Breakout Session II Notes

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Breakout Session II Notes

These notes are intended as a supplement to the presentations. The following discussion points were captured by workshop rapporteurs during breakout groups:

- Wave buoy measurements are important for model testing, validation, and for data assimilative models.
- Ship observations are not generally used in research models, but may be used in operational models if the observations have been adequately quality controlled. Data products from ship observations that are most frequently used include wind velocities and significant wave heights.
- Wave models are important to weather prediction, optimal ship tracking, research, and education.
- Major models include WaveWatch III, WAM, and SWAN. Differences are found in grid implementation, interfacing with models of different spatial and temporal scales, nowcasting and forecasting parameters, type of processor on which implemented, inputs (whether from data or models), and output applications in response to specific user requirements.
- The popular models in current use include WaveWatch III, WAM, SWAN, COAMPS; Wave Watch III is used as input to power generation systems. The most important output parameters include significant wave height, period, and direction, for both swell and wind-generated waves. COAMPS is a high resolution regional weather model used operationally by the Navy on a daily basis.
- Various organizations are moving from the WAM model to WAVEWATCH III.
- Operators need to understand the differences among global, regional, and local models.
- Wave model output should be made available using GIS formats to benefit sophisticated operators such as coastal zone managers, staff civil engineers at seaports, and first responders at coast guard stations.
- Global and regional wave model research needs to improve the ability to consider wave-current interactions. Efforts are underway to consider the effects of permanent currents such as the Gulf Stream.
- Some Weather Forecast Offices have implemented SWAN to provide improved sea state forecasts in shallow water.
- Representatives from the Naval Oceanographic Office highlighted their capability to collect, analyze, and display data from commercial and US government remote-sensing satellites and fleet of ships, seaborne buoys, gliders, and lidar-equipped aircraft using GIS. They also provided information on the METOC Model Viewer that is used for on-scene display and manipulation of tidal current files, Delft3D files, climatological layers, and annotated imagery.
- Surface gliders, such as those made by Liquid Robotics Corporation use wave models to monitor operational characteristics as a function of sea state, as well as for safety and possible need for recovery situations. Researchers have used wave models to determine environmental conditions during AUV deployment and retrieval operations, and for determining AUV stability during various wave conditions.
- There is a need for uniform standards in significant wave height, wave period, direction, and directional spectra. One problem that often occurs is the lack of a standard language among modelers and stake holders, such as ship captains, and port authorities. The distinction between the swell and wind wave characteristics is important to make clear in model outputs, and to users.
- Model errors need to be quantified across a range of time and space scales. Wave observations are important to identifying the causes of these errors, which may result from data assimilation or our inaccurate representation of the physical processes. For example,
soft mud bottoms were described as a confounding factor for shallow water wave models. Improved models need to account for the effects of wave shoaling, energy dissipation within fluid mud, and wave breaking. Another area of research relates to waves under ice.

- Important model outputs include significant wave height, period, direction, sea and swell climatologies, nowcasts and forecasts over the time and space scales of the project. The most important considerations for modeling outputs are governed by the local requirements that necessitate modelers, field parties, design engineers, and managers having a common terminology.
- Basic research at locations such as NRL, which is focused on improving the representation of wave physics, is dependent on high quality data or observations. NRL researchers need to ensure accurate knowledge on available wave measuring systems and updated bathymetry.
- Operational models need to provide users with some sense of the errors that are associated with the forecasts.
- Some additional effort is required to ensure that operators understand the parameters being presented, or output should be simplified to showcase impacts.
- Coastal zone managers in increasing numbers are using oceanographic parameters to include wave information to make decisions about beach maintenance, navigation safety, fisheries management, and the like. Overlays of wind, wave, current, bathymetric obstructions, and the like provide the manager with effective tools for planning and maintaining coastal structures and operations. During operations, nowcasts and forecasts keep the manager apprised of local conditions.
- Wave steepness is critical to small boat operations, platform operators, surfers, fishermen, and is a highly desired parameter to be output in present and future models. It should be output to boat operators as nowcasts and 36-hour forecasts; statistics of wave steepness can be provided on charts and overlays.
- Suites of models at different grid spacings and time steps are being interfaced to provide nowcast and forecast data to meet a variety of user requirements. For example, new and upgraded models currently being developed at NAVO should be available to users next year.
- All available measurements should be made available to modelers to provide testing and validation of localized models, such as SWAN, the Navy Standard Surf Model, and search-and-rescue models to optimize the information available to the users. The outputs at various regions are driven by the specific user requirements. It is very important to associate error bars with these forecasts to allow the users to interpret the results in accord with their specific needs.
- Models at, for example, NRL can output the probabilities of occurrence of extremely large waves. These can be displayed as a color code to immediately alert the users to the possibility of dangerous conditions at specific locations.

Session Summary — The importance of the following factors:

- Obtaining good wind and accurate bathymetric data for input to the models,
- Using technologies such as LIDAR and hyperspectral imagery to measure shifting channel and shoals in very shallow regions such as the surf zone,
- Providing error bars on forecasts, so that stakeholders can interpret the likelihood of the forecast being correct,
- Eliciting greater input from users, and
- Helping users and modelers to “speak the same language” was emphasized during breakout discussions.

These rapporteur notes do not necessarily reflect the view of all participants and speakers of the respective breakout groups.