

A predictive model for ocean and coastal acidification thresholds from Long Island Sound to the Nova Scotian Shelf

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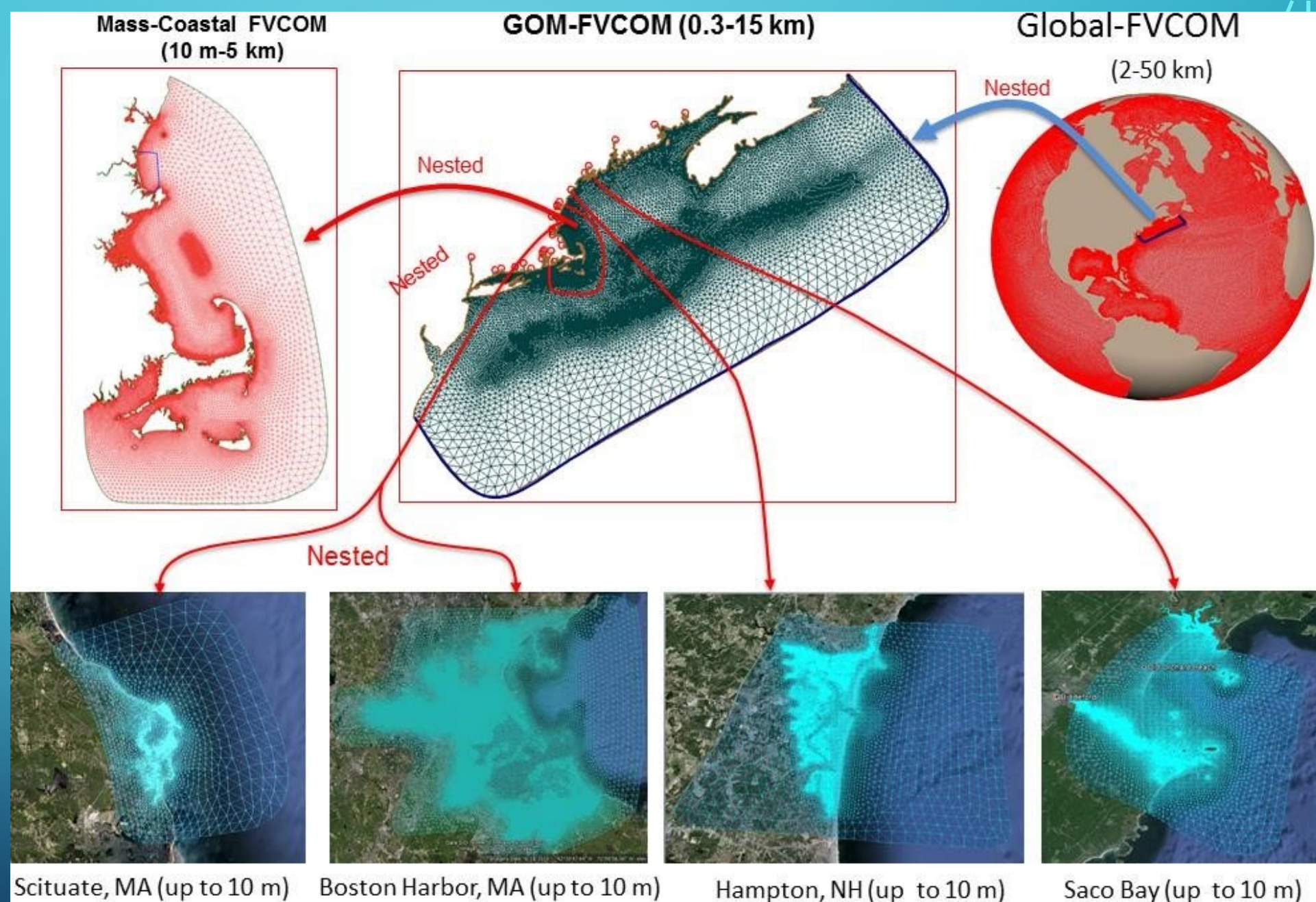
OCEAN AND COASTAL ACIDIFICATION CONCERNS

- State commissions highlight overall concerns (ME, NH, MA)
- Limited understanding of how nearshore and coastal ecosystems will respond to OCA, how these impacts will affect human communities, and how society might cope with these unprecedented changes.
- An absence of actionable information and the dynamic nature of coastal carbonate systems pose major challenges to industry, resource managers, and coastal policy makers.

PROJECT APPROACH

- Expand the Northeast Coastal Ocean Forecast System (NECOFS) to include carbonate parameters and key ecosystem properties.
- Seek input from three key decision areas to help define threshold detection and warning capabilities:
 - Water quality management and monitoring
 - Shellfish aquaculture
 - Wild harvest shellfisheries
- Development of a Management Transition Plan that utilizes NECOFS to ensure credible, salient and legitimate decision-making support.

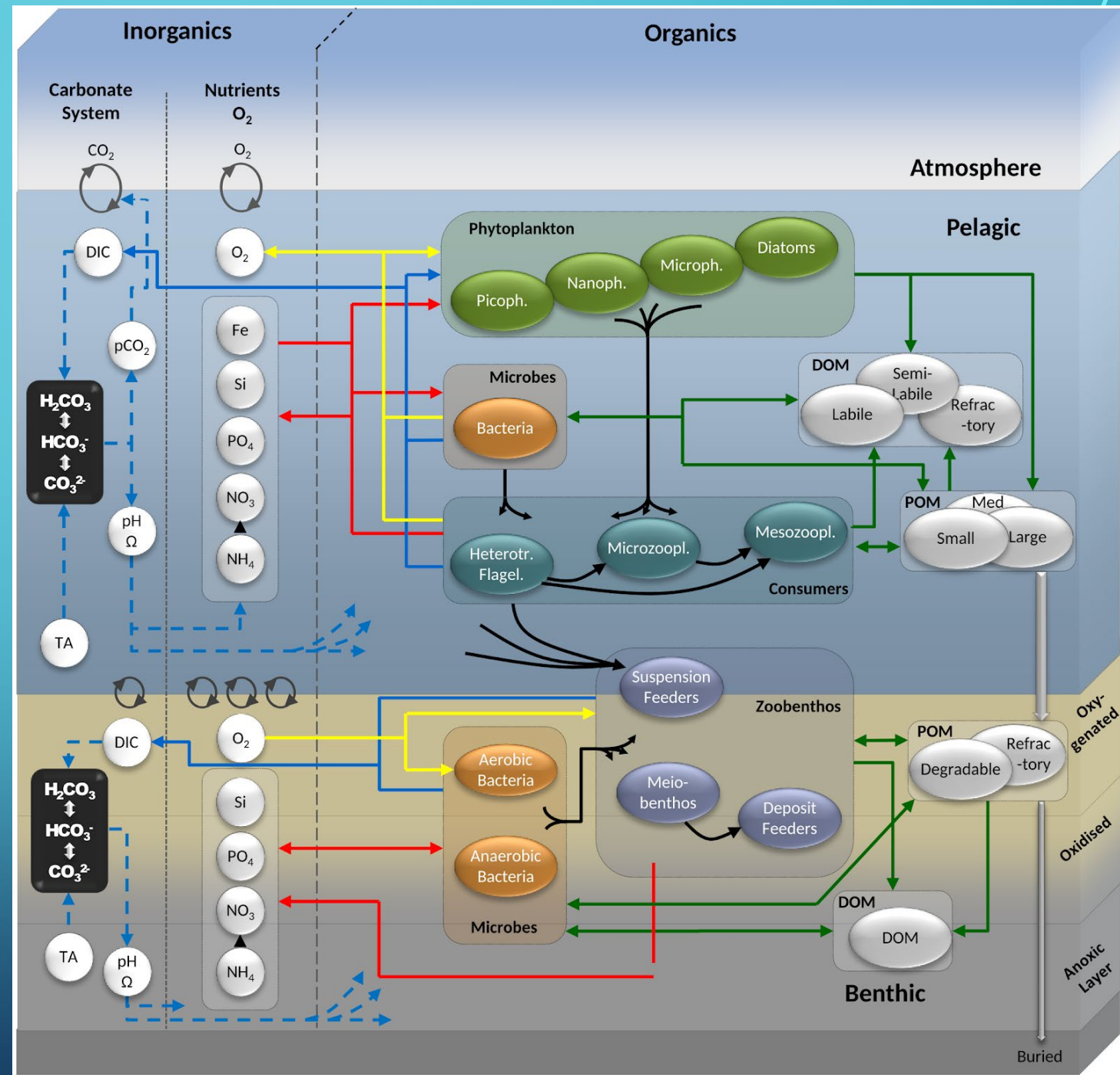
FVCOM: Finite Volume Coastal Ocean Model



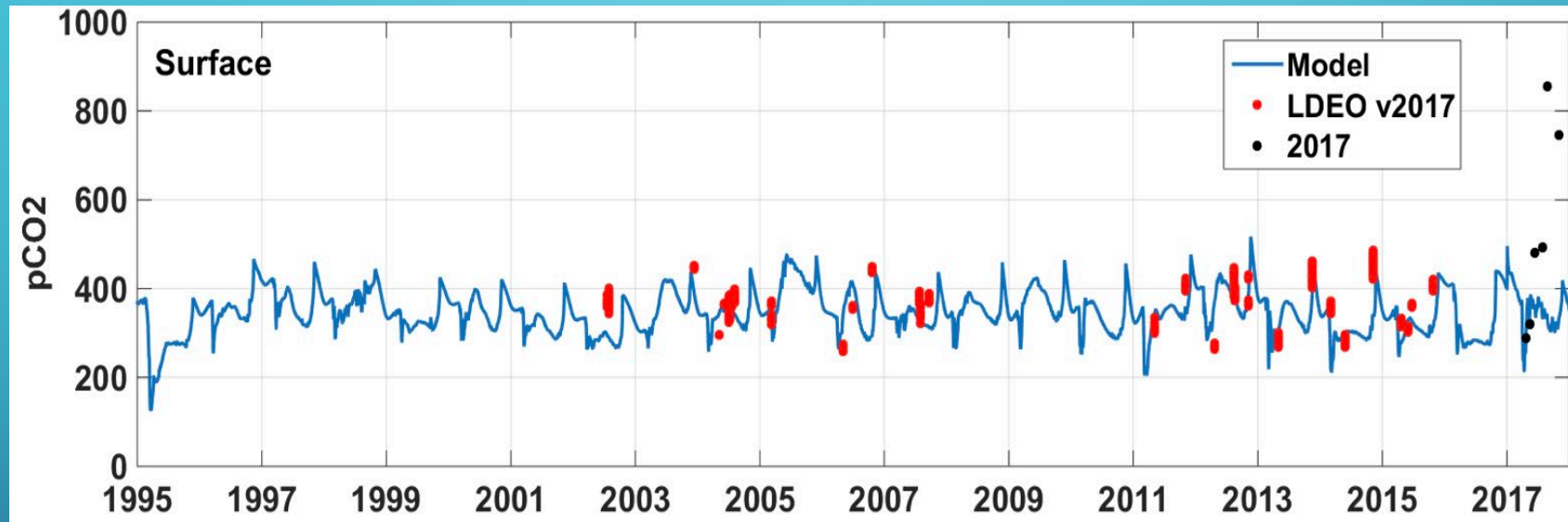
Unstructured grids of nested GOM3/GOM4/GOM5-FVCOM system.

ERSEM- THE EUROPEAN REGIONAL SEA ECOSYSTEM MODEL

- Integrate into NECOFS
- Physical drivers: FVCOM fields, solar irradiance, precip/evap, winds, river discharge, tides
- Carbonate parameters: DIC, PCO_2 , pH, TA, Ω
- Nutrients: N, PO_4 , Si, Fe
- Biology: phytoplankton (4 classes), bacteria, zooplankton (3 classes), DOM, POM



APPLYING HINDCAST TO MASS BAY STATION FOR PCO2



Comparison between model-simulated and in-situ observed PCO₂ values in the Mass Bay at stations F22 over the period of 1995-2017. Note: pCO₂ measured in 2017 is unusually higher. pCO₂ data for 2017 were provided by the MIT Sea Grant Office.

STAKEHOLDER OUTREACH AND MODEL APPLICATIONS

AQUACULTURE OPERATIONS

- NECAN survey results show relatively low number of NE aquaculture operators (22%) observing impacts from OCA on their operations
- Concerns about warming, storms, and harmful algal blooms are noted before impacts of OCA
- In a multiple stressor setting, how best to use ecological forecasting around OCA to inform decisions?

WATER QUALITY MANAGEMENT

- Water quality managers could use models to design monitoring, assess vulnerability, use in scenarios or use for developing WQ criteria
- Forums in 2020 to discuss potential use of the model for WQ management

DISCUSSION QUESTIONS

What would you want to know about ocean and coastal acidification that could support your work?

If we could forecast OCA conditions and/or impacts in the areas that you work, how would you use that information?

Email Parker Gasset, parker.gasset@maine.edu

WE NEED YOUR HELP!

- Our modeling of the nearshore environment's OA status is in need of **NUTRIENT INPUT DATA**. If you or your organization uses estimates of riverine or coastal nutrient loading with data that are publicly available, please reach out to us to let us know. Email parker.gassett@maine.edu, astrong@Hamilton.edu and c1chen@umassd.edu