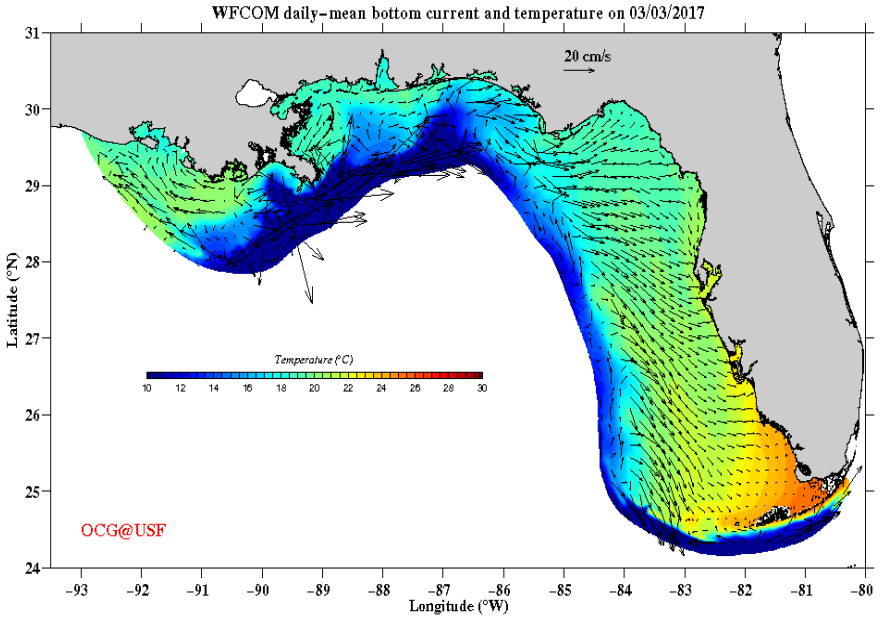
Charlotte Harbor Region (Zoomed)

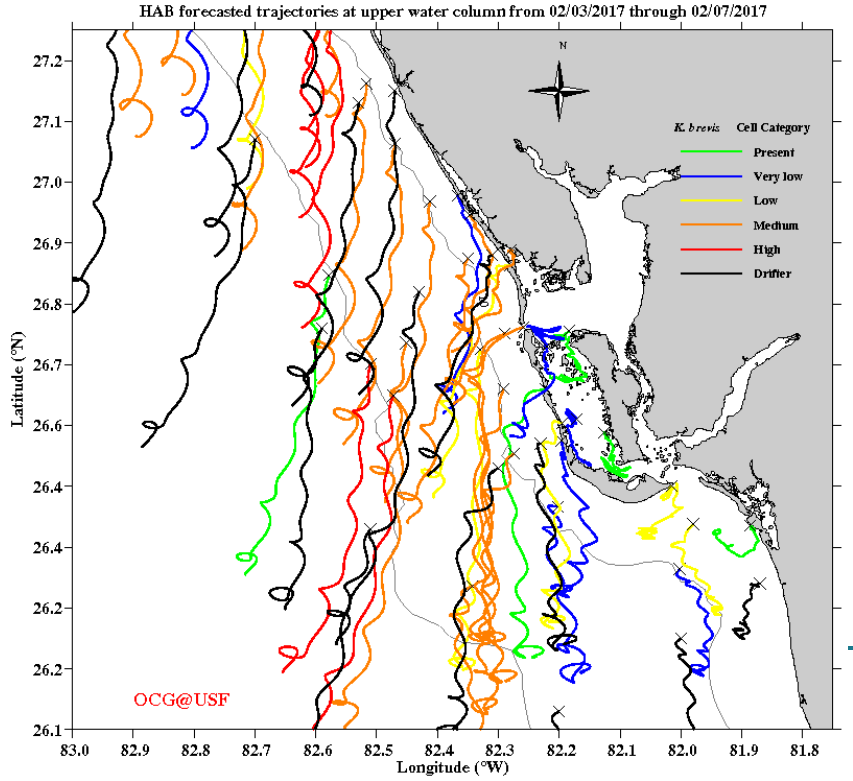
Hindcast Nowcast 24 hr Forecast 48 hr Forecast

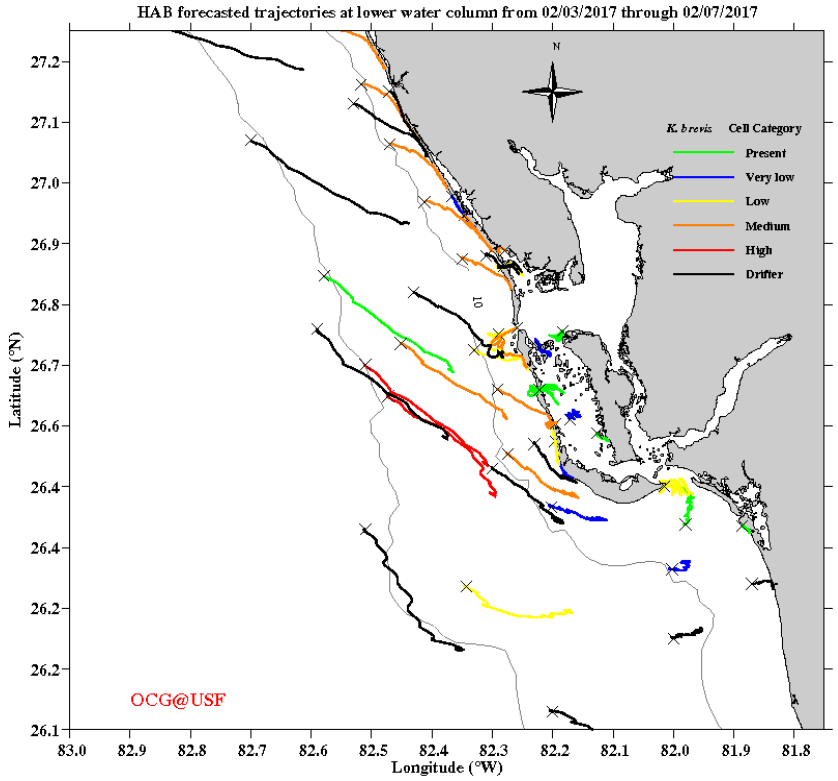
2017	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2016	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2015	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2014	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2013	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
2012	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec



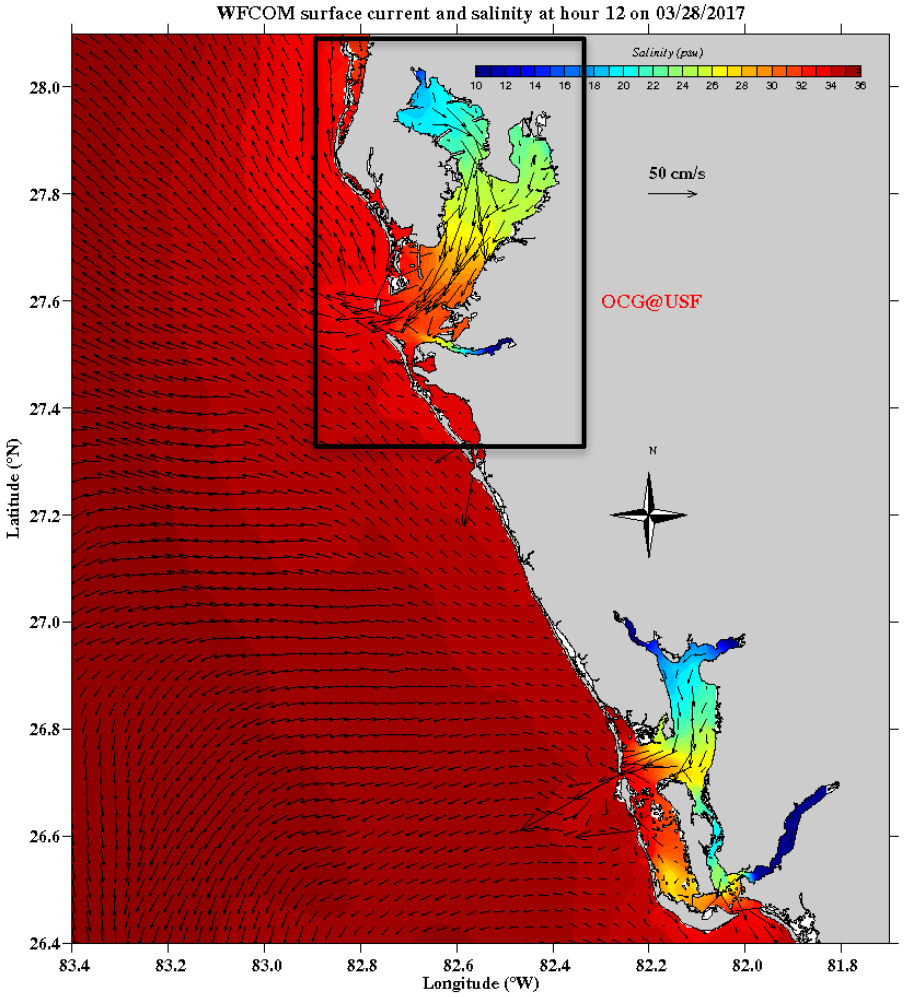

WFCOM daily-mean surface current and salinity on 03/03/2017
50 cm/s
Salinity (psu)
10 12 14 16 18 20 22 24 26 28 30 32 34 36
OCG@USF
Latitude (°N)
Longitude (°W)

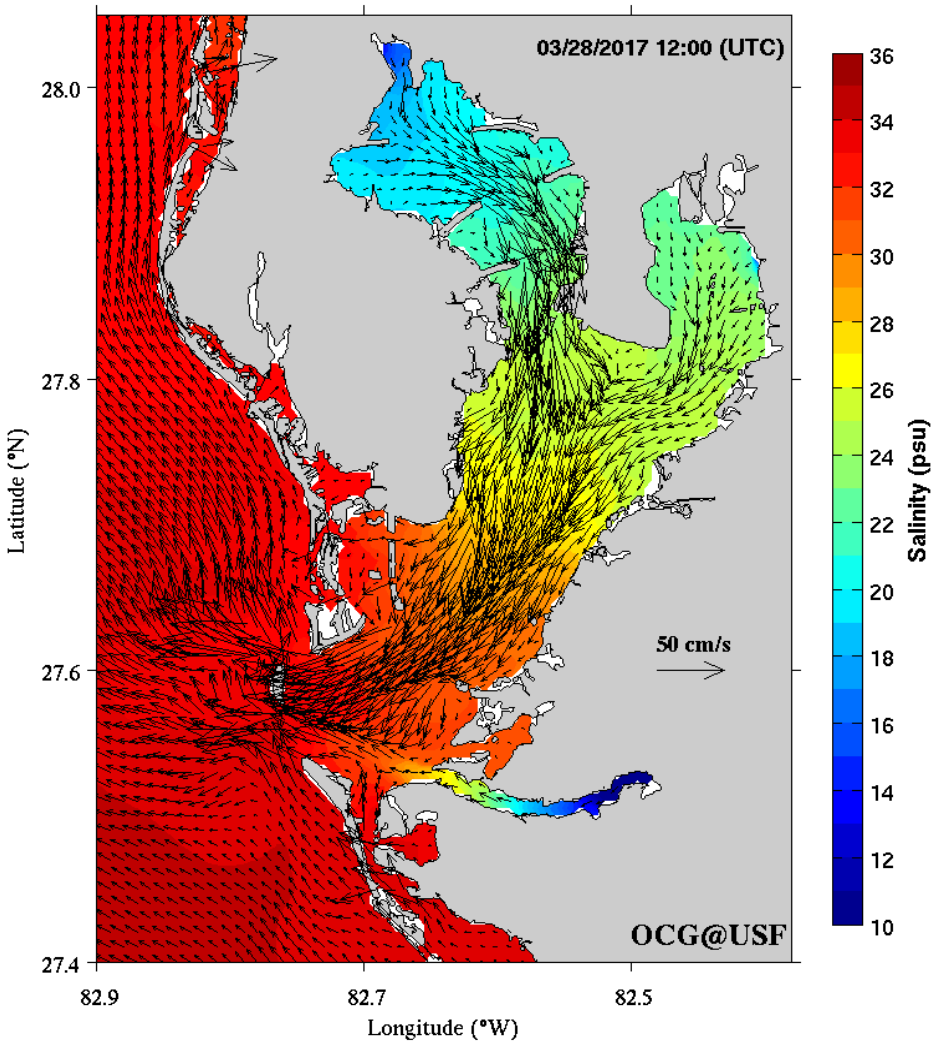

WFCOM daily-mean bottom current and temperature on 03/03/2017
20 cm/s
Temperature (°C)
10 12 14 16 18 20 22 24 26 28 30
OCG@USF
Latitude (°N)
Longitude (°W)


HAB forecasted trajectories at upper water column from 02/03/2017 through 02/07/2017
K. brevis Cell Category
Present
Very low
Low
Medium
High
Drifter
OCG@USF
Latitude (°N)
Longitude (°W)


HAB forecasted trajectories at lower water column from 02/03/2017 through 02/07/2017
K. brevis Cell Category
Present
Very low
Low
Medium
High
Drifter
OCG@USF
Latitude (°N)
Longitude (°W)

Surface current and surface salinity on March 28, 2017





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- Liu, Y., C. Merz, R.H. Weisberg, B.K. O'Loughlin, and V. Subramanian (2017), Data return aspects of CODAR and WERA high frequency radars in mapping ocean currents, in *Observing the Oceans in Real Time*, edited by Venkatesan et al., Springer (in press).
- Mayer, D.A., R.H. Weisberg, L. Zheng, and Y. Liu (2017), **Winds on the West Florida Shelf: Regional comparisons between observations and model estimates**, *J. Geophys. Res. Oceans*, 122, 834-846, http://dx.doi.org/10.1002/2016JC012112.
- Liu, Y., R.H. Weisberg, J.M. Lenes, L. Zheng, K. Hubbard, and J.J. Walsh (2016), **Offshore forcing on the "pressure point" of the West Florida Shelf: Anomalous upwelling and its influence on harmful algal blooms**, *J. Geophys. Res. Oceans*, 121, 5501-5515, http://dx.doi.org/10.1002/2016JC011938.
- Weisberg, R.H., L. Zheng, and Y. Liu (2016), **West Florida Shelf upwelling: Origins and pathways**, *J. Geophys. Res. Oceans*, 121, 5672-5681, http://dx.doi.org/10.1002/2015JC011384.
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- Weisberg, R.H., L. Zheng, Y. Liu, A.A. Corcoran, C. Lembke, C. Hu, J.M. Lenes, and J.J. Walsh (2016), ***Karenia brevis* blooms on the West Florida Shelf: A comparative study of the robust 2012 bloom and the nearly null 2013 event**, *Cont. Shelf Res.*, 120, 106-121, http://dx.doi.org/10.1016/j.csr.2016.03.011.
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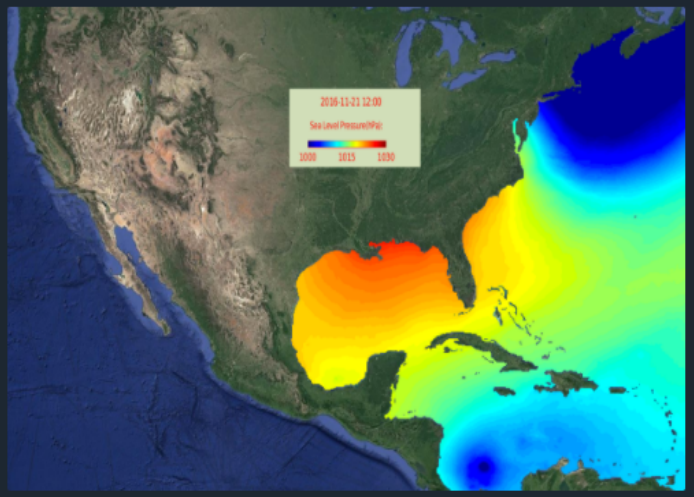
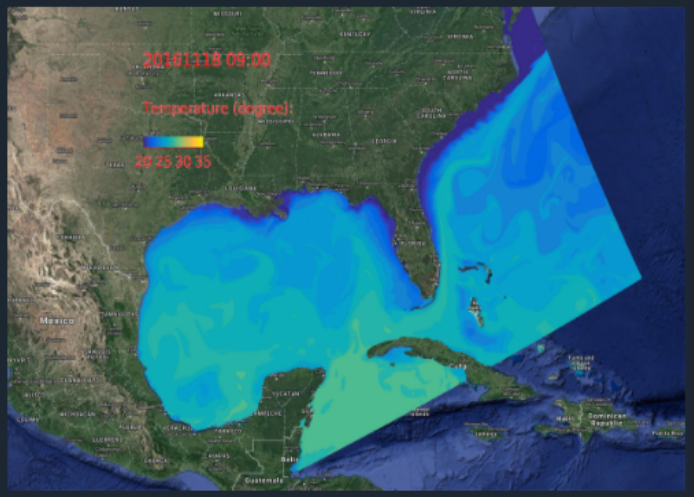
Products

Coupled Northwest Atlantic Prediction System (CNAPS)



The Coupled Northwest Atlantic Prediction System (CNAPS) is a three-dimensional marine environment nowcast and forecast model developed by the Ocean Observing and Modeling Group. This fully coupled ocean circulation, wave, and atmosphere modeling system predicts conditions over a wide area of the coastal northwest Atlantic Ocean on a daily basis. The model domain covers from the eastern edge of Nova Scotia to...

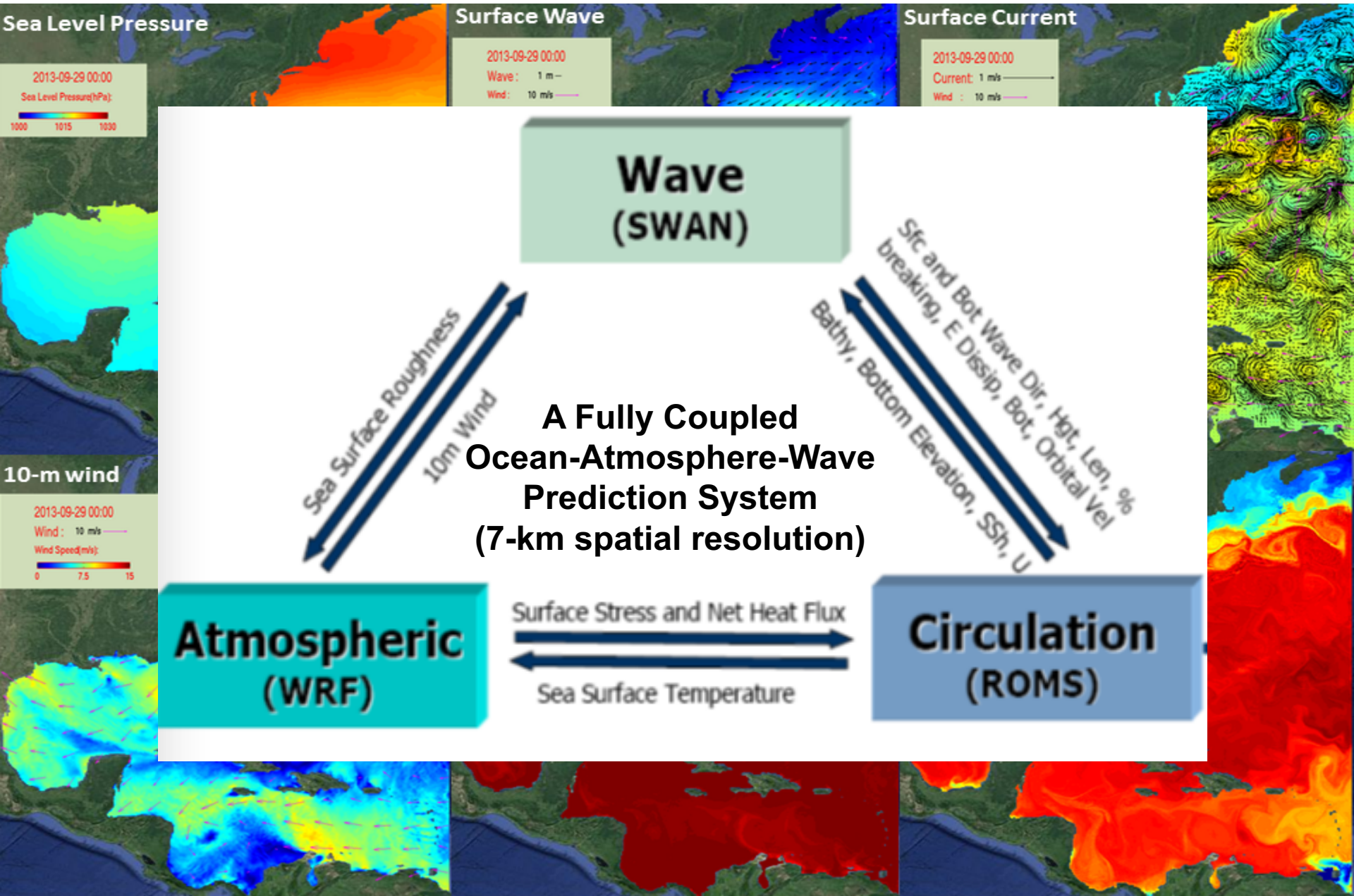
Marine Environment in the South Atlantic Bight and Gulf of Mexico (SABGOM)



The South Atlantic Bight – Gulf of Mexico (SABGOM) model is a three-dimensional marine environment nowcast and forecast model developed by the Ocean Observing and Modeling Group. This system provides predictions of ocean circulation, wave, and atmosphere conditions over the South Atlantic Bight and Gulf of Mexico on a daily basis. The model domain covers the U.S. east coast from New Jersey...

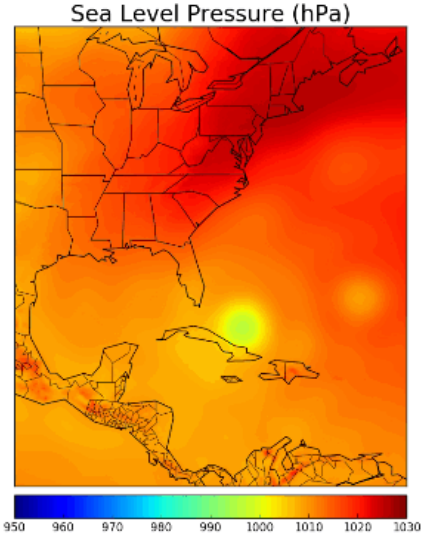
NC STATE UNIVERSITY

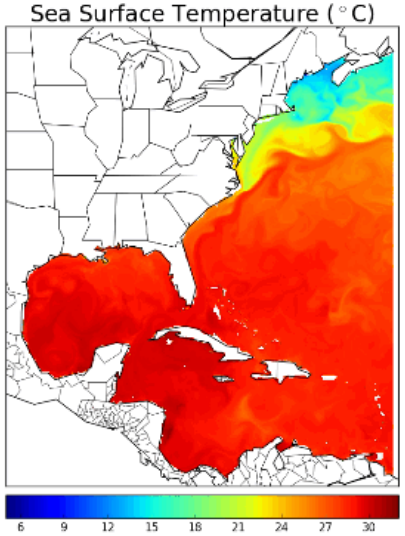
Coupled Northwest Atlantic Prediction System (CNAPS)
http://omgsrv1.meas.ncsu.edu:8080/CNAPS/

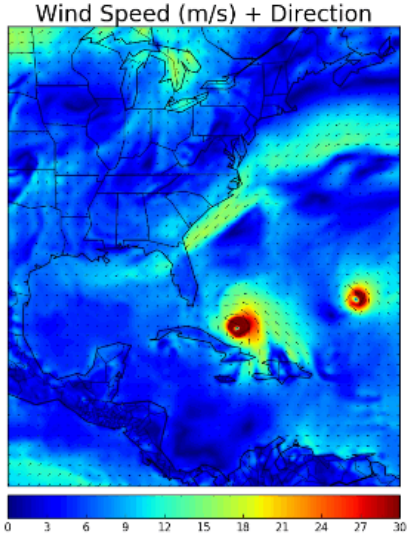


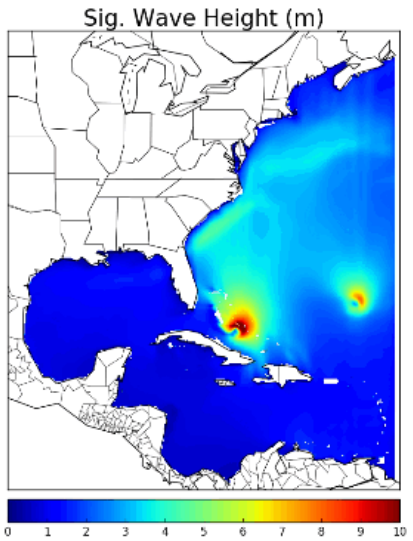
Hurricane Matthew

Forecast Valid: 06 Oct 2016 00Z UTC

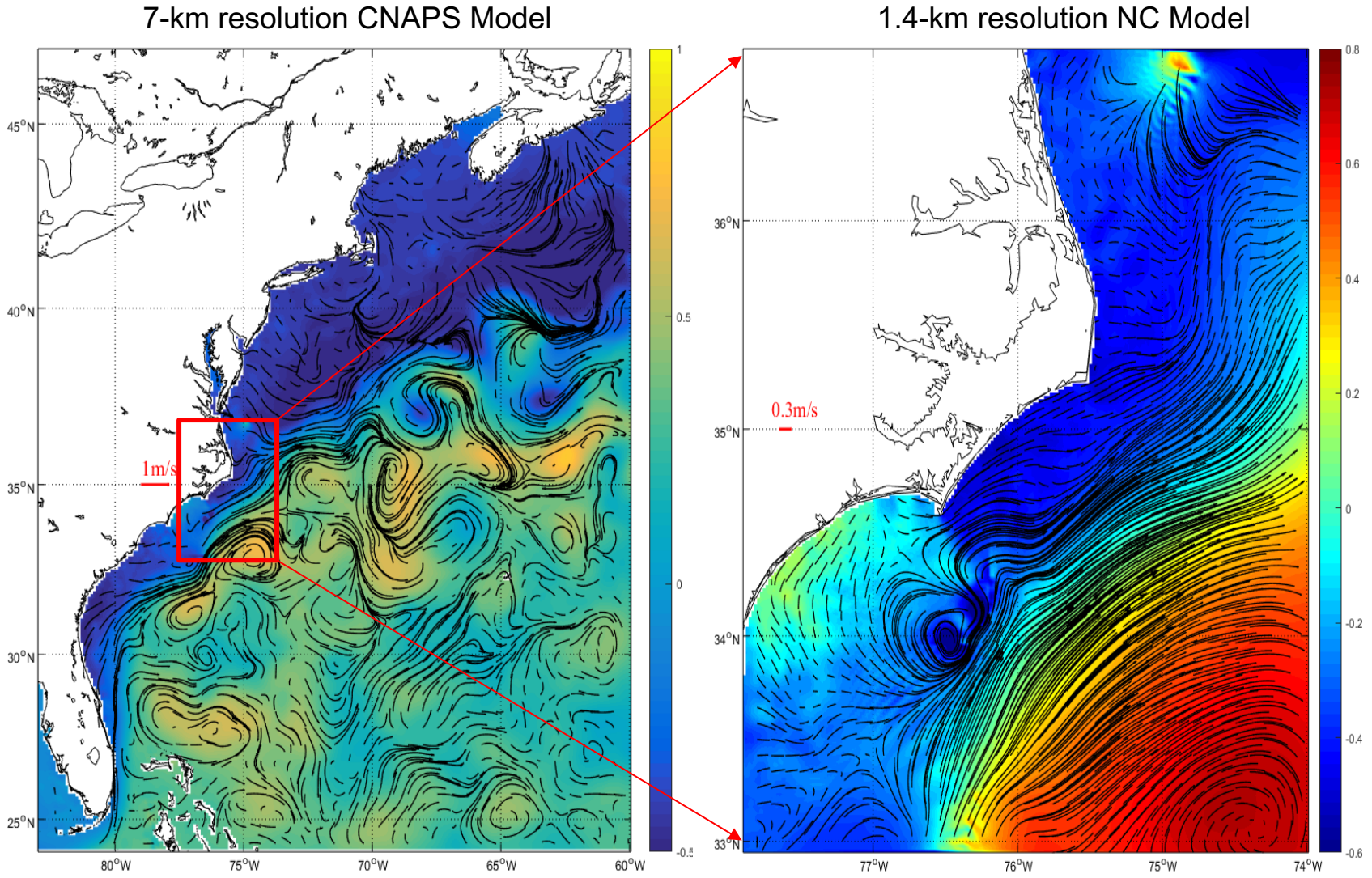








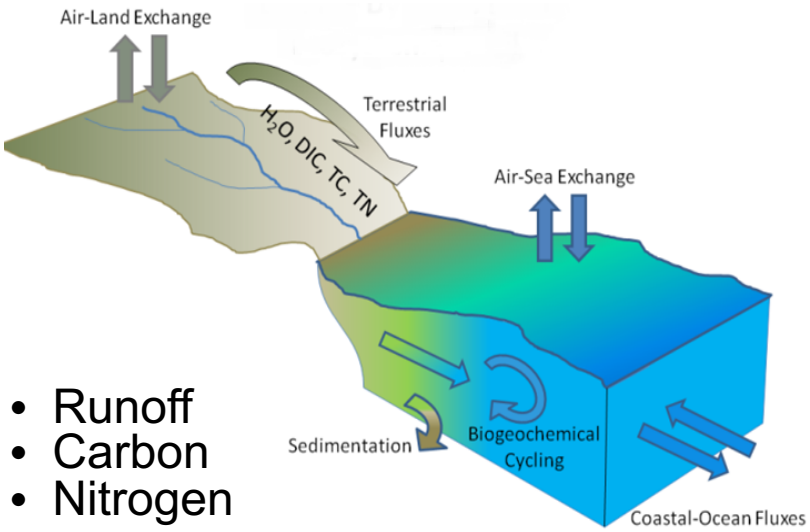
Multi-level two-way nesting



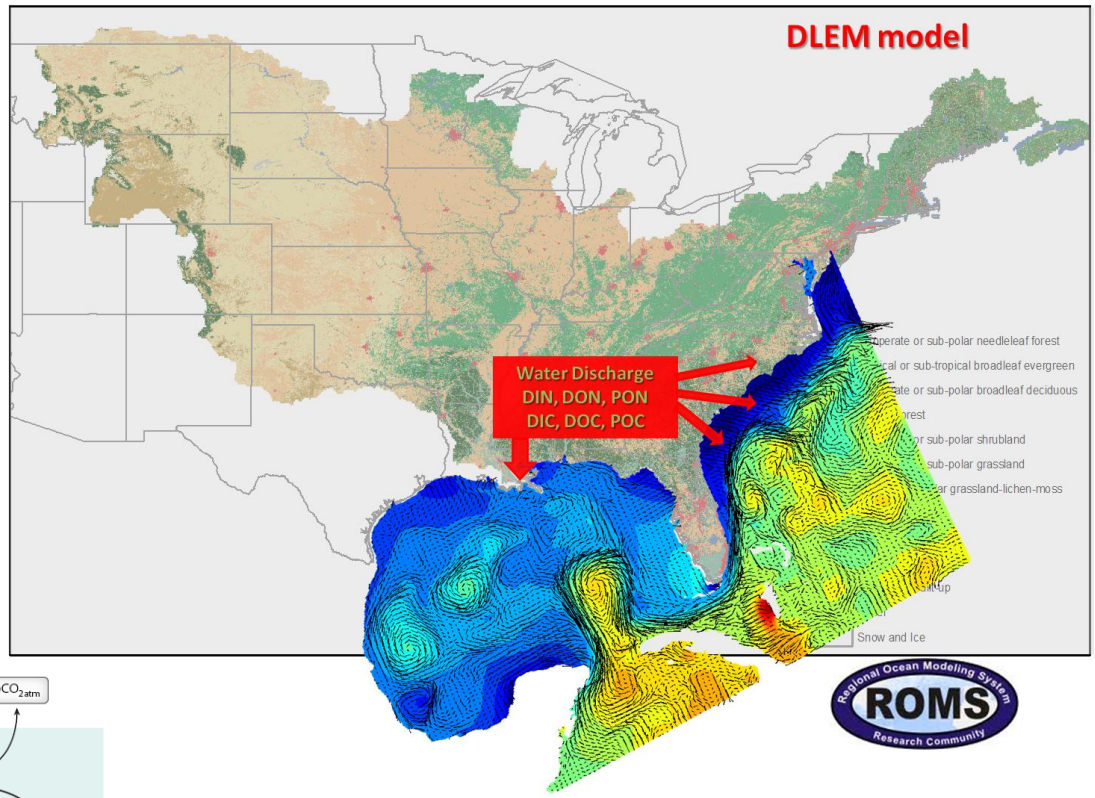
Physical-Biogeochemical Interactions

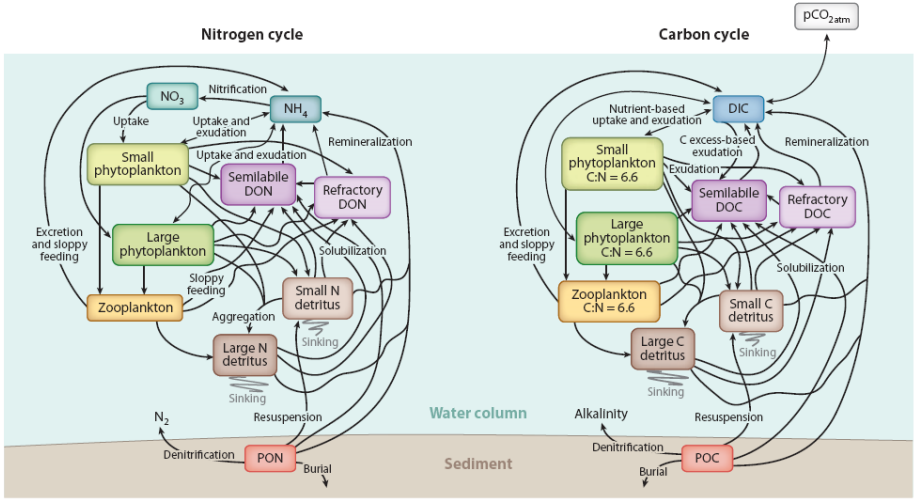
(1) Marine Ecosystem (2) Major Riverine System

Nutrient/Carbon Dynamics (3) Harmful Algal Bloom (4) larval transport and connectivity



- Runoff
- Carbon
- Nitrogen





UMass | Dartmouth

AUBURN UNIVERSITY

NC STATE UNIVERSITY

UNIVERSITY OF DELAWARE

DALHOUSIE UNIVERSITY
Inspiring Minds

Publications

- Bane, J., **R. He**, M. Muglia, **Y. Gong**, and C. Lowcher (2017) Marine hydrokinetic energy from western boundary currents, *Annual Review of Marine Science*, 9:7.1-7.19, doi: 10.1146/annurev-marine-010816-060423 [PDF]
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- **Yao, Z., Z. Xue, R. He**, X. Bao, and J. Song (2016) Statistical downscaling of IPCC sea surface wind and wind energy predictions for the U.S. east coastal ocean, Gulf of Mexico and Caribbean Sea, *Journal of Ocean University of China*, 15(4) 577-582, doi: 10.1007/s11802-016-2869-0 [PDF]
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