IOOS/SURA COASTAL OCEAN MODELING TESTBED

Rick Luettich, University of North Carolina at Chapel Hill

Don Wright, Liz Smith, Southeast Universities Research Association

Doug Levin, Becky Baltes, NOAA Integrated Ocean Observing System Office

Rich Signell, US Geological Survey

Carl Friedrichs, Marjy Friedrichs, Virginia Institute of Marine Sciences

John Harding, Northern Gulf Institute

Katja Fennel, Dalhousie

Eoin Howlett, Applied Science and Associates

Sara Graves, University of Alabama Huntsville

Numerous PIs

28 August 2012
Chesapeake Bay Modeling Lab Action Team Meeting

Coastal Ocean Modeling Testbed Goal

Target R&D and accelerate the transfer of R&D to improve the operational use of models by the coastal ocean modeling community

Broad definition of *operational use* – activities that address critical societal needs:

- nowcasts / forecasts (e.g., 4x365 or event based),
- hindcasts (e.g., event based forensic studies),
- risk assessment (e.g., 100 yr flood levels),
- design (e.g., flood protection systems) and
- management / regulation (e.g., total maximum daily nutrient loads).

COM TESTBED IS NOT AN OPERATIONAL MODEL ENTITY!!

Approach

- Create a cyber-infrastructure / community standards to enable collaboration by researchers and operational users – O2R / R2O

- Develop tools to enable the efficient access, visualization, skill assessment and other evaluation of model results

- Establish an archive of observational data, model inputs and results for evaluation of current / future models in high priority areas – SURA supporting this

- Evaluate model behavior (e.g., skill, robustness, execution speed) and implementation requirements (e.g., parameterization, resolution, computer capacity) to characterize model performance

- Build the community both within academia and between academia and operational users

- *IMPACT ON OPERATIONAL USE* - transition into operational use implementation guidance, models and tools.
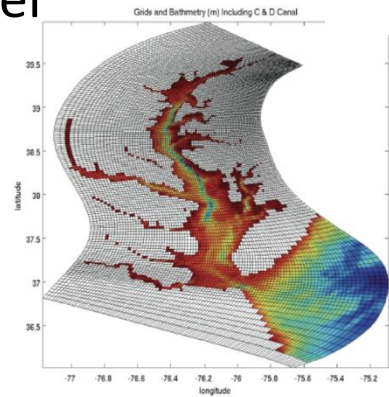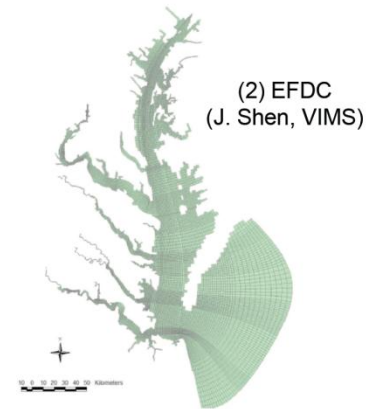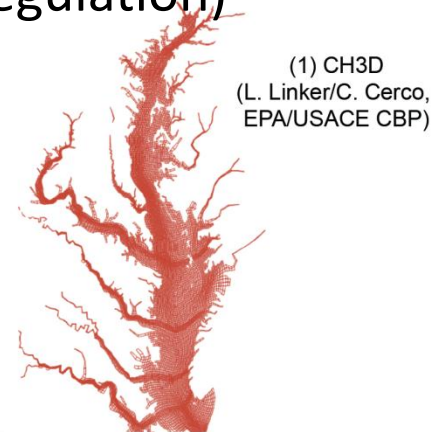
Testbed V 1.0

- Phase I – June 1, 2010 – May 31, 2011 (NCE until 5/12)
  - $4 million ear mark
  - NOAA IOOS released an RFP and open competition for funds won by SURA
- Phase II – August 1, 2011 – July 31, 2012 (NCE until 6/13)
  - $1 million from the US IOOS office
  - Used to expand on Phase I

- Projects in 4 areas

Estuarine Hypoxia – Chesapeake Bay

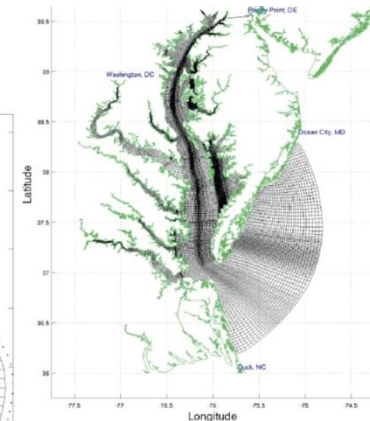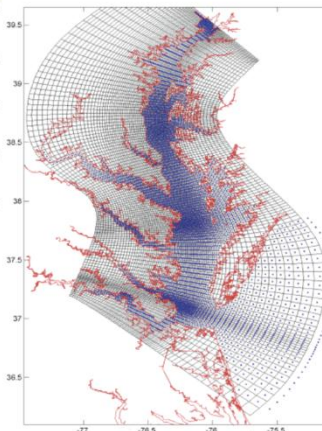*Project Lead: Carl Friedrichs -> Marjy Friedrichs, VIMS*

Evaluate coupled hydrodynamic and water quality models in use or in consideration for use for operations (incl. regulation)

- 5 Hydrodynamic models
- 5 Biogeochemical / DO models
- Novel skill assessment and model comparisons using "target diagrams"
- Transition of simple DO model to NOAA CSDL CBOFS model

(1) CH3D
(L. Linker/C. Cerco, EPA/USACE CBP)

(2) EFDC
(J. Shen, VIMS)

Grids and Bathmetry (m) Including C & D Canal

(3) ChesROMS
(R. Hood/W. Long, UMCES)

(4) UMCES ROMS
(M. Li/Y. Li, UMCES)

(5) CBOFS2
(L. Lanerolle, NOAA-CSDL)

Shelf Hypoxia – Northern Gulf of Mexico

Project Lead: John Harding, NGI -> Katja Fennel, Dalhousie

Evaluate and advance a coupled hydrodynamic and biogeochemical model for nowcast / forecasts of shelf physical and ecosystem processes.

- Initiation / evolution of hypoxic events on synoptic timescales

- Effect of regional model boundary conditions on shelf model response

- Evaluate NOAA vs EPA biogeochemical models

- Transition biogeochemical model to NOAA CSDL

TAMU ROMS   NOAA NGOM

NRL IASNFS NCOM   NRL/FSU HYCOM
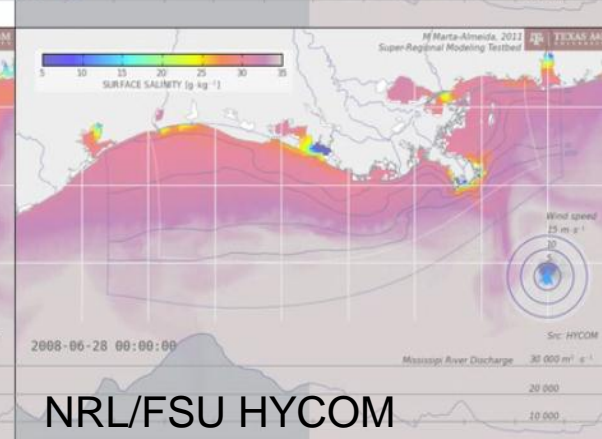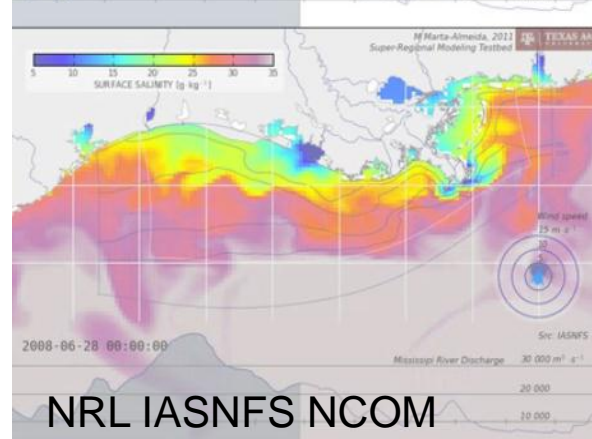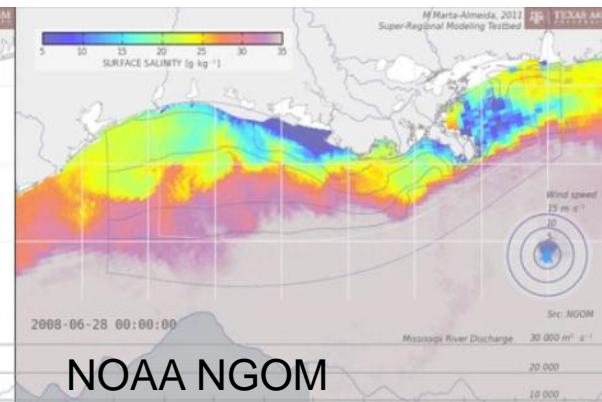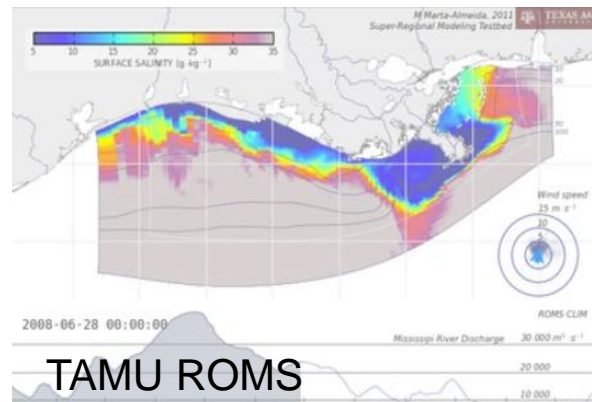
Storm Surge / Inundation

Project Lead: Rick Luettich, UNC

Evaluate the behavior and implementation requirements of coastal models of tides, surge, waves, inundation

- Gulf of Maine – extratropical storms in 2005, 2007
- Nested unstructured grids
- Models
  - ➢ FVCOM/SWAVE
  - ➢ SELFE/WWM
  - ➢ ADCIRC/SWAN
  - ➢ SLOSH/SWAN
  - ➢ WWIII

Nested

1.67 km
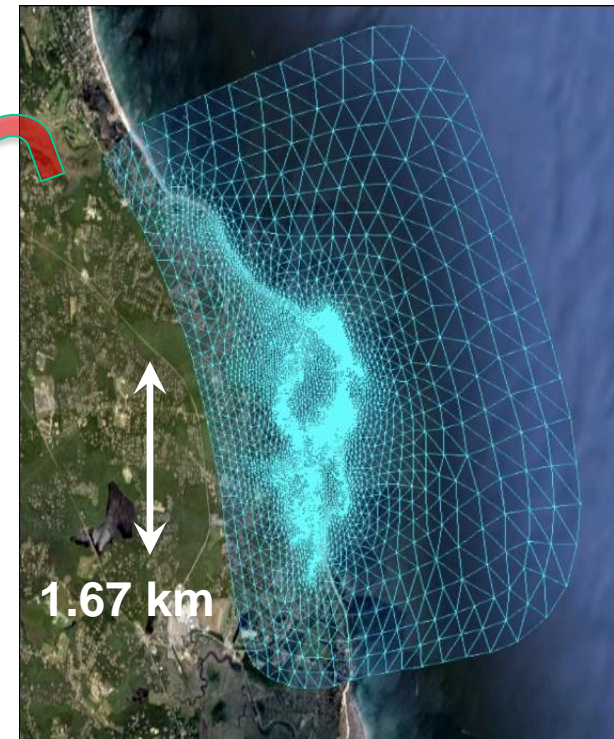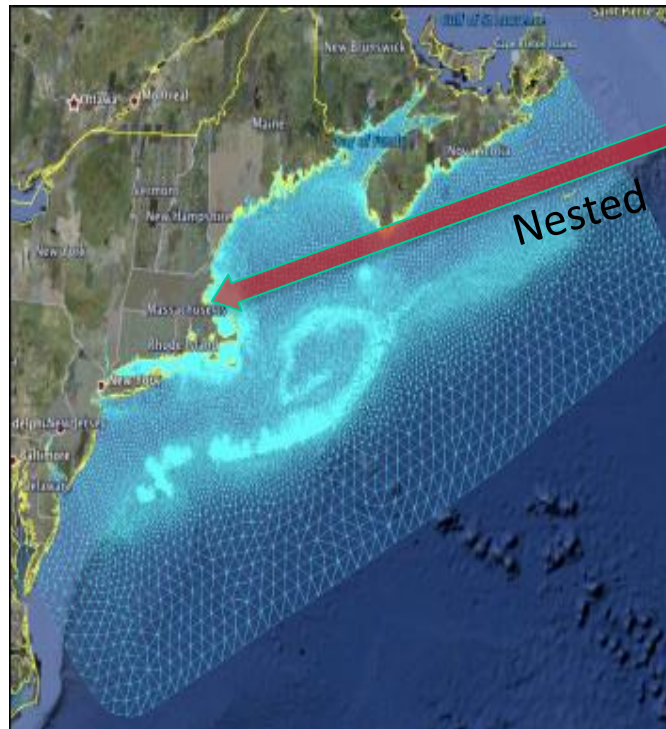
Storm Surge / Inundation

- Gulf of Mexico – hurricanes Rita (2005), Ike (2008)
- Single, large grid
- Extensive efforts at common forcing, parameterizations
- Models
  - ➢ FVCOM/SWAVE
  - ➢ SELFE/WWM
  - ➢ ADCIRC/SWAN
  - ➢ SLOSH/SWAN
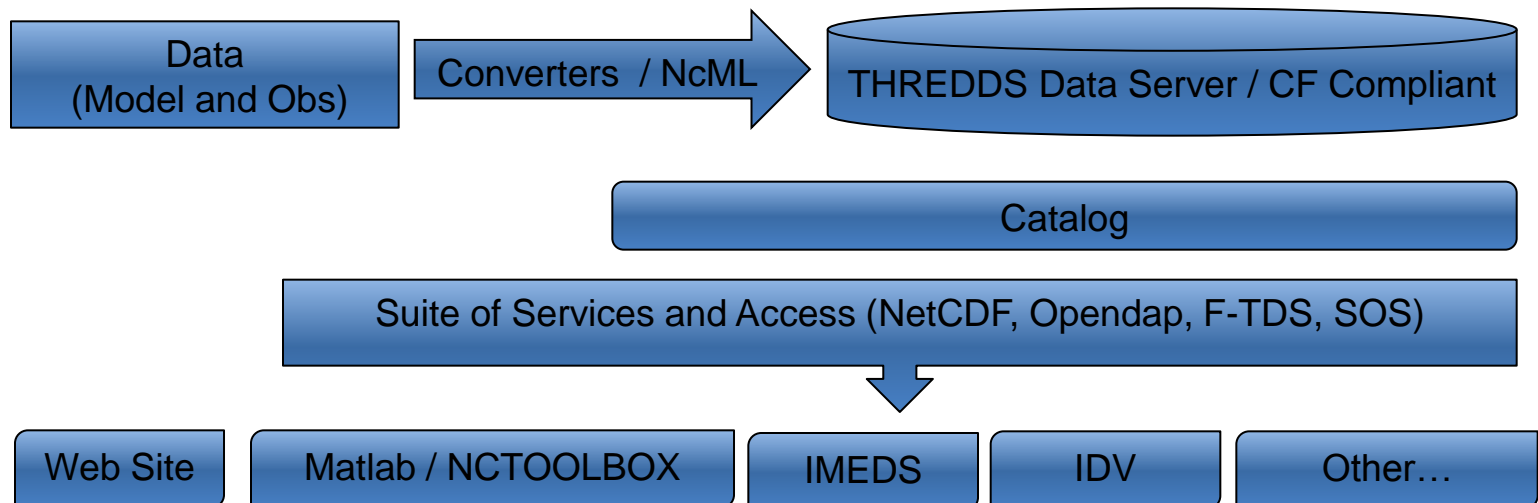- Initial transition of SLOSH/SWAN to NHC
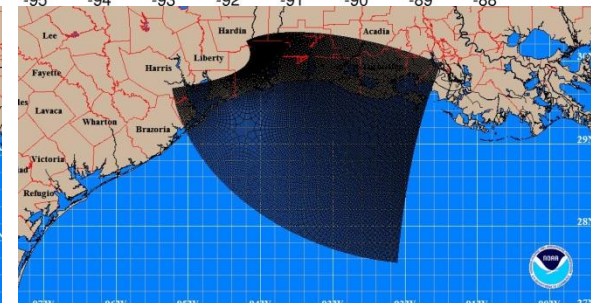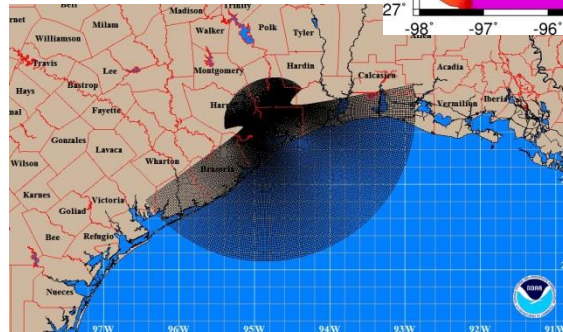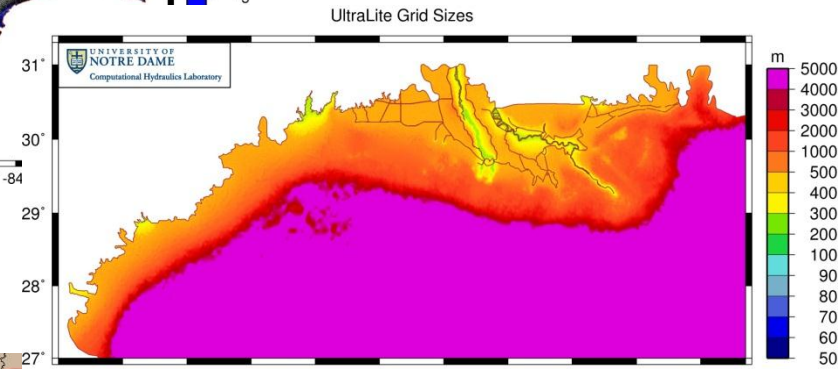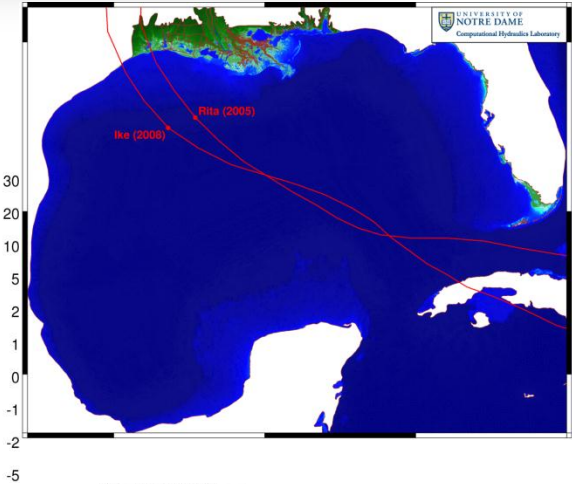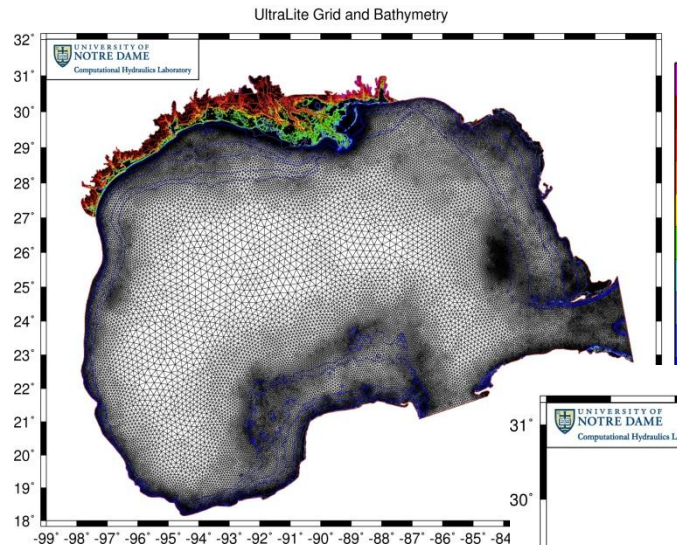
Cyber-Infrastructure

Project Lead: Eoin Howlett, ASA

Develop data standards, particularly for unstructured grids

Develop a testbed data archive and tools

- access to observed data, forcing, model input
- deliver results for model analysis, comparison, visualization, and evaluation - NCTOOLBOX
- end-to-end data integration and delivery
- capabilities to manipulate model output on unstructured grids

Data
(Model and Obs) → Converters / NcML → THREDDS Data Server / CF Compliant

Catalog

Suite of Services and Access (NetCDF, Opendap, F-TDS, SOS)

Web Site | Matlab / NCTOOLBOX | IMEDS | IDV | Other…

Cyber-Infrastructure

Project Lead: Sarah Graves, UAH

Develop web portal

testbed.sura.org

- Info for ongoing projects & documentation

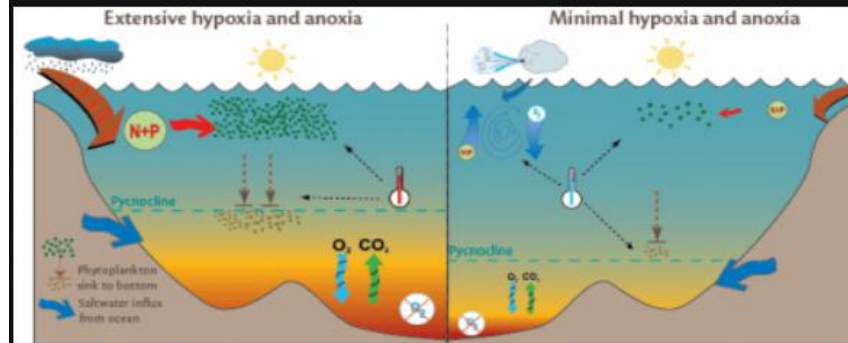- interface to data archive and tools in development

Selected Testbed Accomplishments

After 26 months

- Unstructured grid CF standards defined
- NCTOOLBOX and IMEDS tools development advanced – used to build Matlab viz tool for inundation used extensively during Isaac 2012
- Archive substantially populated with results from 3 projects
- Web portal used minimally by testbed team, for others?
- Important insights and some model improvements gained from model skill assessments and model comparisons in each venue
- Several transitions to operations have occurred or are in progress, more to come
- Progress towards journal special volume to document model implementation guidance / lessons learned
- Considerable community development
- Progress toward a sustained testbed……..

Coastal Ocean Modeling Testbed V2.0+

Strong NWS/NCEP support (NOAA)

IOOS led development of Testbed organizational document – (Terms of Reference Doc) currently in draft /near final form

FFO (RFP) to be released Sept? for Testbed v2.0

- 5 year cooperative agreement
- Agency priorities identified for years 1-2
- $2 million target – dependent on availability of funds???
- SURA expects to respond to FFO – fall 2012
- June 1, 2013 – funding starts for next testbed / projects?

Need to engage additional operational users / agency support outside NOAA …….