Swell forecasting with WAVEWATCH III wave modeling in the Taiwan sea

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Abstract

The capability of monitoring and predicting the marine environment leads to a more sustainable development of coastal and offshore regions. In recent years, operational marine environment condition has been considered a necessity given its essential role in solving economic, environmental and social problems. Since there is a strong connectivity between the ocean and atmosphere, thus marine forecasting is usually limited by atmospheric predictability in forecasting horizon and accuracy. Coastal areas such as the Taiwanese water are characterized by a lot of user pressure of uses brought about by human activities and infrastructures. In this area waves are highly variable and have a significant impact on such activities. For this reason, wave prediction and evolution is of great importance for the design and management of such coastal areas and the mitigation of typhoon damages. Another reason is the swell component is one of the important factors to prevent the disaster over the Taiwan waters, where a lot of marine activities are increasing recently. Identification and separation of the wave energies of wind wave and swell provide a more realistic description of the sea state, which is of great importance to scientific and engineering applications Therefore the continuous research and improvement of wave monitoring and operational forecasting is becoming a vital issue for a better management of coastal risks.

The performance of wave simulations, whether for research or operational forecasting, depends on the quality of the driving wind fields. It is important to note that the best source of surface wind fields to drive the wave model does not necessarily correspond to identifying the ‘‘best atmospheric model,’’ as surface winds are not the main focus of an operational atmospheric model. Even for oceanographic applications, the best model might depend on the specific problem and on the use of the input winds. Therefore, the purpose of this paper is to test and verify the simulated results from the WAVEWATCH III wave model in order to require an efficient approach to characterize individual significant wave height and swell wave components. Verification on wind and wave height between the model data and buoy data around the Eastern Taiwan water are presented. The results, wind components from the NCEP, JMA, NFS, WRF and wave components from the wave model, show that the NCEP model presented the best results in surface wind when compared with observed wind data in buoy station, and simulated wave results also were better when forced with

NCEP, which presents higher wind speeds over the Eastern Taiwan waters. Thus, the project will go to study the parameters to produce the reasonable swell wave component of WAVEWATCH III, especially typhoon period.

The other conclusion is that the WAVEWATCH III produce a little bit underestimation of the significant wave height, but produce a large underestimation of the swell wave height based on the those four wind fields. Therefore, the future work of the project will discuss the method of separation in wind and swell waves will be studied before the end of this year.