Utility of Delft3D Forced With Low Grade Bathymetry (Extended Abstract)

Charlie Fox  
*QinetiQ North America*

Chad Monfort  
*QinetiQ North America*

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Utility of Delft3D Forced With Low Grade Bathymetry
Charlie Fox1)* and Chad Monfort1)
1)QinetiQ North America
*Corresponding author: Charles.Fox@QinetiQ-NA.com

1. Introduction

Expeditionary operations require a thorough assessment of the nearshore environment, such that depths, obstructions, breaking waves, and currents can be accurately predicted for conducting safe navigation through the surf zone [1]. Significant nearshore modeling challenges can be summarized by two main points: (1) high resolution nearshore model accuracy is highly dependent on the quality of nearshore bathymetry, and (2) for most locations of interest abroad the available bathymetry is of poor quality or nonexistent. It follows, that model output forced with low-grade bathymetry will lack in its ability to fully characterize the complex nearshore environment required for expeditionary operations.

The purpose of this report is to assess the usefulness of pre-forced Delft3D-Wave (D3D) in the planning/forecast process under conditions of limited/poor bathymetry (generated principally from Digital Nautical Charts, then smoothed in the model).

A period of 6-days of surf observations along a 1-km Indonesian fringing reef were compared to the D3D model predictions “forced” along the model boundary with deep water spectral wave forecasts (Spectral Wave Bulletins). In addition, manual surf calculations were derived by employing all of the available information [2,3,4]. The straight D3D model output, visual observations, and manual forecasts are compared in Fig. 1.

![Figure 1. Comparison of results. Wave heights plotted in feet.](image)

2. Conclusion

The D3D model by itself did a poor job predicting accurate surf heights, showing a very low bias (Fig. 2). However, the model correctly illuminated indispensable aspects of the surf zone critical to the planner/operational forecaster: areas of maximum and minimum wave concentration, shadowing effects and no-wave zones. Note the comparison of the model in Fig. 2 to the main surf breaks annotated in the inset image.

![Figure 2. Pre-forced D3D model of area of interest (AOI). Inset shows location of surf breaks along the modeled reef section.](image)

Though a straight reading of the model output was inaccurate, the predicted patterns proved extremely useful, demonstrating the model as an essential capability for the nearshore forecaster. The manual (human) forecasts plotted in Fig. 1 represents an assimilation of all available (D3D/SWB) model output, combined with nearshore nomograms, which produced values closer to the observations.

References


