

Prediction of wave field generation performance for the new Coastal and Ocean Basin (COB) in Belgium

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In recent years there has been much discussion on the role of experimental facilities in coastal and offshore engineering. It is commonly recognized that despite the progress in computing and consequently in numerical modelling performance, physical scale modelling remains an essential tool for numerical modelling validation. Scientific research in the fields of coastal and offshore engineering, like many other engineering domains, has evolved into a so-called integrated research methodology, combining both numerical and physical scale modelling. In this context, limitations of existing testing infrastructure and the need for modern facilities for maritime research and development calls for further investment in this sector.

The new Coastal and Ocean Basin (COB) located at the Greenbridge Science Park in Ostend, Belgium, is under construction since February 2017. The laboratory will provide a versatile facility to facilitate a wide range of physical modelling studies, including the ability to generate waves in combination with currents and wind under arbitrary relative directions. The new wave basin is designed to have state-of-the-art generating and absorbing wave generators, a recirculation current system, and a wind generator. The COB will allow users to conduct tests for coastal and offshore engineering research and commercial projects, i.e. scale models of coastal and offshore structures, coastal defense constructions, floating wind turbines, wave and tidal energy converters, floating platforms and device mooring applications. Applications directly related to Blue Energy and Blue Growth. The COB will be 30 m long, 30 m wide and will have a variable water depth of up to 1.4 m allowing for coastal to near offshore test conditions with a maximum regular wave height of 0.55 m while at the same time a central pit with a water depth of 4.0 m will serve for mooring applications. The wave generator will ideally cover spatially two sides of the basin, forming an 'L'-shaped corner. The other two sides will be equipped with wave-absorbing units. This layout will allow generation of waves with 1.0 s wave period or higher in any oblique direction with respect to the wave generators.

However, the optimization of the wave field generation performance of a wave basin is a challenge. Wave reflection from physical wave-absorbing units and variations in the homogeneity of the wave field due to the interaction between the wave generators and the other two basin sides are to be expected. The purpose of this research is to deal with these issues and increase significantly the performance of the generated wave fields. To achieve this aim, numerical modelling is undertaken using two phase resolving wave propagation models, MILDwave (Troch, 1998; Troch & Stratigaki, 2016), a mild-slope wave model developed at Ghent University and SWASH (Zijlema et al., 2011), a non-hydrostatic model, in order to provide a first assessment of the homogeneity of the generated wave field in the COB, and how this is affected by a range of different configurations of the L-shaped wave generators.

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Acknowledgement

The first author would like to acknowledge his PhD funding grant by the Research Foundation Flanders, Belgium (FWO).

Keywords: wave basin; numerical modelling; COB; coastal and offshore engineering; marine renewable energy

BOOK OF ABSTRACTS



VLIZ SPECIAL PUBLICATION 80

Book of Abstracts | VLIZ Marine Science Day | 21 March 2018 | MEC Staf Versluys | Bredene, Belgium



BOOK OF ABSTRACTS

VLIZ MARINE SCIENCE DAY

**MEC STAF VERSLUYS, BREDENE
21 MARCH 2018**

VLIZ SPECIAL PUBLICATION 80

This publication should be quoted as follows:

Jan Mees and Jan Seys (Eds). 2018. Book of abstracts – VLIZ Marine Science Day. Bredene, Belgium, 21 March 2018. VLIZ Special Publication 80. Vlaams Instituut voor de Zee – Flanders Marine Institute (VLIZ): Oostende, Belgium. 142 + ix p.

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Photo cover: VLIZ

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ISSN 1377-0950

PREFACE

This is the 'Book of Abstracts' of the 18th edition of the VLIZ Marine Science Day, a one-day event that was organised on 21 March 2018 in the MEC Staf Versluys in Bredene.

This annual event has become more and more successful over the years. With almost 400 participants and more than 100 scientific contributions, it is fair to say that it is the place to be for Flemish marine researchers and for the end-users of their research. It is an important networking opportunity, where scientists can meet and interact with their peers, learn from each other, build their personal professional network and establish links for collaborative and interdisciplinary research.

Marine scientists from all Flemish universities and scientific institutes – and representing all marine science disciplines – have contributed to this volume. The book thus illustrates the diversity, quality and relevance of the marine sciences in Flanders (and Belgium): it provides a beautiful and comprehensive snapshot of the state-of-the-art of marine scientific research in Flanders.

Pre-doc and post-doc scientists present their research in an exciting way and communicate their fascinating science – and its importance to society – to the wider public. We thus hope to demonstrate the excellence of Flemish marine science and to increase its national and international visibility.

The volume of research that is presented here holds a great promise for the future. It shows that marine science is a very lively discipline in Flanders, and that a new generation stands ready to address the grand challenges and opportunities that our seas and oceans represent.

For the second year, the Brilliant Marine Research Ideas are awarded, an initiative sponsored through the philanthropy scheme of VLIZ. We are proud to announce that last year's winners present their results here at the VLIZ Marine Science Day.

I want to congratulate all participants with their contributions, and I invite them all to become members of VLIZ and to actively participate in our events and activities in the future.

Bredene, 21 March 2018

Prof. Dr Jan Mees

General Director VLIZ

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