Geophysical Research Abstracts
Vol. 17, EGU2015-13421-1, 2015
EGU General Assembly 2015

A Real-Time Offshore Weather Risk Advisory System

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Offshore oil and gas operations in South East Asia periodically face extended downtime due to unpredictable weather conditions, including squalls that are accompanied by strong winds, thunder, and heavy rains. This downtime results in financial losses. Hence, a real time weather risk advisory system is developed to provide the offshore Oil and Gas (O&G) industry specific weather warnings in support of safety and environment security. This system provides safe operating windows based on sensitivity of offshore operations to sea state. Information products for safety and security include area of squall occurrence for the next 24 hours, time before squall strike, and heavy sea state warning for the next 3, 6, 12 & 24 hours. These are predicted using radar now-cast, high resolution Numerical Weather Prediction (NWP) and Data Assimilation (DA).

Radar based now-casting leverages the radar data to produce short term (up to 3 hours) predictions of severe weather events including squalls/thunderstorms. A sea state approximation is provided through developing a translational model based on these predictions to risk rank the sensitivity of operations. A high resolution Weather Research and Forecasting (WRF, an open source NWP model) is developed for offshore Brunei, Malaysia and the Philippines. This high resolution model is optimized and validated against the adaptation of temperate to tropical met-ocean parameterization. This locally specific parameters are calibrated against federated data to achieve a 24 hour forecast of high resolution Convective Available Potential Energy (CAPE). CAPE is being used as a proxy for the risk of squall occurrence. Spectral decomposition is used to blend the outputs of the now-cast and the forecast in order to assimilate near real time weather observations as an implementation of the integration of data sources. This system uses the now-cast for the first 3 hours and then the forecast prediction horizons of 3, 6, 12 & 24 hours. The output is a 24 hour window of high resolution/accuracy forecasts leveraging available data-model integration and CAPE prediction. The systems includes dissemination of WRF outputs over the World Wide Web. Components of the system (including WRF computational engine and results dissemination modules) are deployed in to computational cloud. This approach tends to increase system robustness and sustainability.

The creation of such a system to share information between the public and private sectors and across territorial boundaries is an important step towards the next generation of governance for climate risk and extreme weather offshore. The system benefits offshore operators by reducing downtime related to accidents and incidents; eliminate unnecessary hiring costs related to waiting on weather; and improve the efficiency and planning of transport and logistics by providing a rolling weather risk advisory.