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WAVE CLIMATE STUDY IN BUSHEHR BAY, THE PERSIAN GULF

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Introduction

Determining of wave distribution is the most crucial portion of hydrodynamic study in all oceanic area. Importance of Bushehr Port Commercial position, necessitate study of its wave climate. Hence one-year-wave field measurements were carried out in the Bay and offshore of it. As modeling result obtained, the Bushehr Bay is a medium wave climate area where its inner region is much calmer than outer part. Moreover, based on extreme value analysis at harbor, 100-year-design wave height is estimated about 1.4m.

Study Area

Bushehr port is located at the end of the Soltani channel on the south of Bushehr Bay (Fig.1). This port is connected to the Persian Gulf by means of a shipping channel which is divided into two part, outer channel and inner channel [4].

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Fig. 1) Satellite image of Bushehr harbour, as well as location of measured points

Procedure of Research

The bathymetry and grid of calculation domain is shown in Figure 2. Model boundaries were limited on the northern side to the Helleh River Delta and on the southern side to the piazi estuary. The offshore boundary was set on 30 m depth contour. Measurement data at AW1 station were used as offshore boundary input. Model calibration was done by using AQ1 data which located in shallow water (Fig.1). From recorded data, five periods were selected to evaluate model results, three periods were employed for calibration and two periods were applied for model results verification.

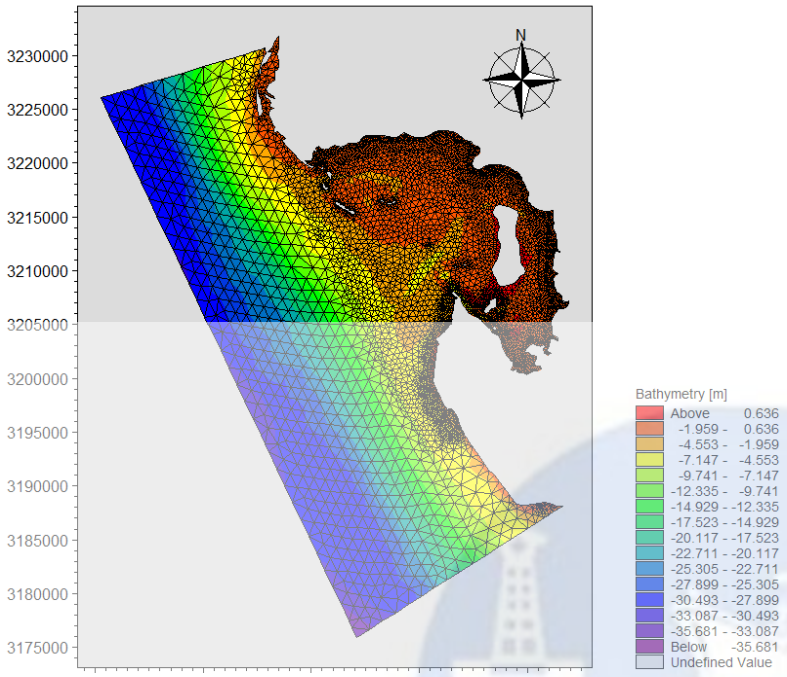

Fig. 2) Model bathymetry and grid for Bushehr Bay

At first, a sensitivity analysis was performed to identify those parameters which have the highest impact on the model output and Bushehr port wave climate. Recommended values in the literature or from the Danish Hydraulic Institute have been assumed for the less sensitive parameters. Values for the sensitive parameters have been selected in second step by calibration process, in which different periods have been simulated. Comparison for the 3rd period is shown in Figure 3, as an example. Verification of model results also was accomplished in this step (Fig. 4).

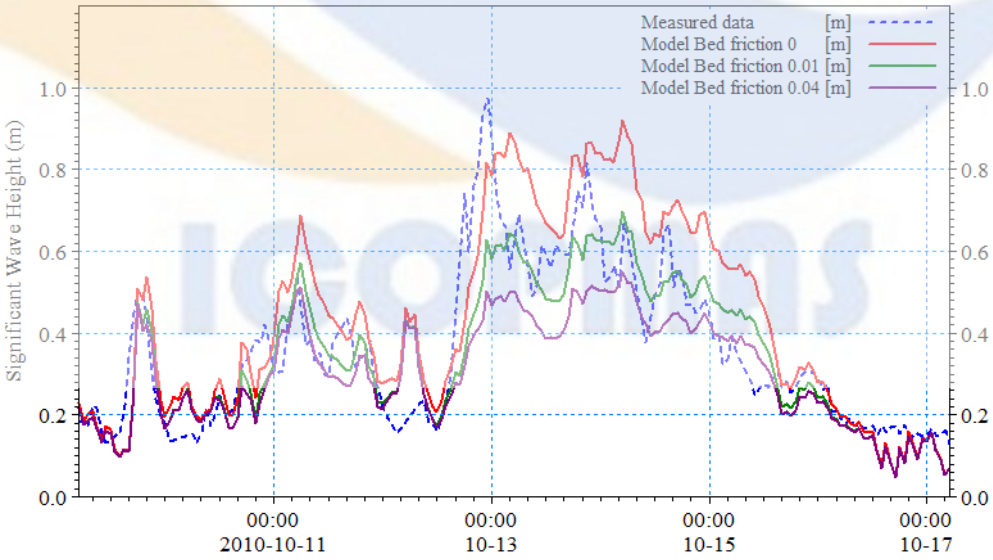

Fig. 3) Model calibration: Effects of the bed resistance parameter on the model wave height predictions

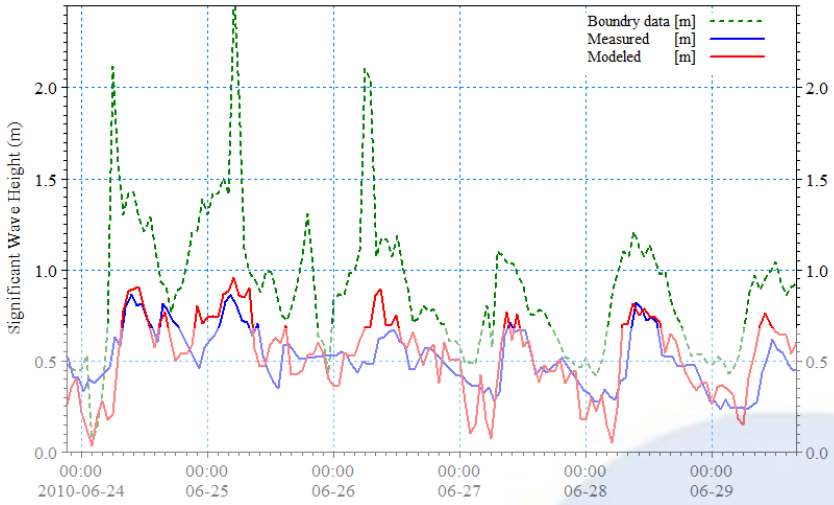

Fig. 4) verification: model predictions with selected parameters against measured wave height

Finally, the verified model was applied within period of 1984-2009, using wave hindcast data to determining the wave distribution pattern in the Bushehr Bay. Fig. 5 shows wave height distribution in the Bay for maximum occurred wave occurred in mentioned period. Moreover, wave extreme value analysis has investigated for varies locations and design height has been calculated (Fig.6).

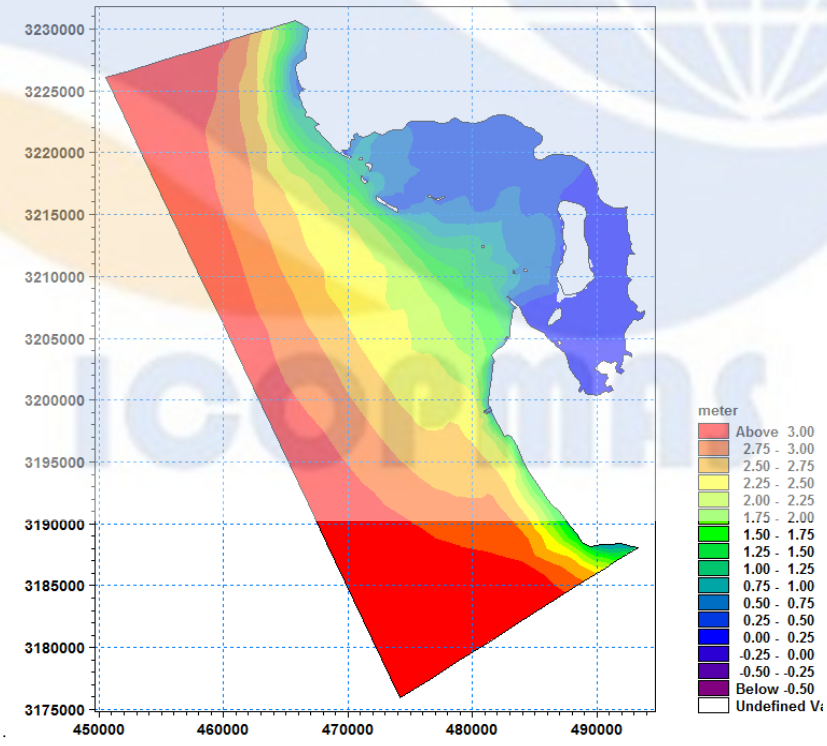

Fig. 5) Maximum wave height distribution occurred in the Bushehr Bay

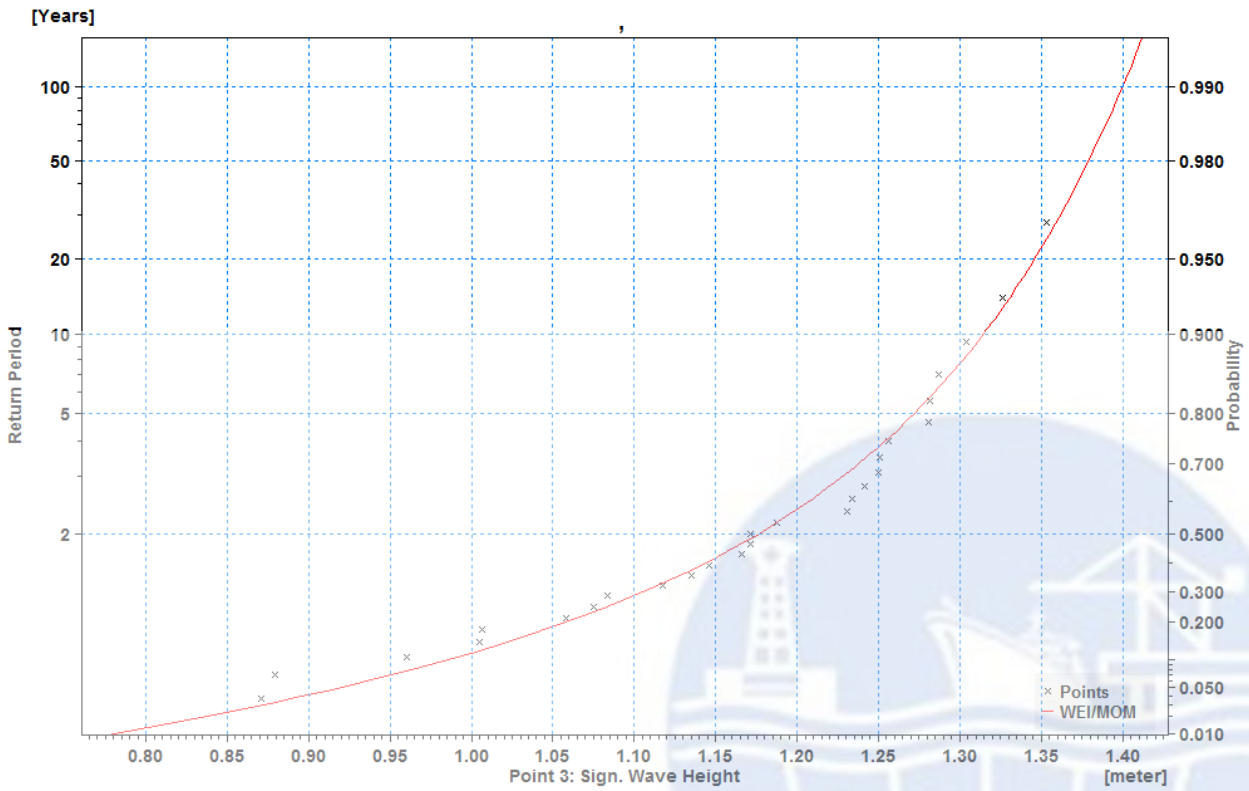

Fig. 6) probability and return period of wave height plot near Bushehr harbor base on Weibull distribution

Conclusion

Obtained Modeling results have fair correlation (٪90) against measurements in the Bay. Based on the achievements, Bushehr Bay is a medium wave climate area where the average wave period is about 6 seconds and dominant wave direction is NS. Due to refraction effect, the inner region dominant wave is in west direction (Fig.7). The highest waves in the study area come from the S direction.

Based on obtained wave height distribution, the inner part of Bay is much calmer comparing with the outer part; while the northern and eastern parts are sheltered because of the big islands existence. Moreover, extreme value analysis near the harbor has been shown that 100-year-design wave height in this area is 1.4m, which is much less than incoming wave height (about 4m).

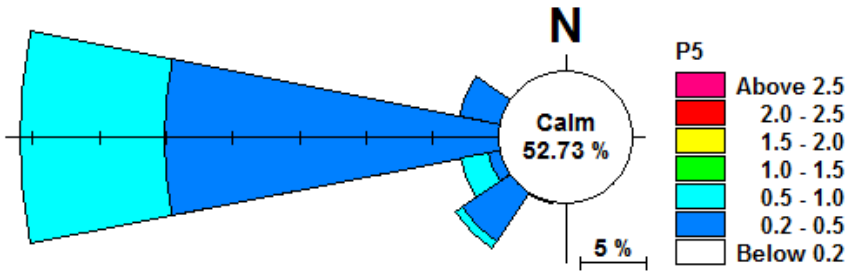

Fig. 7) Wave rose near the Bushehr Port from 1984 to 2009

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