

# **ABSI Modeling**

## **Hydrographic Modeling Update**

**Dr. Steve Morey**

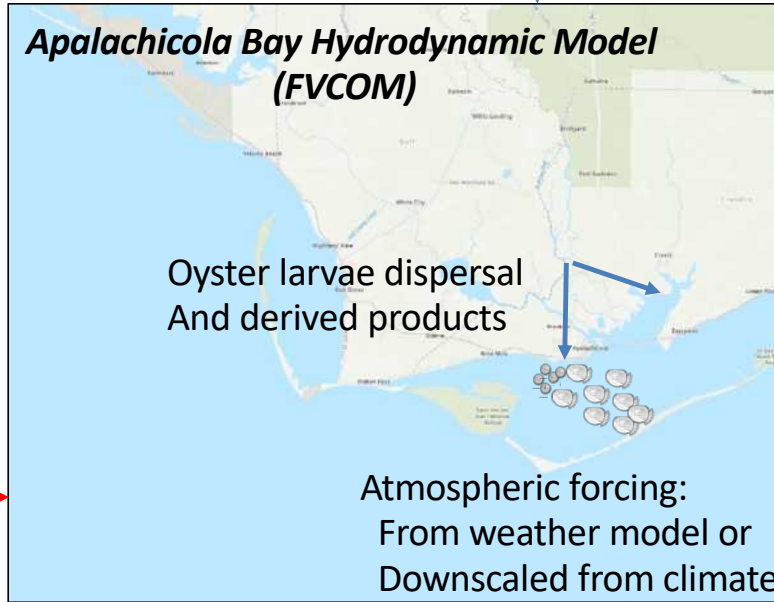
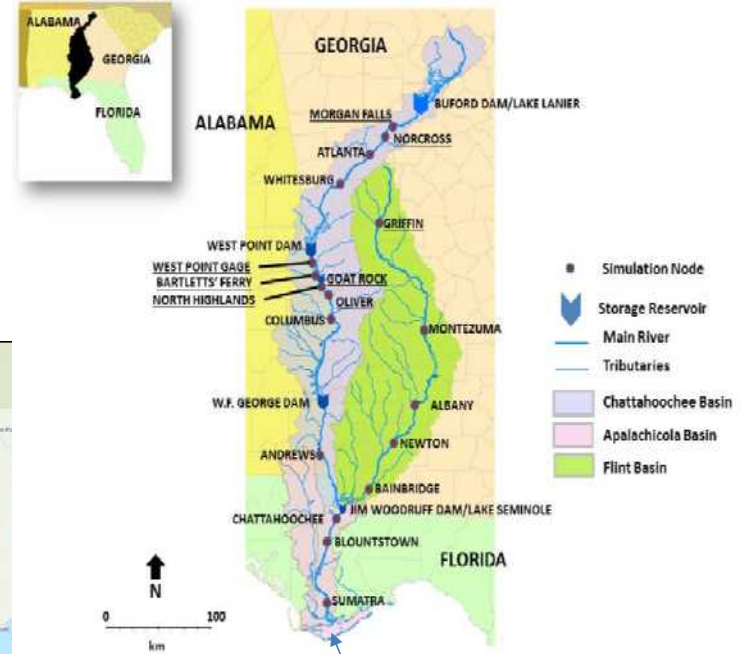
**Dr. Xu Chen**

**Florida A&M University**

**With Adam Alfasso, Florida State University**

# ABSI Bio-Physical Model Concept

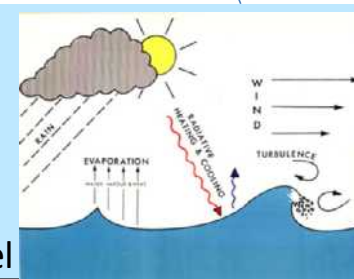
ACF watershed and  
Apalachicola River distributary  
flow from ACF STELLA Model  
and downscaled FVCOM



Forcing at boundary:  
Currents  
Temperature  
Salinity  
Water elevation (tides)

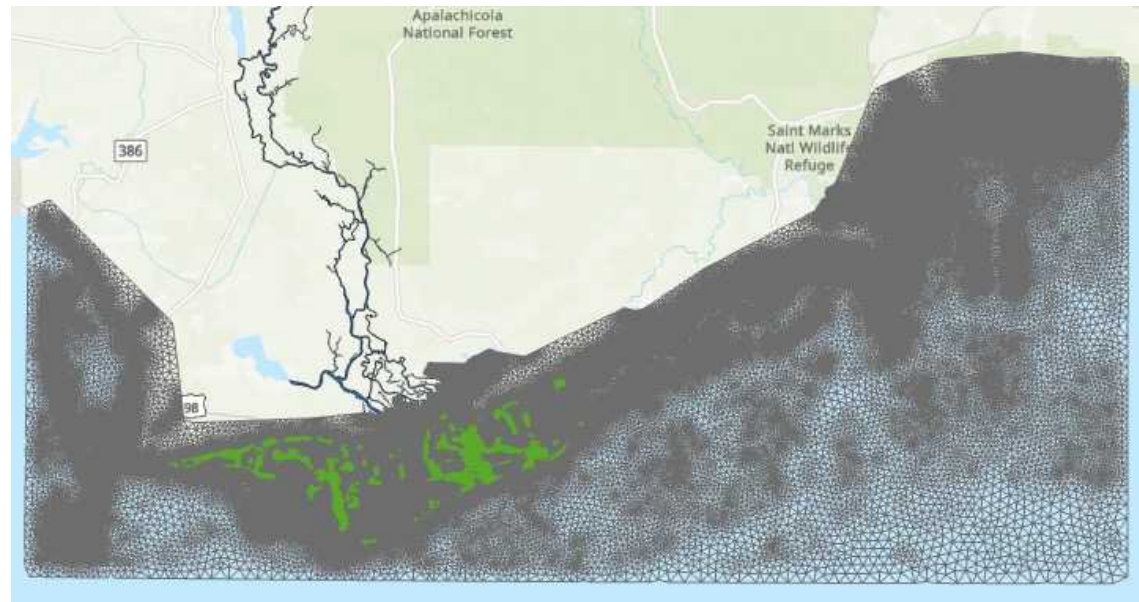
From Gulf of Mexico hydrodynamic model

Atmospheric forcing:  
From weather model or  
Downscaled from climate model



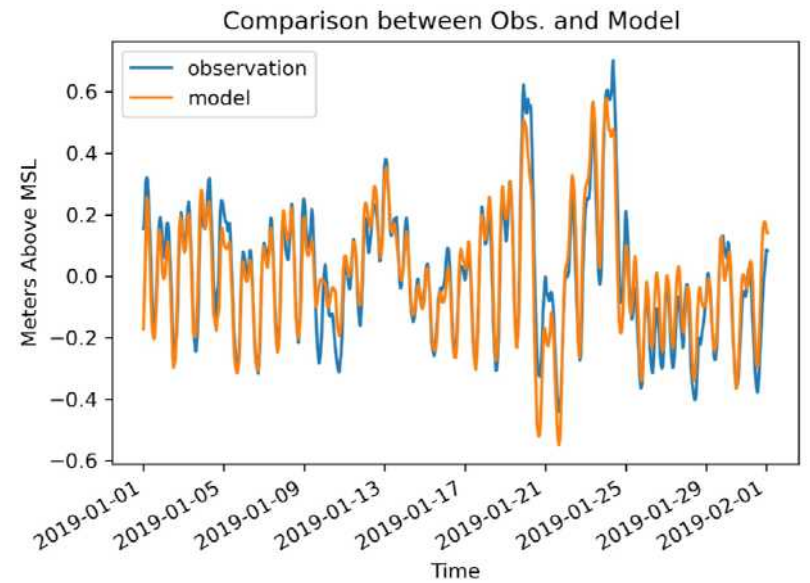
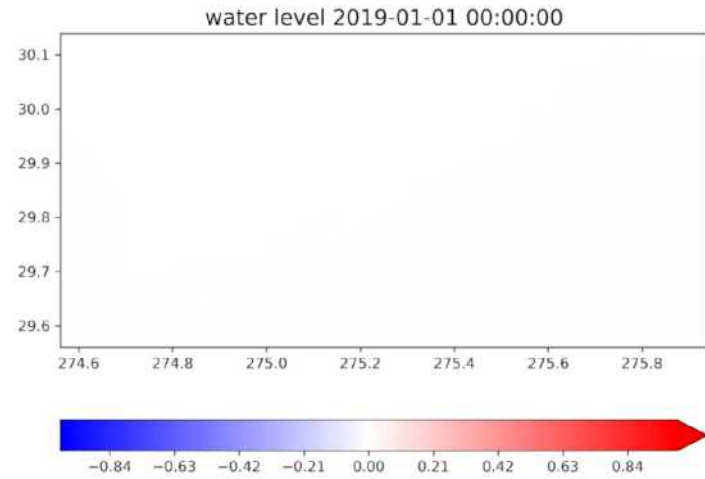
# ABSI Hydrodynamic Model Configuration

- **Finite Volume Coastal Ocean Model (FVCOM)**
- **Mesh Resolution:** 800m - 30m (water and land)
- **Vertical Grid:** 10 layers
- **Surface Forcing:** CFSR (atmospheric model) and Wind Observations
- **River Discharge:** USGS or Leitman's Model
- **River Temperature:** NOAA NOS station
- **Initial Condition (U, V, T, S):** HYCOM Reanalysis
- **Boundary Condition (Tide, T, S):** HYCOM Reanalysis
- **Model Periods run to date:** 1998, 2011-2012, 2019

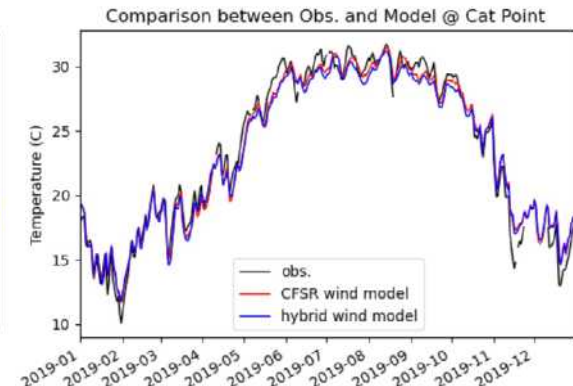
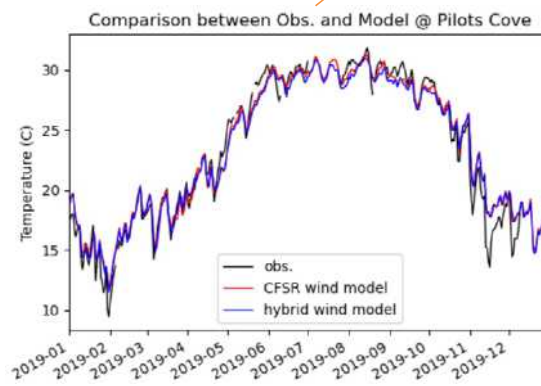
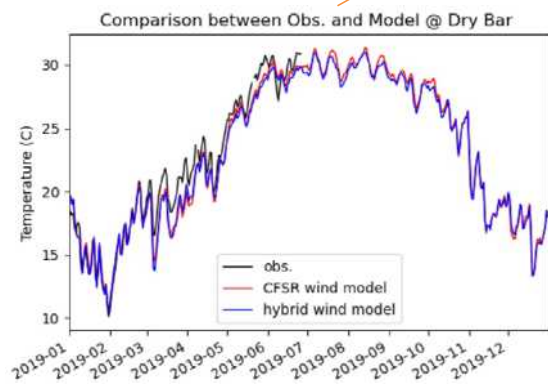




# Model Results: Water Surface Elevation

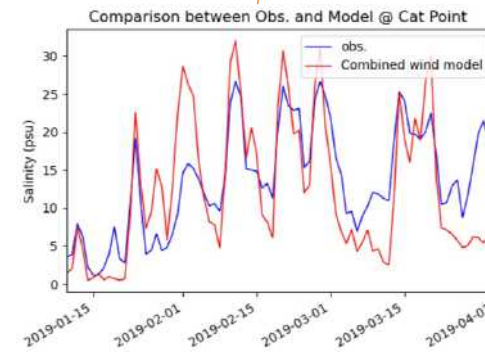
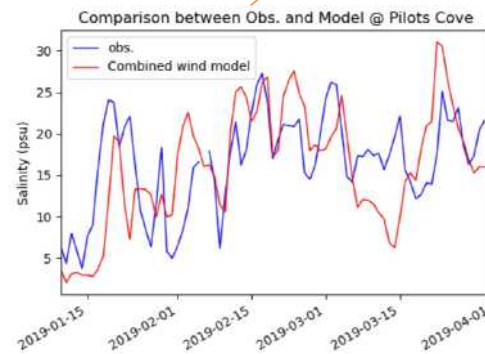
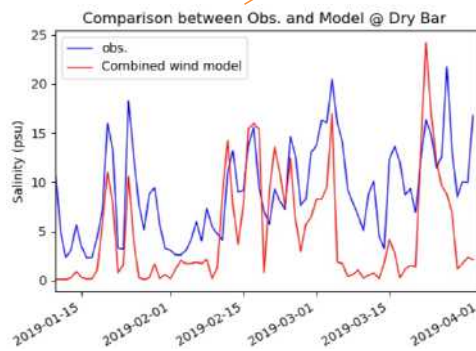
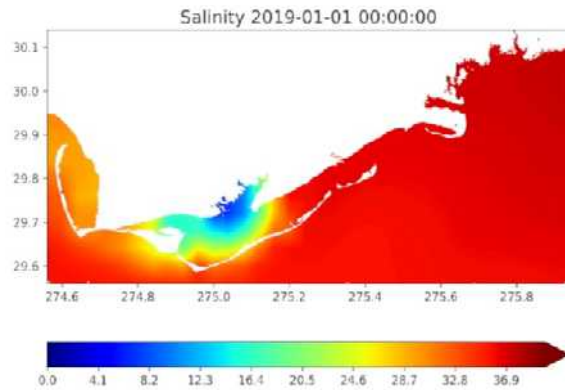


# Model vs. Observation (Temperature 2019)

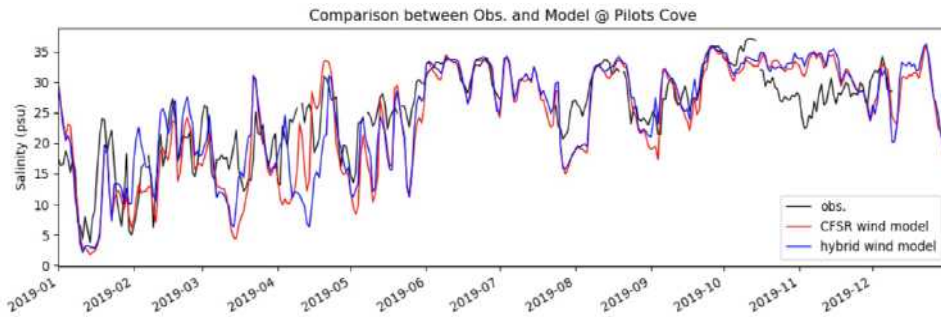
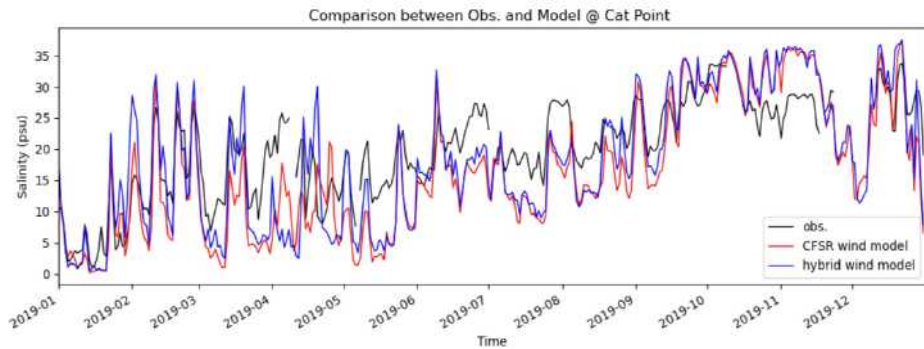
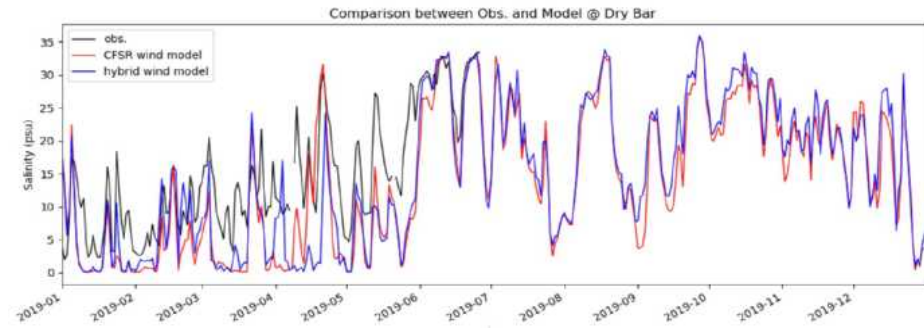


# Model vs. Observation (Salinity 201901)

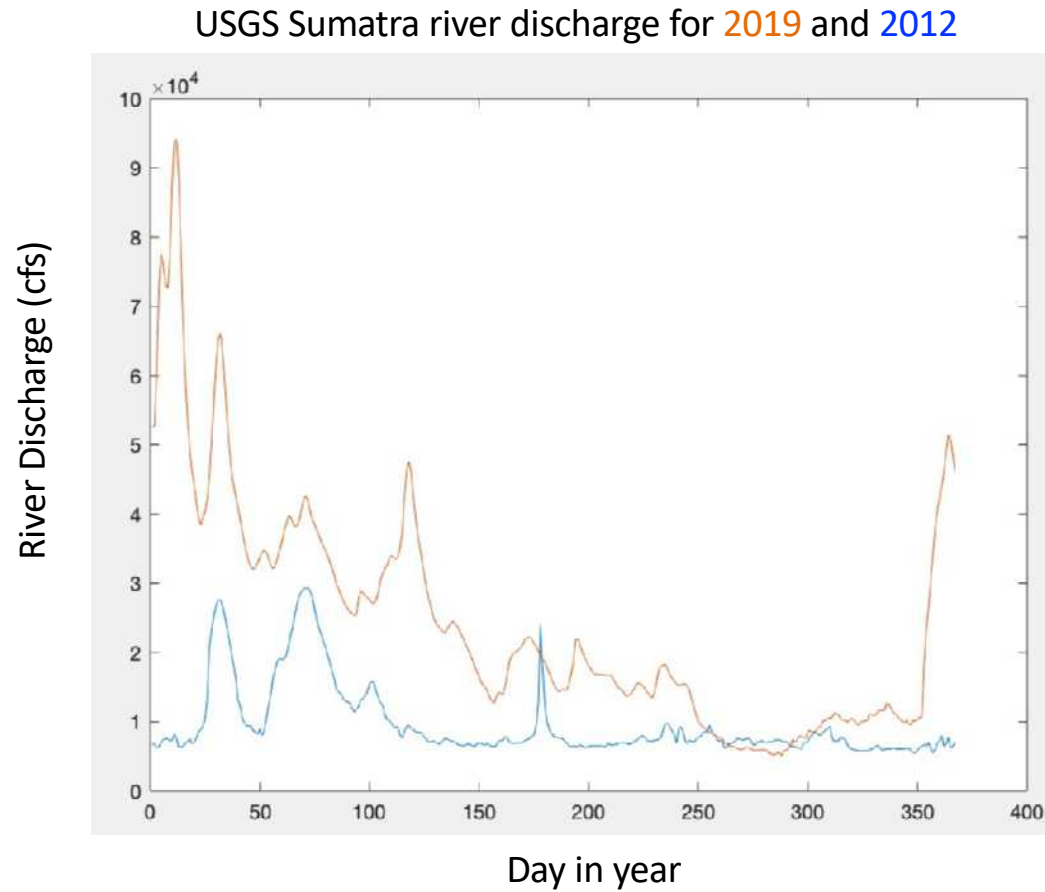
National Estuarine Research Reserve System



# Model vs. Observation (Salinity 2019)

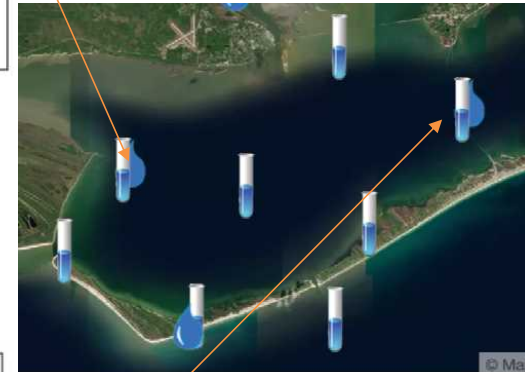
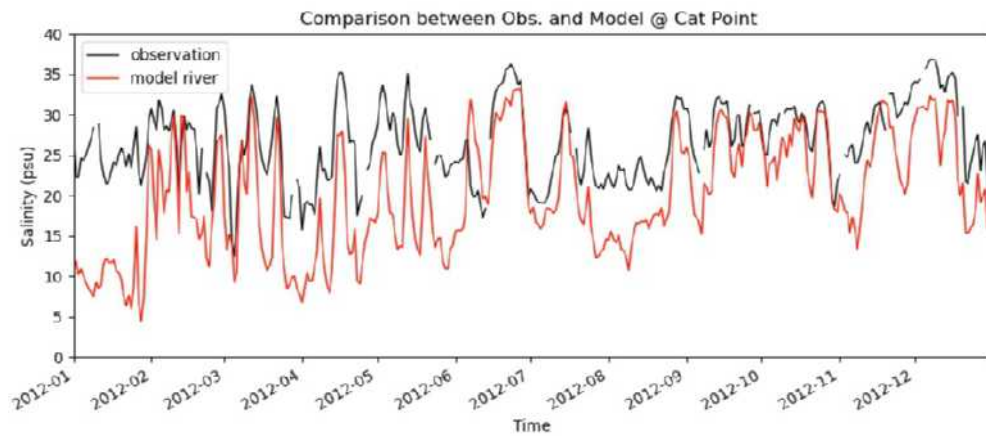
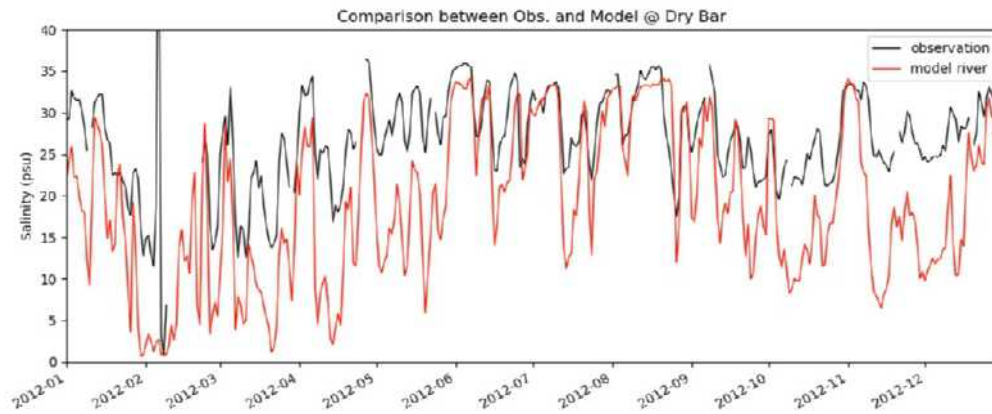


## Model vs. Observation (Salinity 2019 vs. 2012)





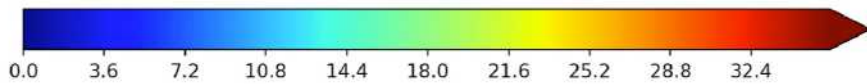
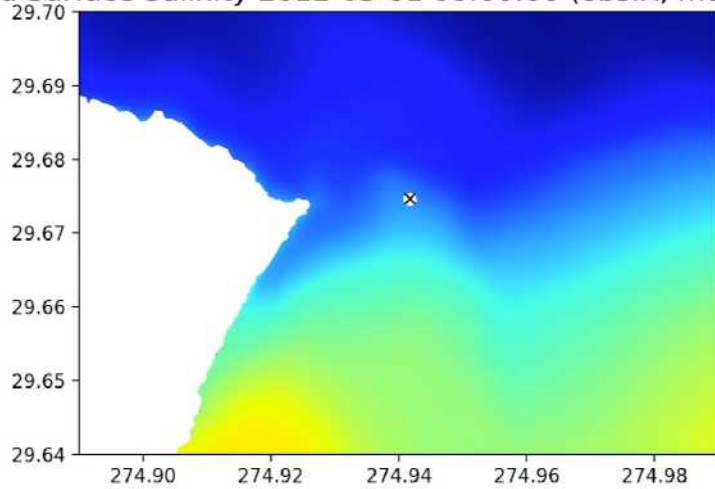
# Model vs. Observation (Salinity 2012)



# Sub-domain Videos ( Salinity 201203)

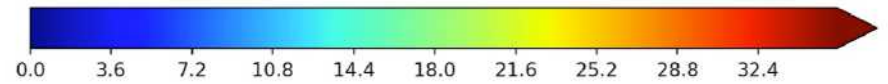
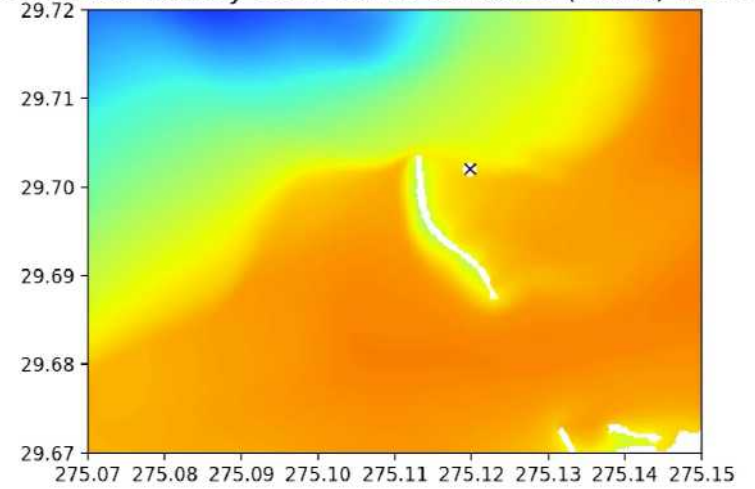
## Dry Bar

Sea Surface Salinity 2012-03-01 00:00:00 (obs:X, model:dot)



## Cat Point

Sea Surface Salinity 2012-03-01 00:00:00 (obs:X, model:dot)

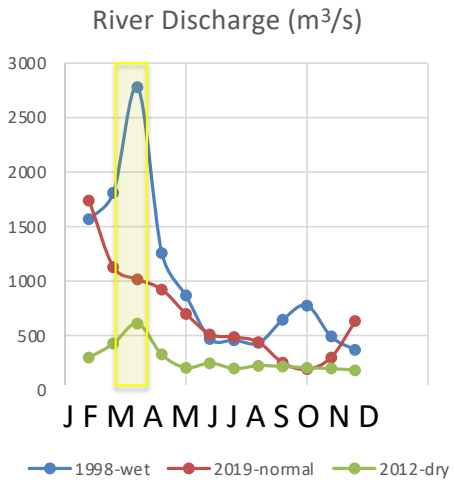
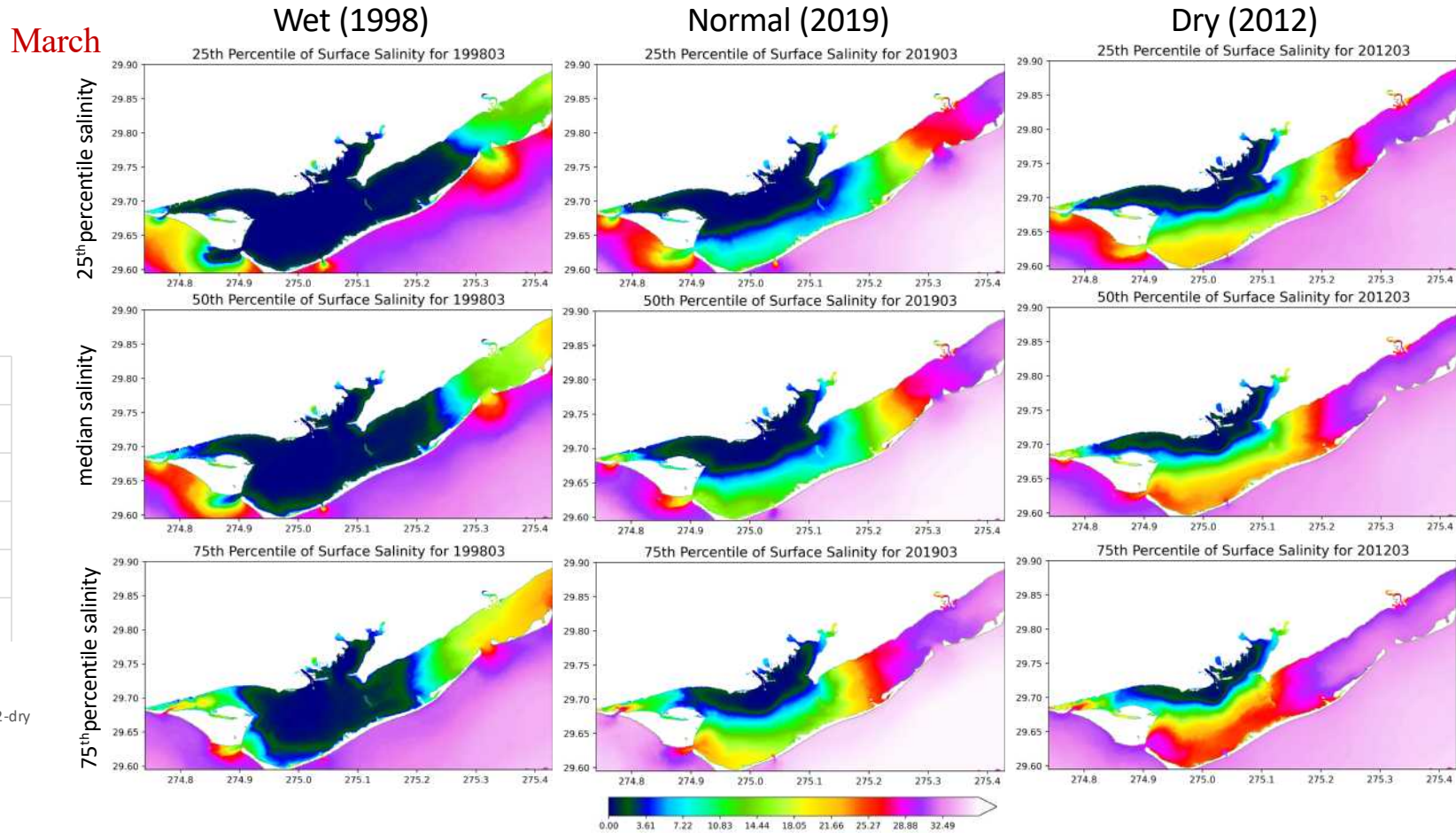


# Hydrodynamic Model-Derived Products

Model output is analyzed to develop derived products informative to the stakeholder community and to inform restoration efforts.

- Model hindcasts to estimate past conditions in the bay
- Predictions of possible future scenarios (freshwater flow / climate)
- Statistical analyses that can provide information for forecasting future conditions
- Mapped products of environmental variables
- Input to Larval dispersion models
- Input to habitat suitability models

# Maps of salinity quantiles (median, 25<sup>th</sup> percentile, 75<sup>th</sup> percentile) corresponding to wet, normal, and dry March.



# Habitat Suitability Models

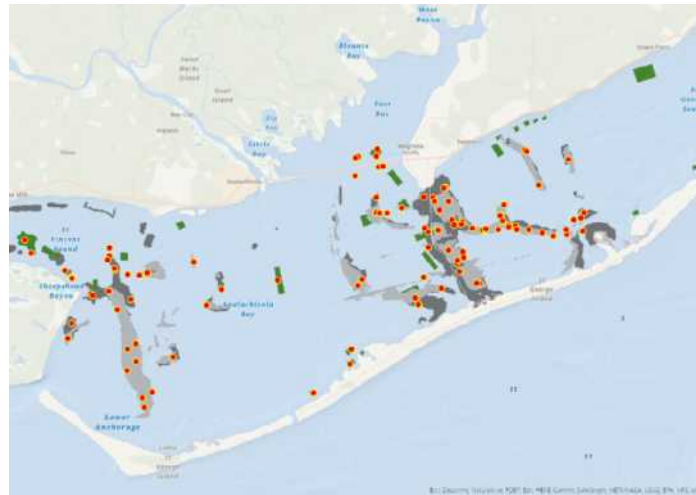
The hydrodynamic model variables can be used as input to Oyster Habitat Suitability Models.

## Environmental Variables

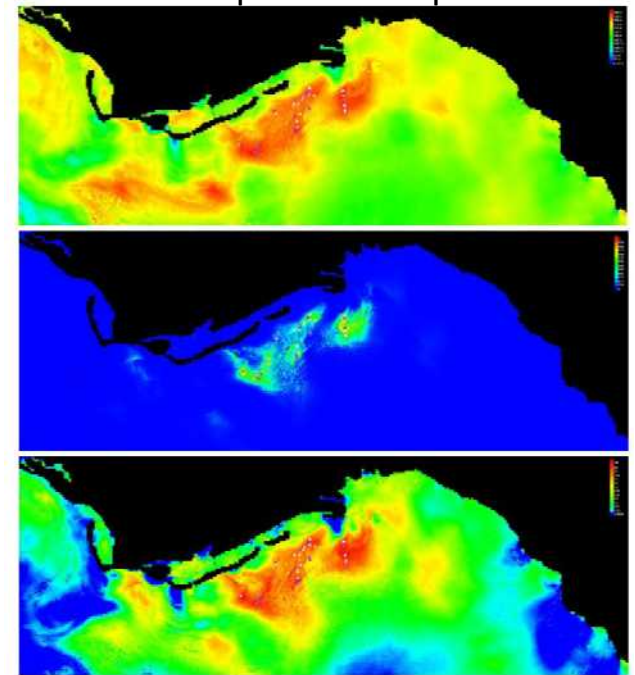
- Salinity
- Temperature
- Current Direction
- Current Velocity
- Exposure
- Substrate Type
- Nutrient content
- Sea Level Height
- pH
- Dissolved Oxygen
- Precipitation

+

## Observed Presence/Absence Data



## Example HSM output



Statistical Analysis (Models)