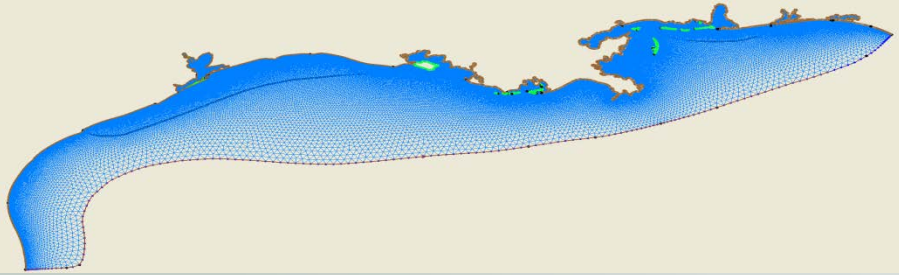
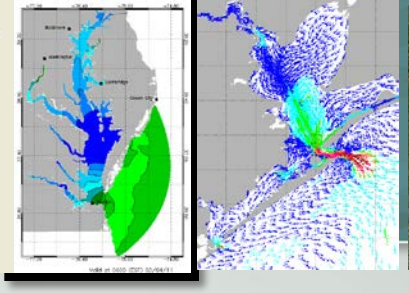



NOS Coastal Modeling

Patrick Burke

NOAA/NOS

Center for Operational Oceanographic Products and Services (CO-OPS)

December 7, 2015

NCEP Production Suite Review

Program Objectives

- **Regional Coverage**
  - Forecast guidance for high priority ports and approaches for ***navigation purposes***
  - Head of tide for all regions (high-resolution forecast guidance of total water levels, currents, water temperature and salinity)
- **Establish modeling infrastructure to enable other types of forecasts – *"national backbone"***
  - Integrated total water prediction
  - Ecological, biogeochemical modeling
  - Particle trajectory tracking applications
- **Legacy model refinements and upgrades**
- **All models meet an accepted standard of performance and stability (NOAA Technical Report #24)**

NOS/NWS Partnership

NOS/CO-OPS

- Transition to Operations
- Mission and Requirement Analysis
- NOS OFS Framework Development (COMF)
- System Development and Demonstration
- Operation, Maintenance and Routine Updates
- Product Dissemination and Outreach

NOS/OCS/Coast Survey Development Lab

- Development and Transition
- Requirement Analysis
- NOS OFS Framework Development (COMF)
- OFS Development and Enhancements
- Routine updates
- Product Development

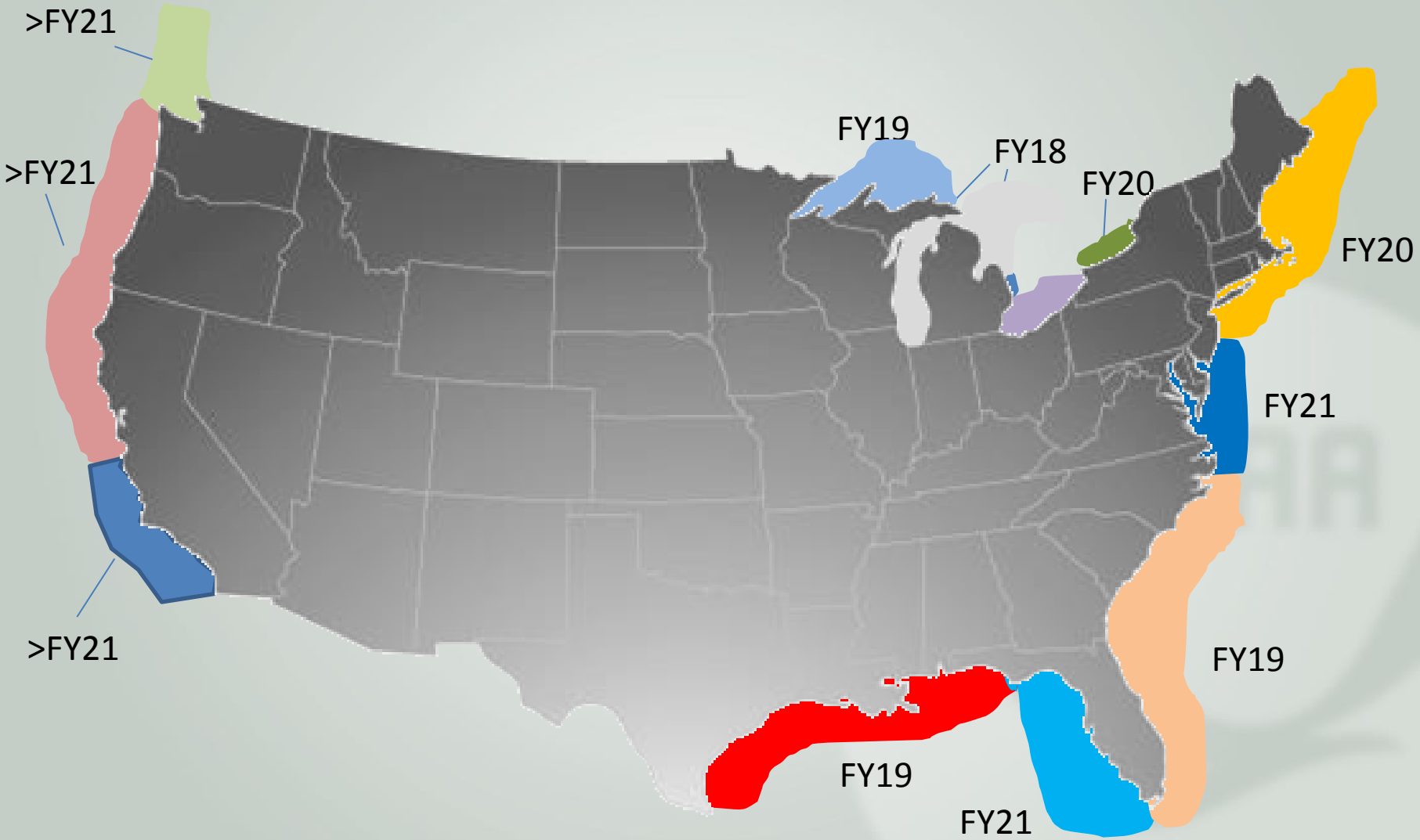
NWS/NCEP

- Computer System Technical Support
- Implement NOS OFS on NOAA's Weather and Climate Operational Supercomputing System (WCOSS)
- Operation, Maintenance and Routine Update
- Product Delivery on WOC or Dbnet

Partners (IOOS RAs, Academia, OAR/GLERL)

- Maintain operational version of model code (ROMS (Rutgers), FVCOM (UMASS-Dartmouth)) and ADCIRC (UNC-Chapel Hill)
- Develop new capabilities and modules based on NOS requirements (COMT)
- Routine updates

Proposed OFS Coverage Strategy

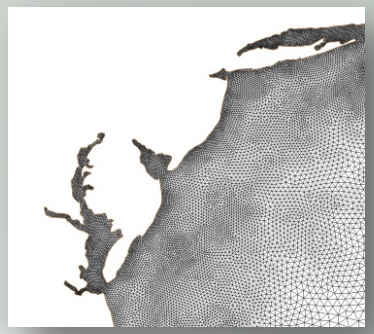


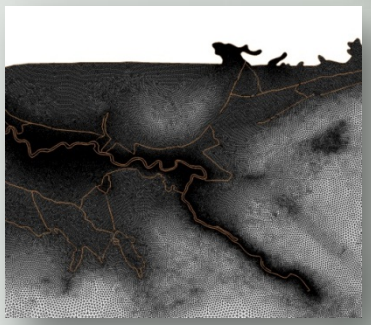
Proposed OFS Outlook for next 5 Years

Fiscal Year	New Operational Implementations	Existing OFS Upgrades
FY16		ROMS version code update Lake Erie (FVCOM code update) Tampa Bay Marine Channel Forecast New York/New Jersey (IOOS)
FY17	Cook Inlet (ROMS code update)	
FY18	West Coast (DA) Gulf of Maine (shelf)	Lake Michigan/Huron (FVCOM code update (Ice forecast))
FY19	Merged Northern Gulf of Mexico (includes Lower Mississippi River) SE Atlantic (Miami to North Carolina)	Lake Superior (FVCOM code update)
FY20	Northeast (NJ to Maine)	Lake Ontario (FVCOM code update)

Storm Surge Modeling Efforts

- Using ADCIRC model for extratropical (e.g., nor'easter) and tropical (e.g., hurricane)
  - Uses large scale unstructured triangular grids with localized resolution
  - Uses nonlinear shallow water physics
  - Can combine surge, tides, rivers and wave input for integrated total water predictions
  - Extratropical Surge and Tide Operational Forecast System (ESTOFS) running for Atlantic and Eastern Pacific and being developed for Western Pacific islands

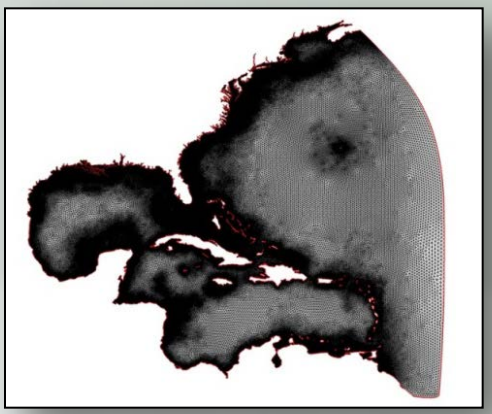


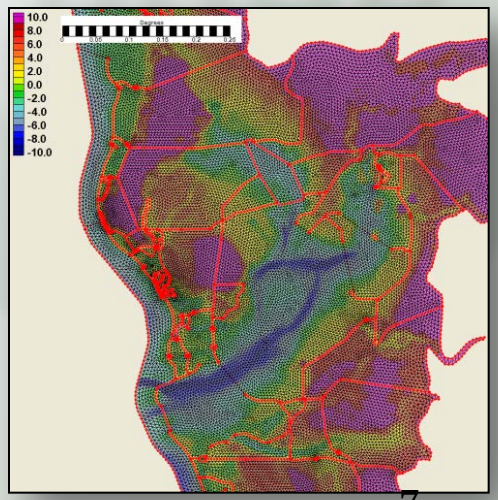


Storm Surge Modeling Efforts

Hurricane Surge On-Demand Forecast System (HSOFS)

- Via Sandy Supplemental funding, 200 m coastal resolution model developed
  - Validation and testing underway in 2015
- Small ensemble generated by modifying the NHC Forecast Advisory track
  - Official, Left, Right, More/Less Intense
- NHC will initiate runs on demand near/at landfall when uncertainty low
  - Addresses response and recovery needs
  - Supports COASTAL Act requirement for post-event analysis





Future Needs of OFS

- **Short–term needs**
  - *Data assimilation (WCOFS)*
  - *Observations for model skill assessment*
  - *Integration of hydrodynamic and atmospheric forecast products*
  - *Ice modeling (Great Lakes and Arctic)*

- **Long-term needs**
  - *Complete geographic coverage to head of tide by larger, regional models*
  - *Coastal contributions to Total Water Prediction efforts (linking rivers to the coasts; coupling wave models with OFS)*
  - *Biogeochemical forecasting (WCOFS)*

Challenges

- Lack of real-time observations within shallow coastal waters for data assimilation and model skill assessment
- Addressing emerging requirements from Ecoforecasting Roadmap
- Adequately resolving physical phenomena for both deeper shelf areas and shallow estuaries within same model domain (e.g. mixing, eddies inside bays)
- Improving accuracy of forcing conditions of freshwater (river forecasts), precipitation and surface heat flux inputs (bulk flux algorithm for high wind events) to improve density and water column stratification forecasts

What is needed?

- Availability of more real-time observations in data tank (IOOS and other partner networks)
- Seamless access to WFO forecasts for integrated product development
- Availability of standard river forecast products for riverine boundary conditions
- Additional supercomputing resources to support expanding mission requirements (both development and production)
- Less frequent WCOSS outages for maintenance and system upgrades

QUESTIONS???

http://tidesandcurrents.noaa.gov/models.html