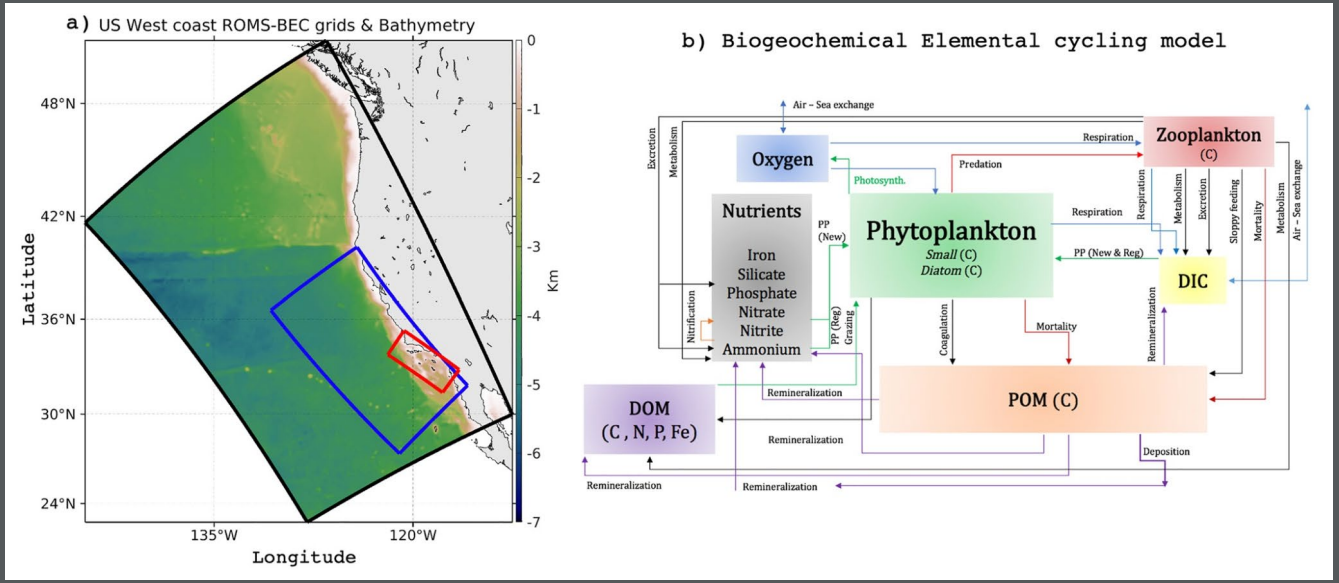
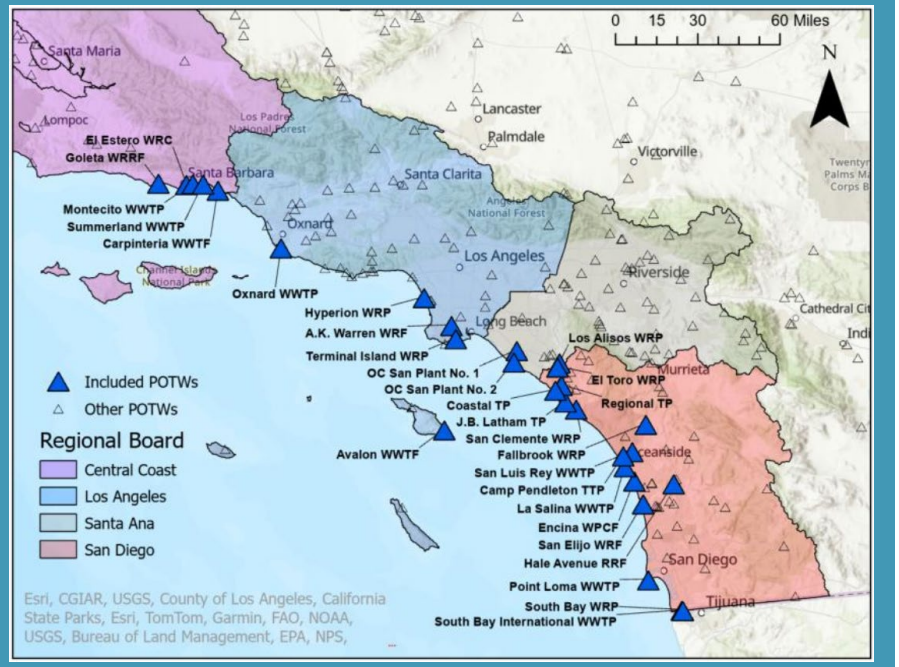


COLLABORATING WITH SCCWRP TO ASSIMILATE AND RUN THE ROMS-BEC MODEL

Andy Thuman (HDR)



01 **MODEL DEMOCRATIZATION**

02 **LONG ISLAND SOUND EXAMPLE**

- MODEL-DATA VALIDATION
- MODEL-DATA SHARING

03 **COLLABORATION**

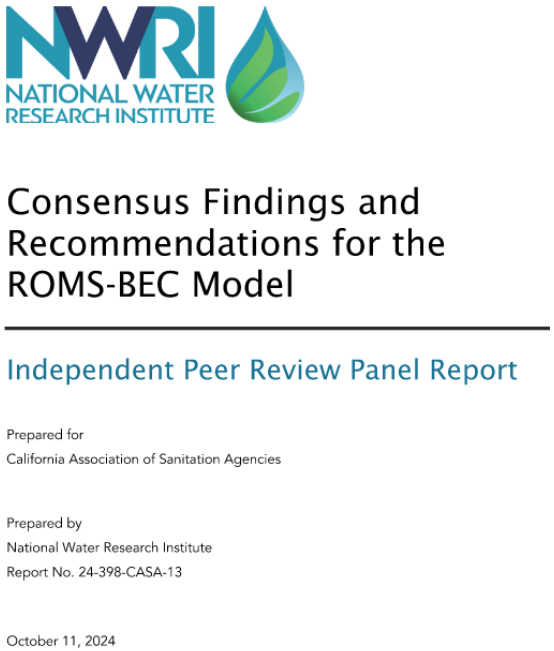
MODEL DEMOCRATIZATION

- Consensus Findings and Recommendations for the ROMS-BEC Model
  - Independent Peer Review Panel Report (10/11/2024)

4. Model Transparency and Data Sharing

   4.1. Enhanced Data Output. Provide more comprehensive model output through public channels, including daily averages of key variables. The goal of such transparency is to enable stakeholders to perform independent evaluations of the Model's predictions.

   4.2. Version Control. Establish a clear system for tracking changes in the Model's source code, associated datasets, and observations. This will facilitate better collaboration among regulators, scientists, and other stakeholders.

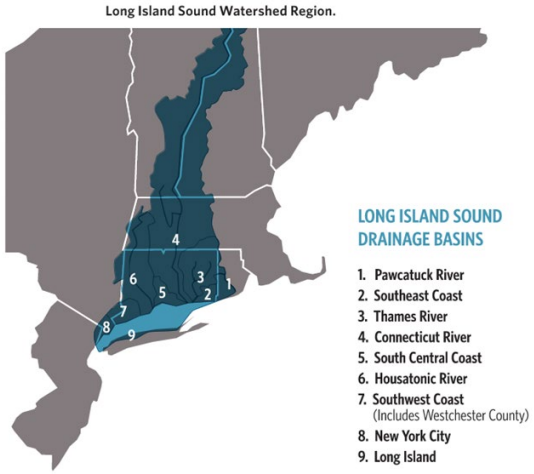


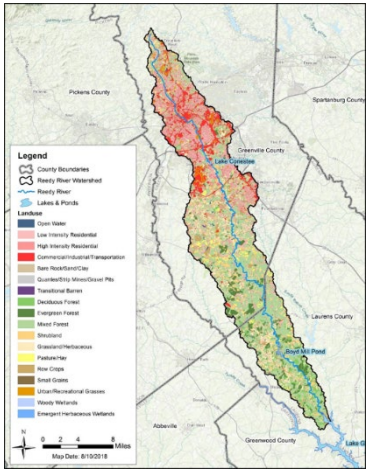
GENERAL INVESTMENTS IN TRANSPARENCY AND COMMUNICATION

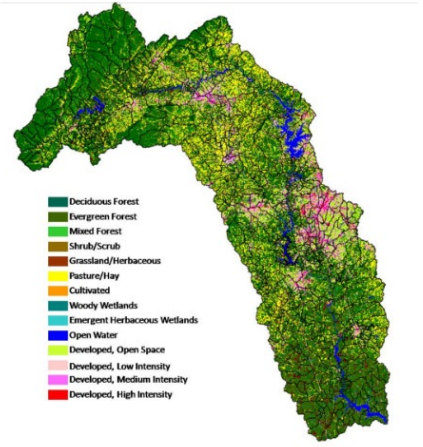
- More comparisons with observations that follow norms in the engineering community
  - Semi-automated model-data graphical comparisons & statistical summaries
- Openly provide model output, as opposed to highly condensed summaries
  - Model output sharing (e.g., THREDDS servers)
- System for linking code version with output, model-data comparisons & scientific publications
  - Version control for shared model results
    - From “Consensus Findings and Recommendations” #3.1 (p21-22) of IRP Report

COLLABORATIVE EXAMPLES

- Long Island Sound (NY/CT)
  - NYCDEP, EPA, CTDEEP, NYSDEC, NJDEP
- Lower Catawba River Watershed (NC/SC)
  - LOWCARB, SCDES, EPA
- Reedy River Watershed (SC)
  - ReWa, City of Greenville, Greenville County, SCDES, EPA
- Forge River Watershed (NY)
  - Town of Brookhaven, NYSDEC
- Tidal Delaware River (NJ/PA/DE)
  - DEWQIP, NJDEP, PADEP, DNREC, EPA
- San Francisco Bay (CA)
  - BACWA, SWCBs







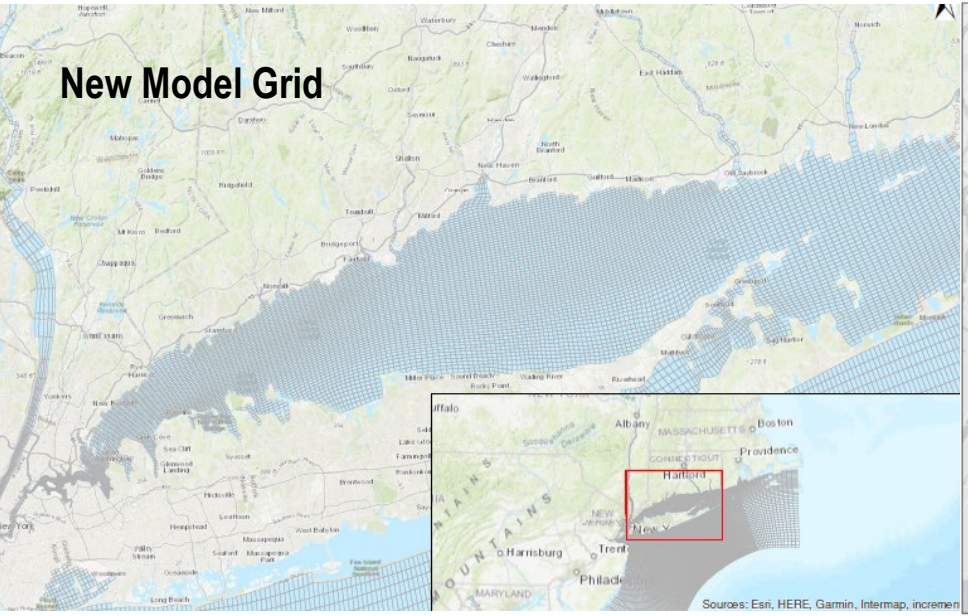
LONG ISLAND SOUND COLLABORATION

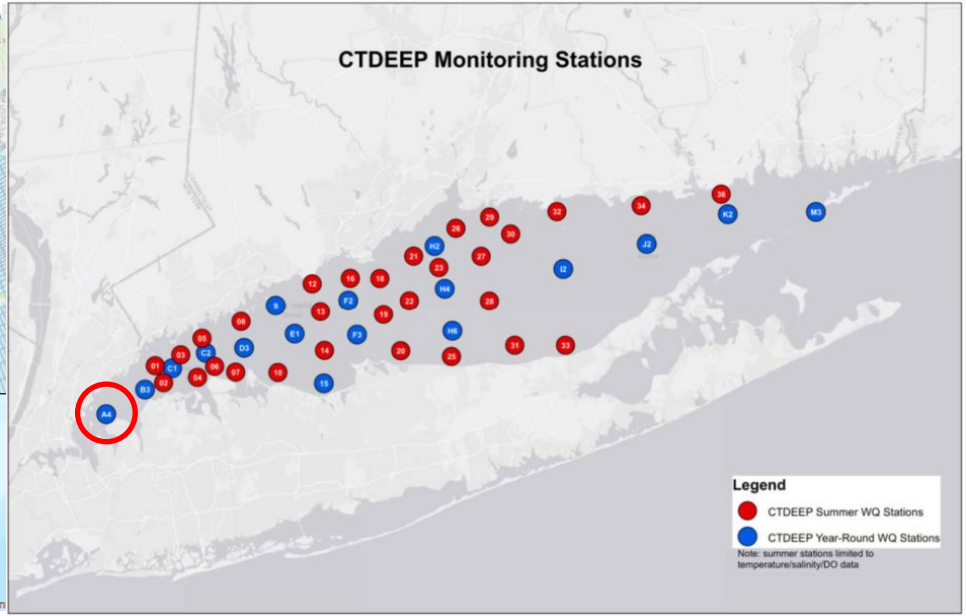
- Funded by NYCDEP & EPA
  - Started 8/2020, ending 8/2026

- Major project components
  - Update LIS hydrodynamic and water quality models
  - Develop two embayment models (NY, CT)
  - Build model GUI (dashboard) for stakeholder use
  - Demonstrate application of living resource models
    - Oysters, eelgrass, sugar kelp (nutrient bioextraction)

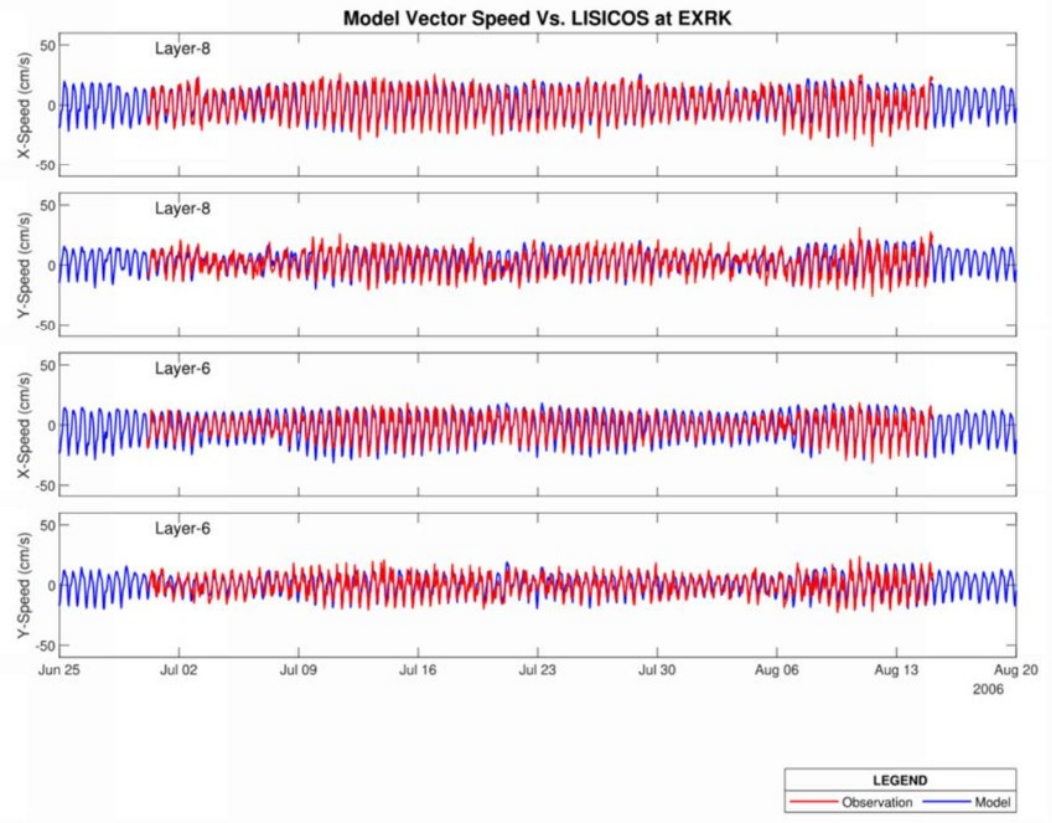
- Use of open source, publicly available models
  - ROMS – hydrodynamic
  - RCA – water quality (eutrophication w/ sediment flux model)

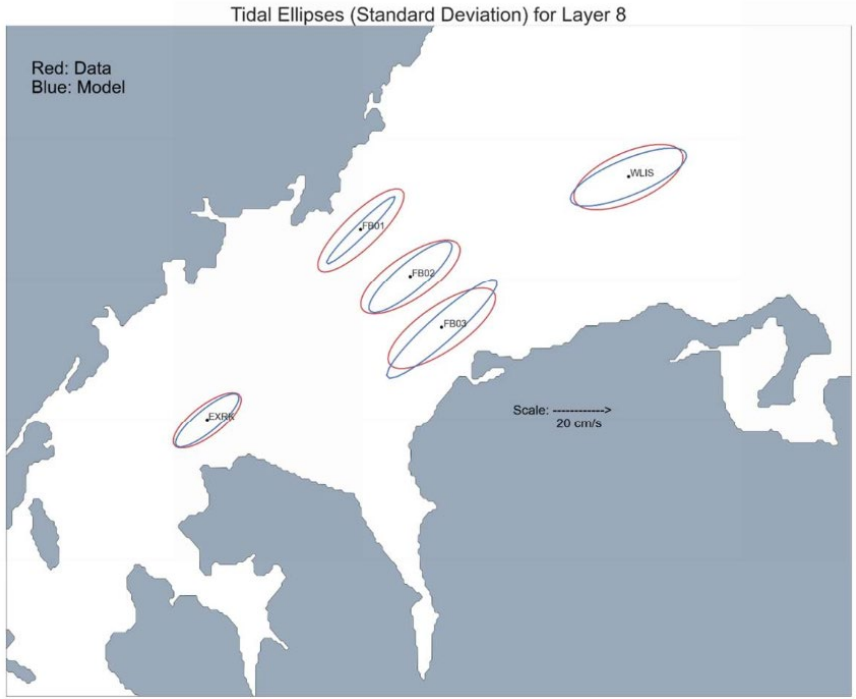
LONG ISLAND SOUND MODEL-DATA COMPARISONS



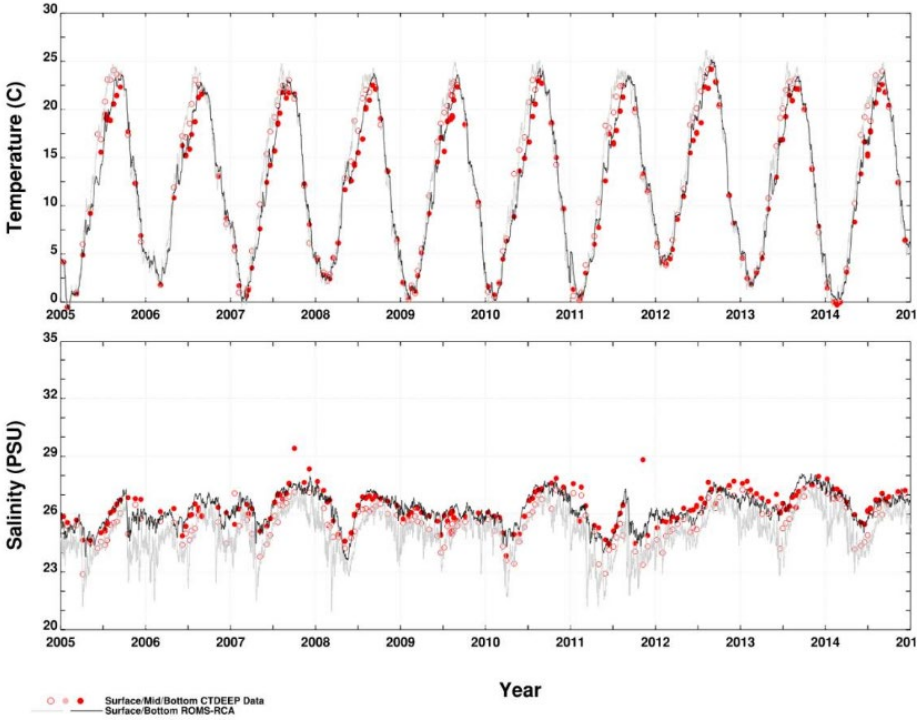


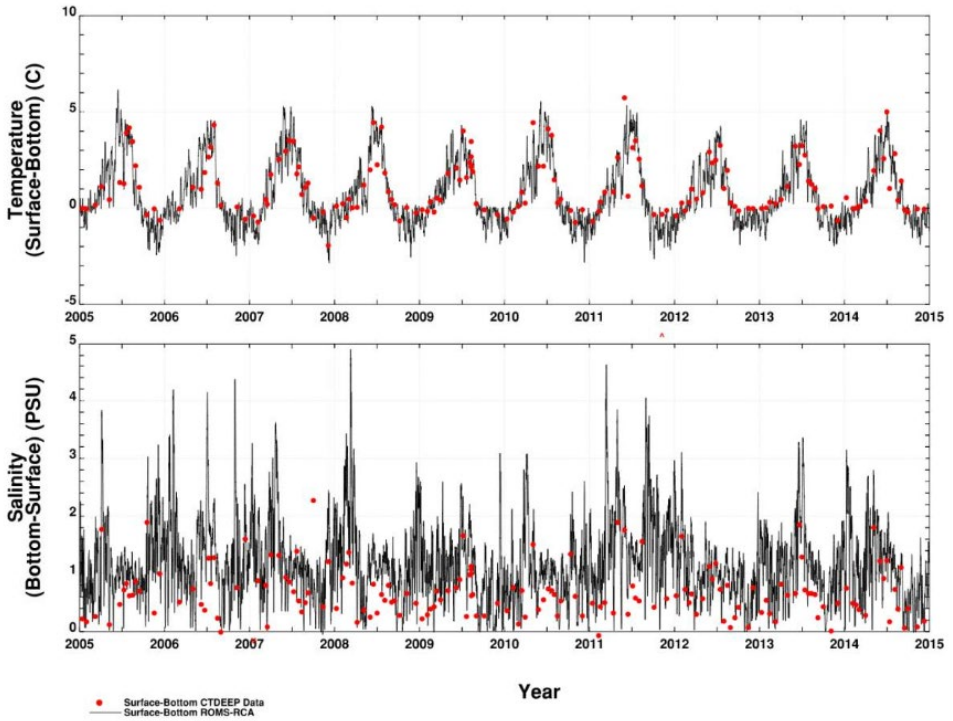
ROMS HYDRODYNAMIC MODEL-DATA VALIDATION



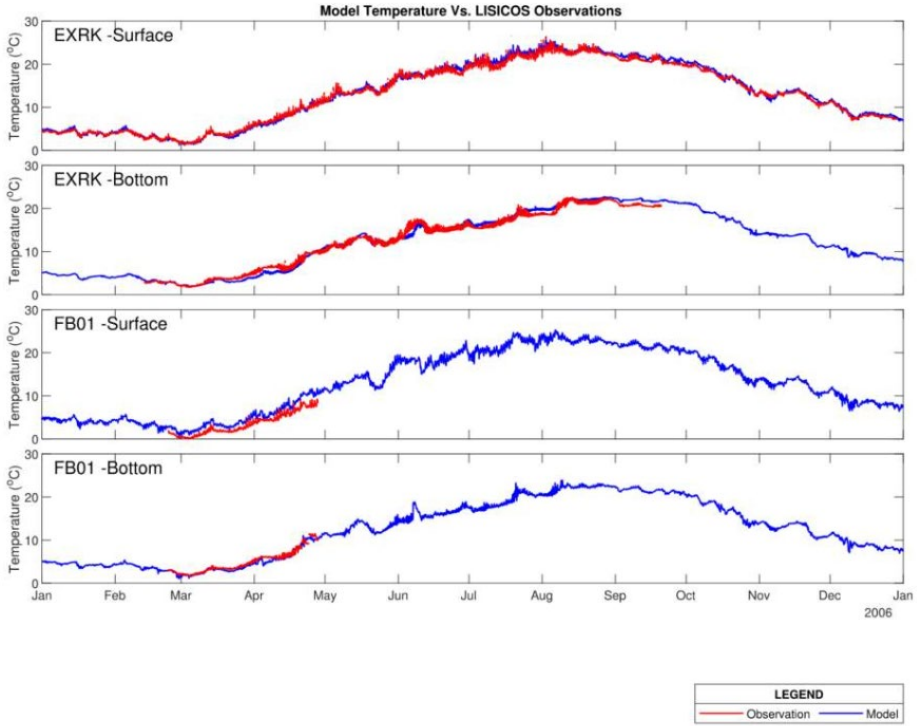


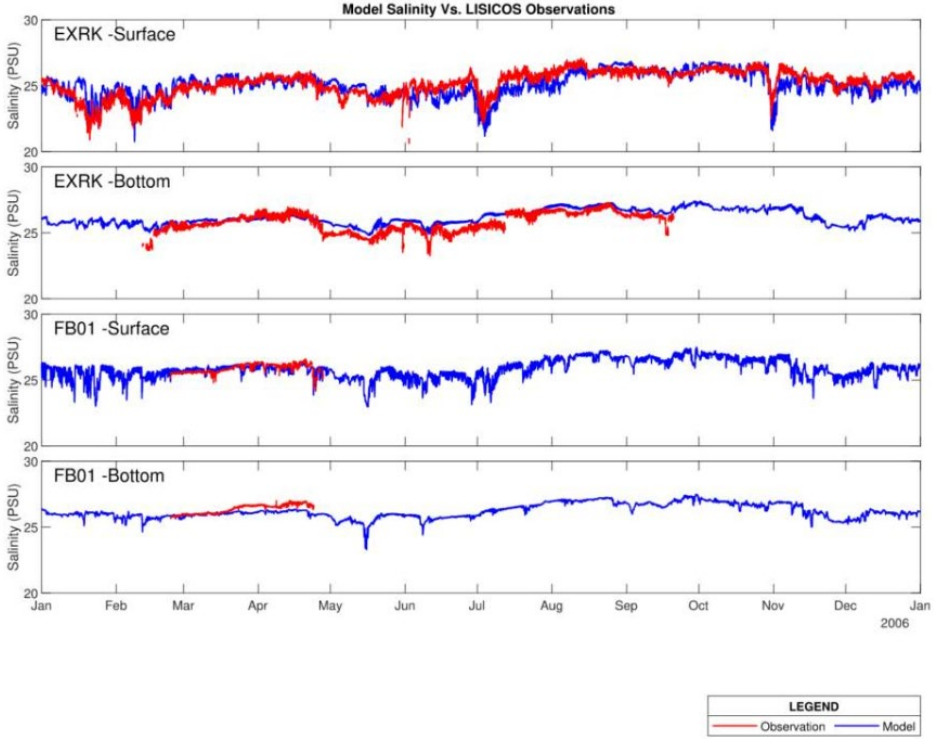
ROMS HYDRODYNAMIC MODEL-DATA VALIDATION



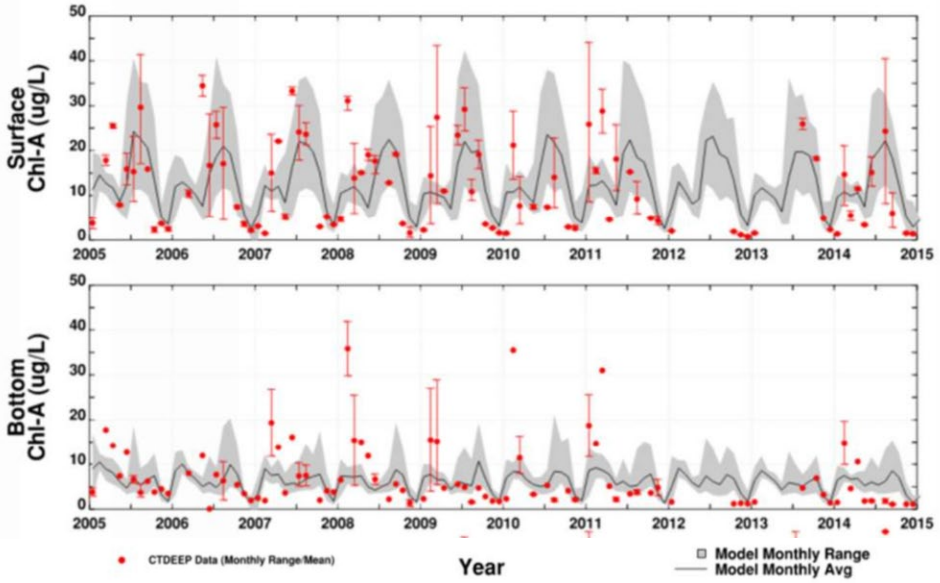


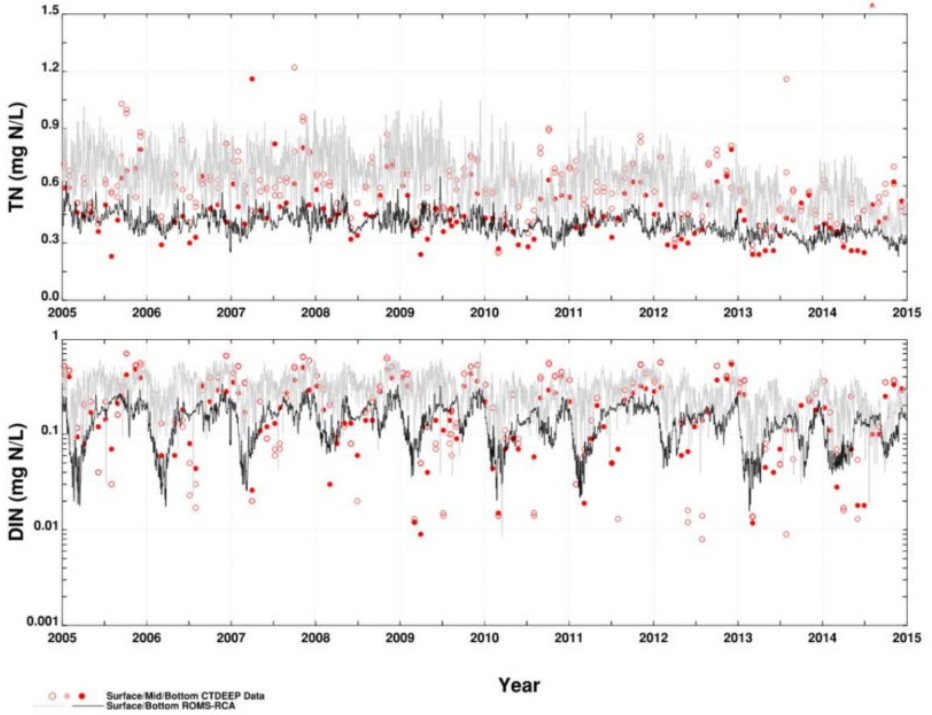
ROMS HYDRODYNAMIC MODEL-DATA VALIDATION



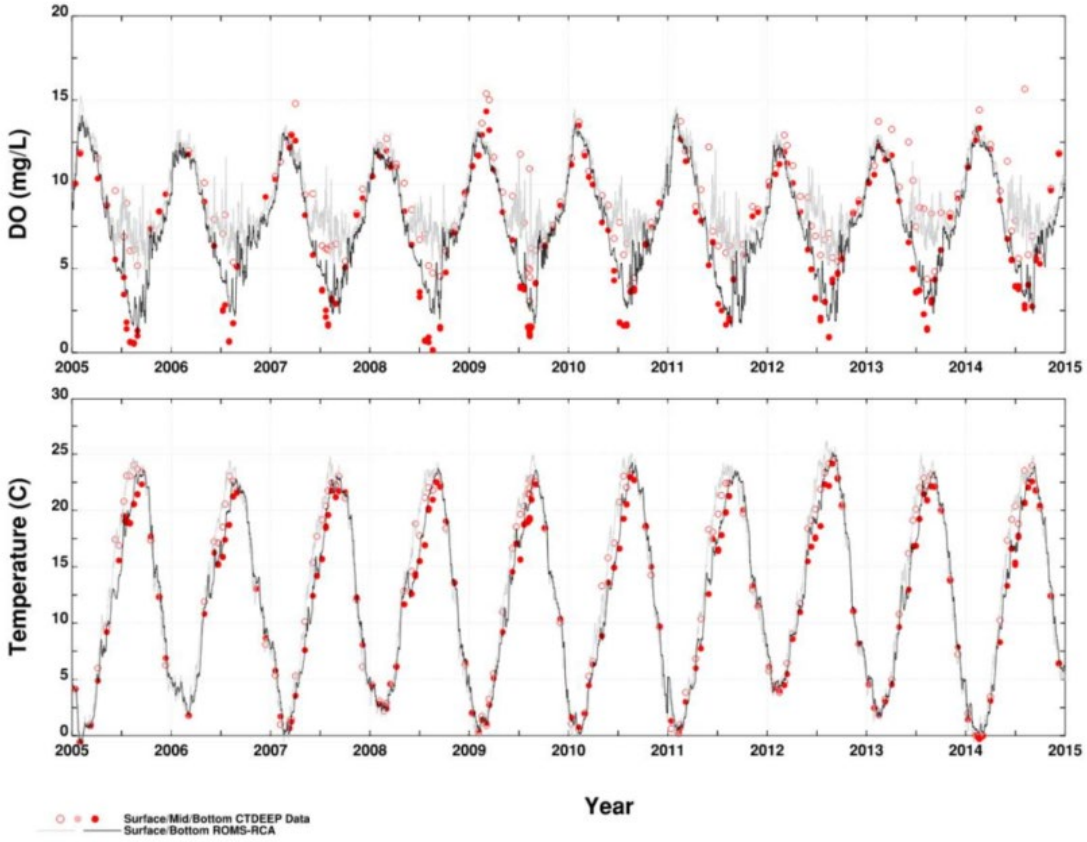


RCA WATER QUALITY MODEL-DATA VALIDATION





RCA WATER QUALITY MODEL-DATA VALIDATION



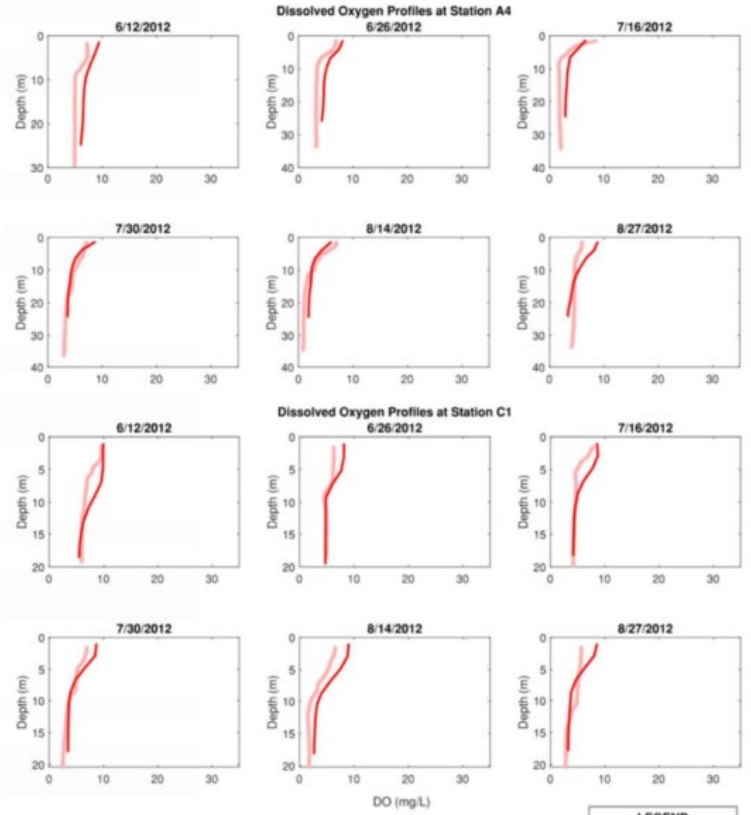
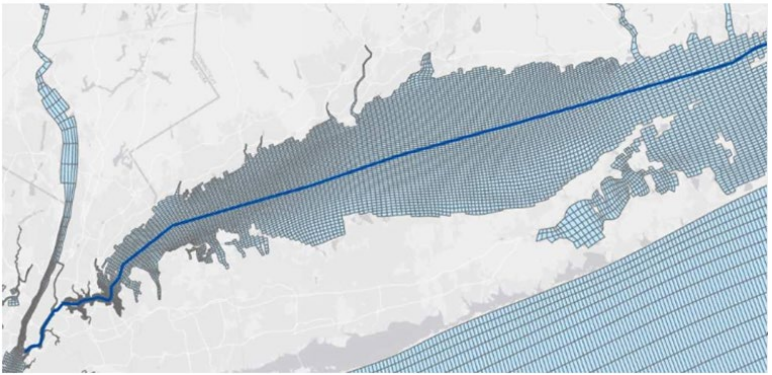
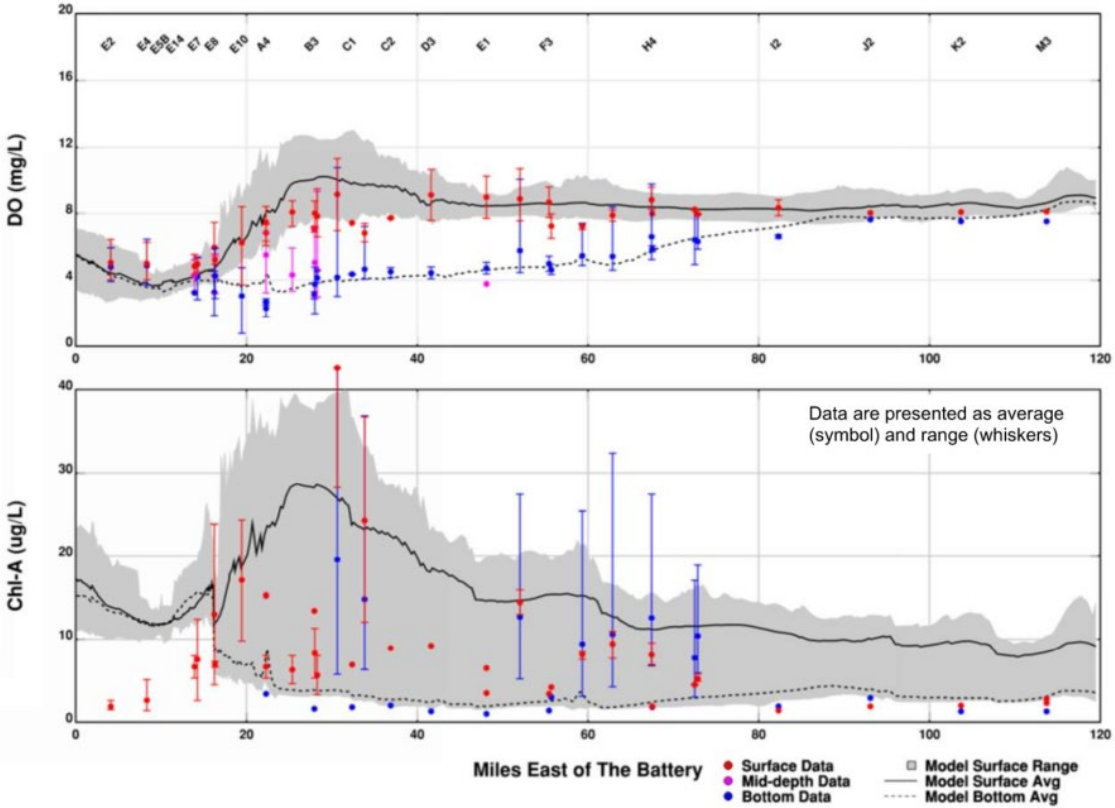


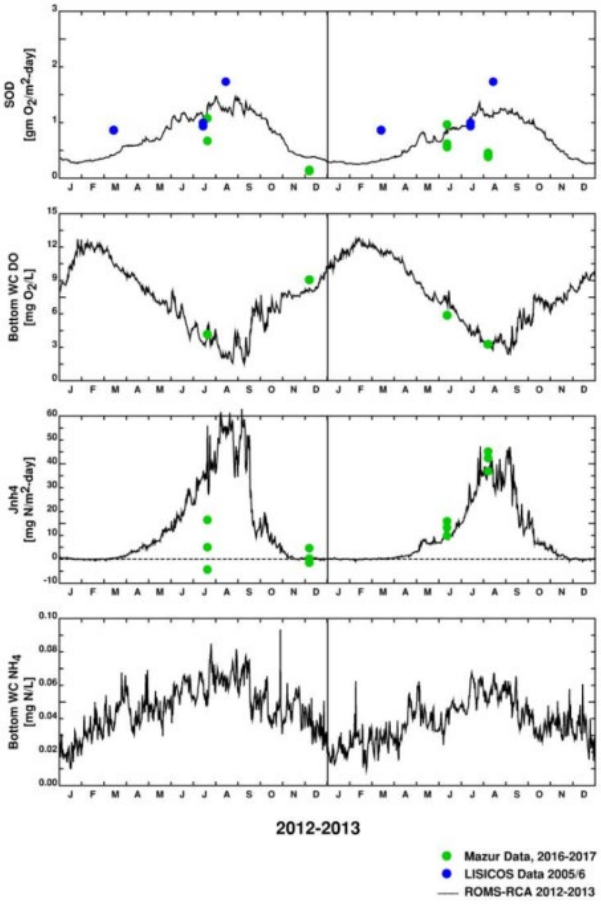
Figure 142. CTDEEP Vertical DO Model-Data Comparisons (2012)

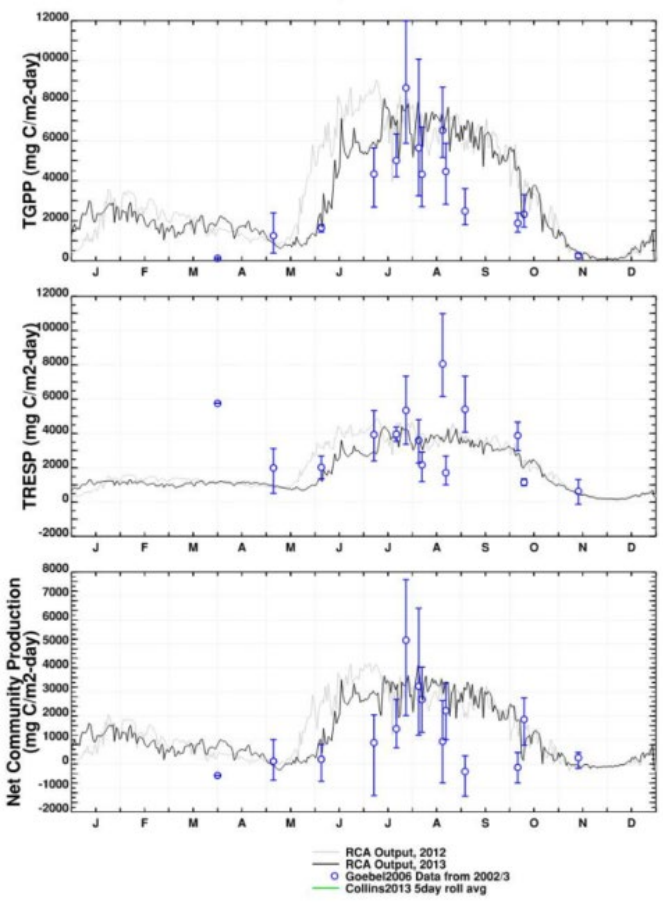
RCA WATER QUALITY MODEL-DATA VALIDATION



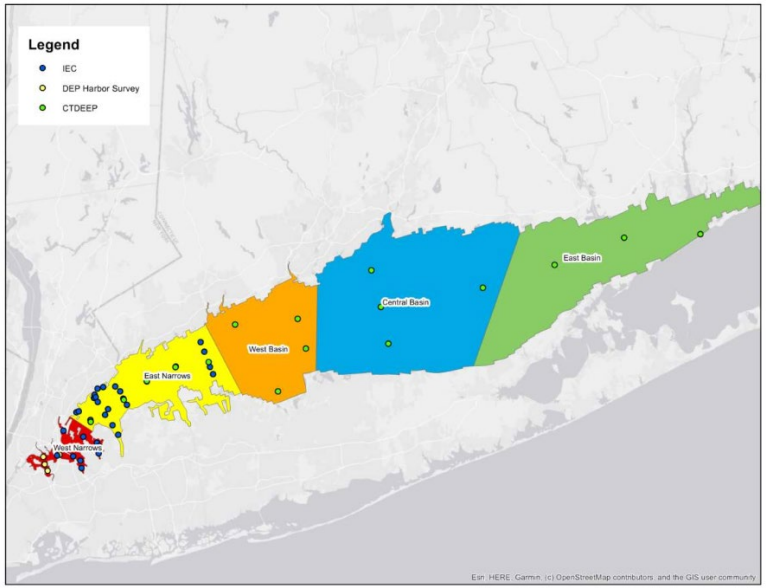


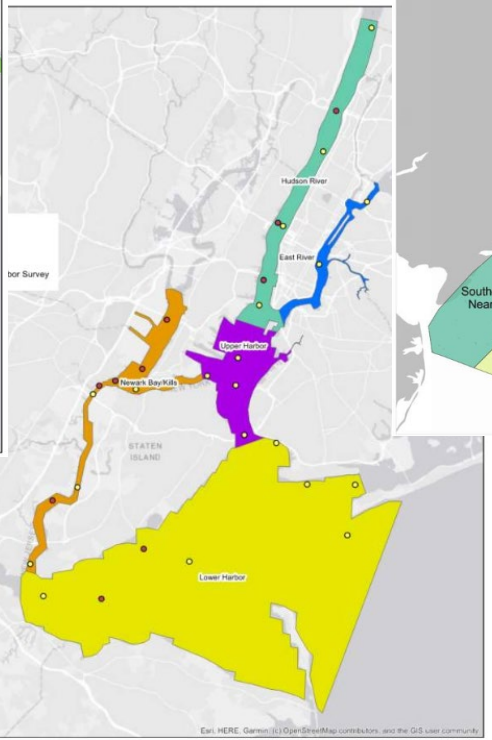
RCA WATER QUALITY MODEL-DATA VALIDATION

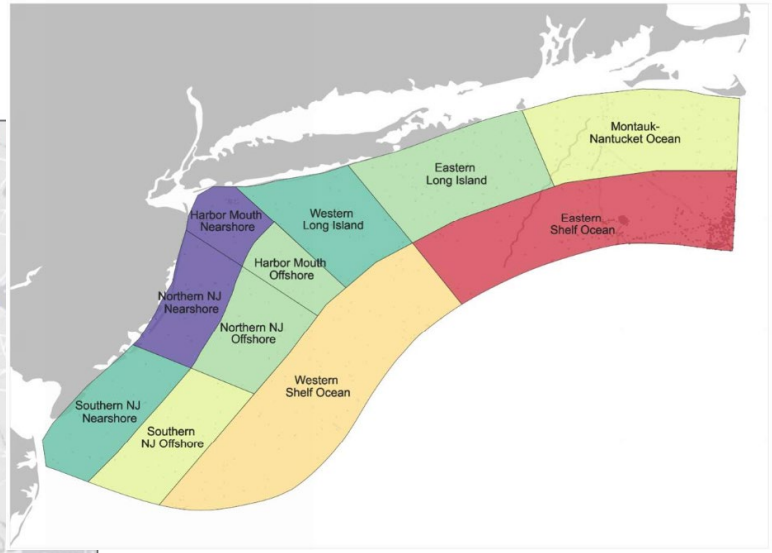




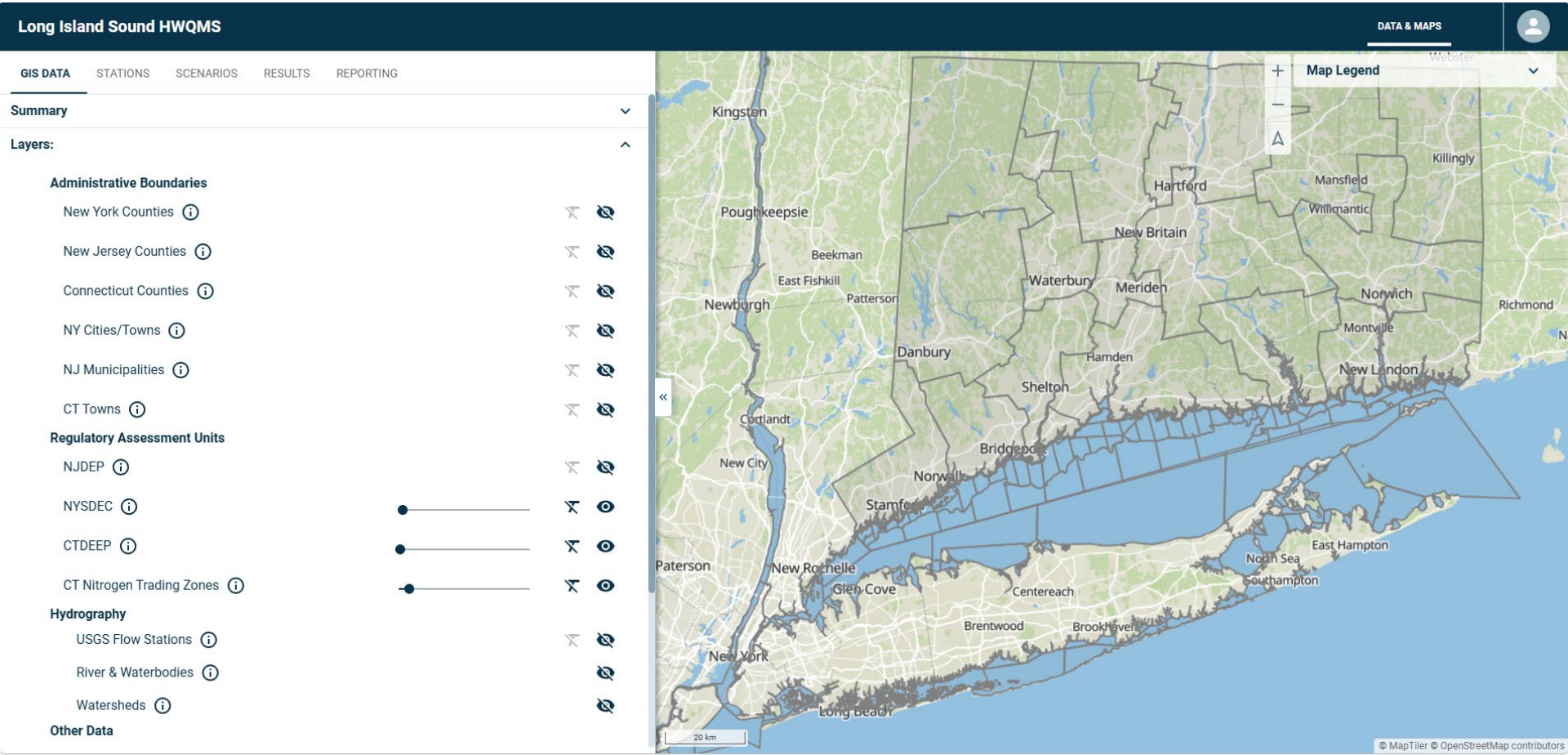
REGIONS USED FOR MODEL SKILL ASSESSMENT



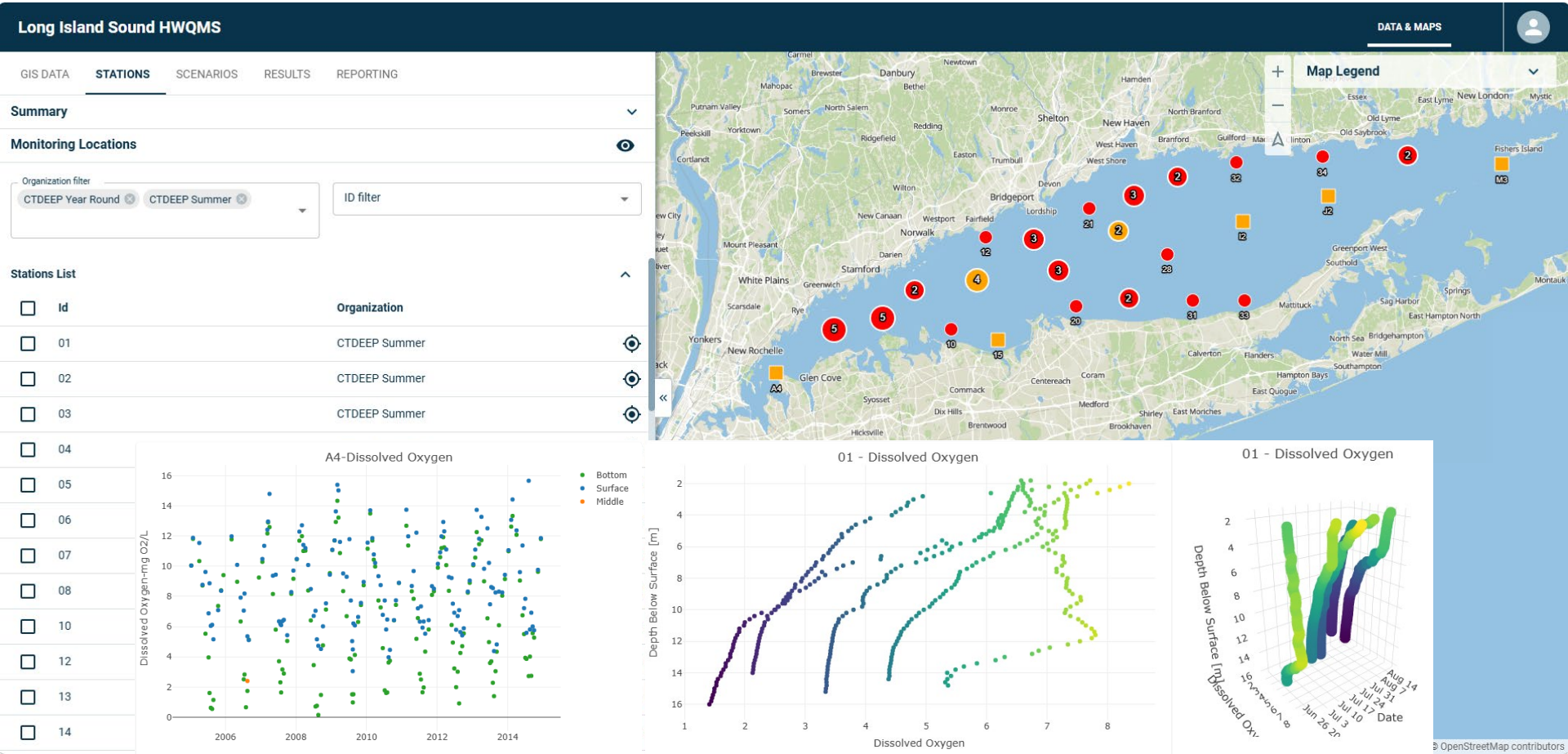




LONG ISLAND SOUND MODEL-DATA SHARING

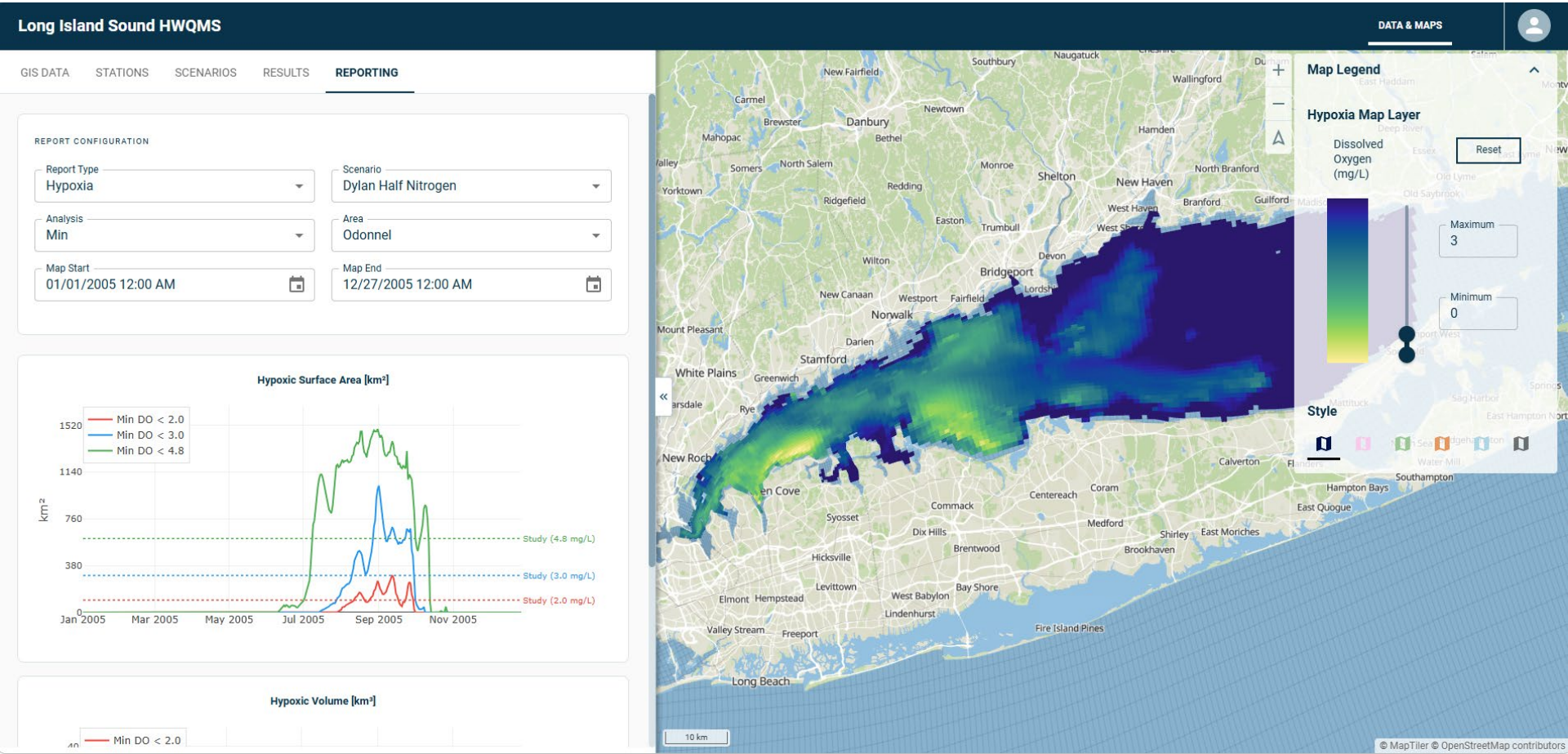


LONG ISLAND SOUND MODEL-DATA SHARING



LONG ISLAND SOUND MODEL-DATA SHARING

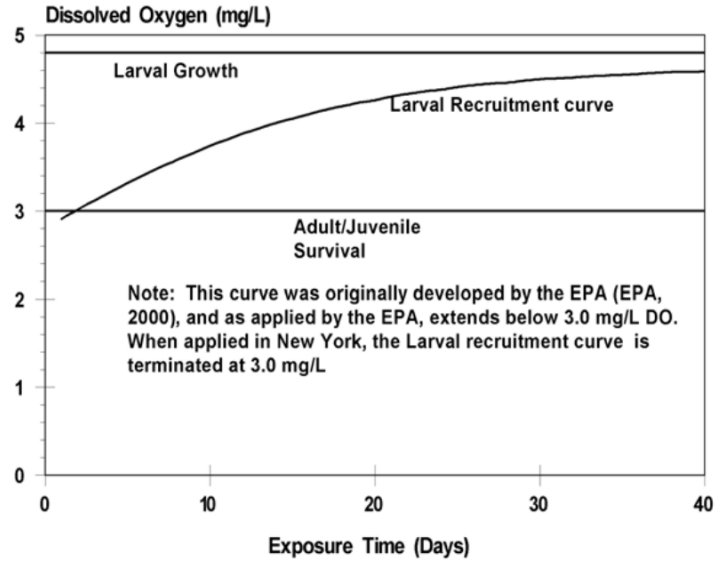
HYPOXIA REPORTING

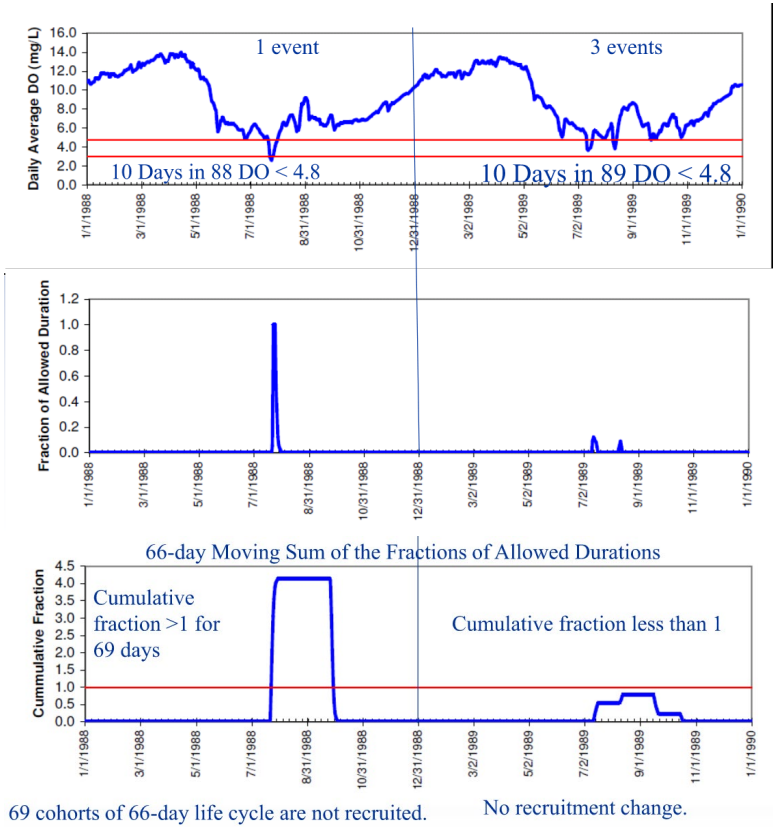


MARINE DO CRITERA REPORTING

(CTDEEP, NYSDEC)

- Builds allowable excursions between 4.8 and 3.0 mg/L for chronic criteria
- Acute criteria never less than 3.0 mg/L





COLLABORATION

- Able to run ROMS-BEC & process NetCDF output on HDR VMs
  - Developed tool for processing output locally after output file transfer
- Embed HDR modeler at SCCWRP for support & to provide access to VM cluster
  - Extra set of hands to investigate model/scenarios in parallel
- Help process output to compare to data & WQS/targets
  - DO, pH (aragonite saturation), chl-a, HABs, habitat compression
- Evaluate management scenarios (global or utility specific)
  - Watersheds/coastal regions, proposed/planned upgrades
- Support runtime improvements (sub-grids, less layers)
  - Potential use to help screen scenarios quicker & then fully evaluate w/ detailed model

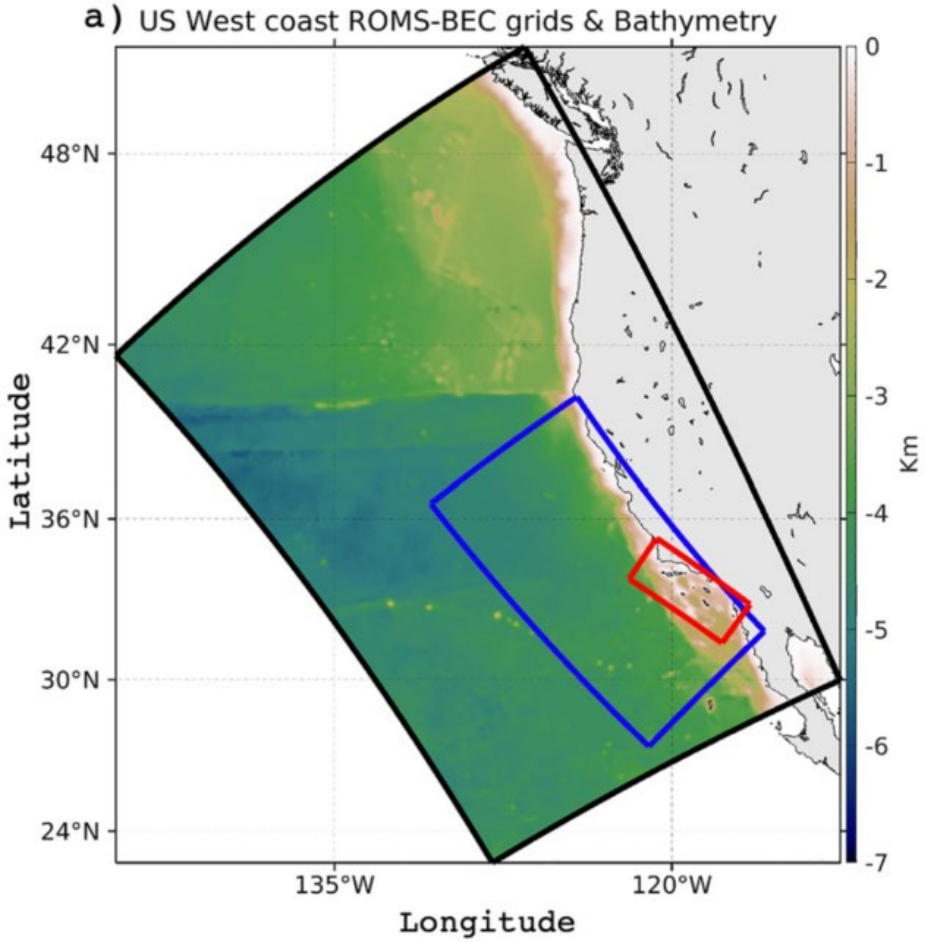
- Don’t create a “black box” / Provide transparency for acceptance

ROMS-BEC MODEL

- Black box – 4km square model grid
- Blue box – 1km square model grid (potential use)
- Red box – 0.3km square model grid (in use)
  - 1400 x 600 model segments
  - 60 vertical layers
  - ~50 million model cells

- SCCWRP runs model w/ 360 CPU cores
  - 1yr simulation about 15d compute time
  - 1yr simulation output size ~3TBs

- HDR runtimes about 3x longer (64 cores)



MODEL OUTPUT

- Already coordinating w/ SCCWRP on receiving model output (Jan-Mar 2000)
  - Temperature, salinity, pH, NO3, DO, DOC, chlorophyll-a, PAR, zooplankton