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سازمان بنادر و دریانوردی



The 9th International Conference on Coasts, Ports and Marine Structures (ICOPMAS 2010)
Tehran, Iran, 29 Nov.-1 Dec. 2010



HYDRODYNAMIC MODEL OF MEYDAN CREEK DEVELOPMENT WITH TELEMAC-2D

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Key Words: Tidal hydrodynamics, Currents, TELEMAC modeling system.

INTRODUCTION

An extensive waterway system is proposed to be developed in Dubai, United Arab Emirates to connect the existing creek back to Gulf through artificial canals. Along the banks of these canals, many real estate and infrastructures projects are also proposed to be developed. Meydan Creek is one among such developments and is to be located as indicated in Fig. 1. The objective of the present study is to develop a localized numerical model to estimate the effect of Meydan Creek project on the tidal currents. The details of software, model setup and methodology adopted for the study are presented in this paper.



Fig. 1) Study area in the Dubai waterway system

DESCRIPTION OF THE NUMERICAL SCHEME

The hydrodynamic study was carried out using Telemac-2D model [1], which is capable of simulating free-surface flows in the two dimensions of horizontal space and solves the Saint-Venant equations using the finite-element method. Telemac model was developed by the Laboratoire National d'Hydraulique et Environnement (EDF-DRD – French Electricity Board). Telemac uses an unstructured mesh that allows representing complex coastal features. Using

Telemac model, Sogreah has developed few regional global models and several large scale models covering coastlines of many countries (eg, Gulf [2], Abu Dhabi [3]).

METHODOLOGY AND CALIBRATION

The study involved development of two bi-dimensional finite element models, of which, one represents the proposed extension of the canal alone (Model 1). Model 1 is developed to calibrate and validate the numerical model of the present study with an available earlier study [4]. With similar boundary conditions, another model to represent the proposed Meydan creek layout (Model 2) was also developed.

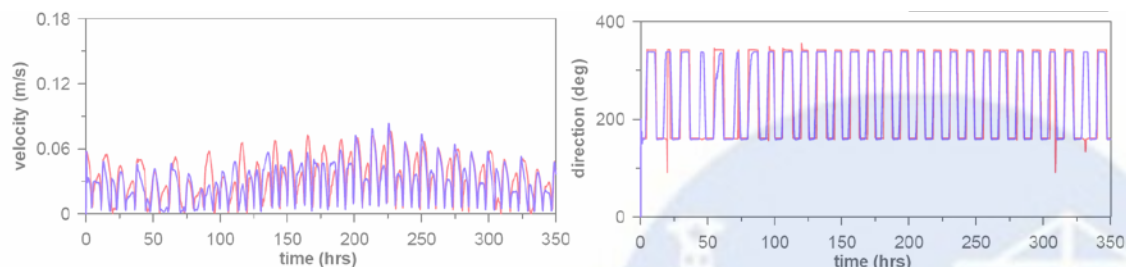


Fig. 2) Typical comparison of results of present study (blue) with earlier study (red)

RESULTS AND DISCUSSION

The proposed development masterplan features three geographically isolated islands and some tidal flats. A typical view of the meshed model domain can be seen in Fig. 3. The boundary conditions, in terms of water levels, were applied at the end boundaries. The hydrodynamic model was run and the tide induced current velocities were obtained at all the nodes, typical of which is shown in Fig. 4. It is observed from the study that the current velocities do not exceed 0.1m/s along the main canal. The differences in the current velocities and water levels along the main canal due to the masterplan layout of Meydan Creek project are less than 0.012m/s and 3mm respectively.

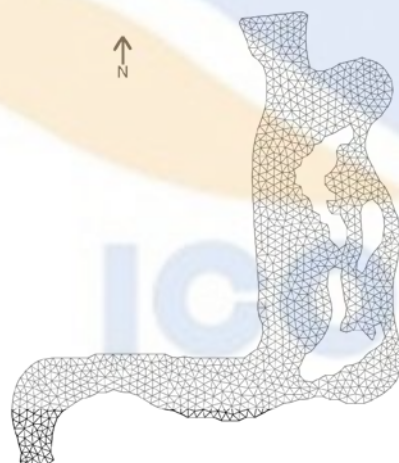


Fig. 3) Model mesh

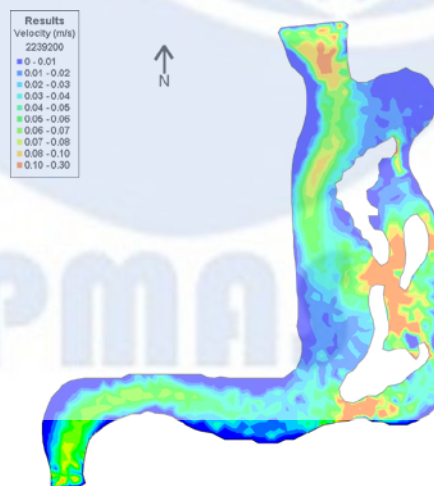


Fig. 4) Typical current variations

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