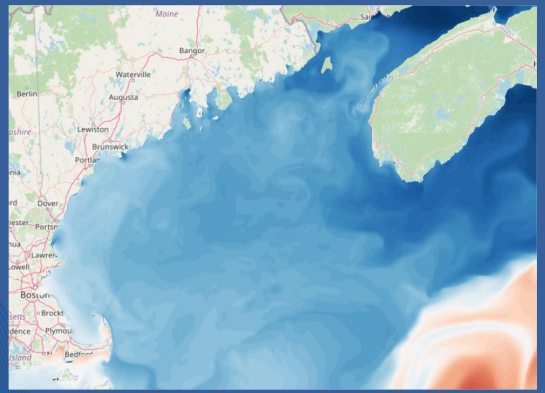
Center for Operational Oceanographic Products and Services
NATIONAL OCEAN SERVICE

Observations in National Ocean Service Operational Modeling

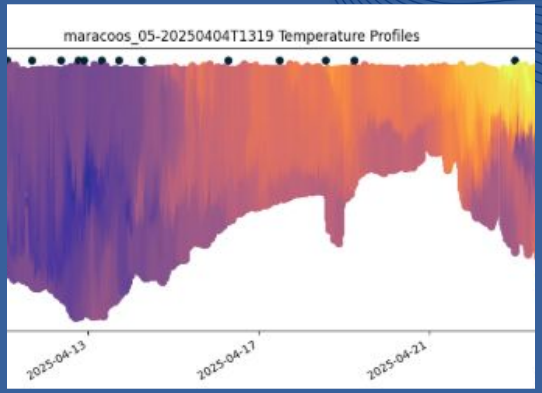
Lucila Houttuijn Bloemendaal

Presentation Outline



Overview: Operational Forecast Systems (OFS)

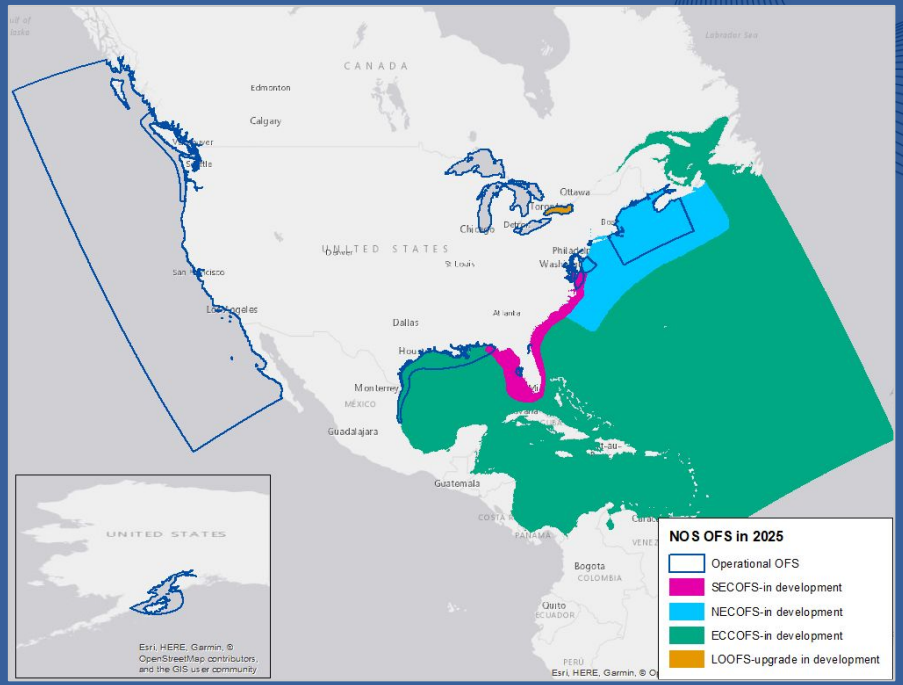
Observations in OFS



Observations for Model Evaluation

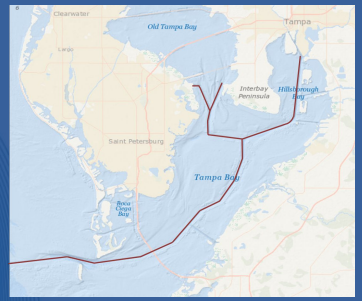
National Operational Coastal Modeling Program

- Established within the National Ocean Service (NOS) in 2003, with the goal to:
  - Provide high resolution short-term forecast guidance out to 2-5 days
  - Include key oceanographic parameters such as 2D water levels, 3D currents, water temperature and salinity
  - Provide coverage for high priority ports and approaches
  - Ensure safe and efficient navigation to head of tide
  - Support emergency response and ecological forecasting
- Aiming to complete CONUS coverage and priority ports in OCONUS and U.S. Territories



Upcoming spatial coverage of NOS Operational Forecast Systems

NOS Operational Forecast Systems: Requirements

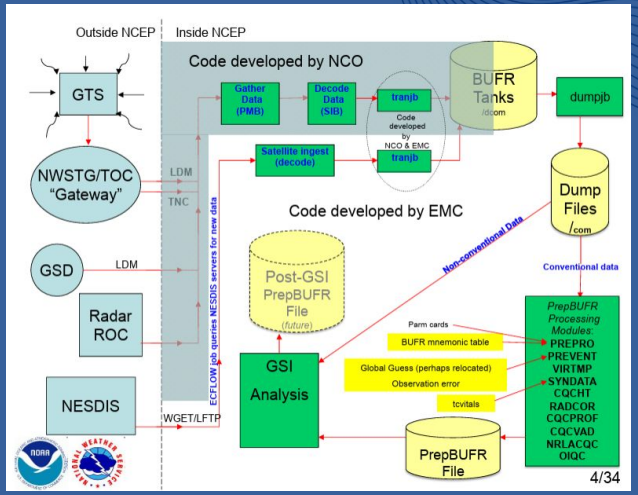


- Core ocean model: open sourced community-based system
  - FVCOM and ROMS are currently selected as core hydrodynamic models
  - SCHISM will be integrated in the future
- Capabilities:
  - Nearshore high resolution
  - *Incorporating data assimilation approaches*
- Coverage and resolution:
  - Grid should extend upstream to head of tide and navigation channel
  - Highly resolve navigational channels (≤ 100m) to meet pilots' needs
- Model skill:
  - Meet NOS standards for model performance and stability
- Operations:
  - On NOAA's supercomputing system (WCOSS)
  - *Data used by models must be available on this system*

Observations for NOS Operational Forecast Systems

Realtime data used as OFS inputs or for data assimilation

- ➔ Physical oceanographic observations of NWLON/PORTS
- ➔ Buoy observations from NDBC
- ➔ River flow and water temperature observations from USGS and Canada
- ➔ Satellite SST and SSH
- ➔ HF radar currents
- ➔ ADCP current observations
- ➔ CTD observations



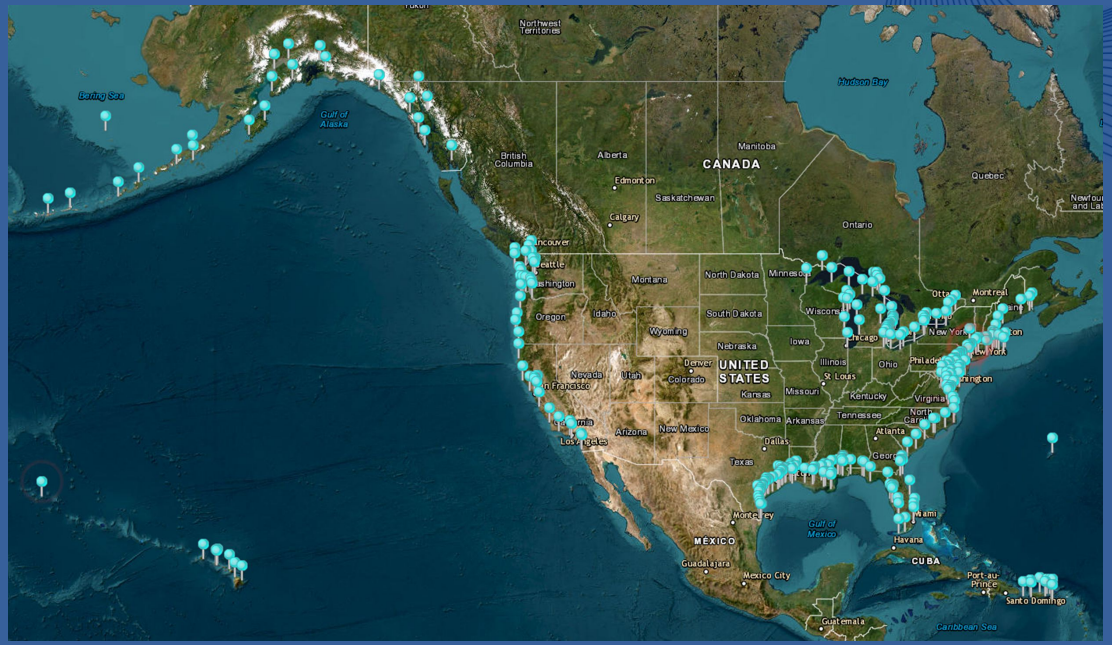
Schematic of NCEP data tank data flow

- ★ All data used in daily operational runs must be available in the NOAA National Centers for Environmental Prediction (NCEP) "data tank"
  - ○ Observational data at NCEP is in BUFR format (Binary Universal Form for the Representation of meteorological data)

Observations for Model Skill Assessment

Current evaluation of NOS Operational Forecast Systems:

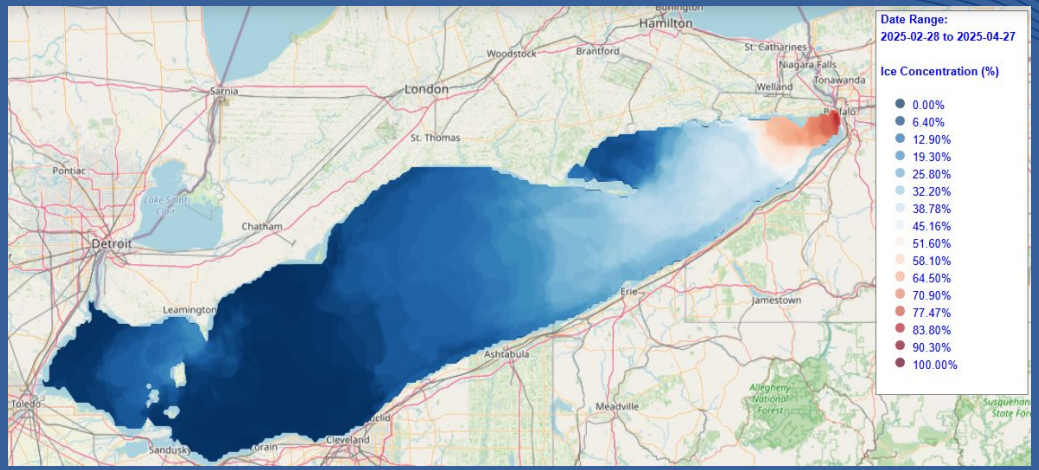
- ➔ Fortran-based skill assessment package
- ➔ Reads observation time series (1D)
  - ◆ Water level, currents, temperature, salinity
  - ◆ Select coastal and ocean stations (e.g., CO-OPS and USGS stations)



Observations for Model Skill Assessment

Next gen evaluation capabilities:

- ➔ Python-based skill assessment package and web-based GIS application for routine NOS OFS verification
- ➔ **Updated 1D skill assessment**: Realtime observations from CO-OPS, USGS, and NDBC stations for water level, currents velocity and direction, temperature, and salinity
- ➔ **Ice validation:** Skill assessment of ice concentration and extent using National Ice Center and Great Lakes Surface Environmental Analysis products
- ➔ **Adding 2D skill assessment:** remote sensing observations and products over entire OFS domain



- ➔ **Adding 3D skill assessment:** CTD and ADCP profiles, gliders, AUVs
  - ◆ *Opportunity for using OOI data*

Center for Operational Oceanographic Products and Services
NATIONAL OCEAN SERVICE

Questions?

Lucila.Houttuijn.Bloemendaal@noaa.gov