سازمان بنادر و دریانوردی به عنوان تنها مرجع حاکمیتی کشور در امور بندری، دریایی و کشتی‌رانی بازرگانی به منظور ایفای نقش مرجعیت دانشی خود و در راستای تحقق راهبردهای کلان نقشه جامع علمی کشور مبنی بر "حمایت از توسعه شبکه‌های تحقیقاتی و تسهیل انتقال و انتشار دانش و سامان‌دهی علمی" از طریق "استانداردسازی و اصلاح فرایندهای تولید، ثبت، داوری و سنجش و ایجاد بانک‌های اطلاعاتی یکپارچه برای نشریات، اختراعات و اکتشافات پژوهشگران"، اقدام به ارایه این اثر در سایت SID می‌نماید.

The 10th International Conference on Coasts, Ports and Marine Structures (ICOPMAS 2012)
Tehran, Iran, 19-21 Nov. 2012

AN INVESTIGATION ON PMO DYNAMIC MODEL IN BUSHEHR BAY, PERSIAN GULF, IRAN

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Key words: PMO Dynamic, MIKE21 SW, Bushehr Bay, Wave distribution.

Introduction

Due to the lack of measurements in many regions, wave characteristics are estimated using different methods. Wave climate hindcasting/forecasting is mostly conducted by numerical models or empirical methods. Until now different empirical methods have been developed for wave hindcasting such as SMB[1], Wilson[2], JONSWAP[3], Donelan[4,5], Shore Protection manual[6] and Coastal Engineering Manual[7]. However, with the development of high speed processors, several sophisticated numerical models have been developed for wave prediction. These models are mostly phase-averaged spectral wave models developed in three generations. In the last two decades, third generation wave models have been used widely in academic and practical projects.

In this regard, Port and Maritime Organization has produced his own model, PMO Dynamic. This model has been developed as a part of first three phases of Monitoring and Modeling of Study of Iranian Coasts project. PMO Dynamic package is a software available for engineering purposes. It has several modules that have been developed for different objectives. Wave model is the module which is used for the generation and transformation of wind waves in coastal areas[8].

In this paper, in order to test the PMO Dynamic model capabilities, it has been applied for the prediction of wave parameters in Bushehr Bay and the results have been compared with MIKE21 SW model and measured data.

MIKE21 SW[9] is also one of the most widely applied spectral wave models in coastal engineering that is available for both research and consultancy studies. This model has been specially designed for coastal applications and can be used in both laboratory conditions and ocean scales. Sørensen et al.[10] presented the efficiencies of unstructured meshes in MIKE21 SW in dealing with problems of different characteristic scales. They found that the agreement between the model results and measurements was excellent in two stations.

The field data set of Bushehr Bay (Fig.1) has been used for testing the performance of the PMO dynamic model[11]. Significant wave height (Hs), peak spectral period (Tp) and mean wave

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direction were hindcasted in the study. Both models were forced by 5 events as their boundary conditions (Fig.2).

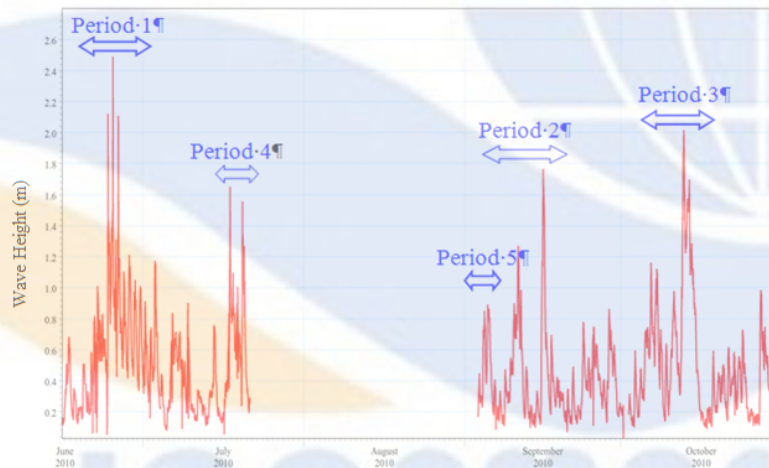**Fig. 1) Satellite image of Bushehr harbor, as well as location of measured data**

Fig. 2) Selected five events from AW1 measurements

Results

As mentioned before, Simulations for models covered a period from June to October 2010, for which a series of simultaneous measurements of the wave data and the flow parameters at several locations around the shipping channel are available, i.e. AQ1 point (Fig.1). From the described recorded data five periods were selected to evaluate model results (Fig.2). Comparison of measured data and models results for the 1st period is shown in Fig.3. Moreover, results of models comparison in the 2nd period are given in Fig.4. Table1 summarized results of five selected periods.
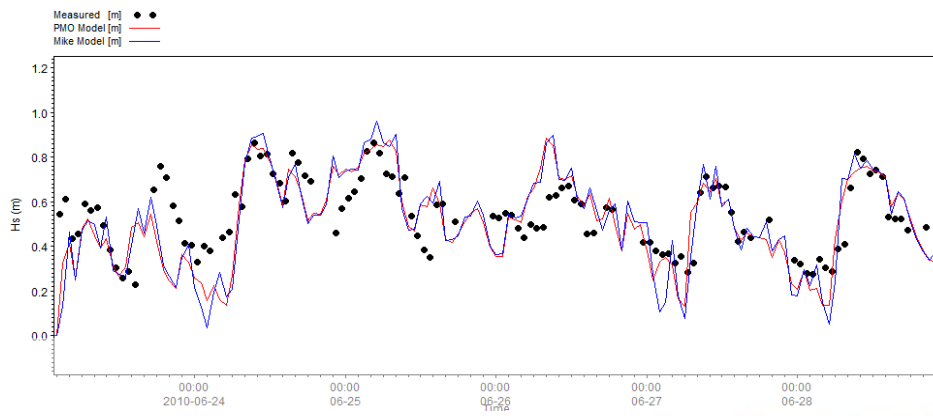
Fig. 3) Comparison of both model against measured data at AQ1 station for first selected period
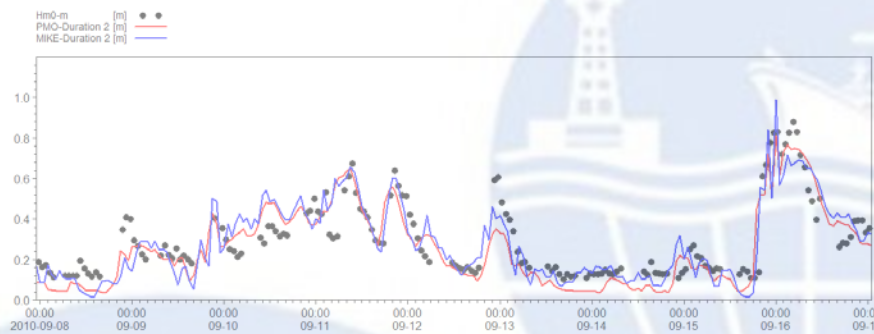

Fig. 3) Comparison of both model against measured data at AQ1 station for second selected period

Table 1) Statistical comparison of PMO and SW Models

Period Number	SW $_{average}$	PMO $_{average}$	CC	RMSE	SI
1	0.50	0.5	0.96	0.06	0.14
2	0.25	0.27	0.94	0.06	0.25
3	0.41	0.44	0.98	0.06	0.14
4	0.39	0.38	0.98	0.05	0.14
5	0.30	0.30	0.97	0.04	0.17

According to this result, it can be concluded that the developed PMO Dynamic model was successfully Compliant with the MIKE21 SW model to simulation of wave conditions in Bushehr Bay. Both models were validated to simulate wave transformation in in the Bay and have shown reasonable agreements against measured data. Moreover, PMO Dynamic model results seem overestimated than SW results.

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