

SEPTEMBER 11 - 16, 2016

31ST SNH



SYMPOSIUM ON NAVAL HYDRODYNAMICS

PORTOLA HOTEL, MONTEREY CA

PROGRAM



Time

Sunday, September 11, 2016

1600 - 1900

REGISTRATION
(Portola Hotel, De Anza Foyer)

1700 - 1900

WELCOMING RECEPTION
(Parviz Moin, Ki-Han Kim)
(Portola Hotel, De Anza Ballroom I)

Time

Monday, September 12, 2016

0730-0830

REGISTRATION

0830-0905

OPENING SESSION (Bonsai Ballroom)
Opening Lecture (Prof. Parviz Moin, Stanford U.): Center for Turbulence Research & Naval Hydrodynamics (Chair: Ki-Han Kim)

0905-0930

Keynote Address (Dr. Joseph T. (Tim) Arcano, Jr. NSWCCD): Naval Hydrodynamics - Looking Ahead to the Future
(Chair: Thomas Fu)

0930-1030

Invited Lecture (Prof. Alexander J. Smits, Princeton U.): Underwater Flight: Hydrodynamics of Manta Ray Swimming
(Chair: James Duncan)

1030-1100

Morning Coffee/Tea

Session 1 (Bonsai Ballroom)

Session 2 (Portola Room)

1100-1150

Cavitation (I)
(Chair: Ronald Joslin)Bubbly Flows (I)
(Chair: Kelli Hendrickson)

1 Probing into Physics of Ventilation Demand for Supercavitating Underwater Vehicles

Effect of Weber Number and Reynolds Number on the Air Entrainment and Micro-bubble Generation in Turbulent Breaking Waves

A. Karn, R. Huang, S. Shao, R.E.A. Arndt, J. Hong

M. Mortazavi, A. Mani

2 Experimental Investigation of Artificial Supercavitation

Modeling Bubble Entrainment for Ship Flows: Model Improvements, Validation and Grid Convergence

B.-K. Ahn, S.-W. Jeong, J.-H. Kim,
S. Shao, A. Karn, J. Hong, R.E.A. Arndt

J. Li, A. Castro, P. Carrica

1150-1300

Lunch

1300-1505

Cavitation (II)
(Chair: Eric Johnsen)Fundamentals of Fluid Dynamics in the Naval Context (I)
(Chair: Ali Mani)

1 Numerical Investigation of Condensation Shocks in Cavitating Flow

Methods for Controlling Vorticity Generation at the Triple Contact Line for Wake and Drag Mitigation

B. Budich, S. J. Schmidt, N. A. Adams

P. Zhang, A. DeVoria, K. Mohseni

2 Numerical Modelling Of Cavitating Flows: Data driven RANS and DNS Approaches

Experimental Study of Non-Uniform Wetting Properties and Contact Line Dynamics

O. Coutier-Delgousha, A. Znidarcic, R. Chebli, I. Khlifa

M. Grivel, D. Jeon, M. Gharib

3 Experimental Study of Sheet to Cloud Cavitation

A Universal Slip Boundary Condition for a Fluid-Solid Interface and its Implementation in a Continuum Solver

X. Wu, E. Maheux, G. L. Chahine

J. Thalakkottor, K. Mohseni

4 Investigation of Cavity Shedding Dynamics on a NACA0015 Hydrofoil Using Time Resolved X-ray Densitometry

Instabilities for Flow over a Bump in a Shallow Water Flume with Steady Downstream Wave Train: Experiments and Simulations

H. Ganesh, J. Wu, S. Ceccio

Z. Wang, L. Gui, H. Yoon, T. Dogan, F. Stern

5 Comparative Study of RANS and LES in Simulating Cavitating Flows

Structure of Three-Dimensional Separated Flow over a Non-Axisymmetric Bump

A. Gnanaskandan, K. Mahesh

D. Ching, C. Elkins, J. Eaton

1505-1530

Afternoon Coffee/Tea

1530-1735

Fluid-Structure Interaction (I)
(Chair: Fred Stern)Nonlinear Wave-Induced Motions and Loads (I)
(Chair: Woei-Min Lin)

1 Full-scale Fluid-Structure Interaction Simulation and Experimental Validation of High-Speed Planing-Hull Slamming with Composite Panels

Validation of a Discrete-Vortex Method (SS-FSRVM) for Modeling Nonlinear Coupled Vertical-Plane and Lateral Ship Motions in Head Waves

S. Volpi, M. Diez, H. Sadat-Hosseini, D.-H. Kim, F. Stern,
R. Thodal, J. Grenestedt

R.W. Yeung, Y. Jiang, L. Wang

2 Design, Assessment and Testing of a Fast Catamaran for FSI Investigation

Numerical and Experimental Analysis of Added Resistance in Waves

D. Dessi, E. Faiella, J. Geiser, E. Alley, J. Dukes

Y. Kim, K. Yang, J. Lee, D. Park, M. Seo

3 Motion of Particles in Free-Surface Flow

Performance Evaluation of a Multi-Ship System for Environmental and Ship Motion Forecasting

C.Y. Wang, T.R. Wu, C.R. Chu,
C. Zhou, J.S. ChiouL. Alford, D. Lyzenga, O. Nwogu, R. Beck, J. Johnson, A. Zundel,
M. Andrews, J. Coller, E. Katz, C. McKelvey, A. O'Brien, G. Smith,
S. Wijesundara

4 An Experimental Analysis of Hydroelastic Response of Flexible Lightweight Hydrofoils in Non-Cavitating and Cavitating Flow

Real-Time Ship Motion Forecasting for Moored Multi-Ship Systems

A. Lelong, J. Astolfi, P. Guiffand

B. Connell, W. Milewski, V. Vinciguillo

5

Course-Keeping Tests for Safe-Return-To-Port of a Damaged Passenger Ship

[No Paper]

J. Seo, M.P.E. Haro, C.S. Bravo, H.K. Choi, K.P. Rhee, S.H. Rhee

Invited Lecture (Prof. Morteza (Mory) Gharib, Caltech): From Velocimetry to Profilometry:
The Impact of Quantitative Visualization on the Naval Hydrodynamics Research
(Chair: Dick Yue)
(Bonsai Ballroom)

0830-0930

0930-1000

Morning Coffee/Tea

Session 1 (Bonsai Ballroom)**Session 2 (Portola Room)**

1000-1205

Turbulent Drag Reduction by Various Means (I)
(Chair: John Kim)

Maneuvering and Control (Surface & Subsurface Vehicles) (I)
(Chair: Sung-Eun Kim)

- 1 **Feature Resolved Simulations of Turbulence over Superhydrophobic Surfaces**
Y. Li, K. Alame, K. Mahesh
- 2 **Direct Numerical Simulation of Turbulent Flows over Superhydrophobic Surfaces with Randomly Distributed Textures**
J. Seo, A. Mani
- 3 **A Turbulent Boundary Layer over Superhydrophobic Surfaces**
H. Park, J. Kim
- 4 **Anisotropic Slip at the Air-Water Interface of an Idealized Superhydrophobic Surface**
H. Choi, T. Jung, J. Kim
- 5 **Turbulent Drag Reduction Over Super-Hydrophobic and Liquid Infused Surfaces: Dependence on the Dynamics of the Interface**
I. Arenas, G. V. Iungo, S. Leonardi

- 1 **Simulation of the Maneuvering Behavior of Ships in Adverse Weather Conditions**
A. Papanikolaou, N. Fourmarakis, D. Chroni, S. Liu, T. Plessas
- 2 **Free Maneuvering Simulation of ONR Tumblehome Using Overset Grid Method in naoe-FOAM-SJTU**
J. Wang, W. Zhao, D. Wan
- 3 **Prediction of Ship Manoeuvrability in Waves Based on RANS Simulations**
A. Cura-Hochbaum, S. Uharek
- 4 **Development of an Efficient Numerical Method for Coefficient-Based Simulations of Stopping Maneuvers**
J. Neitzel-Petersen, M. Pergande, M. Abdel-Maksoud
- 5 **Supermaneuverable Autonomous Swimmer**
R. Alam, M. Saadat, P. Grenfell, S. Messner, M. Jalali

1205-1300

Lunch

1300-1505

Undersea Vehicle Hydrodynamics (I)
(Chair: Stephen Jordan)

Viscous Ship Hydrodynamics (I)
(Chair: Decheng Wan)

- 1 **CFD Simulations and Experiments of a Maneuvering Generic Submarine and Prognosis for Simulation of Near the Surface Operation**
P. Carrica, M. Kerkvliet, F. Quadvlieg, M. Pontarelli, J. Martin
- 2 **Numerical Study of a Self-Propelled Conventional Submarine**
D. Norrison, W. Sidebottom, B. Anderson, K. Petterson, C. Fureby
- 3 **Eddy-Resolving Simulation of Turbulent Flows around Undersea Vehicles**
S.E. Kim, B. Rhee
- 4 **Large-Eddy Simulations of the DARPA SUBOFF Model in Towed and Propelled Configurations**
A. Posa, E. Balaras
- 5 **Manoeuvrability Assessment of Underwater Vehicles by Semi-Empirical, Numerical and Experimental Studies**
A. Ray, D. Sen, S.N. Singh, V. Seshadri

- 1 **Seakeeping Sensitivity Studies Using the Decomposition CFD Model Based on the Ghost Fluid Method**
V. Vukcevic, H. Jasak, I. Gatin, S. Malenica
- 2 **Local and Global Assessment of the Flow around the Japan Bulk Carrier with and without Energy Saving Devices at Model and Full Scale**
M. Visonneau, G. Deng, E. Guilmineau, P. Queutey, J. Wackers
- 3 **Development and Application of a Dual Mesh Solver for Viscous Flows**
K. Delaney, J. Gorski, S. Schroeder
- 4 **Grid Requirements for LES of Ship Hydrodynamics in Model and Full Scale**
M. Liefvendahl, C. Fureby, O. Boelens
- 5 **URANS Studies of Ship-to-Ship Interactions During Lightering Operations**
Q. Meng, D. Wan

1505-1530

Afternoon Coffee/Tea

1530-1735

Cavitation and Bubbly Flows (I)
(Chair: Paul Brandner)

Near- and Far-Field Ship Wave and Wake Hydrodynamics (I)
(Chair: Mattias Liefvendahl)

- 1 **Microbubble Generation from Condensation and Turbulent Breakup of Sheet Cavitation**
P. Russell, D. Giosio, J. Venning, B. Pearce, P. Brandner, S. Ceccio
- 2 **HDNC - Nuclei Size and Number Concentration Estimation with Detection Volume Correction**
E. Ebert, A. Kleinwächter, R. Kostbade, N. Damaschke
- 3 **Non-Spherical Bubble Collapse near Rigid and Compliant Surfaces**
S. Alahyari Beig, M. Rodriguez, E. Johnsen
- 4 **Numerical Study of Bubble Cloud Dynamics near a Rigid Wall**
C.-T. Hsiao, J. Ma, G. Chahine
- 5 **Micro PIV Measurements of Flow over 2D Structured Roughness**
J. Hartenberger, M. Perlin

- 1 **Analysis of the Incompressible Highly Variable Density Turbulent Flow in the Near Wake of a Surface Ship**
K. Hendrickson, S. Banerjee, D. K.-P. Yue
- 2 **Near-Field Wake of Surface Ships and Submarines Operating in a Stratified Fluid**
J. Martin, M. Esmaeilpour, P. Carrica
- 3 **Numerical Modeling of Far-Field Ship Wakes and Their Radar Images**
J. Rottman, L. Brandt, D. Conroy, D. Eliason, P. Jang, D. Wyatt
- 4 **Turbulent Flow along Straight and Longitudinally-Curved Thin Cylinders at Low Angles-of-Incidence**
S. Jordan
- 5 **Investigation of Improved Hull Boundary Conditions for High Reynolds Number Flow Around Complex Geometries on Cartesian Grids**
D. Conroy, T. O'Shea, D. Wyatt

Time

Wednesday, September 14, 2016

Weinblum Lecture (Prof. Dick Yue, MIT): Forty Years of Calculating Water Waves and Their Interactions with Bodies -

0830-0930

Reflections from Personal Journey

(Chair: Robert Beck)

(Bonsai Ballroom)

0930-1000

Morning Coffee/Tea

Session 1 (Bonsai Ballroom)

Session 2 (Portola Room)

1000-1205

Propulsor Hydrodynamics (I)

(Chair: Rickard Bensow)

Free Surface Hydrodynamics (I)

(Chair: Michel Visonneau)

1 Towards Large Eddy Simulation of Hull-attached Propeller in
Crashback
P. Kumar, K. Mahesh

Near-Surface Boundary Layer Turbulence Along a
Horizontally Moving, Surface-Piercing Vertical Wall
N. Washuta, N. Masnadi, J. Duncan

2 Experimental Survey About the Wake Dynamics of a
Naval Propeller Operating in Oblique Flow Conditions
M. Felli, M. Falchi

Air Entrainment in Free Surface Turbulence
X. Yu, K. Hendrickson, D. K.-P. Yue

3 A Rapid Design/Analysis Method for Open, Ducted or Waterjet
Propulsors with Single or Multiple Blade Rows
J. Kerwin

Characterization of a Turbulence Deformed Free-Surface
M. André, N. Batista, C. Fort, P. Bardet

4 A Viscous/Inviscid Interactive Method Applied to Ducted
Propellers with Ducts of Sharp or Blunt Trailing Edge
S. Kinnas, Y. Su, W. Du, S. Kim

Experimental Study of the Bubble Sweep-down
Phenomenon on Two Ship Models
B. Mallat, G. Germain, B. Gaurier, P. Druault, J.-Y. Billard

5 Towards Optimal Jet Formation Dynamics of Finite-Jet Marine
Propulsors
M. Krieg, K. Mohseni

Experimental Investigation of
Plunging Bow-Wave Breaking in Short Waves
B. Choi, R.H.M. Huijsmans

1205-1300

Lunch

1300-1630

Symposium Tour

1800-2200

Symposium Dinner at Monterey Bay Aquarium (1800-1900: Reception & Exhibits, 1900-2200: Seated Dinner)

Invited Lecture (Prof. Krishnan Mahesh, U. of Minnesota): Large Eddy Simulation Applied to Naval Research
(Chair: Ki-Han Kim)
(Bonsai Ballroom)

0830-0930

0930-1000

Morning Coffee/Tea

Session 1 (Bonsai Ballroom)**Session 2 (Portola Room)**

1000-1205

Propulsor Hydrodynamics (II)
(Chair: Moustafa Abdel-Maksoud)

Fluid-Structure Interaction (II)
(Chair: Julie Young)

1 **Investigations of Wave Effects on Propeller Performance**
C.Y. Hsin, C.T. Lin, C.P. Lee, S.Y. Wang,
C.C. Lin, J.H. Chen

Experimental Investigation of the Hydro-Elastic Response of a Surface-Piercing Hydrofoil in Multi-Phase Flow
C. Harwood, J. Ward, Y.L. Young, S. Ceccio

2 **Computation and Experiment of Propeller Performance and Flow Field around Self-Propelled Model Ship in Regular Head Waves**
P.C. Wu, E. Tokgoz, H. Okawa, K. Tamaki, Y. Toda

Spray Formation during the Impact of a Flat Plate on a Water Surface
A. Wang, S. Wang, E. Balaras
D. Conroy, T. O'Shea, J. Duncan

3 **CFD Study on Effective Wake of Conventional and Tip-modified Propellers**
K.W. Shin, P. Andersen

Modeling of Impact and Exit in Deep and Shallow Water
K. Maki, A. Korobkin, T. Khabakhpasheva, G. Filip

4 **The Performance and Force Coefficients of Flapping Foil**
J. Martio, A. Sánchez-Caja

A Numerical Investigation of a Corrugated Wedge Impacting Water
S. Marrone, A. Colagrossi, J. Park, E. Campana

5 **Inverse Method for Determination of the In Situ Hydrodynamic Load Distribution in Multi-Phase Flow**
J. Ward, C. Harwood, Y. Young

A Computational Model for the Evaluation of the Spray Generation of a Wave Adaptive Modular Vessel
J. Garcia-Espinosa, E. Oñate, B. Serván-Camas,
P. Nadukandi, P. Becker

1205-1300

Lunch

1300-1505

Nonlinear Wave-Induced Motions and Loads (II)
(Chair: William Belknap)

Fundamentals of Fluid Dynamics in the Naval Context (II)
(Chair: Krishnan Mahesh)

1 **Dynamics of the Surf-Riding Behavior of a Ship in a Multi-Chromatic Sea Environment**
K. Spyrou, I. Kontolefas, N. Themelis

Geometric Volume-of-Fluid Framework for the Simulation of Two-Phase Flows on Unstructured Grids
C. Ivey, P. Moin, S. Bose, D. Kim

2 **On the Probabilistic Properties of Surf-Riding and Broaching-to in Irregular Waves**
V. Belenky, K. Spyrou, K. Weems

A High-Order Sliding-Mesh Spectral Difference Solver for Simulating Unsteady Flows around Rotating Objects
C. Liang, B. Zhang

3 **Implementation of an Autoregressive Wave Model in a Numerical Simulation Code**
K. Weems, A. Reed, A. Degtyarev, I. Gankevich

Scalable Parallel Fluid Solver on Forest of Octrees Grids
A. Guittet, F. Gibou

4 **Determining Significant Modes of Wave Impact Events Using Empirical Orthogonal Function (EOF) Analysis**
A. Fullerton, S. Punzi

Validation Exercises of Mathematical Models for the Prediction of Transitional Flows

5 **Validation of A Time Domain Panel Code For Prediction Of Impulsive Loads On High Speed Ships**
F. van Walree, D. Sgaroto, T. Turner

L. Eça, R. Lopes, G. Vaz, J. Baltazar, D. Rijpkema
Experimental and Computational Comparisons of the R/V Athena in Calm Water
E. Lee, A. Fullerton, J. Geiser, C. Schleicher, C. Merrill, C. Weil,
M. Jiang, V. Lien, J. Morin, F. Stern, M. Mousaviraad

1505-1530

Afternoon Coffee/Tea

1530-1735

Cavitation and Bubbly Flows (II)
(Chair: Georges Chahine)

Turbulent Drag Reduction by Various Means (II)
(Chair: Steve Ceccio)

1 **Effect of Circumferential Grooves on the Cavitation and Performance of an Axial Waterjet Pump**
H. Chen, Y. Li, N. Doeller, S. Koley, B. Keyser, J. Katz

Experimental Investigation of Turbulent Skin-Friction Drag Reduction on Super-Hydrophobic Materials
J. Gose, K. Golovin, A. Tuteja, S. Ceccio, M. Perlin

2 **Implicit Large Eddy Simulation of the Cavitating Model Propeller VP1304 using a Compressible Homogeneous Mixture Model**
B. Budich, S. Schmidt, N. Adams

Flow Structure and Turbulence in the Inner Parts of Turbulent Boundary Layers over Super-Hydrophobic Surfaces
H. Ling, S. Srinivasan, K. Golovin, V. Pillutla, Abhijeet, G. Mckinley
A. Tuteja, W. Choi, J. Katz

3 **Efficient Numerical Investigation of Propeller Cavitation Phenomena causing Higher Order Hull Pressure Fluctuations**
S. Berger, R. Gosda, M. Scharf, R. Klose, L. Greitsch, M. Abdel-Maksoud

Understanding the Effects of Finite Viscosity in Super-hydrophobic and Liquid-Infused Surface Drag Reduction
M. Fu, Y. Liu, A. Mohammadi, T. Van Buren, J. Wexler, I. Jacobi
I. Arenas, S. Leonardi, H. Stone, A. Smits, M. Hultmark

4 **Multi-Scale Modelling of Cavitation-Induced Pressure Around the Delft Twist 11 Hydrofoil**
A. Lidtke, S. Turnock, V. Humphrey

Robust Drag Reducing Superhydrophobic Surfaces with Large Slip Lengths
V. Pillutla, Abhijeet, H. Ling, L. Rodriguez
D. Rodrigues, J. Katz, W. Choi

5 **Application of Simulation Based Design for ESD Installed Commercial Ships**
Y. Tahara, Y. Ichinose, A. Kaneko, Y. Kasahara

Experimental Study on the Formation an Air Layer with Gas Injection from Discrete Sources
S. Mäkiharju, S. Ceccio

Time

Friday, September 16, 2016

Invited Lecture (Prof. Eric Paterson, Virginia Tech): Revolutionary Computational Hydromechanics in the Era of Disruptive Change
(Chair: Pablo Carrica)
(Bonsai Ballroom)

0830-0930

0930-1000

Morning Coffee/Tea

Session 1 (Bonsai Ballroom)**Session 2 (Portola Room)**

1000-1140

Hydroacoustics (I)
(Chair: Donald Cox)

Hydrodynamics in Ship Design (Optimization and Energy Savings) (I)
(Chair: David Kring)

1 **Computational Noise Prediction from Trailing Edge Flows**
Z. Nitzkorski, K. Mahesh

Combined Geometry and Physics Based Method for Design-Space Dimensionality Reduction in Hydrodynamic Shape Optimization
M. Diez, A. Serani, F. Stern, E. Campana

2 **Hydroacoustic Analysis of a Marine Propeller through the Ffowcs Williams-Hawkings Equation**
S. Ianniello

A NURBS-Based Modification Technique for Bulbous Bow Generation and Hydrodynamic Optimization
C. Yang, F. Huang, L. Wang

3 **An Acoustic Analogy and Scale-Resolving Flow Simulation Methodology for the Prediction of Propeller Radiated Noise**
R. Bensow, M. Liefvendahl

Statistical Validation of a High-speed Catamaran in Irregular Waves
M. Diez, R. Broglio, D. Durante, A. Olivieri, E. Campana, F. Stern

4 **Localization and Source-Strength Estimation of Propeller Cavitation Noise Using Hull-Mounted Pressure Transducers**
E. Foeth, J. Bosschers

Static and Dynamic Roll Stability Analysis of a Semi-Displacement Fast Ship
D. Durante, G. Dubbioso, R. Broglio

1140-12:30

Lunch

1230-1345

Turbulent Drag Reduction by Various Means (III)
(Chair: Simo Mäkiharju)

Ocean Environment and Extreme Waves (I)
(Chair: Arthur Reed)

1 **Optimization of Drag Reduction Effect of Air Lubrication for a Tanker Model based on Air Layer Observation**
S. Park, H. Chun, I. Lee

The Influence of Freak Wave Sequences on Ship Responses and Refining Ship Navigation to Avoid Adverse Conditions
S. Bennett, A. Cattrell, R. Marsh

2 **Investigating the Impact of Surface Condition on the Frictional Resistance of Fouling Control Coating Technologies**
I. Yeginbayeva, M. Atlar, S. Turkmen, B. Kidd, A. Finnie

Interpretation of *in-situ* Ocean Environmental Measurements
D. Drazen, C. Merrill, S. Gregory, A. Fullerton, E. Terrill, T. de Paolo

3 [No Paper]

Wave-Breaking Modification and Spectral Statistics of Wave Spectra
C. Kent, S. Lee

FAREWELL RECEPTION (Hosted by Department of Naval Architecture & Marine Engineering, University of Michigan)
Portola Hotel, Cottonwood Room & Plaza (level three)

1345-1600

Organizing and Papers Committee

Office of Naval Research

Dr. Thomas Fu
Dr. Ki-Han Kim
Dr. Woei-Min Lin

National Science Foundation

Dr. Ronald D. Joslin

Stanford University

Prof. Parviz Moin

Naval Sea Systems Command

Dr. Arthur Reed

University of Michigan

Prof. Robert F. Beck

Osaka University

Prof. Masashi Kashiwagi

Australian Maritime College, University of Tasmania

Associate Prof. Paul Brandner

National Research Council - Marine Technology Research Institute (CNR-INSEAN), Italy

Dr. Emilio F. Campana

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