

# ICCE 2010

Shanghai, China

June 30 - July 5, 2010

**32<sup>nd</sup> International Conference on Coastal Engineering**

**Book of Abstracts**

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**The 32<sup>nd</sup> International Conference on  
Coastal Engineering (ICCE 2010)**

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**32<sup>nd</sup> International Conference on Coastal Engineering  
June 30 --- July 5, 2010, Shanghai, China**

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## Foreword

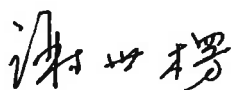
The 32<sup>nd</sup> International Conference on Coastal Engineering (ICCE 2010), which will be convened on June 30 to July 5, 2010, in Shanghai, is the first of its kind ever held in the mainland of China. Delegates from 46 countries will gather in this great event.

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

## Contents

Sessions Summary

Abstract and Session Index

Keynote Speech

Paper Abstracts

Poster Abstracts

Author Index



- 211 Simulation of Irregular Wave Pressure on Perforated Breakwaters  
*CHEN Xuefeng, LI Yucheng, Kong Li*
- 212 Experimental Results of Breaking Wave Impact on A Vertical Wall with An Overhanging Horizontal Cantilever Slab  
*Kisacik D., Troch P., Van Bogaert P.*
- 213 Study of Reflection of New Low-Reflectivity Quay Wall Caisson  
*Joaquín M. GARRIDO, Daniel PONCE DE LEÓN, Antonio BERRUGUETE, Silvia MARTÍNEZ, José MANUEL, Lisardo FORT, Diego YAGÜE, Jose A. GONZÁLEZ-ESCRIVÁ, Josep R. MEDINA*
- 214 An Ensemble Modelling for the Assessment of Random Wave-Induced Liquefaction Risks  
*Ping Dong, Haixia Xu*

#### **C8 Wave-Structure Interaction IV**

**Chairperson: Kyung-Duck Suh**

- 215 Jetties at Bodega Bay Harbor  
*Orville T. Magoon, Donald D. Treadwell*
- 216 Gravel Beaches with Seawalls  
*Ivo VAN DER WERF, Marcel R.A. VAN GENT*
- 217 Wake Effects behind A Farm of Wave Energy Converters for Irregular Long-Crested and Short-Crested Waves  
*Troch P., Beels C., De Rouck J., De Backer G.*
- 218 Large Model Tests of Drifting Container Impact Force Due to Surge Front Tsunami  
*Taro Arikawa, Takashi Tomita, Shigeo Takahashi, Kenichiro Shimosako*
- 219 Multi phase Modeling of Wave Propagation over Semicircular Obstacles Using WENO and Level Set Methods  
*Tamer Kasem, Jun Sasaki*
- 220 The Interaction of Oblique Waves with A Partially Immersed Wave Absorbing Breakwater  
*Yong Liu, Yucheng Li*

#### **C9 Wave-Structure Interaction V**

**Chairperson: Inigo Losada**

- 221 Analysis of Soliton Fission over A Submerged Structure Using "Nonlinear Fourier Transform"  
*Markus Brühl, Hocine Oumeraci*
- 222 3D Simulation of Wave Interaction with Permeable Structures  
*Peter Wellens, Mart Borsboom, Marcel van Gent*
- 223 Wave Structure Interaction: Role of Entrapped Air on Wave Impact and Uplift Forces  
*Mehrdad Bozorgnia, Jiin-Jen Lee, Fredric Raichlen*
- 224 Development on Offshore Structure with Wave Force Reduction  
*Kouichirou Anno, Takeshi Nishihata*
- 225 Practical Measures against Sea Salt Particles from An Existing Vertical Wall  
*Masaru Yamashiro, Akinori Yoshida, Yasuhiro Nishii*

- 226 Loads on Wind Turbines Access Platforms with Gratings  
*Thomas Lykke Andersen, Peter Frigaard, Michael R. Rasmussen, Luca Martinelli*
- 227 The Influence of Core Permeability on the Stability of Concrete Armour Layers, Case Study Ijmuiden Breakwaters  
*Kees Dorst, Bas Reedijk, Bart van Zwicht*

## **C10 Waves in Harbors**

### **Chairperson: Jane Smith**

- 228 Harbor Resonance: A Comparison of Field Measurements to Numerical Results  
*Xiuying Xing, Jiin-Jen Lee, Fredric Raichlen*
- 229 Quay Design and Operational Oceanography. The Case of Bilbao Harbour  
*Agustín Sánchez-Arcilla, Manuel Espino, Manel Grifoll, Cesar Mösso, Joan Pau Sierra, Marc Mestres, Stella Spyroupoulou, Mario Hernández, Alberto Ojanguren, Marcos G.-Sotillo, Enrique Álvarez-Fanjul*
- 230 On Basic Conditions for Long-Wave Simulations in Harbors by the Boussinesq Model  
*Kazuyuki Ota, Akinori Yoshida, Masaru Yamashiro, Yasuhiro Nishii*
- 231 Investigation of Long Period Waves and Reduction of Harbor Resonance in Gamcheon Port, Korea  
*Bumshick Shin, Kyuhan Kim, Chongkun Pyun, Nobuhisa Kobayashi*
- 232 Numerical Modelling of Wave Penetration in Ostend Harbour  
*Vasiliki Stratigaki, Dieter Vanneste, Peter Troch, Stefaan Gysens, Marc Willems*

## **C11 Wave Runup**

### **Chairperson: Jentsje van der Meer**

- 233 On the Effect of Wind and Current on Wave Run-up and Wave Overtopping  
*Stefanie Lorke, Anja Brüning, Antje Bornschein, Stefano Gilli, Reinhard Pohl, Miroslav Spano, Jentsje van der Meer, Stefan Werk, Holger Schüttrumpf*
- 234 Regular Periodic Waves Runup and Overtopping Simulations by Lagrangian Blocks  
*Lai-Wai Tan, Vincent H. Chu*
- 235 Propagation and Run-up of Tsunami Waves with Boussinesq Model  
*Xi Zhao, Benlong Wang, Hua Liu*
- 236 Extreme Wave Runup on Natural Beaches  
*Andrew Mather, Derek Stretch, Gerald Garland*

## **C12 Breakwater Stability**

### **Chairperson: Hocine Oumeraci**

- 237 Stability of Breakwater Roundheads during Construction  
*Marcel R.A. VAN GENT*
- 238 Oblique Wave Attack on Cube and Rock Armoured Rubble Mound Breakwaters  
*Guido Wolters, Marcel van Gent*
- 239 Validity of Simplified Analysis of Stability of Caisson Breakwaters on Rubble Foundation Exposed to Impulsive Loads  
*Lars Andersen, Hans F. Burcharth, Thomas Lykke Andersen*

## 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).

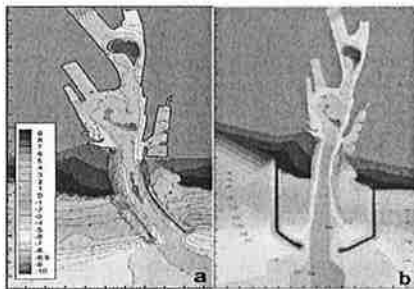


Figure 1 - Ostend harbour, bathymetry and geometry: a) initial situation, b) final situation

### 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.

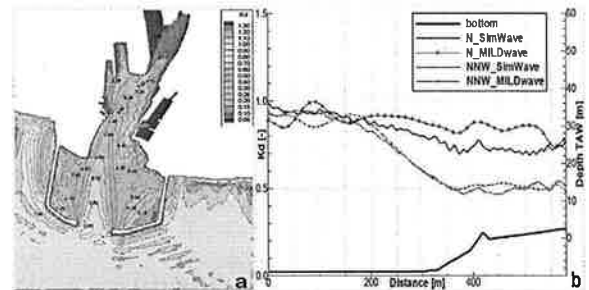


Figure 2 - a) Contour plot of  $k_d$  values; b) Simwave and MILDwave results (longitudinal section of outer harbour)

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