Integrated and Sustained Ocean Observing System (IOOS)

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CIOSS-NOAA Shallow Water Altimetry WS
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OUTLINE

- IOOS introduction, especially the Modeling and Analysis Steering Team (MAST) (charge, members, general needs, and “passions”)
- IOOS Regional Associations (RAs) and “operational” Regional Coastal Ocean Observing Systems (RCOOSs)
- RCOOS modeling and related requirements

AN IOOS GOAL STATEMENT

- Provide ocean state estimation on a continuing, robust, reliable, resilient basis to support
  - Marine Emergency Management
  - Maritime Operations
  - Stewardship of Marine Living and Non-Living Resources in the Presence of Natural and Anthropogenic Global Change,

  in order to Sustain and Enhance Economic Development, Marine Ecosystems, and National Security

  NOTE: requires simulation, detection, prediction, attribution, and mitigation capabilities

IOOS COMPONENTS

- National Backbone of Operational Observations
- National Backbone of Operational Model Products
- Global Ocean
  - NCEP
  - NAVO
  - CPO/OAR
- Coastal Ocean (EEZ)
  - CSDL/CO-OPS
  - 11 Regional Associations (RAs) and their Regional Coastal Ocean Observing Systems (RCOOSs)

IOOS integrates:

- Observing (satellite & in situ) subsystems
- Modeling (numerical) subsystems
- Information management (Web-based) subsystems
- Multiple scales
- Multiple disciplines
- Multiple agencies
- Multiple sectors
- All links in a “user-driven” information system
- Operations and R&D (???)

MAST Charge (21 NOV 06)

- (1) enhance the collaboration between operational and research modeling groups at both national and regional levels
- (3) assess adequacy of model performance and skill of emerging research and operational modeling systems
- (4) develop a community consensus for a research agenda to achieve operational capabilities
- (8) develop a 5-yr action plan and budget for MAST
- (9) work with NOPP, etc. to attract needed funding

MAST Members

- Frank Aikman, Vice Chair, NOAA-NOS-CSDL, Estuarine and Coastal Ocean Circulation
- Alan Blumberg, SIT, Estuarine and Coastal Ocean Circulation
- C.J. Beegle-Krause, Vice Chair, ex-NOAA-NOS-HAZMAT, Water Quality
- Frank Bub, Navy-NAVO, Coastal and Global Ocean Circulation/Waves
- Dale Crockett, TX Water Dev. Bd.-**RA**, Coastal Ocean Circulation
- Bruce Ebersole, USACOE, Waves
- Eileen Hofmann, ODU-PARADIGM, Ecosystem Dynamics
- Anne Hollowed, NOAA-NMFS-AFSC-**RA**, Fisheries
- Eoin Howlett, ASA, Coastal Ocean Circulation/Waves
- Gregg Jacobs, NRL, Ocean Data Assimilation

MAST Members (continued)

- Harry Jenter, USGS, Watershed Hydrology
- Walter R, Johnson, MMS, OCS Environmental Impacts
- Richard Luettich, UNC-**RA**, Coastal Inundation/Waves
- Chris Mooers, Chair, RSMAS-**RA**, Coastal Ocean Circulation
- Steve Payne, Navy-CNMOC, Marine Meteorology
- Michele Rienecker, NASA-GSFC, Global Ocean-Climate
- Jorge Sarmiento, PU, Global Biogeochemistry
- Charles Spooner, EPA, Hydrological Monitoring Networks
- Fred Toepfer, NOAA-NWS-NCEP, Marine Meteorology
- John Wilkin, Rutgers-**RA**, Coastal Ocean Circulation and Ecosystem Dynamics
- Ex-Officio, Tom Malone, Ocean.US

RCOOS “operational model” types needed

for the Coastal Ocean (i.e., semi-enclosed seas, continental margins, estuaries, and Great Lakes)

RCOOS model needs (continued)

- 3D coastal ocean (baroclinic) circulation
- 2D/3DLagrangian trajectory and dispersion
- 2D/3D storm surge/inundation
- Tide
- Surface gravity waves
- NPZD etc. ecosystem, fisheries, etc.
- Sediment transport
- Ice dynamics
- Biogeochemical, bio-optical, bio-acoustic, etc.
- Mesoscale atmospheric

RCOOS circulation model forcing needs

- Hi-res, accurate bottom topography
- Mesoscale atmospheric forcing
- Tidal forcing
- Runoff forcing (weakest now)
- Open boundary forcing
- Surface waves
- Typically, 1 hr temporal res., 1 km horizontal res., and 10 m (non-uniform) vertical res.
- Experiments are needed to determine adequacy of the forcing in terms of coastal ocean response

RCOOS circulation model verification/data assimilation data needs

- Sea surface temperature, winds, pressure, etc. time series (NDBC buoys and C-MAN stations) and maps (satellite IR and NWP)
- Horizontal velocity vertical profiles (NDBC buoys & RCOOSs (???))
- Horizontal velocity (& directional wave spectra (?)) surface maps from coastal HF-radar (RCOOSs)
- Surface (USCG and ???) and subsurface drifters (???)
- Sea surface salinity time series and maps (?)
- Coastal sea level time series (CO-OPS tide gauges)
- Temperature and salinity vertical profiles (gliders (RCOOSs (???))
- Sea surface height field (satellite radar altimetry (?))

RCOOS special skill assessment needs

- The quality of the velocity, temperature, and salinity open boundary conditions provided in downscaling from basin or global ocean models to the coastal ocean needs focused and sustained skill assessment

- The coastal ocean is significantly externally forced but also has internal dynamics and, hence, “ocean weather” (viz., mesoscale eddies, fronts, and meandering jets) for which there is a forecast skill challenge

RCOOS Physical Information Transfer to Ecosystem Models or Modelers

- Many ecosystem applications require Lagrangian transport and dispersion estimates
- Other applications require basic characterization of physical habitats (temperature, salinity, currents, and turbulence time series of maps)
- However, the perceived need is for 100 m or much finer resolution = non-hydrostatic models

MAST's "Passions"

- Improve transition process from R&D to operations
  - Community-based for buy-in
  - Testbeds (sustained)
  - Experiments, jointly between R&D and OPS

MAST “PASSIONS” (continued)

- Establish program of rigorous OSEs & OSSEs for observing system design
- Establish program of re-analyses for diagnostic studies
- Establish model output archival hierarchy
- Establish updatable model inventory (for users of varied levels of sophistication)
- Establish model skill assessment standards (based on not just statistics but also on phenomenology)

RCOOS/IOOS needs

- Consistent and long-term funding
- Concept-of-Operations (CONOPS): to define functions, roles and responsibilities, resource and management issues, etc.; to identify “marine weather forecasters” (i.e., “super users”); Etc.
- Series of combined field and numerical, regional scale prediction experiments, conducted jointly between R&D and OPS personnel to quantify capability and errors in the context of application requirements
- Education of needed human resources for OPS and R&D
- Facilitation of rapid advances in modeling and scientific understanding by the R&D community