# ICCE 2010

**Shanghai, China**

**June 30 - July 5, 2010**

**32nd International Conference on Coastal Engineering**

**Book of Abstracts**

# Book of Abstracts

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

June 30 --- July 5, 2010

Shanghai, China

Prepared and Published
By the ICCE 2010 Local Organizing Committee

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# 32nd International Conference on Coastal Engineering
# June 30 --- July 5, 2010, Shanghai, China

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# Foreword

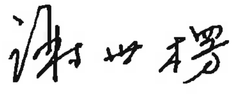
The 32nd International Conference on Coastal Engineering (ICCE 2010), which will be convened on June 30 to July 5, 2010, in Shanghai, is the first of its kind ever held in the mainland of China. Delegates from 46 countries will gather in this great event.

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. 217

# WAKE EFFECTS BEHIND A FARM OF WAVE ENERGY CONVERTERS FOR IRREGULAR LONG–CRESTED AND SHORT–CRESTED WAVES

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## INTRODUCTION

Wave Energy Converters (WECs) in a farm are partly absorbing and partly redistributing the incident wave power, creating a wake behind each WEC. The power absorbed by each WEC in a farm is affected by the wakes of its neighbouring WECs. Simplified attempts to calculate the wave climate near a farm have been reported: Millar et al. (2006) have used the spectral wave propagation model SWAN. In Venugopal and Smith (2007), WECs are modelled in a Boussinesq wave model (MIKE 21).

## NUMERICAL SIMULATION OF WAKE EFFECTS

In this paper, the wake behind a single and multiple hypothetical WECs based on the overtopping principle is studied for irregular long-crested and short-crested waves in a time dependent mild-slope equation model MILDwave. The WEC has the same working principle as a prototype WEC of the overtopping type and has for simplicity a square plan view shape (36 m x 36 m, white square in figures). In the phase-resolving model MILDwave each combination of reflection and transmission characteristics, and consequently absorption characteristics, can be modelled for all individual WECs in a farm using the sponge layer technique (Beels et al., 2010). This results in a more accurate representation of the wake effects in the lee of a single WEC and a farm of WECs, providing an uncoupling between reflection and transmission characteristics of each WEC.

## RESULTS

Fig. 1 shows the disturbance coefficients $K_d$ (ratio between disturbed and incident significant wave height) in a wave basin with a single WEC for irregular long-crested and short-crested waves (head-on) with $H_s$ = 1 m and $T_p$ = 5.2 s. For long-crested waves a long wake is observed. In the case of short-crested waves a wake is still observed, but the effects of redistribution, caused by directional spreading and diffraction around the WEC, are apparent. In Fig. 1b, a long shadow zone occurs behind the WEC, comparable to the one observed in Fig. 1a, as the directional spreading is still quite small ($s_{max}$ = 75 - swell). In Fig. 1c the shadow zone is shorter due to a faster redistribution behind the WEC ($s_{max}$ = 10 - wind waves).

This paper presents the wake behind various lay-outs of 9 WECs for long- and short-crested waves. The wave power redistribution in and behind each farm lay-out is studied, from which the power absorption of each lay-out is derived.

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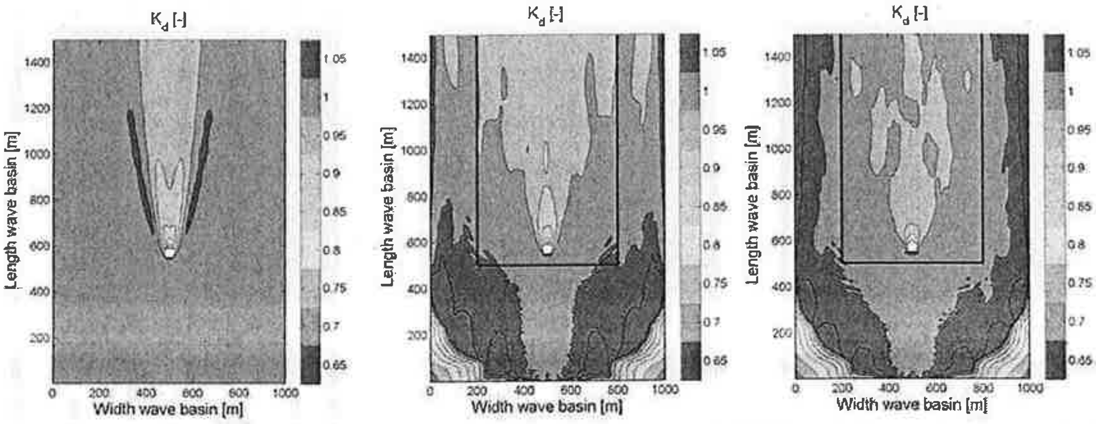


Fig.1: Calculated disturbance coefficient $K_d$ in a wave basin with a single WEC for (left) irregular long-crested waves and irregular short-crested waves with (middle) $s_{max}$ = 75 and (right) $s_{max}$ = 10, for $H_s$ = 1 m and $T_p$ = 5.2