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Session 1 Discussion Notes

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Session 1 Discussion Notes

Session

Session 1 - Impacts of waves on operations, property, and natural resources

Start Date

7-12-2017 10:00 AM

End Date

7-12-2015 10:45 AM

Comments

These rapporteur notes do not necessarily reflect the view of all participants and speakers participating in the discussion session.

Session I Notes

Impacts of Waves on Operations, Property, and Natural Resources

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

- Waves affect many aspects of marine operations occurring in the coastal ocean, from ports and harbors and shipping to offshore energy operations. Rapid changes in weather and sea conditions makes continuous monitoring of both meteorological and oceanographic (metocean) parameters a critically important part of ensuring coastal and offshore safety and maintaining offshore operations.
- Loss of life and infrastructure damage due to storm surge, overtopping waves, tsunami, and other coastal hazards will likely increase with climate change and sea level rise.
- The vulnerability of coastal infrastructure is difficult to assess due to the uncertainty in absolute sea level rise and potential increase in storm frequency and intensity in climate change scenarios. Planning for the continuation of infrastructure operations and disaster recovery is exacerbated by the uncertainty in coastal vulnerability and hazard assessments.
- Loss of the continuous metocean monitoring networks during rare events (e.g., hurricanes) presents additional challenges for now- and forecast systems upon which public and private entities rely on for regular operations. Weather station losses and even several NDBC Coastal-Marine Automated Network (C-MAN) Station losses were reportedly a consequence of wind damage during hurricanes.
- For the construction of infrastructure (e.g., causeways and piers) in the coastal zone, wave impact loads should be considered. Besides the hydrostatic and hydrodynamic loads from water, one might also consider impacts from floating debris and localized scour.

- In order to save lives and protect property, wind, wave, and current loads on coastal and marine structures are presently incorporated into design and operations by most organizations; however, uncertainty in future conditions poses a challenge that communities must face.
- Engineering research is primarily concerned with design standards and risk assessments for extreme conditions (e.g., the worst wind, wave, and current conditions expected in a 100-year period); however, the coastal engineering community is only slowly adopting the latest science in potential for accelerating sea level rise and potential increased storm intensity due to climate change.
- Severe weather conditions regularly challenge and endanger offshore operations (e.g., shipping, oil and gas platforms), especially during hurricane season in the Gulf of Mexico and Atlantic coast.
- Wave induced motions on vessels or floating platforms have many impacts including the generation of fluid motion in internal tanks (e.g. fuel, water tanks, and other containers in barges). The non-linear conditions generate hazards that must be continuously monitored and acted upon by experienced operators.
- Severe weather damage can cause platforms to list and sink; rigs, barges, and workboats can capsize; rigs may break away from their moorings and set adrift; and equipment may be destroyed or severely damaged by wind. Real-time data and forecasts are required for operations and incident investigations.
- Waves impact operations requiring the use of workboats, whose work includes crew transfers, diving support, pipe-laying and offshore sub-sea installation, and clean-up operations after hurricanes.
- Offshore platforms monitor selected meteorological and oceanographic variables in real time and these data are valuable for operations (e.g., crew transfer) and dynamic positioning systems. On-board operators document other marine observations manually.
- Weather forecasts are presented each morning to offshore operators and operators make operational decisions on the forecasts coupled with real-time conditions. Each owner has specific rules on the limits of operational conditions.
- Generally, offshore platforms use NOAA analysis/forecast charts to include sea state (wind/wave) charts. They are especially important to support crew transfers from workboats.
- Operators shutdown oil production and evacuate personnel ahead of tropical storms and hurricanes. After the storm makes landfall, crews return to work, damage assessments are performed, and if required facilities are repaired. The decisions for shutdown and restart of operations are made based upon the forecasts and real-time data.

- Data-enabled solutions are used to optimize oil-drilling processes to reduce operational costs and maximize profits. Some oil companies have two levels of data collection – operational and scientific. Sensors such as x-band radar (e.g., the Miros Wavex[®] system) provide streaming, real-time directional wave and surface current parameters. In addition to sensor data, the data collected from oil rigs may include semi-structured and unstructured data. Some data may be available for use by the science community.
- For offshore operators and coastal harbor/port masters, it is useful, and sometimes required, that a specific front-end data display of critical metocean parameters be available to decision makers so they have real-time feed of relevant data in an easy to read format. In specific cases (e.g., harbor masters) this may be heavily augmented with site-specific experience and local knowledge.
- In order to maintain sea power, the US Navy requires characterization and simulation of the wave field to safely operate in heavy weather. The US Navy relies on internal forecast and measurement capabilities coupled with publicly available data (e.g., NOAA).
- Safe operations and infrastructure design in both the coastal zone and offshore requires multiple lines of evidence including real-time monitoring and a significant database of historical information.