Update on National Ocean Service's Operational Forecast Systems (OFS)

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HSRP Fall Meeting
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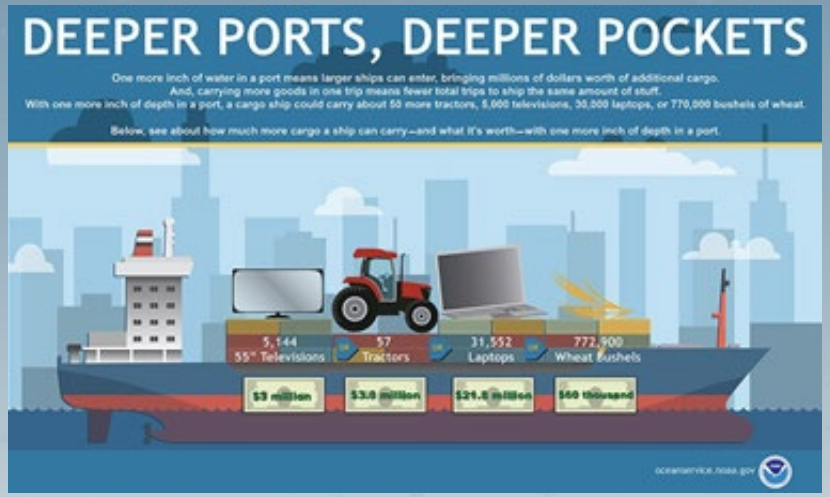
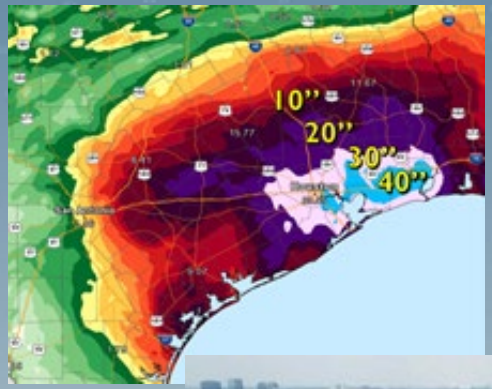
Motivation

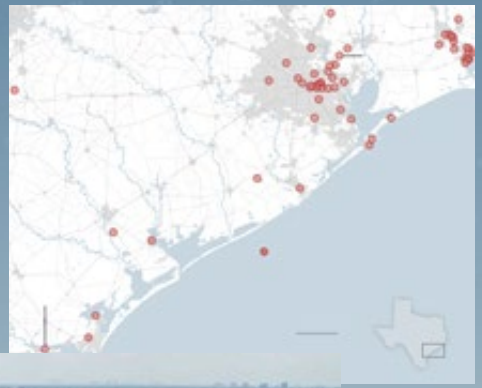
New Blue Economy



In 2021, the U.S DOT estimated that the U.S. maritime transportation system carried $4.6 trillion of cargo through U.S. seaports

Hurricane Harvey (August, 2017)



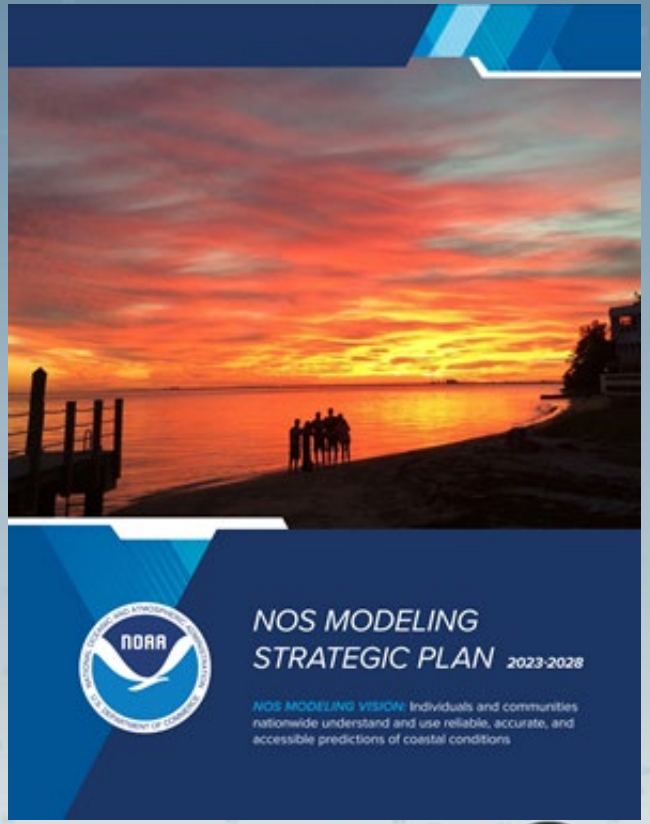


Coastal Resilience

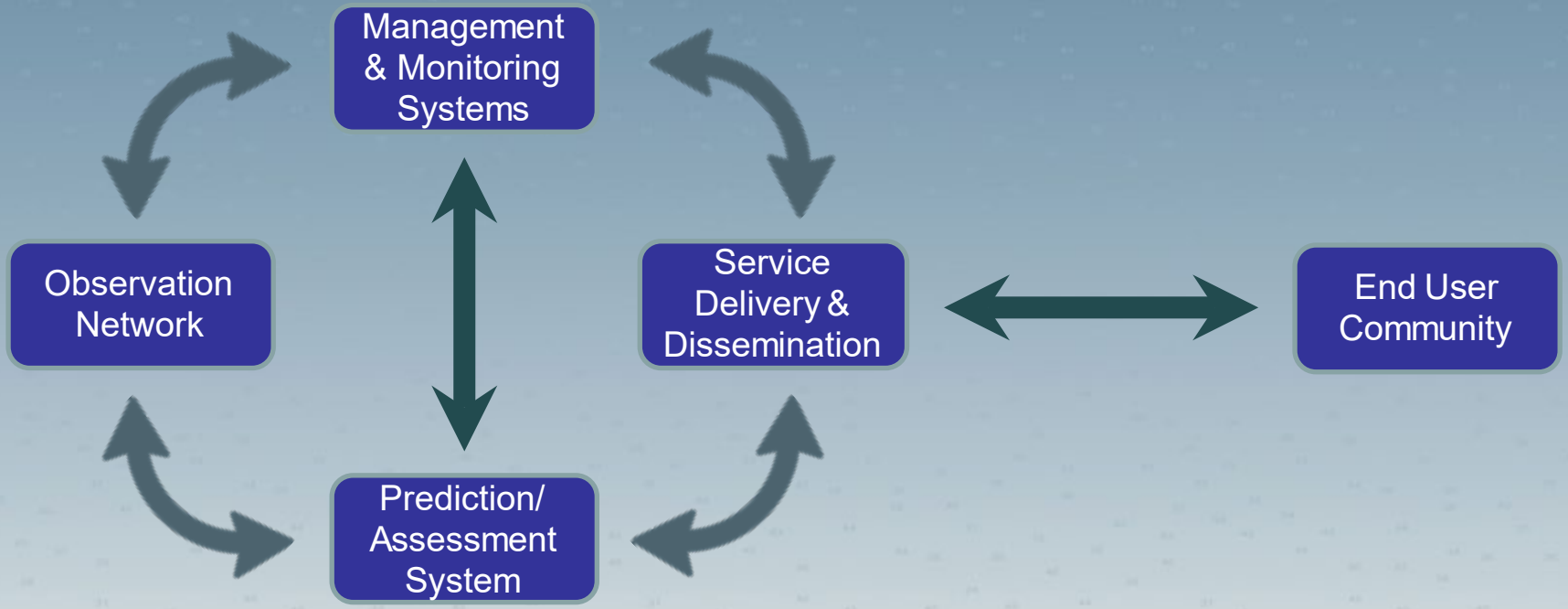
NOS Modeling Strategy

Vision: Individuals and communities nationwide understand and use reliable accurate, and accessible predictions of coastal conditions

- **Goal 1. Address User Needs through Sustained Community Engagement and Partnerships**
- **Goal 2. Develop Ocean and Coastal Models through Community Modeling**
- **Goal 3. Issue National Ocean Service Forecasts through Accurate and Reliable Operational Models**



Operational Oceanography System



Schiller, A., et al., 2018: An overview of operational oceanography. In "*New Frontiers in Operational Oceanography*"

NOAA's Service Delivery Framework

Environmental Spill Response

Safe, Efficient Navigation

Search and Rescue

Stakeholder Needs

Coastal Resilience

Marine Living Resources

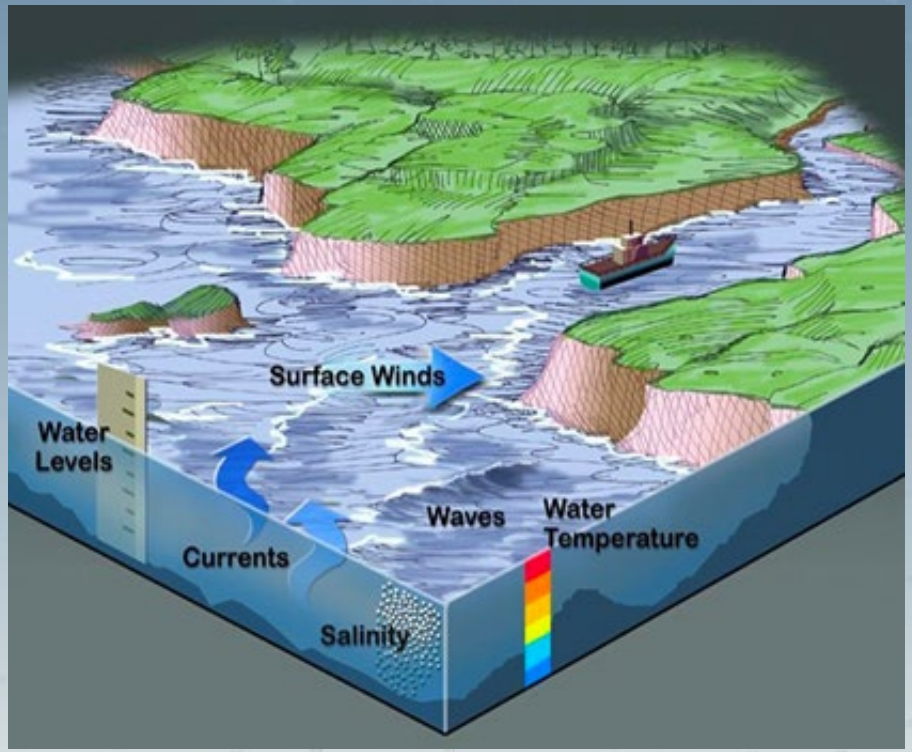
Protecting Human Health

Mapping and Coastal Management

Operational Forecast Systems

- Driven by real-time data and meteorological, oceanographic, and/or river flow rate forecasts to provide nowcasts and forecasts of water levels, currents, salinity, and water temperatures for 2-5 days
- Presently, NOS has 15 Operational Forecast Systems with documented reports assessing skill of each model
- Models run on NOAA supercomputing platform
- CO-OPS monitors performance and maintains 24/7 support

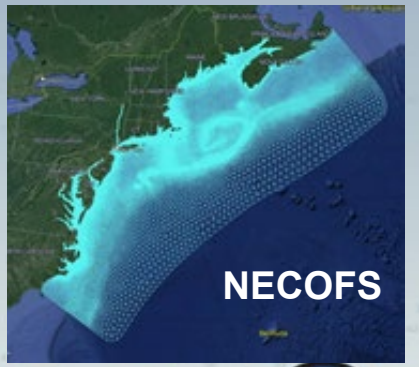
NOS OFS Navigation Requirements



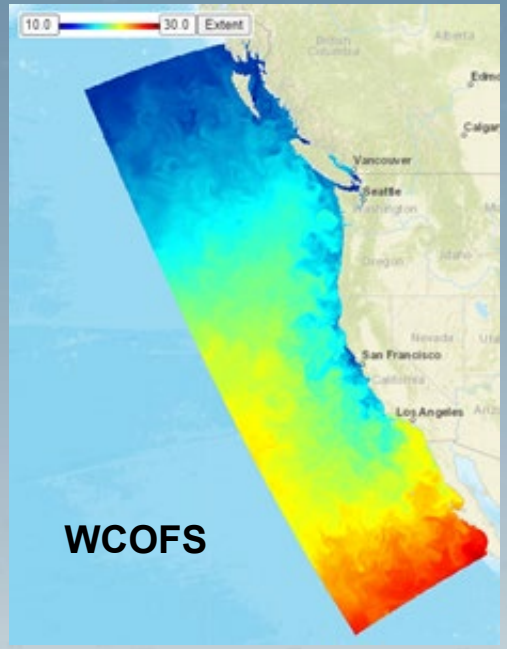
- Open-sourced community based systems
- Cover and extend upstream to head of tide and navigation channel
- Highly resolve navigational channels (i.e., tens of meters)
- Minimum forecast of 48 hours of water levels (MLLW or LWD), currents (S-111), water temperature, and salinity updated every 6 hours
- Meet documented NOS metrics for model performance (i.e., accuracy)
- Forcing data must be available within HPC environment

Future Planned OFS Implementations

- Salish Sea and Columbia River OFS (Fall FY24)
- Great Lakes Improvements (FY26)*
- Northeast Coast OFS (FY26)*
- Southeast Coast OFS (FY27)*

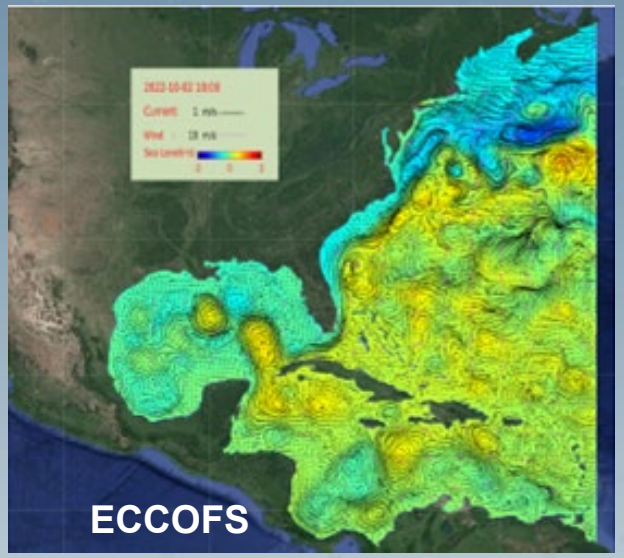


Regional Applications



- West Coast OFS

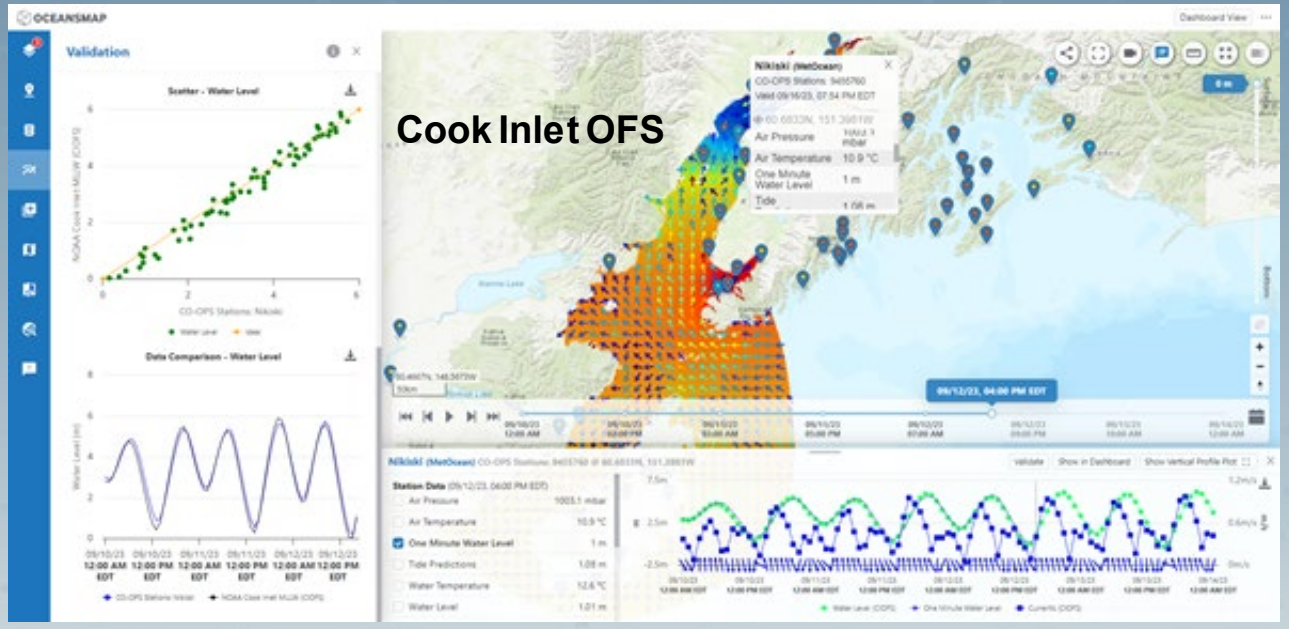
- WCOFS and ECCOFS can support regional navigation applications, but are designed to support other NOS Mission areas, including ecosystem services, search and rescue, and human health.
- Models assimilate data from satellites, HF Radar and uncrewed systems
- Plan to evaluate output to improve boundary conditions to existing OFS suite



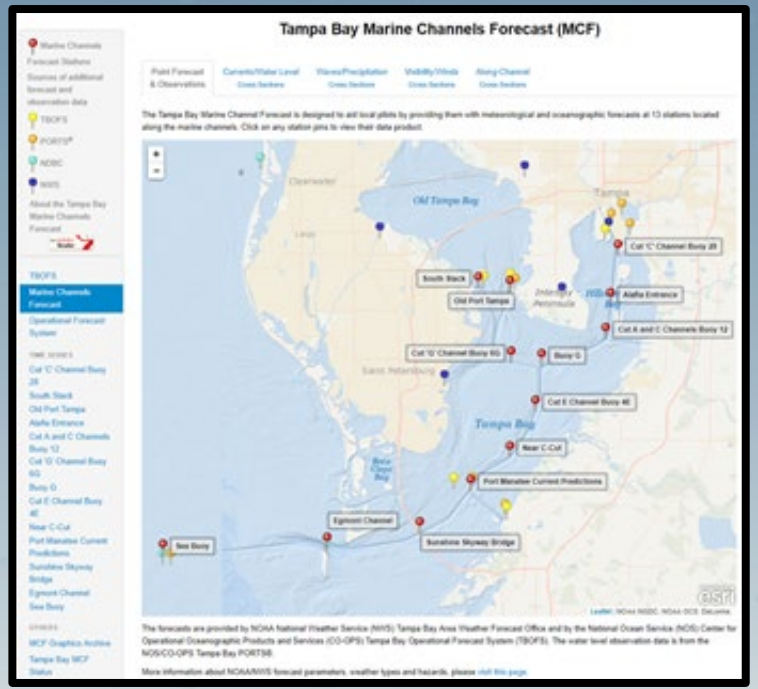
- East Coast Community OFS (FY28)*

Release of CO-OPS OceansMap

- New application that integrates real-time observations with OFS forecasts to provide up-to-date assessments of ocean conditions.
- Beta-launch in Q1 of FY24



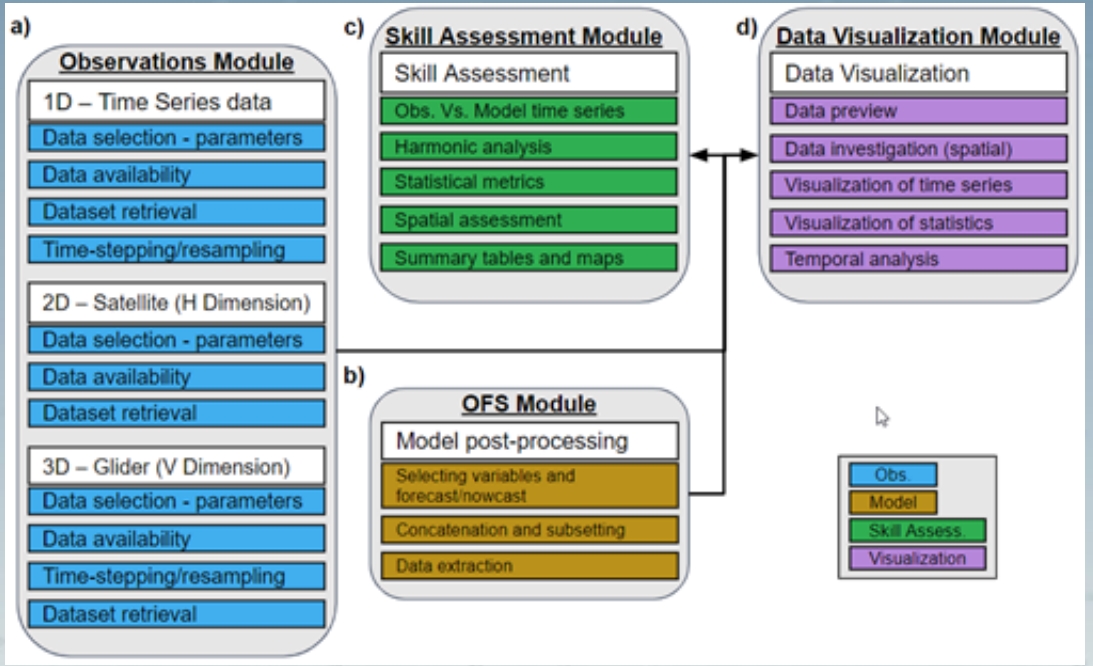
Marine Channels Forecast



Shared Infrastructure for Data Retrieval and Skill Assessment

Purpose

To create the necessary infrastructure and applications for the continuous validation and evaluation of existing OFS to support the iterative development of increasingly skillful models



Challenges and Opportunities

- Improving bathymetry and boundary forcing conditions
- Building a data inventory with standard QC (i.e., QARTOD) and interacting with observing entities to exploit new technology (e.g., cross-federal agencies, IOOS Regional Associations, communities of practice, academia, etc.) to support model validation efforts and improve boundary conditions
- Supporting and leveraging research and development:
  - Providing NOAA funding opportunities (e.g., Coastal and Ocean Modeling Testbed, Cooperative Institutes, etc.).
  - Enhance coupling and data assimilation of long-term observations from satellite, glider, HF Radar, Argo, drifters, and conductivity-temperature-depth profiles, etc.

Challenges and Opportunities

- Continuing collaboration with the coastal modeling community to develop a comprehensive and standard methodology and criteria for coastal ocean model skill assessment to communicate confidence to user community
- Developing coastal coupling solutions with the National Water Model to improve water quality predictions and navigation applications (i.e., more accurate salinity and temperature predictions for improved buoyancy forecasts)
- Requesting more RDHPC allocations to perform longer term hindcasts and sensitivity experiments
- Embracing emerging and innovative technologies, such as cloud services and AI/ML

THANK YOU!

For further information:
please contact CO-OPS at tide.predictions@noaa.gov
or visit our website at https://tidesandcurrents.noaa.gov/