Ocean Waves Workshop

Dec 7th, 12:30 PM - 12:45 PM

Session 2 Discussion Notes

Ocean Waves Workshop 2017

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Session
Session 2 - Development of a wave modeling framework to protect life and save property

Start Date
7-12-2017 12:00 PM
End Date
7-12-2015 12:45 PM
Comments
These rapporteur notes do not necessarily reflect the view of all participants and speakers participating in the discussion session.

Session 2 Notes
Development of a Wave Modeling Framework to Protect Life and Save Property

These notes are intended as a supplement to the Session 2 presentation. The following discussion points were captured by workshop rapporteurs:

- Wave models and modeling tools exist in many forms both public domain and privately maintained. The range of modeling tools from crude swell approximations to high fidelity phase resolved coastal models suite a variety of model needs. The appropriateness of a model is ultimately controlled by the questions the model is trying to answer. Regardless of the model deployed and the end users need, quality controlled, high-resolution geospatial data are critical to modeling efforts.

- Do we have the physics right? The session presentation by Resio et al. (see https://scholarworks.uno.edu/cgi/viewcontent.cgi?article=1061&context=oceanwaves) illustrates how present day third generation wave models have gotten the detailed source balance, spectral shape evolution, and momentum transfer incorrect. Careful and objective testing of operational metrics of the present day models and future improvements is needed.

- Wave models rely on remote sensing, *in situ* sensors, and human observations to provide skillful future predictions. Actionable information is necessary for maritime decision makers. Decision makes are presently getting information from a variety of wave models (e.g., SWAN and NOAA WAVEWATCH III®).

- Enhancing a wave modeling framework is dependent on observational programs, the ability to meet the needs of operators, and the capacity of a diverse group of stakeholders to maintain and support the systems (e.g., marine operation groups from industry, government operators such as weather forecast offices, applied researchers, and basic researchers).

- Wave forecasts might be improved through a number of means. Wind fields are a primary input to models that are generating waves over large areas and improvements in the resolution of wind measurements and forecast will enhance the capabilities of wave models. Shallow water wave models can be substantially improved by implementing coupled, data-assimilating approaches over areas of interest.

- Research focused on improving physics helps to reduce tuning of the model results after forecasts have been made. For example, storm surge characteristics can be more severe than often forecast and improved physics will result in more accurate forecasts (storm surge is caused by more than just the wind).

- Complex coastlines and surge development over the life of storm (e.g., from offshore platforms to rivers) must be carefully considered in forecasts. Improved modeling is needed for flow and wave impacts into and out of bays and harbors by including coupled ocean and hydrology models. These are often the processes that create the largest coastal hazards.

- Differing types of models provide information at various temporal and spatial scales requiring a mission-driven mapping between model type and information requirements. Operationally relevant metrics must be identified to validate models.

- Bulk parameters from directional wave spectra are presently the highest fidelity metrics in use by the larger community. Wind, sea, and swell decoupling provide the basis for many of the metrics provided by NOAA NDBC and represented big improvements in how things are being done in the 21st century.

- Consider modeling processes and the effectiveness of the output for users through the use of operation specific guidance. Is there a need for more guidance on the use of wave forecast information?

- Requirements, objective testing, and exploitation of information technologies are the foundation for development of a viable wave modeling framework. Use the NOAA Coastal and Ocean Modeling Testbed and Hydometeorology Testbed for model validations. NOAA's Testbed and Proving Ground programs promise a methodology to execute these comparisons in an accessible and objective manner.

- Documentation of model skill against data should be certified by an independent group (e.g., WMO JCOMM). The Navy approaches these "accreditation" tasks through AMOP (Administrative Model Oversight Panel) and an OAML (Ocean Atmosphere Model Library) process to ensure that model transitions are responsive to operational needs.

- The WMO formed a Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), which includes an Expert Team on Waves and Coastal Hazards Forecasting Systems or ETWCH. The ETWCH's Operational Wave Forecast

Verification Project provides a mechanism for benchmarking and assuring the quality of wave forecast model products that contribute to applications, such as safety of life at sea, ship routing, and, in general, the Global Maritime Distress and Safety System GMDSS.

- Innovations to benefit operators and the public require strong, effective collaboration among the government, academic, and private sectors. Modeling efforts usually involve interdisciplinary partnerships to best leverage resources.

- The USACE Field Research Facility provides potential for adequate instrumentation to develop next generation models for a straight coast with gentle sloping beach profiles. Other sites (e.g., SCRIPPS, Columbia River Mouth) may provide testbeds for other coast types.

- Enhancing the instrumentation (e.g., wave buoys, wave gliders, and radar) at selected Navy ranges would support the development of improved models that better consider hydrology while building data sets for assessing the quality of developmental models.

- Wave modeling projects with NOAA testbeds, at the Field Research Facility, Pacific Ocean sites, and at Navy ranges facilitates basic researcher involvement with operators to advance modeling efforts in varying types of coasts.