Use of Northeast Coastal Ocean Forecast System (NECOFS) in Offshore Wind Energy Resource Planning

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Information Needs

- Incorporating data from individual wind turbines and wind turbine arrays within a validated modeling system for the US North Atlantic, which includes 30 years of hindcasting scenarios and forecasting capabilities, will allow BOEM to use detailed simulations to more accurately conduct NEPA analyses for areas of interest.
- The modeling in this study will assist with assessment of the effects of wind turbines on larval transport and may assist with tracking of spills related to ship allision in proposed areas of interest.

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Background

• NECOFS = integrated atmosphere/surface wave/ocean model system (developed at UMASS-Dartmouth) with forecast variables of surface wind, air pressure, precipitation/evaporation, surface heat flux, ocean currents, water temp. and salinity, and significant wave ht. and frequencies

- ✓ Finite-Volume Coastal Ocean Model (FVCOM) (Chen et a. 2006) is an unstructured grid finite-volume model, with an advantage of flexibility in grid sizes – easily adjusted based on need!
- ✓ Subdomain may be developed within FVCOM that has boundary connected to NECOFS with a horizontal resolution of 1 meter or less

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Objectives

- ✓ Determine mesoscale effects of offshore wind resource facilities on environmental conditions and habitat
- ✓ Use hindcasting and forecasting capabilities of NECOFS to provide comprehensive temporal and spatial simulations of wind energy impacts on proposed areas of offshore wind energy development
- ✓ Develop a sub-domain FVCOM that includes proposed turbines with a boundary connected to NECOFS

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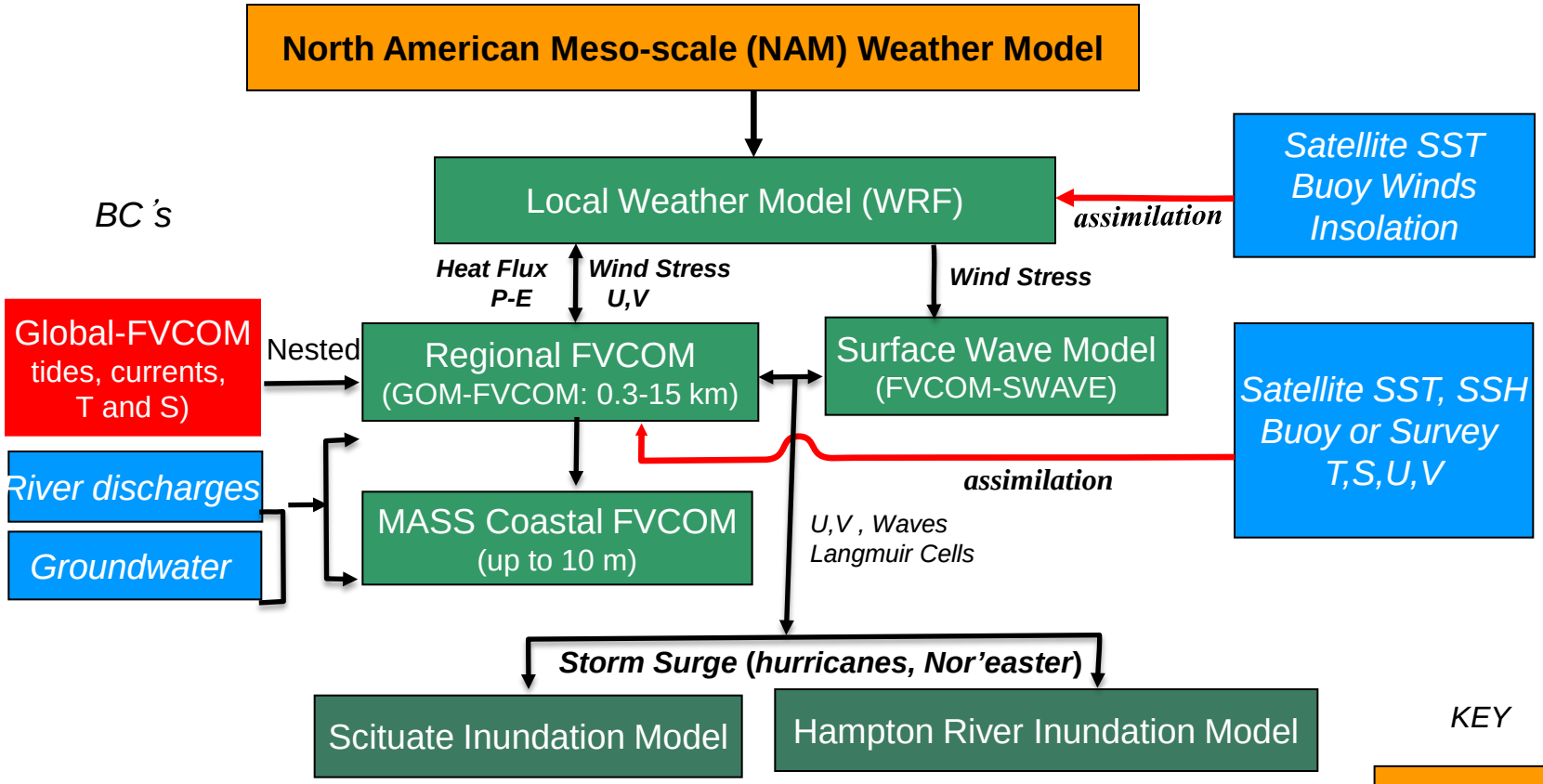
Methods

✓Use sub-grid FVCOM with a refined grid

1) Construct subdomain in study area with a horizontal resolution of up to 1 m around each proposed turbine.
2) Sub-grid model will have grid transition away from turbine area to current NECOFS grid
3) Run the subdomain model without and with turbines for conditions of normal weather, hurricanes, and Nor'easters to examine how oceanic responses will change after turbines are installed, particularly for bottom stress and turbulent mixing
4) Compare conditions with and without turbines in the high-resolution sub-domain model experiments to provide quantitative estimation of environmental changes once turbines are installed

Northeast Coastal Ocean Forecast System (NECOFS)



Products:
Weather: winds, air temperature, air humidity, air pressure, heat flux, E-P
Oceans: sea level, currents, T, S, wave heights, wave frequencies, icing
Lands: inundation areas

KEY

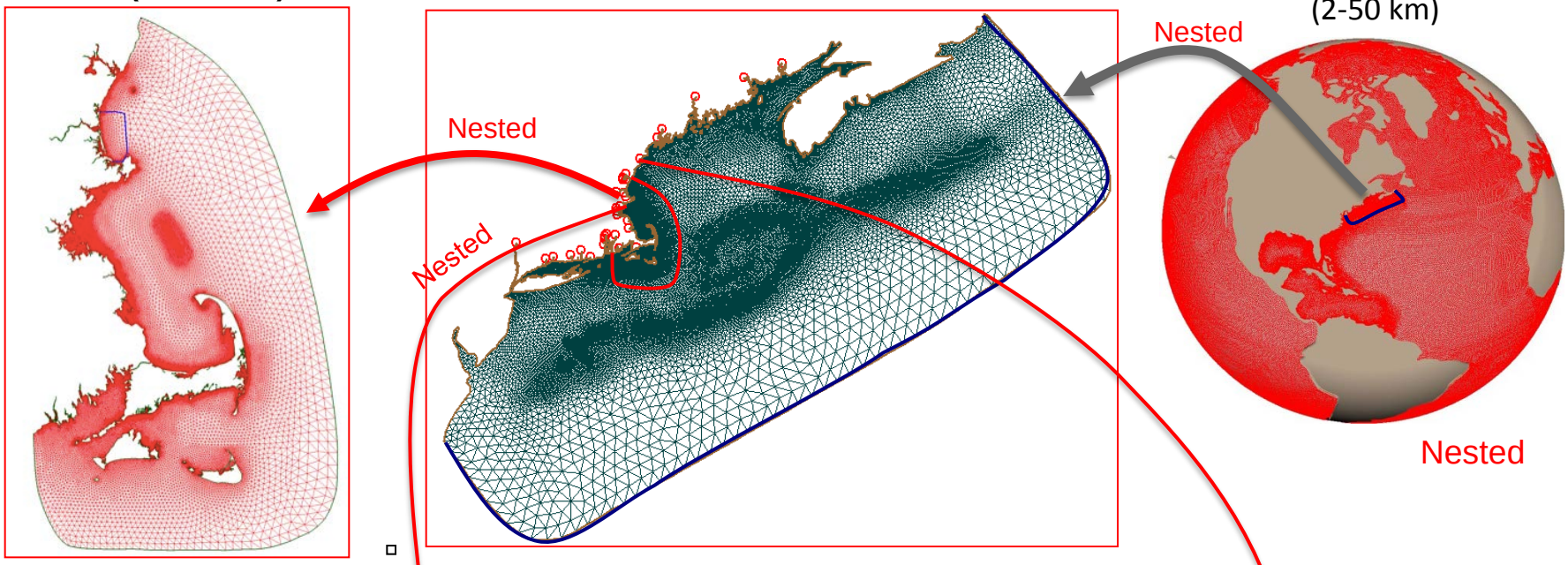
- Existing Models
- NECOFS
- Data
- Products
- To Be Developed

Current NECOFS Domains and Grid

Mass Coastal FVCOM (10 m-5 km)

GoM-FVCOM (0.3-15 km)

Global-FVCOM (2-50 km)



Scituate, MA (up to 10 m)

Hampton, NH (up to 10 m)