

PROCEEDINGS

27TH INTERNATIONAL WORKSHOP ON WATER WAVES AND FLOATING BODIES



EDITORS:
HARRY B. BINGHAM, ROBERT W. READ & TORBEN B. CHRISTIANSEN

APRIL 22-25, 2012
COPENHAGEN, DENMARK

PROCEEDINGS

27TH INTERNATIONAL WORKSHOP ON WATER WAVES AND FLOATING BODIES

EDITORS:
HARRY B. BINGHAM, ROBERT W. READ
& TORBEN B. CHRISTIANSEN

APRIL 22-25, 2012
COPENHAGEN, DENMARK



Cover Page Photo: Werner Karrasch.
Copyright: The Viking Ship Museum, Roskilde, Denmark.

This picture shows a replica of the viking ship 'The Sea Stallion from Glendalough' in the English Channel returning from Ireland to Denmark in 2008, after visiting the town where the original ship was built in the 11th century. The remains of the original ship, along with several contemporaries, were raised from the bed of the Roskilde Fjord and are currently on display at the Viking Ship Museum in Roskilde, Denmark. During the Viking Age, in the 8th through 11th centuries, the Scandinavian Vikings explored the coasts of the Baltic Sea, Britain, Normandy and Greenland in their characteristic, slender ships. They even crossed the Atlantic Ocean to become the first Europeans to reach North America around the year 1,000, some 500 years before Columbus.

SPONSORS OF THE 27TH IWWWF

The organizing committee of the 27th International Workshop on Water Waves and Floating Bodies is grateful for the generous financial support provided by the following sponsors.

*A. P. Møller og Hustru
Chastine Mc-Kinney Møllers Fond til almene Formaal*

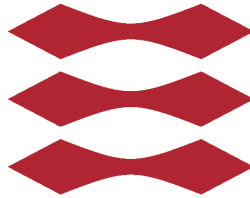
COWIfonden



ORGANIZATIONS & COMMITTEES

HOSTED BY

DTU



Section for Fluid Mechanics, Coastal and Maritime Engineering
Department of Mechanical Engineering
Technical University of Denmark

SCIENTIFIC COMMITTEE

Assoc. Prof. Harry B. Bingham, Technical University of Denmark, Denmark
Professor Spyros Mavrakos, National Technical University of Athens, Greece
Professor Duan Wenyang, Harbin Engineering University, China

ORGANIZING COMMITTEE

Assoc. Prof. Harry B. Bingham
Dr. Robert W. Read
PhD Student Torben B. Christiansen

PREFACE

The International Workshop on Water Waves and Floating Bodies is an annual meeting of engineers and scientists with a particular emphasis on water waves and their effects on floating and submerged marine structures. The Workshop was initiated by Professor D. V. Evans (University of Bristol) and Professor J. N. Newman (MIT) following informal meetings between their research groups in 1984. First intended to promote communication between researchers in the UK and the USA, the interest and participation quickly spread to include researchers from many other countries around the world. The Workshop places particular emphasis on the participation of younger researchers, on the stimulation of discussion between engineers and scientists, and to the presentation of preliminary basic scientific work before its publication elsewhere. The Workshop is an important reference point for organizing and spreading knowledge in this area. In particular, the Workshop proceedings are freely accessible through the dedicated internet address www.iwwwfb.org where any interested individual can find all contributions from 1986 on.

Since its inception, the Workshop has seen a robust growth in attendance and now annually brings together around eighty marine hydrodynamicists, naval architects, offshore and arctic engineers and other scientists and mathematicians from around the world. Attendance is restricted to the authors of submitted extended four page abstracts, and those presented at the Workshop have been selected by a small committee. All of the accepted abstracts for this year's Workshop are collected in these proceedings, and the abstracts along with recorded discussions are available on the Workshop web site.

A NOTE FROM THE ORGANIZERS

We are very pleased to welcome the participants of the 27th International Workshop on Water Waves and Floating Bodies to Copenhagen, Denmark. This will be the first time the Workshop has been held in Denmark, a country with historically strong nautical traditions and one which is currently taking a leading role in the transition to renewable, carbon emissions-free sources of energy. In keeping with these timely themes, a number of the presentations will focus on problems related to harvesting offshore renewable energy from the wind, waves and tides, as well as strategies for increasing the efficiency of, and reducing emissions from ship transportation. The Workshop venue is the Danish Society of Engineers Conference Center located on the Copenhagen Waterfront and within sight of the Middelgrunden offshore wind turbine park. This park was built in 2000 and at the time, it was the world's largest offshore wind power installation. It supplies approximately 4% of Copenhagen's electricity today.

Over 70 abstracts were submitted for this year's workshop, out of which 55 have been accepted for presentation and are included in these proceedings. The contributions cover a wide range of topics related to the interaction between ocean waves and marine structures, while the authors cover all career stages from young PhD students to the most senior and distinguished researchers. This is the third year since the establishment of the Tuck Fellowship which, in memory of Prof. Ernie Tuck, supports the participation of one student, or young researcher, each year. Four applications for the Tuck Fellowship were received this year and the prize was awarded to Sarah Crowley, a PhD student at the University of Bristol, UK. Edward Ransley, a PhD student from the University of Plymouth, UK, was selected as the runner-up.

Given the outstanding quality of the accepted abstracts, and our efforts to organize a smooth event, we are confident that this year's workshop will live up to the usual high expectations. Welcome to Copenhagen and we wish you all a stimulating meeting and a pleasant stay in Denmark!

With best wishes,

Harry B. Bingham, Robert Read & Torben Christiansen

27TH IWWWF B PROGRAM

SUNDAY, APRIL 22, 2012

9-12 **Lab Tour to DHI & Force Technology**

9-13 **Registration**

Registration takes place Sunday at the participants hotel 9–11, and at the conference center 11–13. Registration also takes place Saturday at the participants hotel 18–21.

12:00 **Lunch**

13:30 **Opening Remarks – Welcome**

Harry B. Bingham

SESSION 1: WAVE ENERGY DEVICES I. CHAIR: J.N. NEWMAN

13:45 The new Bristol cylinder: a submerged cylinder wave energy converter Crowley S., Porter R. & Evans D. V.

14:10 Two-component axisymmetric wave-energy absorber – analysis of dynamics and geometric proportions Cochet C. & Yeung R. W.

14:35 Wave-energy absorption efficiency by a rotating pendulum-type electric-power generator installed inside a floating body Kashiwagi M., Nishimatsu S. & Sakai K.

15:00 Numerical time integration methods for a point absorber wave energy converter Zurkinden A. S. & Kramer M. M.

15:25 Coffee break

SESSION 2: WAVE ENERGY DEVICES II. CHAIR: D.V. EVANS

15:40 Experimental investigation on the power generation performance of floating point absorber wave energy systems Li Y., Yu Y. -H., Epler J. & Previsic M.

16:05 Investigating interaction effects in an array of multi-mode wave energy converters Ransley E. & Greaves D.

16:30 Multi-objective optimization of a wave energy absorber geometry Kurniawan A. & Moan T.

16:55 Resonant scattering by an array of thin plates for wave energy extraction Renzi E. & Dias F.

17:20 Coffee break

SESSION 3: LOADING ON VERTICAL CYLINDERS. CHAIR: J. GRUE

17:35 Long duration experiments in irregular waves, to determine 10,000-year wave loads on a 3.5m diameter vertical cylinder Chaplin J. R. & Rainey R. C. T.

18:00 Phase manipulation and the harmonic components of ringing forces on a surface-piercing column Fitzgerald C., Grice J., Taylor P. H., Eatock-Taylor R. & Zang J.

18:25 Accurate computation of wave loads on a bottom fixed circular cylinder Paulsen B. T., Bredmose H. & Bingham H. B.

18:50 Second order hydroelastic response of the vertical circular cylinder to monochromatic water waves Malenica Š. & De Hauteclocque G.

19:30 **Dinner**

MONDAY, APRIL 23, 2012

SESSION 4: SHALLOW WATER EFFECTS. CHAIR: R. EATOCK-TAYLOR

- 8:15 Application of the high level GN theory to shallow-water wave problems Zhao B. B. & Duan W. Y.
- 8:40 Nonlinear Forces on a submerged, horizontal plate: the G-N theory Hayatdavoodi M. & Ertekin R. C.
- 9:05 Evolution of water waves generated by subaerial solid landslide Viroulet S., Cébron D., Kimmoun O. & Kharif C.
- 9:30 Laboratory experiments on waves in moderate and shallow water and their kinematics Grue J. & Laskovski D.
- 9:55 A non-reciprocal Green's function providing an exact, explicit Dirichlet-Neumann operator: An example for linear waves on a sloping beach in 1DH Schäffer H.
- 10:20 Coffee break

SESSION 5: RADIATION AND DIFFRACTION I. CHAIR: M. KASHIWAGI

- 10:40 Solving the linear radiation problem using a volume method on an overset grid Read R. W. & Bingham H. B.
- 11:05 Solutions of nonlinear free surface-body interaction with a harmonic polynomial cell method Shao Y. -L. & Faltinsen O. M.
- 11:30 Scattering by a cylinder with variable bathymetry Newman J. N.
- 11:55 Simulation of nonlinear wave elevation around a square array of truncated cylinders Teng B. & Cong P. W.
- 12:30 Lunch

SESSION 6: RADIATION AND DIFFRACTION II. CHAIR: J. PINKSTER

- 13:30 Taylor Expansion Boundary Element Method for floating body hydrodynamics Duan W. Y.
- 13:55 Hydrodynamic exciting forces on immersed prolate spheroids Mavrakos S. A. & Chatjigeorgiou I. K.
- 14:20 Time-harmonic water waves trapped by surface-piercing motionless bodies floating freely Kuznetsov N. G. & Motygin O. V.
- 14:45 On Application of Multi-pole Expansions to Roll Damping of a Rectangular Box Choi Y. M., Kwon S. H., Park J. H. & Lee S. B.
- 15:10 Wave run-up on a vertical plate in an infinite wave field Chatjigeorgiou I. K. & Molin B.
- 15:35 Coffee break

SESSION 7: RADIATION AND DIFFRACTION III. CHAIR: S. A. MAVRAKOS

- 15:55 The time-dependent motion of a floating cylinder Meylan M. H. & Ralph T.
- 16:20 Dissipation in the gap resonance between two bodies Lu L. & Chen X. B.
- 16:45 Experimental and numerical analysis of the wave propagation through a narrow channel in a wave flume Dupont G., Kimmoun O. & Molin B.
- 17:10 Investigation of gap resonance in moonpools at forward speed using a non-linear domain-decomposition method Fredriksen A. G., Kristiansen T. & Faltinsen O. M.
- 17:45 **Harbor Tour**
- 19:00 **IWWWFB Steering Committee Meeting**
- 20:00 **Dinner**

TUESDAY, APRIL 24, 2012

SESSION 8: SHIP WAVES I. CHAIR: O. FALTINSEN

- 08:15 The Neumann-Michell theory of ship waves Noblesse F., Huang F. & Yang C.
08:40 A surface-piercing body moving along the free surface Semenov Y. A., Wu G.X. & Yoon B. S.
09:05 Towards real time simulation of ship-ship interaction Lindberg O., Bingham H. B., Engsig-Karup A. P. & Madsen P. A.
09:30 Wave Pattern Analysis by a Higher-order Boundary Element Method He G. & Kashiwagi M.
09:55 Computational evaluation of the added resistance in oblique seas Joncquez S., Simonsen C. D. & Otzen J. F.
10:20 Coffee break

SESSION 9: SHIP WAVES II. CHAIR: R. W. YEUNG

- 10:40 Development of a time domain strip theory approach for maneuvering in a seaway Subramanian, R. & Beck R. F.
11:05 Simulation of free-surface viscous flows by a finite-element front-tracking approach Charlot L., Hay A., Etienne S. & Pelletier D.
11:30 Load field estimation based on principal component analysis Dessi D.
11:55 Assessment study of a domain-decomposition strategy for marine applications Greco M., Colicchio G. & Lugni C.
12:30 Lunch

SESSION 10: SLAMMING. CHAIR: W. Y. DUAN

- 14:00 Modelling of the oblique impact of an elongated body by a 2D+t approach Tassin A., Korobkin A. A. & Cooker M. J.
14:25 Hydrodynamic impact (Wagner) problem and Galin's theorem Scolan Y. -M. & Korobkin A. A.
14:50 The bounce of a blunt body from a water surface at high horizontal speed Reinhard M., Korobkin A. A. & Cooker M. J.
15:15 Coffee break

SESSION 11: SLAMMING & ELASTIC BODIES. CHAIR: J. ZANG

- 15:30 Inclined impact of a smooth body on thin liquid layer Khabakhpasheva T. I. & Korobkin A. A.
15:55 Water exit of a wedge-shaped body Piro D. J. & Maki K. J.
16:20 Approximations of wave propagation in one-dimensional multiple scattering problems with random characteristics Bennetts L. G. & Peter M. A.
16:45 Coffee break

SESSION 12: ELASTIC PLATES & ICE. CHAIR: R. PORTER

- 17:05 Generation of unsteady waves by three-dimensional source in deep water with an elastic cover Sturova I. V.
17:30 Unsteady motion of elliptic cylinder under ice cover Kostikov V. K., Makarenko N. I. & Korobkin A. A.
17:55 A waves-in-ice model with a floe-breaking parameterisation Williams T. D., Bennetts L. G. & Squire V. A.
19:30 **Banquet dinner**

WEDNESDAY, APRIL 25, 2012

SESSION 13: SLOSHING. CHAIR: A. A. KOROBKIN

- 09:00 Study on the effect of density ratio of liquid and gas in sloshing experiment Ahn Y., Kim S. -Y., Kim K. -H., Kim Y. & Park J. -J.
- 09:25 Wave-impact in a sloshing tank: hydroelastic challenges Bardazzi A., Lugni C., Faltinsen O. M., Graziani G., Greco M. & Colicchio G.
- 09:50 Experimental and numerical study of the sloshing motion in a rectangular tank with a perforated screen Molin B. & Remy F.
- 10:15 Incompressible impulsive sloshing Tyvand P. A. & Miloh T.
- 10:40 Coffee break

SESSION 14: NUMERICAL METHODS. CHAIR: B. MOLIN

- 11:00 Efficient pseudo-spectral model for nonlinear water waves Christiansen T. B., Engsig-Karup A. P. & Bingham H. B.
- 11:25 Added resistance in short waves: a ray theory approach Sportelli M. & Huijsmans R. H. M.
- 11:50 Effective treatment of Fourier integrals associated with a hemi-sphere advancing in waves Ten I. & Chen X. B.
- 12:30 Lunch