Chesapeake Bay Hydrodynamic and Hypoxia Model Intercomparison: Initial Results

Carl Friedrichs and the SURA Modeling Testbed Estuarine Hypoxia Team

Estuarine Hypoxia Component of the SURA Super-Regional Modeling Testbed

- Carl Friedrichs (VIMS) – Team Leader

Federal partners

- David Green (NOAA-NWS) – Transition to operations at NWS
- Lyon Lanerole (NOAA-CSDL) – Transition to operations at CSDL; CBOFS2
- Lewis Linker (EPA), Carl Cerco (USACE) – Transition to operations at EPA; CH3D, CE-ICM
- Doug Wilson (NOAA-NCBO) – Integration w/observing systems at NCBO/IOOS

Non-federal partners

- Marjorie Friedrichs*, Aaron Bever* (VIMS) – Metric development and model skill assessment
- Yun Li, Ming Li (UMCES) – ROMS hydrodynamics in CB
- Wen Long*, Raleigh Hood* (UMCES) – ChesROMS with NPZD water quality model
- Scott Peckham*, Jisamma Kallumadikal* (CSDMS) – Multiple ROMS grids, forcings, O_2 codes
- Malcolm Scully* (ODU) – ChesROMS with 1 term oxygen respiration model
- Kevin Sellner* (CRC) – Academic-agency liason; facilitator for model comparison
- Jian Shen*, Bo Hong (VIMS) – SELFE, FVCOM, EFDC models in CB
- John Wilkin, Julia Levin (Rutgers) – ROMS-Espresso + 7 other MAB hydrodynamic models

* = CSDMS Members

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Part of a larger NOAA/IOOS/SURA larger "Super-Regional Testbed to Improve Models of Environmental Processes on the U.S. Atlantic and Gulf of Mexico Coasts"

Pilot projects in the larger "Super-Regional Testbed" will address three chronic issues of high relevance within the super region:

- Coastal Inundation
- Estuarine Hypoxia
- Shelf Hypoxia

Motivation:

January 2010 NOAA Funding Opportunity Announcement: "FY2010 Integrated Ocean Observing System Community Modeling Environment To Support a Super-Regional Test Bed":

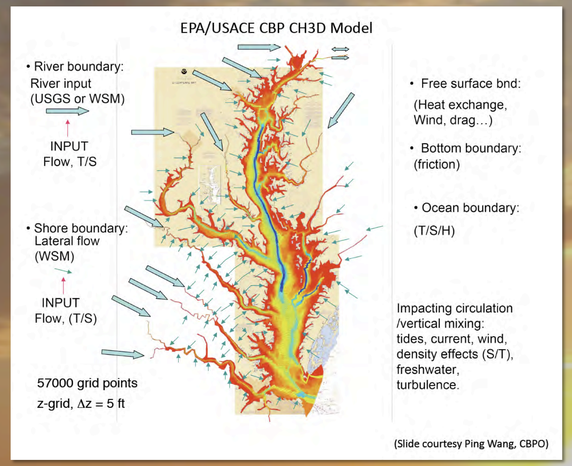
"The program priorities for this funding opportunity are to conduct a super-regional testbed demonstration of the community modeling environment by transitioning models, tools, toolkits and other capabilities to a Federal operational facility to improve the understanding, prediction, and mitigation of the consequences of extreme events and chronic conditions."

How did we choose our models?

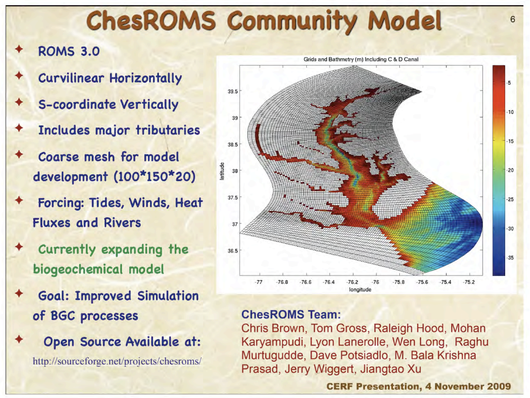
- Include existing Federal models presently used in operations/decision making (e.g., NOAA-CSDL CBOFS2, EPA/USACE CH3D, EPA/USACE ICM, Navy/NOAA HyCOM-NCODA, Navy NCOM, NOAA-NWS RTOFS).
- Include other mature, existing open source community models that have a significant number of users around the US and/or globe (e.g., 4 flavors of ROMS, SELFE, FVCOM, EFDC, COAWST, Mercator).
- In the horizontal, include structured and unstructured horizontal grids.
- In the vertical, include both z-grids and sigma-grids.
- Include varying degrees of horizontal resolution/model speed.
- Include varying degrees of complexity of model formulation (for ecosystem/oxygen).
- Include structure to aid in interoperable linking/model swapping.

Project Deliverables

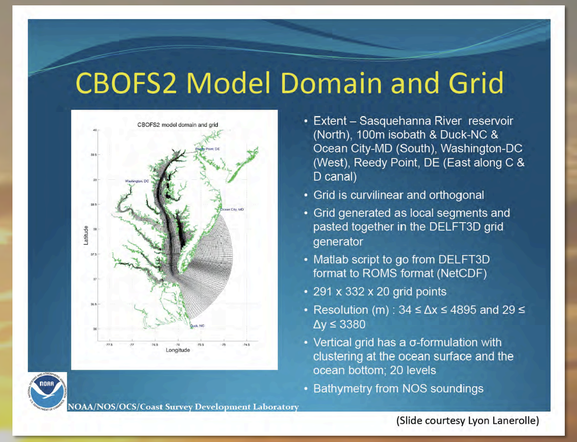
- General results of data-model intercomparison, including quantification of model accuracy, complexity, efficiency and sensitivity.
- Identification of strengths and weaknesses of various approaches (i.e., structured vs. unstructured; z- vs. sigma-grid; high resolution vs. high performance; more complex vs. simpler water quality formulations).
- Advice to NOAA-CSDL (via Lyon Lanerole, Frank Aikman) and NOAA-NWS (via David Green) for implementing 3-day forecasts of hydrodynamic/water quality conditions.
- Advice to EPA/USACE CBP (via Lewis Linker, Carl Cerco) for scenario-based hydrodynamic/water quality model improvement for "2017" EPA/CBP modeling effort.
- Delivery to NOAA NCBO (via Doug Wilson) of interactive web-based summary of final model output, model data comparisons, and project conclusions .



(Slide courtesy Ping Wang, CBPO)



(Slide courtesy Jerry Wiggert)



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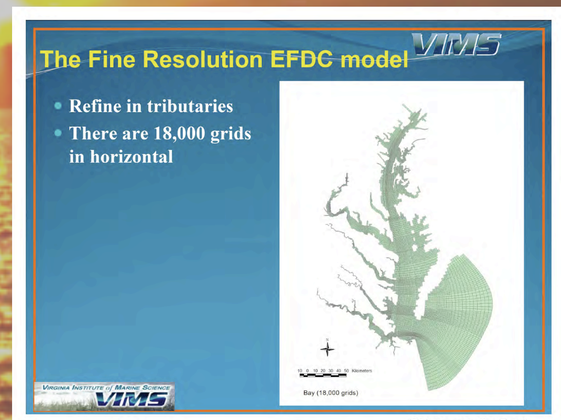

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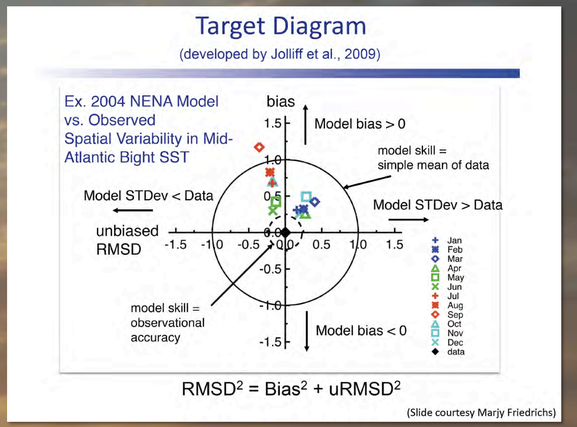

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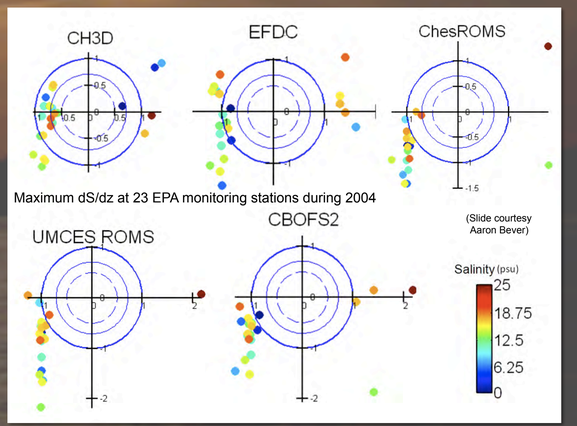

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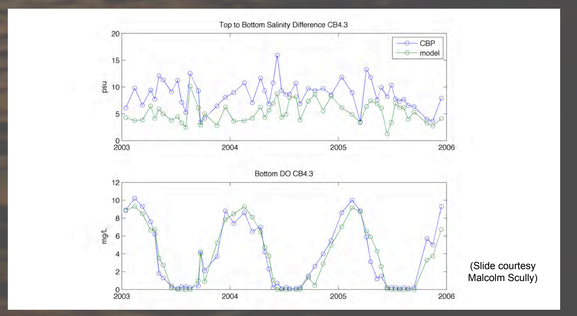

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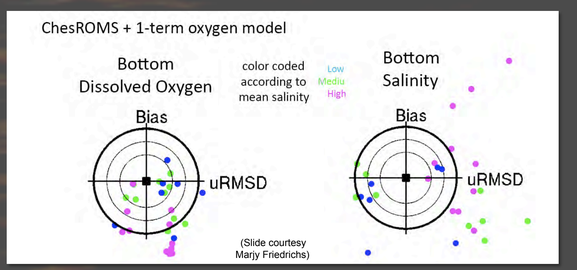

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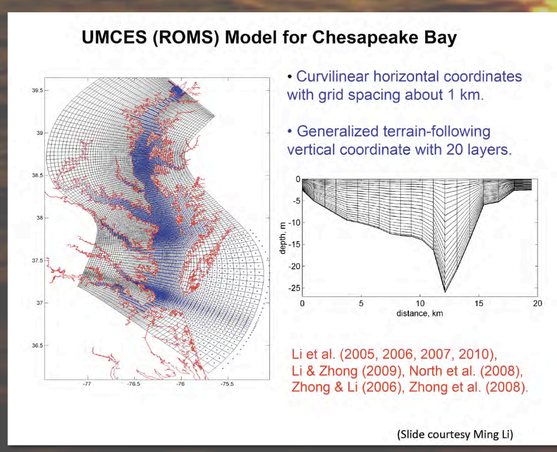

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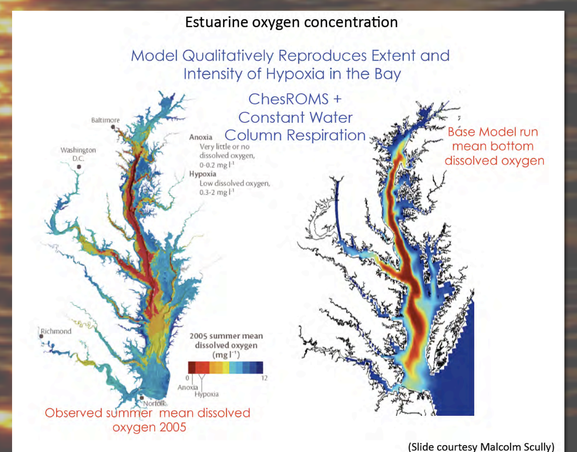

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