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PREFACE

This volume contains full-length papers of contributions presented at *MARINE 2019*, the *Eight International Conference on Computational Methods in Marine Engineering,* held at Chalmers Conference Center, Gothenburg, Sweden, May 13-15, 2019. The first edition of this series of conferences was held in Oslo, Norway, in June 2005, with following editions every second year, in Barcelona, Spain, June 2007, in Trondheim, Norway, June 2009, in Lisbon, Portugal, September 2011, in Hamburg, Germany, May 2013, in Rome, Italy, June 2015, and, finally in Nantes, France, May 2017.

In the spirit of previous editions, the objective of MARINE 2019 is to provide *"a meeting place for researchers developing computational methods and scientists and engineers focusing on challenging applications in Marine Engineering"*. The state of the art in computational approaches is addressed in sessions on, e.g. computational fluid dynamics (both fundamental and applied), propulsors, design and optimization, fluid-structure interaction with a specific focus on ship hydrodynamics, lightweight design and structures. We see further large contributions to topics related to multiphase flows, both on development of the numerical methods as to applications related to e.g. water entry problems, waves-structure interaction, and seakeeping. Further, the interest on marine renewable energy is continued large.

The conference programme includes five plenary lectures, six keynotes lectures, and in total over one hundred and fifty seven contributions distributed in seventeen contributed sessions and equally seventeen invited sessions organised by recognised experts. The programme extends over three days with four parallel sessions.

MARINE 2019 is the eight international conference on this topic organized in the framework of the Thematic Conferences of the European Community on Computational Methods in Applied Sciences (ECCOMAS). Moreover, MARINE 2019 is a Special Interest Conference of the International Association for Computational Mechanics (IACM). The conference is jointly organized by Chalmers University of Technology, Department of Mechanics and Maritime Sciences and by the International Center for Numerical Methods in Engineering (CIMNE) in co-operation with the Technical University of Catalonia (UPC).

Our sincere appreciation goes to plenary lecturers, keynote lecturers, invited session organizers and all authors who have contributed to the outstanding scientific quality of the conference as reflected in the proceedings. Finally, we wish to thank Mr. Alessio Bazzanella and Ms Laia Aranda and the staff from the Congress Department of CIMNE, Barcelona, Spain, for their excellent work in the support of the conference organization and for the publication of this volume.

Gothenburg, 13th of May 2019

Rickard Bensow and Jonas Ringsberg, Editors

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Kongsberg Maritime

Caterpillar Propulsion

BETA CAE SYSTEM

Siemens

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EXPERIMENTAL VALIDATION OF A RANS-VOF NUMERICAL MODEL OF THE WAVE GENERATION AND PROPAGATION IN A 2D WAVE FLUME

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Key words: Numerical wave flume, model validation, wave characterization

Abstract. This paper focus on the study of free surface variation in a Numerical Wave Flume (NWF) due to a paddle movement. The NWF is the numerical representation of a 12.5 meters long Experimental Wave Flume (EWF) of the laboratory of the University of the Basque Country. The experiments and the numerical simulations are performed in several depths (0.3, 0.4 and 0.5 meters). Besides different velocities for the paddle movement are induced between 0.064 and 0.1 m/s. The numerical simulations are based on an Eulerian Multiphase of two fluids, air and water, more concretely the Volume of Fluid model. The surface variation in two points (6.0 and 6.3 meters from the wave flume start) is studied in both numerical and experimental wave flumes and compared its variation through the experiment time. Besides, the experiments will be analyzed in the wave maker theory. The results show the models quality in the first moments of the experiments, where the reflection does not appear, in which the results from both experimental and numerical simulations are pretty similar.

1 INTRODUCTION

The need of decrease the greenhouse gases emissions is one of the main objectives in order to fight the climate change and the global warming. The United Nations (UN) agreed to aim this decrease, among other objectives, in the Paris agreement [1]. In order to fulfill this purpose, the use of renewable energies seems to be one of the best options. Some technologies like onshore wind or solar have arisen as the most known ones, but the need of augment the number of technologies to harness energy is present [2]. Thus, offshore renewable energies ensue as one of most promising options.

Figure 7 shows the relation between the wavelength and the wave period. In it, it can be observed that the relation between experiments and numerical simulations, the wave period has small errors. Thus, both experiments and numerical simulations follow the theoretical tendencies better than in Figure 6.

5 CONCLUSIONS

Analyzing the results from the nine simulations the first conclusion obtained is that the VOF model approach is correct. The great accuracy of the simulations and the similarity of them in the first waves when the reflection does not affect the measurements, show the success of the approach of the simulations.

However, some modifications in both the grid and physic models have to be done in order to reduce the error when reflection affects to the measurements. Besides continuous improvements in the paddle control of the EWF aim to have more constant waves and approach the theoretical models. Moreover, the inclusion of acceleration in the numerical simulations should create an approximation to the experimental results.

Thus, this study exists as an initial work in the area of numerical simulations of the EWF. Studies of physical effects, as reflection, and of the behavior of offshore structures, as wave energy converters or floating structures for offshore wind, will be the next steps of the research group. With a proper NWF the simulations of a wide range of waves and depths will be possible in order to validate these type of structures.

6 AKNOWLEDGEMENTS

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