## Feedback from CZ07 Café Conversation "*Making waves: establishing priorities for National Ocean Service (NOS) estuarine, coastal, and ocean modeling*"

~ 25 participants from NOAA, other Fed. Agencies, state agencies
General agreement that areas of need were correctly identified for the most part
In setting priorities for modeling efforts, focus on

1. human health and safety
2. economic impacts
3. systems for potential for catastrophic change
    a. identify ecological tipping points and methods/indicators for identifying ecosystem change
        i. biodiversity index?
        ii. sentinel species?
    b. getting "ahead of the curve" in planning
4. warning systems and planning
    a. but need regulatory "teeth" to back it up

Broke into 2 groups: Navigation/Commerce/Coastal Hazards and Water Quality/Human Health/Coastal Habitat

**Navigation/Commerce/Coastal Hazard group**

General note: As is often the case with conferences, if the word "modeling" is in the title of a session, the modelers all show up, and non-modelers stay away. As a result, the folks in the Navigation/Commerce/Coastal Hazard group were primarily modelers themselves, rather than coastal planners/model results users.

Attendees affiliation and interests:
Naval Postgraduate School (teaching),
USGS Coastal Geologist (use of Delft models),
NOAA/CO-OPS,
NOAA's Marine Debris program (interest in using hydrodynamic models to predict debris movement),
NOAA/WFO (wave modeling),
NOAA/National Geodetic Survey (Remote Sensing Division),
Oregon Department of Environmental Quality (interest in GNOME model, oil spill response),
Oregon Health and Science University (develops and applies hydrodynamic models),
NOAA Coastal Services Center (DEM development, accuracy).

Needs identified in the report for Navigation and Commerce:

## Navigation and Commerce

| Improvement needed | Approach |
|---|---|
| Accurate nautical charts, real-time tide and current information to reduce travel delays and increase traffic-handling capabilities | PORTS improvements and expansion nationwide |
| Real-time information and model forecasts to allow ships to adjust loads to use available draft margins | Comprehensive three-dimensional physical hydrodynamic circulation and tide models |
| Impact of sewage and pollution discharge | Improved transport modeling, including improved 3-D hydro and incorporation of ecological impacts |
| Management solutions for dredged materials, minimizing impacts to marine and cultural resources | Improved sediment transport modeling, including 3-D hydro, BBL dynamics, biological and geochemical processes |
| Impact (prevention) of invasive species from ballast | Develop risk analysis approaches and make them operational |

Needs identified in the report for Coastal Hazards:

## Coastal Hazards

| Improvement needed | Approach |
|---|---|
| Improved data access capabilities and enhanced visualization tools | Development of decision support systems |
| Improved access to databases and model output | Query-driven retrieval systems |
| Improved modeling of high water levels and storm conditions, Predict flood and surge impacts from coastal storms | Integrated water level models, joint probabilities methodology, tide gage monitoring sites and data assimilation |
| Prediction of spatial and temporal variability of the nation's shorelines | Improved coastal geomorphology models linked to 3-D hydro models and climate scenarios |
| Information and predictive capability for effects of tsunamis | Coupling of coastal and deep ocean circulation and water level models |
| Impacts of point and non-point source pollution | Fate and transport models linked to 3-D hydro models |
| Predicting ecosystem function and response to hazards | Coupled or linked land-atmosphere-ocean-biology models |

Attendees' use of models in daily work:
The Navy Postgraduate School attendee was interested in using California CODAR data in his modeling applications. While this is data, the need for systematic standardization (be it CODAR data or model results) was discussed with respect to both models and data.

The NOAA/WFO uses an ADCIRC application developed by the Corps of Engineers as input to a SWAN wave model. He mentioned that they are expanding similar applications to other NOAA/WFO's, and would be interested in knowing what hydrodynamic circulation models would be available to provide input to their SWAN wave model applications.

The NOAA/Marine Debris program attendee also was interested in what circulation models were available that have been applied to past hurricanes such as Katrina. He wanted to use these to help predict marine debris pathways during the event.

The Oregon DEQ attendee was interested in learning more about using GNOME along Oregon's estuaries/bays. For this, they would like to know what hydrodynamic models are available along the Oregon coast.

The Oregon Health and Science University attendee develops circulation models and applies them to different coastal and estuarine systems.

Did anyone use models developed at NOAA/NOS?:

The Oregon DEQ attendee was interested in using NOAA/NOS models (GNOME, circulation models), but GNOME is currently only available in Oregon for the Columbia River estuary.

The OHSU model developer has coordinated with NOAA/NOS on transitioning a Columbia River circulation model to NOS.

The NOAA/WFO wave modeler was interested in using NOAA/NOS circulation models in areas where other WFO's would have an interest.

The Marine Debris program attendee was interested in using NOAA/NOS storm surge models.

What non-NOAA/NOS models were used: the USGS coastal geologist uses Delft models. The NearCoM (Nearshore Community Model) was also mentioned.

Beyond this, the discussion migrated to how NOAA/NOS models could be better made available to fit a variety of user needs. Here are a couple of key points from this discussion:

- Wave/current interaction modeling is a key need to many WFO offices and navigation groups. There is a critical need to link currents (from either HF radar/CODAR or

circulation models) with wave models. NOAA/NOS could coordinate on making the currents available for such applications.

- Engaging the user community: in many cases, it is not enough to develop products and make them available. The products also need to be sold to the community in a way that builds confidence in the improvements the models can lend them.

- There is a need to communicate what NOAA/NOS models are available, where they are available, what purposes they can serve, and what their limitations are. The NOAA/NOS modeling inventory was discussed as to how it could be made available to the public, with appropriate metadata describing its uses/limitations.

Needs identified in the session:

As most of the attendees were modelers themselves, end user needs were not the primary topic of conversation. However, some models need the output of other models, and there were a few users in the group. The following needs are mentioned in the notes above, and highlighted here.

- The NWS is beginning an effort to improve its wave forecasting. Circulation models (primarily tidal) are required to provide data necessary to forecast wave-current interactions. These interactions can have a substantial effect on waves in area of large current, particularly the bars at exposed harbor entrances, which are very hazardous places. It is a natural partnership between NOS (CSDL & COOPS?) and NWS to work on this together.
- The Oregon department of Environmental quality would like GNOME (OR&R's General NOAA Oil Modeling Environment) Location files for additional locations in Oregon: Tillamook Bay, Coos Bay, etc. This need is need is probably reflected in other coastal states. OR&R currently has developed about 20 GNOME Location files for the United States, but has fairly limited resource to develop more, particularly for the smaller ports.
- There is a desire to use HF Radar and other coastal data for a variety of uses. This highlights the need to data standards and easy data distribution. NOS is playing (and should continue to play) a major role in the IOOS program, that is seeking to establish such standards and protocols.
- There is a need for folks outside of NOS to know what we are doing, and what is available. Perhaps the NOS model inventory should be made more accessible — perhaps online and searchable.
- The NOAA Marine Debris Program would like a model that would help them predict where Debris from coastal storms might end up. There may be a way to make use of CSDL's recent storm surge modeling efforts to support this.

**Water Quality/Human Health/Coastal Habitat group**

Attendee affiliations:
NOAA/NOS/NCCOS
NOAA/NOS/CSC
State of Oregon (Coastal Management Program)
State of Alaska (Kachemak Bay NERR)
NASA

Attendees' use of models in daily work:
Some (mostly NOAA attendees) were modelers themselves, and used models to predict WQ and living marine resource parameters
Others (mostly state attendees) didn't use models themselves, but were interested in how modeling results could assist them in predicting potential impacts on WQ and habitat.

Needs identified in the report for Water Quality and Human Health:

## Water Quality/Human Health

| Improvement needed | Approach |
|---|---|
| **Prediction of the sources, sinks, and fluxes of nutrients/contaminants under current and future conditions and scenarios** | **Complex models which include multipath sources, and transport and transformations of nutrients and pollutants** |
| **Information and tools to help prevent and mitigate HAB and contaminant impacts on public health and fisheries** | **Regionally-based research, monitoring and prediction programs** |
| **Integrated decision support tools for short- and long-term predictions of nutrients, HABs, larval transport** | **Holistic models that simulate current understanding of overall system function** |
| **Prediction of effects of hypoxia or contaminants' spatial and temporal extent on important species or groups** | **Coupled three-dimensional biological and physical process models, with monitoring and data assimilation** |
| **Quantitative forecasting of coastal system response to multiple stresses** | **Ecosystem models to help understand, predict, and assess responses of coastal ecosystems to multiple stressors/scales** |

Feedback specific to Water Quality/Human Health:

- Are there specific contaminants that deserve more attention than others?
    - Fecal pollution is what most managers are concerned about, since that is what their standards are usually based upon.
    - "Personal Care" products (estrogen) and caffeine
- Models are larger than the systems being managed, need to downscale spatial scale of models
    - Need basic system characterization more than models in some cases (It was noted by the moderator that the MPP took this as a given, and didn't deal with this issue specifically in the report)
    - Use place-based models specific to sub-estuary or embayment

    - Don't overwhelm managers with too much information
        - Most specific and detailed model might not be the best
        - Simple models (e.g. sea level in Chesapeake Bay, *Vibrio* presence/absence) can be very useful
    - Use steering groups of managers when developing models to match model to need
- Increase public/management confidence in models by demonstrating skill with easily-understood metrics
- Need WQ indicators in nearshore areas, models might give ideas about what indicators are best
    - For NPS loading, runoff/precipitation, need day-of information, as well as 1-2 day advance coupled with weather forecast
        - This needs to be right, or at least uncertainties need to be delivered along with the forecast. False positives mean lost business to coastal communities
- For some applications, "plug and play" modules might be useful to develop, especially where underlying model system already exists
- Need for hindcasts as well as forecasts – look at past conditions, see why conditions are changing, why some part of ecosystem isn't returning or responding to restoration?
- Need to account for extreme events, might not be suitable to modeling that takes average values or climatology

Needs identified in the report for Coastal Habitats:

## Coastal Habitats

| Improvement needed | Approach |
|---|---|
| **Support for coastal habitat conservation & restoration efforts incorporating wetland inundation predictions from SL rise, storms, etc.** | **Hydrodynamic/ecological modeling that can resolve near-shore physics and biology and their coupling to inner shelf, watershed, and climate processes** |
| **Improved siting, implementation, management and evaluation of Marine Protected Areas** | **Linked modeling of behavior, larval transport, population dynamics and reserve effectiveness on species of interest** |
| **Social science needs on topics such as socioeconomic impacts, public opinions, and cultural values** | **Socioeconomic models to assess the impacts of coastal development, human use and demand on coastal habitats** |
| **Improved capabilities for managing and mitigating the impacts of hazardous spills and marine toxins on coastal habitats** | **Trajectory and fate models; multispecies population dynamics models, metapopulation models, species-habitat relationships, trophic interactions** |
| **Predict longer-term tradeoffs and interactions among actions** | **Develop gaming strategies and scenario testing** |

Feedback specific to Coastal Hazards:

- General cynicism about models needs to be overcome
    - Simple models with specific uncertainties can be used to show applicability
        - Sea Level Rise effects on coastal infrastructure as well as habitats
        - Models that can provide the basis for statutory initiatives (e.g., SLR models and coastal planning)
        - Visualization tools (e.g., fly-through, 3-D visualizations) are impressive, but might be too much information for management to use in building policy
- Interactions between fisheries and ocean models need to be acknowledged, NMFS modeling plays a role
    - Better integration of NOS and NMFS modeling
- Human dimension and social science efforts need to be aligned with other science efforts in NOS (and NOAA in general)
- Need to account for extreme events (similar to comments in Water Quality/Human Health)
- Invasive species are important to model, as they alter physical and ecological habitat
    - Models for susceptibility to invasive species, potential spread of invasives
- Need to have human capital – translators to serve as intermediaries between modelers and users
- New user groups developing: offshore aquaculture, energy generation – need to model and predict effects of these operations
- General disconnect between theoretical approach and engineering approach – perhaps modeling should be based on “good enough”, not “best”?