ICCE 2010

Shanghai, China

June 30 - July 5, 2010

32nd International Conference on Coastal Engineering

Book of Abstracts

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The 32nd International Conference on Coastal Engineering (ICCE 2010)

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Foreword

The 32nd International Conference on Coastal Engineering (ICCE 2010), which will be convened on June 30 to July 5, 2010, in Shanghai, is the first of its kind ever held in the mainland of China. Delegates from 46 countries will gather in this great event.

A total of 725 papers were submitted. After review jointly by Technical Paper Review Committee (TPRC), Coastal Engineering Research Council (CERC) and the Local Organizing Committee (LOC) of ICCE 2010, the abstracts-in-depth of 436 papers and 55 posters have been selected for inclusion in this Book of Abstracts.

With the rapid development of science and technology in recent years, much progress has been made in the basic theory, computational methodology and data processing approaches in coastal engineering studies; the understanding of various physical phenomena in coasts and seas has been deepened; and the relationship among various disciplines has become much closer. The accepted papers and posters cover the science and technology relating to planning, design, management and construction for coastal protection, estuary training and port engineering, including topics on wave; swash, nearshore currents and long waves; coastal management, risk and environmental restoration; sediment transport and morphology; and coastal structure. Interdisciplinary topics, covering more than three sub-disciplines, number quite a few, leading to the understanding that scientists of today and in the future need a more comprehensive and integrated ability to handle various problems. This conference will surely help to broaden the vision of coastal researchers and engineers, trigger new approaches and concepts, and promote the development of coastal engineering studies, which is the very goal of ICCE conferences.

We wish to express our sincere thanks to the organizer and hosting institutions of ICCE 2010 for their hard work to ensure the success of the conference; thanks also to the sponsoring and supporting institutions and exhibitors for their strong support of and active participation in the conference. We believe that delegates from all over the world will enjoy their participation in ICCE 2010 both academically and culturally.

May ICCE 2010 be a great success!

Xie Shileng
Chairman, LOC
ICCE 2010

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Paper No. 232

NUMERICAL MODELLING OF WAVE PENETRATION IN OSTEND HARBOUR

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INTRODUCTION

Safety and economical reasons have lead to a plan of extension and modification of the initial Ostend harbour entrance (Fig. 1a) at the North Sea coast of Belgium, with two new rubble-mound breakwaters (Fig. 1b). Navigation requirements, wave penetration into the inner harbour, long waves responsible for unwanted ship agitation, the flood risk assessment of the adjacent low lying city centre, etc. determine the design procedure of the harbour. In the frame of an integrated study of the wave penetration in Ostend harbour, the waves are being acquired through prototype measurements (seven wave gauges inside the harbour) and physical and numerical modelling is carried out. The physical model tests (3D; scale 1:100) are carried out at Flanders Hydraulics Research (FHR, Belgium).

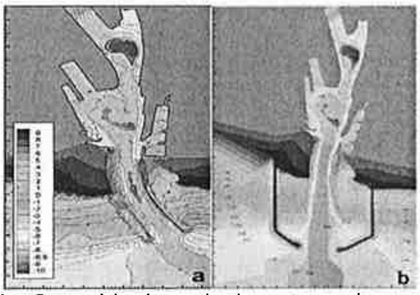

Figure 1 - Ostend harbour, bathymetry and geometry: a) initial situation, b) final situation

NUMERICAL MODELLING AND RESULTS

Throughout the different design and construction phases, numerical results have been used for various purposes. Various wave conditions have been investigated numerically, i.e. different return periods and therefore focusing either on short term results (RP=1 yr or daily wave conditions, which are more important during construction phases and are validated by field data) or on a longer term (RP=100 yrs; 1000 yrs which provide the risk of overtopping over the quay walls in the inner harbour). Numerical modelling is also used for the investigation of the most critical wave direction in terms of wave penetration in the outer and the inner harbour for each of the construction phases and for the simulation of prototype storms. Moreover, simulations have been carried out (Geeraerts et al., 2002) to study the final situation. Input for the armour stability calculations of the breakwaters has been also provided by the numerical models. Bathymetry and geometry modifications are numerically examined, i.e. changes in bed level, width or direction of the access navigation channel, removal of the eastern jetty, construction phases of the breakwaters etc..

Two numerical models have been validated and used for those studies. SimWave (Sinha et al., 1998) is a numerical model based on Nwogu's extended Boussinesq equations, solved in the time domain. Wave propagation and transformation are simulated, including shallow water effects (e.g. shoaling, refraction, diffraction, wave run-up and breaking).
The second numerical model is MILDwave (Troch, 1998), a mild-slope wave propagation model based on the equations of Radder and Dingemans (1985).The phase resolving model MILDwave is able to generate linear water waves over a mildly varying bathymetry and to calculate instantaneous surface elevations throughout the domain. Wave transformation processes such as refraction,shoaling, reflection, transmission and diffraction are simulated intrinsically, while MILDwave provides with results in a time efficient way, even for large grids.
Results (samples shown in Fig. 2) are presented in terms of disturbance coefficients, k_d (=H_s/H_{sGB}, where: H_s, the local significant wave height; H_{sGB}, the wave height at the wave generation boundary). Validation using prototype data has been carried out. Results acquired by the two numerical models show, in general, good agreement.

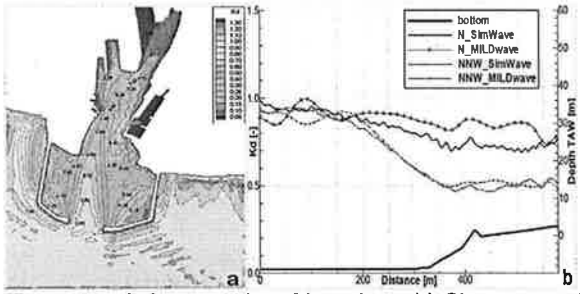

Figure 2 - a) Contour plot of k_d values; b) Simwave and MILDwave results (longitudinal section of outer harbour)

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