Computational Methods for Coupled Problems in Science and Engineering IV - *"COUPLED PROBLEMS 2011"*

Computational Methods for Coupled Problems in Science and Engineering IV

Proceedings of the IV International Conference on Computational Methods for Coupled Problems in Science and Engineering
held in Kos, Greece
20-22 June 2011

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A publication of:

International Center for Numerical Methods in Engineering (CIMNE)
Barcelona, Spain

Computational Methods for Coupled Problems in Science and Engineering IV
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First edition, June 2011

Printed by: Artes Gráficas Torres S.L., Huelva 9, 08940 Cornellà de Llobregat, Spain

Depósito legal: B-22987-2011

ISBN: 978-84-87867-59-0

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PREFACE

This volume contains the Technical Programme, the Abstracts and Full Papers on CD Rom of the papers accepted for presentation at the IV International Conference on Computational Methods for Coupled Problems in Science and Engineering, *COUPLED PROBLEMS 2011*, island of Kos, Greece on June 20 – 22, 2011.

COUPLED PROBLEMS 2011 is the fourth International Conference on this subject organized in the framework of Thematic Conferences of the European Community on Computational Methods in Applied Sciences (ECCOMAS) and is a Special Interest Conference of the International Association for Computational Mechanics (IACM).

The objective of *COUPLED PROBLEMS 2011* is to become a forum for state of the art presentations and discussions of mathematical models, numerical methods and computational techniques for solving coupled problems of multidisciplinary character in science and engineering. The conference goal is to make a step forward in the formulation and solution of real life problems with a multidisciplinary nature and industrial interest, accounting for all the complex couplings involved in the physical description of the problem.

Previous editions of the conference were held on the Island of Santorini, Greece (2005), Ibiza, Spain (2007) and Ischia, Italy (2009), with an increasing number of participants in each edition. Coupled Problems 2011 has attracted over 320 participants, coming from all over the world. All together some 300 lectures will be presented, including 11 plenary lectures, which reflect the current state of the research and advances in engineering practice in the field. The CD Rom Proceedings contains contributions sent directly by the authors and the editors cannot accept responsibility for any inaccuracies and opinions expressed in the text.

The conference is jointly organized by the National Technical University of Athens (Greece), the International Centre for Numerical Methods in Engineering (CIMNE), of the Technical University of Catalonia (UPC) and the University of Padova (Italy). The organizers acknowledge the encouragement and support of ECCOMAS and IACM, under whose auspices this conference is held. The organizers would like to thank the authors for submitting their contributions and for their respect of the deadlines. Special thanks go to the colleagues who contributed to the organization of the 15 Invited Sessions.

Welcome to Kos, one of the most historic islands of the Dodecanese complex, located in the Southeast part of the Aegean Sea. The island flourished during the Minoan and Mycenaean Periods and took part in the Trojan War with 30 ships. Kos is the birthplace of Hippocrates, a physician of the Golden Age of Pericles, founder of the Hippocrates School of Medicine and father of Western Medicine. The subject of the conference and the idyllic location offer a perfect blend for scientific endeavor and recreation. Thus, we invite you to enjoy the conferences and the island of Kos and to experience an unforgettable event.

Manolis Papadrakakis

Institute of Structural Analysis & Antiseismic Research
National Technical University Athens, Greece

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Barcelona, Spain

Bernhard A. Schrefler

Dipartimento di Costruzioni e Trasporti
Università di Padova
Padova, Italy

ACKNOWLEDGEMENTS

The conference organizers acknowledge the support towards the organization of the COUPLED PROBLEMS 2011 Conference to the following **organizations**:

- European Community on Computational Methods in Applied Sciences (ECCOMAS)
- International Association for Computational Mechanics (IACM)
- Greek Association for Computational Mechanics (GRACM)
- National Technical University of Athens, Greece
- International Center for Numerical Methods in Engineering (CIMNE), Barcelona, Spain
- Universitat Politècnica de Catalunya, Spain
- Dipartimento di Costruzioni e Trasporti, Università di Padova, Italy

Plenary Speakers and Invited Session Organizers

We would also like to thank the Plenary Speakers and the Invited Session Organizers for their help in the setting up of a high standard Scientific Programme.

Plenary Speakers: *Ramon Codina, Leszek Demkowicz, Thomas J. R. Hughes, Sergio R. Idelsohn, George Karniadakis, Lyesse Laloui, Wing Kam Liu, Roger Ohayon, K. C. Park, Tayfun Tezduyar and Wolfgang A. Wall*

IS Organizers: *Carlos Agelet de Saracibar, Yuri Bazilevs, Gernot Beer, Elias Cueto, Francisco Chinesta, Suvranu De, Eduardo Divo, Carlos Felippa, Massimo Guarnieri, Alain Kassab, Wing Kam Liu, Carmelo Majorana, Bernd Markert, Francesco Marotti de Sciarra, Roger Ohayon, Sebastià Olivella, K. C. Park, Jacques Pèriaux*, *Jean-Philippe Ponthot, Ernst Rank, Lakshmi Reddi, David Ryckelynck, Valentina Salomoni, Lorenzo Sanavia, Fotis Sotiropoulos, Dörte Carla Sternel, Kenji Takizawa, Tayfun Tezduyar, Zohar Yosibash, Lucy Zhang and Jessica Zhang.*

ORGANIZERS AND COMMITTEES

Conference Chairmen

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E. Oñate, International Center for Numerical Methods in Engineering (CIMNE), Universitat Politècnica de Catalunya, Spain

B. Schrefler, Università degli Studi di Padova, Italy

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- Ch. Wu, U.K.
- Z. Yosibash, Israel
- L. Zhang, USA
- Y. Zhang, USA

TECHNICAL PROGRAMME OVERVIEW

Sunday June 19th.

18:00 - 20:00 **Pre-registration**
19:00 **Welcome Reception**

Monday June 20th.

08:00 - 09:00 **Registration**

09:00 - 09:15 **Room R1: Opening Session**

09:15 - 10:35 **Room R1: Plenary Lectures I: Thomas J. R. Hughes and George Karniadakis**

10:35 - 11:05 **Coffee-break**

	Room R1	Room R2	Room R3	Room R4	Room R5	Room R6	Room R7
11:05 - 13:05 Technical Sessions	Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions I *Oganized by Kenji Takizawa, Yuri Bazilevs and Tayfun Tezduyar*	Numerical Methods for Coupled Problems I	IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering I: Magneto-hydrodynamics and High frequency Coupled Problems *Invited Session organized by Massimo Guarnieri and Carmelo Majorana*	Coupled Solution Strategies I	IS - Computational Mechanics of Multiphase Porous Materials I *Invited Session organized by Bernd Markert and Lorenzo Sanavia*	IS - Coupled Problems in Geotechnical Engineering I *Invited Session organized by Sebastià Olivella*	IS - Speeding-up Numerical Simulations: Model Reduction and Other Advanced Discretization Techniques I *Invited Session organized by Francisco Chinesta, David Ryckelynck and Elias Cueto*

13:05 - 14:35 **Lunch Time**

	Room R1	Room R2	Room R3	Room R4	Room R5	Room R6	Room R7
14:35 - 17:00 Technical Sessions	Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions II *Organized by Kenji Takizawa and Yuri Bazilevs*	Numerical Methods for Coupled Problems II	IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering II: Electro-thermal Modeling *Invited Session organized by Massimo Guarnieri and Carmelo Majorana*	IS - Coupled Problems for Biomimetics *Invited Session organized by Fotis Sotiropoulos*	IS - Computational Mechanics of Multiphase Porous Materials II *Invited Session organized by Bernd Markert and Lorenzo Sanavia*	IS - Coupled Problems in Geotechnical Engineering II *Invited Session organized by Sebastià Olivella*	IS - Speeding-up Numerical Simulations: Model Reduction and Other Advanced Discretization Techniques II *Invited Session organized by Francisco Chinesta and David Ryckelynck*

17:30 **Visit to the Asklipiion. Buses will depart at 17:30 from the Conference Hotel**

Tuesday June 21st.

	Room R1	Room R2	Room R3	Room R4	Room R5	Room R6	Room R7
08:00 - 10:00 Technical Sessions	Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions III *Invited Session organized by Kenji Takizawa and Yuri Bazilevs*	Numerical Methods for Coupled Problems III	IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering III: Electrostatic-micro Interactions and Electro-actuators *Invited Session organized by Massimo Guarnieri and Carmelo Majorana*	IS - Multidisciplinary Biomechanical Simulation *Invited Session organized by Ernst Rank and Zohar Yosibash*	Fluid-Structure Interaction I	IS - Coupling of Different Numerical Methods *Invited Session organized by Gernot Beer*	Aeroelasticity

10:00 - 10:30 Coffee-break

10:30 - 12:30 Room R1: Plenary Lectures II: Wing Kam Liu, Tayfun Tezduyar and Sergio R. Idelsohn

12:30 - 14:00 Lunch Time

	Room R1	Room R2	Room R3	Room R4	Room R5	Room R6	Room R7
14:00 - 16:00 Technical Sessions	Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions IV *Invited Session organized by Kenji Takizawa and Yuri Bazilevs*	Numerical Methods for Coupled Problems IV	IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering IV: Electrostatic-multiphase Problems *Invited Session organized by Massimo Guarnieri and Carmelo Majorana*	IS - Computational Multiphysics: Methods and Models I *Invited Session organized by Carlos Felippa, Roger Ohayon and K. C. Park*	IS - Coupled Thermomechanical Simulation of Material Forming and Impact Problems I *Invited Session organized by Carlos Agelet de Saracibar and Jean-Philippe Ponthot*	IS - Fast Single and Multi Discipline Optimization Tools for Aircraft/Aero Engines Design with Uncertainties *Invited Session organized by Jacques Pèriaux*	IS - Plasticity and Damage: Experimental and Numerical Simulations I *Invited Session organized by Valentina Salomoni and Francesco Marotti de Sciarra*

16:00 - 16:30 Coffee-break

	Room R1	Room R2	Room R3	Room R4	Room R5	Room R6	Room R7
16:30 - 18:30 Technical Sessions	Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions V *Invited Session organized by Kenji Takizawa and Yuri Bazilevs*	Thermo-Hydromechanical Problems I	IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering V: Electro-vibrational and Electro-thermo-mechanical Problems *Invited Session organized by Massimo Guarnieri and Carmelo Majorana*	Invited Sessions Computational Multiphysics: Methods and Models I *Organized by C.Felippa et all* Multiresolution Biomechanics: From Nano to Macro *Invited Session organized by W.K. Liu et all*	IS - Coupled Thermomechanical Simulation of Material Forming and Impact Problems II *Invited Session organized by Carlos Agelet de Saracibar and Jean-Philippe Ponthot*	IS - Coupled Problems in Bioengineering *Invited Session organized by Alain Kassab and Eduardo Divo*	IS - Plasticity and Damage: Experimental and Numerical Simulations II *Invited Session organized by Valentina Salomoni and Francesco Marotti de Sciarra*

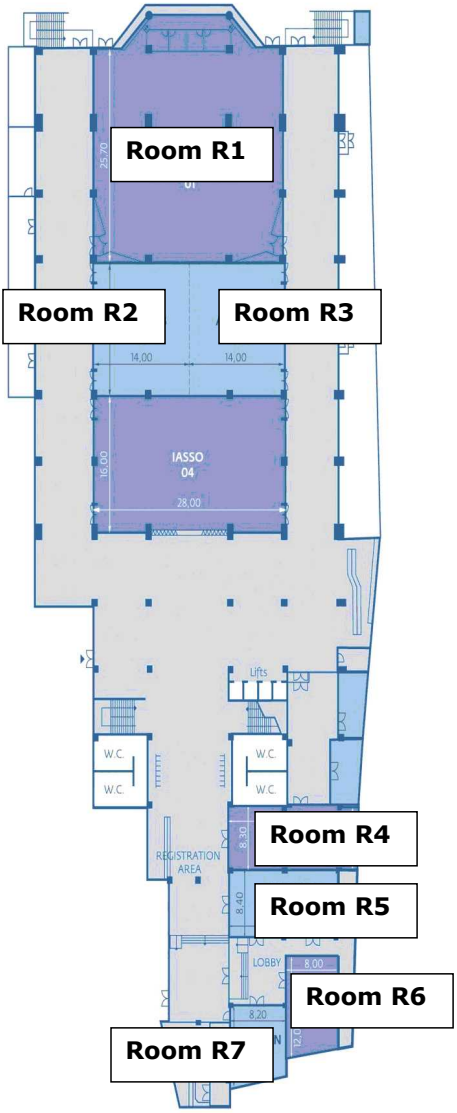
20:30 - 23:00 Conference Banquet

Wednesday June 22nd

	Room R1	Room R2	Room R3	Room R4	Room R5	Room R6	Room R7
08:00 - 10:00 Technical Sessions	Optimum Design and Control of Coupled Problems I	Numerical Methods for Coupled Problems V	Coupled Problems in Geomechanics I	Coupled Solution Strategies II	Fluid-Structure Interaction II	IS - Interaction with Time Resolved Turbulent Flow Fields *Invited Session organized by Dörte Carla Sternel*	Thermo-Mechanochemical Problems
10:00 - 10:30	**Coffee-Break**						
10:30 - 12:30	**Room R1: Plenary Lectures III: Roger Ohayon, Ramon Codina and Leszek Demkowicz**						
12:30 - 14:00	**Lunch Time**						
14:00 - 16:00	**Room R1: Plenary Lectures IV: Wolfgang A. Wall, K. C. Park and Lyesse Laloui**						
16:00 - 16:30	**Coffee-Break**						
	Room R1	**Room R2**	**Room R3**	**Room R4**	**Room R5**	**Room R6**	**Room R7**
16:30 - 18:30 Technical Sessions	Optimum Design and Control of Coupled Problems II	Thermo-Hydromechanical Problems II	Coupled Problems in Geomechanics II	Coupled Solution Strategies III	Fluid-Structure Interaction III	Multiscale Problems	Multiphysics Problems

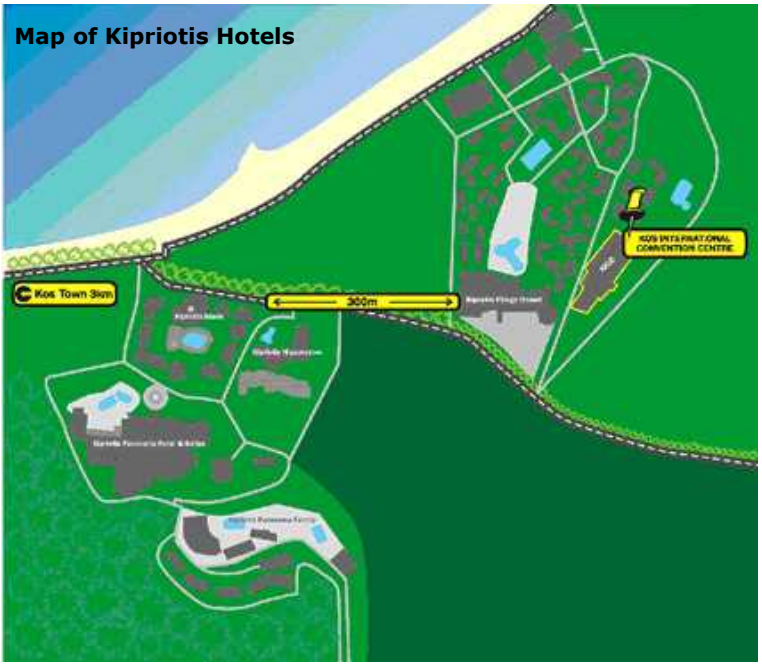
CONFERENCE INFORMATION

Rooms Location



GROUND LEVEL

Conference Venue




KICC
INDOOR POOL
MACEDONIA 1 RESTAURANT
MACEDONIA 2 RESTAURANT
OLYMPUS BAR
MAIN LOBBY
MAIN LOBBY
KIPRIOTIS
PARKING
Sol Kipriotis Village ****

Programme Format

The Technical Programme consists of 11 Plenary Lectures, 15 Invited Sessions and 10 Contributed Sessions, with almost 300 presentations in total.

Plenary Lecturers

Codina, Ramón
International Center for Numerical Methods in Engineering, Spain
Model Problems in Magneto-hydrodynamics: Individual Numerical Challenges and Coupling Possibilities

Demkowicz, Leszek
The University of Texas at Austin, USA
hp-Adaptive Finite Elements for Coupled Wave Propagation Problems

Hughes, Thomas J. R.
The University of Texas at Austin, USA
Phase-field Models and Isogeometric Analysis

Idelsohn, Sergio
ICREA Research Professor at CIMNE, Spain
Multi-fluid Flow Simulations using Large Time-steps

Karniadakis, George
Brown University, USA
Flow-Structure Interactions in Biomedical Problems

Laloui, Lyesse
École Polytechnique Fédérale de Lausanne, Switzerland
Multiphysical Coupled Processes in Underground Nuclear Waste Disposal Problems

Liu, Wing Kam
Northwestern University, USA
Validated Multiscale Immersed Electrokinetic Molecular Finite Element Methods for the Analysis and Design of Nano-Devices in Bio-Sensing and Drug/Gene Transport

Ohayon, Roger
Conservatoire National des Arts et Métiers (CNAM), France
Vibrations of Structures containing Compressible Fluids

Park, K. C.
University of Colorado, USA
A Computational and Experimental Modeling of the Physics of Nonlinear Sloshing and Internal Wave Breaking

Tezduyar, Tayfun
Rice University, USA
Space-Time FSI Techniques

Wall, Wolfgang
Technische Universität München, Germany
Coupled Problems on the Cellular and Sub-cellular Scale

Invited Sessions

- Computational Mechanics of Multiphase Porous Materials
  Organized by Bernd Markert and Lorenzo Sanavia

- Computational Multiphysics: Methods and Models
  Organized by Carlos Felippa, Roger Ohayon and K.C. Park

- Coupled Problems for Biomimetics
  Organized by Fotis Sotiropoulos

- Coupled Problems in Bioengineering
  Organized by Alain Kassab, Eduardo Divo and Lakshmi Reddi

- Coupled Problems in Geotechnical Engineering
  Organized by Sebastià Olivella

- Coupled Thermomechanical Simulation of Material Forming and Impact Problems
  Organized by Carlos Agelet de Saracibar and Jean-Philippe Ponthot

- Coupling of Different Numerical Methods
  Organized by Gernot Beer

- Fast Single and Multi Discipline Optimization Tools for Aircraft/Aero Engines Design with Uncertainties
  Organized by Jacques Pèriaux

- Interaction with Time Resolved Turbulent Flow Fields
  Dörte Carla Sternel

- Multidisciplinary Biomechanical Simulation
  Organized by Ernst Rank and Zohar Yosibash

- Multiresolution Biomechanics: From Nano to Macro
  Organized by Wing-Kam Liu, Yongjie (Jessica) Zhang, Suvranu De and Lucy Zhang

- Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering
  Organized by Massimo Guarnieri and Carmelo Majorana

- Plasticity and Damage: Experimental and Numerical Simulations
  Organized by Valentina Salomoni and Francesco Marotti de Sciarra

- Speeding-up Numerical Simulations: Model Reduction and Other Advanced Discretization Techniques
  Organized by Francisco Chinesta, David Ryckelynck and Elias Cueto

- Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions
  Organized by Kenji Takizawa, Yuri Bazilevs and Tayfun Tezduyar

Contributed Sessions

- Aeroelasticity
- Coupled Problems in Geomechanics
- Coupled Solution Strategies
- Fluid-Structure Interaction
- Multiphysics Problems
- Multiscale Problems
- Numerical Methods for Coupled Problems
- Optimum Design and Control of Coupled Problems
- Thermo-Hydromechanical Problems
- Thermo-Mechanochemical Problems

Social Programme

The Social Programme includes the Welcome Reception, a visit to the Asklipiion of Kos and the Conference Dinner. The Conference Dinner is not included in the reduced student's fee.

The Welcome Reception is scheduled for Sunday, June 19th at 19:00. It will take place at the Olympus Bar of the Kipriotis Village Hotel.

The visit to the Asklipiion of Kos will take place on Monday, June 20th. Buses will depart from the conference venue at 17:30.

The Conference Banquet will be held on Tuesday, June 21st at 20:30 at the Kipriotis Village Pool area.

Accompanying Persons Programme

The accompanying persons programme features a number of guided tours:

Monday, June 20th: City Tour. Price per person (including professional guiding, bus and three entries) €50.00.

Tuesday, June 21st: Island Tour. Price per person (including professional guiding, bus and entries Windmill and Traditional House) €40.

Wednesday, 22nd: Island Cruise

Option 1: Kalymnos/Plati/Pserimos Islands. Price per person (including guiding and barbecue on board) €45.00.

Option 2: Nissyros Island. Price per person (pickup on Kos, guiding, transfer on Nissyros and volcano entry included) €45.00.

Reservation can be made through the appointed travel agent Nostalgia Travel: nostalgia@nostalgia.gr, tel: +30 22420 27531.

Presentations: Time & Equipment

Each regular presentation is allocated 20 minutes, and each plenary lecture presentation is allocated 40 minutes including discussion.

All parallel session rooms will be equipped with a PC Projector. **No computers will be provided.** For testing your laptop/projector combination you are kindly requested to go to the session room before its beginning and contact the person in charge.

Internet Access

Wireless internet access will be available at the Kipriotis Conference Centre during the Conference.

Where to Eat

Participants may have lunch at the hotel restaurants or cafeterias that will operate during the Conference.

Transportation

Transfer from and to the Airport: The Hippocrates Airport of Kos is located 22 km, southwest of Kos Town and 25 kilometers from the Conference Venue. Bus transfers from the airport will be provided by the Conference Organizers on Sunday, June 19th. To organize your transfer from and to the airport, please contact Nostalgia Travel.

To get around Kos Island: public municipal transportations, taxis and, for rent, cars, motorbikes and bicycles. Taxi service is available either at the Reception Desk of the Conference Hotel or by phone to the Taxi Telephone Center: (+30) 22420 22777, 23333-4 & 21666
Municipal Transportation (D.E.A.S.): Tel. 22420 26276
Intercity Busses (KTEL): Tel. 22420 22292

TECHNICAL PROGRAMME

Monday June 20th.

09:00 - 09:15 Opening Session — **MoMP Room: R1**

09:15 - 10:35 Plenary Lectures I — **MoMP Room: R1**

Phase-field Models and Isogeometric Analysis
*M. Borden, V. Calo, L. Dede, H. Gomez, **T.J.R. Hughes**, J. Liu and X. Nogueira*

Flow-Structure Interactions in Biomedical Problems
G.E. Karniadakis

10:35 - 11:05 **Coffee-break**

11:05 - 13:05 **TECHNICAL SESSIONS**

Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions I — **MoM01 Room: R1**
Invited Session organized by
Kenji Takizawa, Yuri Bazilevs and Tayfun Tezduyar

Keynote Lecture: Towards a Scalable Parallel Sparse Linear System Solver
A. Sameh and M. Manguoglu

Multiscale Space-Time Computation Techniques
K. Takizawa and T.E. Tezduyar

Fluid-Structure Interaction of Wind Turbines: Geometry Modeling, Simulation Techniques and Applications
Y. Bazilevs

Comparison of Solution Strategies to Resolve the Strong Coupling
W.G. Dettmer and D. Peric

Comparative Patient-Specific FSI Modeling of Cerebral Aneurysms
K. Takizawa, T. Brummer, T.E. Tezduyar and P.R. Chen

Numerical Methods for Coupled Problems I — **MoM02 Room: R2**

Simulation of Residual Stresses in an Induction Hardened Roll
C. Groth and L. Hellenthal

Separate Reduction Bases Algorithm and Low-rank Approximations for Model Order Reduction of Coupled Systems
A. Lutowska, M.E. Hochstenbach and W. Schilders

Numerical Simulations of Particles in a Shear Flow
N. Verdon, P. Laure, A. Lefebvre-Lepot and L. Lobry

Development and Implementation of an Eulerian Approach for Efficient Simulation of Frictional Heating in Sliding Contacts
N. Strömberg

Geometrically Non-linear Hyperelasticity Coupled with Diffusion
A. McBride, P. Steinmann, S. Bargmann and A. Javili

Some Aspects of Dynamic Computational Modelling of Direct Current Plasma Arc Phenomena
Q.G. Reynolds and B.D. Reddy

IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering I: Magneto-hydrodynamics and High frequency Coupled Problems
MoM03
Room: R3
Invited Session organized by
Massimo Guarnieri and Carmelo Majorana

Advanced Numerical Approach to Reduce the Anodic Voltage Drop in the Hall-Héroult Process
E. Jeddi, D. Marceau, L.I. Kiss, L. St-Georges, D. Laroche and L. Hacini

Isogeometric analysis applied to the simulation of induction furnaces
A. Bermúdez, A. Buffa and R. Vázquez

Influence of Mechanical Strains on Electromagnetic Signals of a Microstrip Antenna. FEM/BIM model
N. Adnet, F. Pablo, I. Bruant and L. Proslier

Accurate Forward Model of Thermoacoustic Imaging System
A. Hajiaboli, V. Ntziachristos and D. Razansky

Parallel Block Preconditioners for the Bidomain Model of Electrocardiology
P. Colli Franzone, L.F. Pavarino and S. Scacchi

Coupled Solution Strategies I
MoM04
Room: R4

Improved LU-SGS Relaxation Procedures in the TAU Code According to the Coupling Way of Mean Flow and Turbulence Equations
G. Wang, R. Heinrich and N. Kroll

Numerical Approaches in Solving Volume and Surface Coupled Problems
S. Zinatbakhsh, B. Markert and W. Ehlers

A Multi-model Incremental Adaptive Strategy to Accelerate Partitioned Fluid-structure Algorithms using Space Mapping
T. Scholcz, A.H. van Zuijlen and H. Bijl

Finite Element Methods for Strongly-coupled Systems of Fluid-structure Interaction with Application to Granular Flow in Silos
S. Reinstädler, A. Zilian and D. Dinkler

Coarse Level Newton-Krylov Acceleration of Sub-iterations in Partitioned Fluid-structure Interaction
A.H. van Zuijlen and H. Bijl

Spatial Coupling of Lattice Boltzmann and PDE Models
Y. Vanderhoydonc and W. Vanroose

A Coupling Concept for Heterogeneous Models
J. Steiner and R. Krause

IS - Computational Mechanics of Multiphase Porous Materials I **MoM05 Room: R5**
Invited Session organized by Bernd Markert and Lorenzo Sanavia

Keynote Lecture: Theory and Numerics of the Strongly Coupled Problem of Wave Propagation in Unbounded Porous Media
B. Markert, Y. Heider and W. Ehlers

Attenuation and Phase Velocities in Partially Saturated Porous Rocks
H. Steeb, P. Kurzeja, B. Quintal, M. Frehner and S.M. Schmalholz

A Moving Frame Formulation for Modeling Dynamic Response of Saturated Porous Media
B. Lenhof, F. Larsson, S. Diebels and K. Runesson

Back Analysis of a Coupled Thermo-Hydro-Mechanical Model Based on Instrumented Constant Volume Column Test
T. Schanz, M. Datcheva and L. Nguyen-Tuan

Multi-physics Modelling of Thermo-elasto-plastic Saturated/Unsaturated Porous Materials
L. Sanavia, L. Luison and L. Laloui

IS - Coupled Problems in Geotechnical Engineering I **MoM06 Room: R6**
Invited Session organized by Sebastià Olivella

Keynote Lecture: Towards the Generic Conceptual and Numerical Framework for the Simulation of CO_2 Sequestration in Different Types of Georeservoirs
U-J. Görke, J. Taron, A.K. Singh, W. Wang and O. Kolditz

Numerical Study of the Chemo-poro-mechanical Behaviour of the Cement Sheath during CO_2 Injection
V. Vallin, J.M. Pereira, A. Fabbri, H. Wong and N. Jacquemet

Numerical Analysis of CO_2 Injection into Deformable Saline Reservoirs: Benchmarking and Initial Observations
J. Taron, C-H. Park, U.-J Görke, W. Wang and O. Kolditz

Non-isothermal Compositional Gas Flow during Carbon Dioxide Storage and Enhanced Gas Recovery
A.K. Singh, N. Böttcher, W. Wang, U.J. Görke and O. Kolditz

Coupled Hydromechanical Processes during CO_2 Sequestration in Deep Saline Aquifers
V. Vilarrasa, S. Olivella and J. Carrera

Algebraic Multigrid Preconditioning for Mixed Elliptic-Hyperbolic Problems
M. Emans

IS - Speeding-up Numerical Simulations: Model Reduction and Other Advanced Discretization Techniques I **MoM07 Room: R7**
Invited Session organized by
Francisco Chinesta, David Ryckelynck and Elias Cueto

Keynote Lecture: A Wavelet-based Multiscale Approach for the Resolution of Time-dependent PDEs in the Proper Generalized Decomposition Framework
D. Néron and P. Ladevèze

SUPG-based Stabilization of Proper Generalized Decompositions for the Advection-Diffusion Equation
D. González, E. Cueto, F. Chinesta, P. Díez and A. Huerta

Proper Generalized Decomposition to Solve Multiphysical Problems: Effect of the Environment on the Durability of Polymers and Composites
M. Beringhier and J.C. Grandidier

Application of the Proper Generalized Decomposition Method to a Viscoelastic Mechanical problem with a Large Number of Internal Variables and a Large Spectrum of Relaxation Times
M. Hammoud, M. Béringhier and J-C. Grandidier

Numerical simulation & modelling of ageing processes in composite materials: application of the PGD model reduction method to the development of CNT based ageing sensors
H. Lamari, A. Leygue, F. Chinesta and K. Lafdi

On the Dynamic Data-Driven Simulation of Coupled Models
Ch. Ghnatios, F. Masson, E. Cueto, A. Leygue and F. Chinesta

13:05 - 14:35 **Lunch Time**

14:35 - 17:00 **TECHNICAL SESSIONS**

Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions II **MoA01 Room: R1**
Invited Session organized by
Kenji Takizawa, Yuri Bazilevs and Tayfun Tezduyar

Keynote Lecture: Finite calculus. A Paradigm for Deriving Stabilized Finite Element Methods in Computational Mechanics
E. Oñate, S.R. Idelsohn and F. Zárate

Vibrations of Structures Containing Liquids. Reduced Order Models
R. Ohayon and J-S. Schotté

Residual-Based Variational Multiscale Simulation of Complex Fluid- Structure Interaction Problems in Offshore Engineering
E. Lins, C. Silva, N. Guevara, J. Gonzalez, L. Gazoni, R. Elias, J. Alves, F. Rochinha and A. Coutinho

Analysis of a Stabilized Finite Element Approximation of the Transient Advection-Diffusion-Reaction Equations in Turbulent Flow in Wells Turbine
A. Corsini, A. Marchegiani, F. Rispoli, E. Tuccimei and T.E. Tezduyar

A Spectral Element Method for Fluid-structure Interactions
S. Dong

Numerical Methods for Coupled Problems II **MoA02 Room: R2**

Solution of Integral Equation in Scattering Analysis of Bodies of Revolution by MoM with First Type Elliptic Integrals
C. Vidal and U. Resende

Finite Element Modelling of Energy Extraction from Flow Induced Structural Vibrations by means of Piezoelectric Materials
S. Laue and A. Zilian

The Finite Cell Method for Spatially Varying Dispersions in Coupled Multi-species Reactive Transport Problems
Q. Cai, S. Kollmannsberger, R-P. Mundani and E. Rank

The Influence of Stem Surface in Micromobility and Cement Bone Stresses
A. Ramos, C. Relvas, A. Completo and J. A Simões

The Fixed-Mesh ALE Method Applied to Multiphysics Problems
J. Baiges and R. Codina

Crack Propagation in Civil Engineering Bridge Cables: Coupled Phenomena of Fatigue and Corrosion
V. Périer, L. Dieng and L. Gaillet

Numerical Simulation of Quenching Process using an Adaptative Levelset Method
N. Kosseifi, E. Hachem, L. Silva, E. Massoni and T. Coupez

IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering II: Electro-thermal Modeling **MoA03 Room: R3**
Invited Session organized by
Massimo Guarnieri and Carmelo Majorana

Keynote Lecture: Electromagnetically Driven Flow in Industrial Metal Processing Systems
D. Lavers, L. Beitelman and C. Curran

Investigation of the Purely Hyperbolic Maxwell System for Divergence Cleaning in Discontinuous Galerkin based Particle-In-Cell Methods
A. Stock, J. Neudorfer, R. Schneider, C. Altmann and C-D. Munz

Numerical Simulation Framework for Weakly Coupled Multiphysical Problems in Electrical Engineering
P. Alotto, M. Jaindl, R. Kutschera, C. Magele and A. Köstinger

Electromagnetic Plasma Modelling in Circuit Breaker within the Finite Volume Method
L. Rondot, J-P. Gonnet and V. Mazauric

Domain Decomposition Simulation of Thermal Convection Problems and Related Topics
H. Kanayama and Q. Yao

Numerical Approximation of the Full MHD System Using Lagrangian Finite Elements
S. Badia, R. Codina and R. Planas

Numerical Solution of Induction Heating Problems with Nonlinear Temperature Dependent Magnetic Characteristic
F. Freschi and M. Repetto

IS - Coupled Problems for Biomimetics **MoA04**
Invited Session organized by Fotis Sotiropoulos **Room: R4**

Keynote Lecture: An Integrative Muscle Mechanics – Fluid Dynamics Model of Lamprey Swimming
L. Fauci

The Functional Design of Fish Tail
I. Borazjani

Bio-inspired Flow Energy Harvesting Through Flapping Foils
Q. Zhu

A Finite Element Method for Non-linear Hyperelasticity Applied for the Simulation of Octopus Arm Motions
V. Vavourakis, A. Kazakidi, D.P. Tsakiris and J.A. Ekaterinaris

Coupling the Flexible Wing Aerodynamics and Structural Dynamics in Insect Flapping Flight
H. Liu and T. Nakata

The Fluid Dynamics of Particle Capture in Jellyfish with Inspiration for Filtration Devices

L.A. Miller, C. Hamlet and A. Santhanakrishnan

On The Effect of Oral Cavity Shape in the Efficiency of Jet-Propelled Swimmers
T.B. Le and F. Sotiropoulos

IS - Computational Mechanics of Multiphase Porous Materials II **MoA05**
Invited Session organized by Bernd Markert and Lorenzo Sanavia **Room: R5**

On the Modeling and Simulation of Biological Methane Oxidation in Porous Media - A Multiphase Continuum Approach
T. Ricken, R. Widmann and T.C. Schmidt

A Bio-Hydro-Mechanical Model for Propagation of Biogrout in Soils
S. Fauriel and L. Laloui

A Three-phase Model for Damage Induced by ASR in Concrete Structures
C. Comi and R. Pignatelli

An Efficient Computational Model for CO2 Flow in Porous Media
M. Talebian, R. Al-Khoury and L.J. Sluys

Modelling Water Infiltration into Macroporous Hill Slopes using Special Boundary Conditions
L. Stadler, C. Adamczak and R. Hinkelmann

IS - Coupled Problems in Geotechnical Engineering II **MoA06**
Invited Session organized by Sebastià Olivella **Room: R6**

Hydromechanical Analysis in Geotechnical Engineering using the Material Point Method
F. Zabala and E. Alonso

A Combined PFEM-Level Set Model to Simulate the Behavior of a Rockfill Dam in Overtopping Scenarios
A. Larese, R. Rossi and E. Oñate

A Coupled Model of Mechanical Behaviour and Water Retention for Unsaturated Soils with Double Porosity
A. Koliji, L. Laloui and L. Vulliet

Hydromechanically Coupled Analysis of Transient Phenomena in a Rainfall-induced Landslide
J. Eichenberger, M. Nuth and L. Laloui

Simulation of Acoustic Logging Measurements Acquired with Borehole-Eccentered Tools Using a hp-Fourier Finite Element Method
D. Pardo, P. Matuszyk, C. Torres-Verdín, I. Muga, A. Mora and V. Calo

IS - Speeding-up Numerical Simulations: Model Reduction and Other Advanced Discretization Techniques II **MoA07**
Invited Session organized by **Room: R7**
Francisco Chinesta, David Ryckelynck and Elias Cueto

Adaptative Mesh Refinement Technique for the Proper Generalized Decomposition method. Application to a 2D Coupled Heat-chemical Diffusion Problem
T.L. Nguyen, M. Beringhier and J-C. Grandidier

PGD-BEM Applied to the Nonlinear Heat Equation
G. Bonithon, P. Joyot, F. Chinesta and P. Villon

Real Time Simulation of Surgery by Combined Reduced Order Models and X-FEM Techniques
S. Niroomandi, I. Alfaro, E. Cueto and F. Chinesta

Reduced Order Model and Simultaneous Computation for Thermomechanical Multidimensional Model
F-Z. Daïm, D. Ryckelynck and D. Missoum-Benziane

Reduced Basis Method for Parametrized Variational Inequalities
J. Salomon, B. Haasdonk, B. Wohlmuth

Thermo-mechanical Modelling of Dynamic Tensile Extrusion Test
L. Peroni, M. Scapin and M. Avalle

17:30 - 21:00

Visit to the Asklipiion. Buses will depart at 17:30 from the Conference Hotel.

Tuesday, June 21st

08:00 - 10:00 **TECHNICAL SESSIONS**

Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions III **TuM01 Room: R1**

Invited Session organized by
Kenji Takizawa, Yuri Bazilevs and Tayfun Tezduyar

Keynote Lecture: Efficient Coupling Tools for Flexible Partitioned Simulation of Fluid-Structure Interactions
H-J. Bungartz, B. Gatzhammer, M. Mehl and T. Neckel

Seismic Response Analysis of Rod Bundle in Fluid using ADVENTURE System with Partitioned Coupling Technique
S. Yoshimura, S. Kataoka, S. Minami and H. Kawai

A Nested Scheme with Nodal Ordering for Arterial Fluid-structure Interactions
M. Manguoglu, K. Takizawa, A. Sameh and T.E. Tezduyar

Geometry Representation and Mesh Regularization Methods for the Shape Optimization of Fluid-Structure Interaction Problems
E. Stavropoulou, M. Hojjat, R. Wüchner and K-U. Bletzinger

Computational Wind-Structure Interaction
R. Wüchner, M. Hojjat, E. Stavropoulou, A. Michalski and K-U. Bletzinger

Numerical Methods for Coupled Problems III **TuM02 Room: R2**

Adaptive Calibration of Nonlocal Coupled Damage-Plasticity Model for Aluminium Alloy AA6082 T0
J.P. Belnoue and A.M. Korsunsky

Advanced Stochastic FEM-Based Artificial Neural Network for Crack Damage Detection
C. Sbarufatti, A. Manes and M. Giglio

A Three-phase Finite Element Model of Water-infiltrated Porous Materials Subjected to Freezing
M. Zhou and G. Meschke

Discrete Modeling of Crowd Movements and Crowd-structure Coupling
P. Pécol, S. Dal Pont, S. Erlicher and P. Argoul

Reduced-order Modeling of Parametrized Finite Element Solutions by the POD-ISAT Technique. Application to Aircraft Air Control Systems
D. Bui, M. Hamdaoui and F. De Vuyst

Analysis of Bifurcations occurring in a Nonlinear Flight Dynamics Model of Helicopter
S. Kolb, C. Poutous and P-M. Basset

IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering III: Electrostatic-micro Interactions and Electro-actuators
TuM03
Room: R3
Invited Session organized by
Massimo Guarnieri and Carmelo Majorana

A Finite Shell Element Formulation Incorporating a Constitutive Model for Dielectric Elastomers
S. Klinkel and S. Zwecker

Electronic Electro-active Polymers under Electrig Loading: Experiments, Modeling and Simulation
H. De Santis, P. Steinmann and D.K. Vu

Numerical Modelling of Coupled Electro-Mechanical Problems for the State Space Controller Design
T. Nestorović and M. Trajkov

Transport of Submicron Particles in Single-Stage Electrostatic Precipitators
N. Farnoosh, P. Castle and K. Adamiak

Precise Electromagnetic-Thermoelastic Actuator for Laser Technologies
I. Doležel, V. Kotlan and B. Ulrych

IS - Multidisciplinary Biomechanical Simulation
TuM04
Room: R4
Invited Session organized by
Ernst Rank and Zohar Yosibash

Keynote Lecture: Poroelastic Modelling of Trabecular Bone Adaptation Stimulated by Flow-induced Shear Stress on Osteocytic Process Membrane in Lacuno-canalicular System
T. Adachi, Y. Kameo and M. Hojo

Augmented Medical Imaging: Coupling Computed Tomography, Computational Structural Mechanics and Visualization
E. Rank, Z. Yang, M. Ruess, R. Westermann, C. Dick, R. Burgkart, E. Grande Garcia, A. Düster and Z. Yosibash

Mathematical Modeling of Coupled Drug and Drug-encapsulated Nanoparticle Transport in Patient-specific Coronary Artery Walls
S. Hossain, S. Hossainy, Y. Bazilevs, V. Calo and T. Hughes

Simulating the Coupled Active and Passive Mechanical Response of the Artery Wall by High Order Finite Elements
Z. Yosibash and E. Priel

Numerical Homogenization of Heterogeneous Materials
A. Düster, H-G. Sehlhorst and E. Rank

A Spectral Element Method for Nearly Incompressible Nonlinear Elasticity Problems
Y. Yu, H. Baek, M. Bittencourt and G.E. Karniadakis

Fluid-Structure Interaction I	**TuM05** **Room: R5**

Stability of Fluid and/or Gas Filled Thin-walled Multi-chamber Structures using Quasi-static Fluid-structure Interaction
A. Maurer and K. Schweizerhof

Damped Vibrations of Structures Containing Liquids
J-S. Schotté, T. Miras and R. Ohayon

Onset of Two-Dimensional Turbulence with High Reynolds Numbers in the Navier-Stokes Equations
B. Bermudez and A. Nicolas

Multidisciplinary Investigation by Fluid-Structure-Motion Integrated Simulation
S. Takahashi and N. Arai

Computational Fluid-structure Interaction Simulations for Wind Induced Vibrations in Silo Groups
J. Hillewaere, J. Degroote, G. Lombaert, J. Vierendeels and G. Degrande

Passive Suppression of Vortex Induced Vibration of Rigid Circular Cylinder in Laminar Flow
R.K. Tumkur Revannasiddaiah, A. Masud, L.A. Bergman, A.J. Pearlstein, G.B. Dov, R. Calderer and A.F. Vakakis

IS - Coupling of Different Numerical Methods *Invited Session organized by Gernot Beer*	**TuM06** **Room: R6**

Keynote Lecture: Coupled Fluid–particle Dynamics Algorithm using the PFEM and DEM
J. Rojek and E. Oñate

Strategies for Coupling Different Numerical Methods
G. Beer

Stress Analysis of Shotcrete Tunnel Shells, based on Displacement Data Measured with Monitoring Systems of NATM Tunnels
B. Pichler, S. Ullah, S. Scheiner and C. Hellmich

Iterative Coupling of Boundary and Discrete Element Methods using an Overlapping FEM Zone
L. Malinowski, G.F. Karlis, G. Beer and J. Rojek

Fatigue Analysis of the Structural Components of a Mechanical Press Cutting High-Strength Steels
B-A. Behrens, R. Krimm and C. Wager

Finite Volume and Finite Element Schemes for the Euler Equations in Cylindrical and Spherical Coordinates
D. De Santis, G. Geraci and A. Guardone

Aeroelasticity **TuM07 Room: R7**

Frequency Parametrization to Numerically Predict Flutter in Turbomachinery
M. Philit, L. Blanc, S. Aubert, W. Lolo, P. Ferrand and F. Thouverez

A Refined 1D FE Model for Application to Aeroelasticity of Composite Wings
A. Varello, M. Petrolo and E. Carrera

Multi-modal Aeroelastic Damping Predictions of a Jet Engine Fan using Dynamically Coupled Nonlinear RANS Equations
A. Placzek, A. Dugeai, F. Sicot and Y. Mauffrey

Neural Networks as Surrogate Models for Nonlinear, Transient Aerodynamics within an Aeroelastic Coupling-scheme in the Time Domain
K. Lindhorst, M.C. Haupt and P. Horst

Wind-structure Interaction on Construction Stages for Unbalanced Segmental Bridges
A. Hernández and J. G Valdés

Experimental Benchmark and Numerical Validation of a Free Heaving Airfoil
J.J. Sterenborg, A.H. van Zuijlen and H. Bijl

10:00 - 10:30 **Coffee-break**

10:30 - 12:30 **TuMP**
Plenary Lectures II **Room: R1**

Validated Multiscale Immersed Electrokinetic Molecular Finite Element Methods for the Analysis and Design of Nano-Devices in Bio-Sensing and Drug/Gene Transport
W.K. Liu

Space-Time FSI Modeling and Dynamical Analysis of Ringsail Parachute Clusters
K. Takizawa, T. Spielman and ***T.E. Tezduyar***

Multi-fluid Flow Simulations using Large Time-steps
S.R. Idelsohn*, N. Nigro and E. Oñate*

12:30 - 14:00 **Lunch Time**

14:00 - 16:00 TECHNICAL SESSIONS

Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions IV **TuA01 Room: R1**
Invited Session organized by
Kenji Takizawa, Yuri Bazilevs and Tayfun Tezduyar

Keynote Lecture: Multiphase Flow Simulation via Coupled DEM and CFD Codes
P. Wriggers and B. Avci

Keynote Lecture: Improving the Numerical Efficiency of Partitioned Solution Approaches for Fluid-Structure Interaction
M. Schaefer, S. Sachs and D.C. Sternel

Partitioned Fluid-Structure Interaction – Coupling Strategies
M. Mehl, H-J. Bungartz, B. Gatzhammer and T. Neckel

A Large-scale Parallel Analysis of Acoustic Fluid-Structure Interaction Based on Balancing Domain Decomposition Method
S. Minami, H. Kawai and S. Yoshimura

Numerical Methods for Coupled Problems IV **TuA02 Room: R2**

Computational Study of the Interaction between a Newtonian Fluid and a Cellular Biological Medium in a Straight Vessel
T.S. Alexiou, G. Kapellos and S. Pavlou

On Shear Enhanced Variants of Gurson's Damage Model and Their Use in Sheet Metal Forming Simulations
C. Soyarslan, M. Gharbi and A.E. Tekkaya

Curvature Tensors in Large Deformation Micropolar Plasticity
D. Johannsen and Ch. Tsakmakis

Efficient Implementation and Usage of Nitsche‘s Method on Overlapping Meshes for Coupled Problems in 3D
A. Massing, M. Larson and A. Logg

Dynamically Coupled Models of the Sliding and Spinning Friction based on Padé Expansions
A. Kireenkov

The Convected Level Set Method with Anisotropic Mesh Adaptation for Interface Calculation in Multiphase Flow and Fluid Structure Interaction
T. Coupez

IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering IV: Electrostatic-multiphase Problems
TuA03
Room: R3
Invited Session organized by
Massimo Guarnieri and Carmelo Majorana

Numerical Simulation of Droplet Shapes in External Electric Field, Gravity and Surface Tension
T.I. Sung, H.S. Choi, Y.S. Kim and I.H. Park

Numerical Simulations of Tungsten Targets Hit by LHC Proton Beam
M. Scapin, L. Peroni, A. Bertarelli and A. Dallocchio

Numerical Analysis of Dielectric Micro-particle Motion in Fluid and Electric Field
M.K. Baek, Y.S. Kim and I.H. Park

A Procedure for Coupled CFD-Neutronic Calculation using ANSYS CFX 12.1 and PARCS
C. Peña Monferrer, S. Chiva Vicent, R. Miró Herrero, F. Pellacani and R. Macián Juan

Piezoelectric Fields Produced by a Point Electric Charge in a Transversely Isotropic Trimaterial
F.C. Buroni, E. Pan and A. Sáez

CFD-Neutronic Coupled Transient Calculation of a Simplified PWR Fuel Assembly using ANSYS CFX 12.1 and PARCS
C. Peña Monferrer, S. Chiva Vicent, R. Miró, T. Barrachina, F. Pellacani and R. Macián Juan

IS - Computational Multiphysics: Methods and Models I
TuA04
Room: R4
Invited Session organized by
Carlos Felippa, Roger Ohayon and K. C. Park

An Embedded Mesh Approach for Hybrid ALE-fixed-grid Fluid-structure Interaction
S. Shahmiri and W.A. Wall

FSI Analysis and Shape-Optimization of Wind-Loaded Light-Weight Structures
M. Hojjat, E. Stavropoulou, R. Wüchner and K-U. Bletzinger

Finite Element/Boundary Element Coupling for Airbag Deployment
T.M. van Opstal and E.H. van Brummelen

Keynote Lecture: Coupling Finite Elements and Finite Volumes for Fluid-Structure Interaction: Algorithms, Stability Analysis, Implementation and Examples Dealing with Free-Surface Flows
C. Kassiotis, A. Ibrahimbegovic and H.G. Matthies

Iteration Versus Timestep Cutting in Partitioned Integration
C. A Felippa and K.C. Park

An Iteration-free, Partitioned Method for Solving Coupled Problems
J. Rang

IS - Coupled Thermomechanical Simulation of Material Forming and Impact Problems I
TuA05
Room: R5
Invited Session organized by
Carlos Agelet de Saracibar and Jean-Philippe Ponthot

Energy-based Variational Approach for Thermo-mechanical Coupling under Dynamic Conditions
L. Stainier

Validation of Several One-phase Thermomechanical Models for Thixoforming of Steel by Comparison between Numerical and Experimental Results on Semi-solid Extrusion Tests
R. Koeune and J-P. Ponthot

Comparison of Data Transfer Methods between Two Different Meshes
P. Bussetta and J-P. Ponthot

Coupled Thermo-mechanical Analysis for Frictional Stir Welding Processes
M. Chiumenti, M. Cervera, C. Agelet de Saracibar and N. Dialami

IS - Fast Single and Multi Discipline Optimization Tools for Aircraft/Aero Engines Design with Uncertainties
TuA06
Room: R6
Invited Session organized by Jacques Pèriaux

A Hardware-Based Multi-Disciplinary Design Optimization Method for Aeronautical Applications
J. Kok, F. Gonzalez, N. Kelson and T. Gurnett

Coupling Hybrid-Game Strategies with Particle Swarm Optimisation for Multi-Objective High Lift System Design Optimisation
D.S. Lee, J. Pèriaux, L.F. González and E. Oñate

Numerical Analyses of the Performance of a Mechanical Filter for Solid Suspended Substances
M. Carriglio, V. Pediroda and C. Poloni

Robust shape optimization in aeronautics using stochastic analysis with uncertainties
J. Pons-Prats, G. Bugeda, F. Zárate and E. Oñate

IS - Plasticity and Damage: Experimental and Numerical Simulations I **TuA07 Room: R7**
Invited Session organized by
Valentina Salomoni and Francesco Marotti de Sciarra

Keynote Lecture: Coupling of Damage Mechanisms in the Prediction of Creep Failure of a Welded Branched Header Pipe
D.R. Hayhurst

A Geometric Theory of Plasticity
V. Panoskaltsis, D. Soldatos and S.P. Triantafyllou

Thermomechanical Couplings during the Strain Localization Process at the Microstructure Scale of a Metallic Polycrystal
E. Charkaluk, R. Seghir, L. Bodelot, J.F. Witz and P. Dufrénoy

Non-linear Modelling, Design and Production of Steel Blast-resistant Doors and Windows
V.A. Salomoni, G. Mazzucco, G. Xotta, R.L. Fincato, M. Schiavon and C.E. Majorana

Micro Fibre Cracking and Macro Non Linear Behaviour of Composites using Generalized Self Consistent Homogenisation
D.P. Boso, M. Lefik and B.A. Schrefler

Contact–Damage Coupled Modelling of FRP Reinforcements under Variable Loading Times
G. Mazzucco, V.A. Salomoni and C.E. Majorana

16:00 - 16:30 **Coffee-break**

16:30 - 18:30 **TECHNICAL SESSIONS**

Symposium Celebrating the 70th Birthday of Ahmed Sameh: Fluid-Structure Interactions V **TuE01 Room: R1**
Invited Session organized by
Kenji Takizawa, Yuri Bazilevs and Tayfun Tezduyar

Keynote Lecture: A Finite Element Method for Ablation Problems
D.K. Gartling, R.E. Hogan, B.F. Blackwell and D.W. Kuntz

Multi-scale Analysis on Cavitation Damage and its Mitigation for the Spallation Neutron Source
K. Okita, K. Ono, S. Takagi and Y. Matsumoto

A Mixed-Hybrid Finite Element for Fluid-Structure Interaction Problems with Moving Immersed Interface
H.C. Gomes and P.M. Pimenta

Two-scale FSI Modelling of Microscopic Flows in Elastic Porous Media
T. Sawada and A. Tezuka

Finite Elements for the Immersed Boundary Method
L. Gastaldi

Thermo-Hydromechanical Problems I — **TuE02 Room: R2**

Efficient Strategies for Coupling Models of Melt Crystal Growth Processes
A. Yeckel and J.J. Derby

Thermo mechanical analysis of hysteresis heating in rolling contact between a rubber covered roller and a rigid roller
P-E. Austrell

Coupled Simulation of Process-integrated Powder Coating by Radial Axial Rolling of Rings
R. Kebriaei, J. Frischkorn and S. Reese

Application of a Viscoplastic-Damage Model for the Failure Prediction of Regeneratively Cooled Noozle Structures
V. Tini, I.N. Vladimirov and S. Reese

Coupled Analysis of Transport Processes and Mechanical Behaviour of Concrete at High Temperatures
F. Cramer, L. Ostermann, U. Kowalsky and D. Dinkler

Process Modelling of Linear Friction Welding (LFW) between AA2124/SIC_P Composite and Unreinforced Alloy
X. Song, N. Baimpas, S. Harding and A.M. Korsunsky

Aero-thermo-mechanical Coupling for Flame-wall Interaction
B. Baqué, M.P. Errera, A. Roos, F. Feyel, E. Laroche and D. Donjat

IS - Numerical Modelling of Coupled Electromagnetic, Hydrodynamic and Thermomechanical Problems in Engineering V: Electro-vibrational and Electro-thermo-mechanical Problems — **TuE03 Room: R3**
Invited Session organized by
Massimo Guarnieri and Carmelo Majorana

Multiphysical Computations of the Electrical Machines using FEM
A. Stermecki, O. Bíró, M. Hettegger, H. Lang, G. Ofner, S. Rainer and B. Weilharter

The Different Levels of Magneto-mechanical Coupling in Energy Conversion Machines and Devices
A. Belahcen, R. Kouhia and K. Fonteyn

FE Simulation of Electric Power Transformers: A Coupled Magneto-Mechanical-Acoustic Problem
A. Hauck, M. Kaltenbacher, R. Lerch and A. Volk

A Computational Study of Efficiency of Controllable Semiactive Magnetorheological Dampers Reducing Lateral Vibration of Rotors Working in Chambers Submerged in liquid
J. Zapoměl, L. Čermák and P. Ferfecki

Design, Simulation and Prototyping of Polymeric Ortho-planar Microvalves
E. Bertarelli, E. Bianchi, D. Strohmeier, J.G. Korvink and G. Dubini

Electrostatic Diaphragm Micropump Electro-fluid-mechanical Simulation
E. Bertarelli, R. Ardito and A. Corigliano

A Domain Decomposition Method for Electro-Thermo-Mechanical Contact Problems: Numerical Model and Validation
F. Moro, M. Guarnieri, C.E. Majorana, G. Mazzucco and A. Stella

TuE04 - Part I: 16:30 – 17:10
IS - Computational Multiphysics: Methods and Models II
TuE04
Room: R4
Invited Session organized by
Carlos Felippa, Roger Ohayon and K. C. Park

A Partitioned Quasi-Newton Solution Technique for Fluid-structure Interaction Problems using a Coarsened Grid to Accelerate the Convergence of the Coupling Iterations
J. Degroote and J. Vierendeels

Immersed Boundary Method: Performance Analysis of Popular Finite Element Spaces
D. Boffi, N. Cavallini, F. Gardini and L. Gastaldi

TuE04 - Part II: 17:10 – 18:30
IS - Multiresolution Biomechanics: From Nano to Macro
TuE04
Room: R4
Invited Session organized by
Wing Kam Liu, Jessica Zhang, Suvranu De and Lucy Zhang

Keynote Lecture: Mechanics of 3D Assembled Enzymes
A.R. Zamiri, A. Zandi-Atashbar and S. De

Meshing Challenges in Constructing Implicit Solvation Models of Biomolecular Structures
Y. Zhang

Efficient Force Field Calculation in Articulated Multiscale Molecular Simulations
M. Poursina and K.S. Anderson

Simulation Based Nano and Bio Structure Analysis and Design
M.K. Kim, S.H. Park and W.K. Liu

IS - Coupled Thermomechanical Simulation of Material Forming and Impact Problems II
TuE05
Room: R5
Invited Session organized by
Carlos Agelet de Saracibar and Jean-Philippe Ponthot

Keynote Lecture: Coupled Thermomechanical Analysis of Steel Welding Processes
C.E. Majorana, G. Mazzucco and V.A. Salomoni

On the Numerical Simulation of 3D Friction Stir Welding Processes
C. Agelet de Saracibar, M. Chiumenti, M. Cervera, N. Dialami, D. Santiago and G. Lombera

Thermomechanical Simulation of Roll Forming Process based on the Coupling of Two Independent Solvers
Y. Carretta, R. Boman, A. Stephany, T. Bouache, R. Canivenc, P. Montmitonnet, N. Legrand, M. Laugier and J-P. Ponthot

Thixoforging Tools materials: Determination of Appropriate Features and Experimental Evaluation
A. Rassili and J-C. Pierret

IS - Coupled Problems in Bioengineering
Invited Session organized by
Alain Kassab and Eduardo Divo
TuE06
Room: R6

Keynote Lecture: Selected Coupled Thermal Problems in Neonatology and their Computational Modelling
M.K. Ginalski, L.C. Wrobel, D.B. Ingham, A.M. Fic, J. Laszczyk and A.J. Nowak

Predicting human blood pressure changes by thermo-physiological simulation
Z. Ostrowski, A. Frijns, W. van Marken Lichtenbelt, B. Kingma and A. van Steenhoven

Design of a Current-Based Control Model for the Coupled Cardiovascular and Rotary Left Ventricular Assist Device System
E. Divo, G. Faragallah, Y. Wang and M.A. Simaan

A Multiscale Model of the Circulatory System in Infants Undergoing Hybrid Norwood Palliation
A. Ceballos, R.D. Osorio, A.J. Kassab, E. Divo, R. Argueta-Morales and W.M. DeCampli

Coupling of a Phase-field Approach of a Biomembrane and a Stabilized Stokes Fluid Field with Local Max Entropy Approximants
C. Peco, A. Rosolen and M. Arroyo

Numerical Design of Bio-Inspired Energy-Efficient Indoor Environments using a Localized RBF-based Meshless Method
V. Huayamave, E. Divo, L. Reddi and A. Jain

IS - Plasticity and Damage:
Experimental and Numerical Simulations II
Invited Session organized by
Valentina Salomoni and Francesco Marotti de Sciarra
TuE07
Room: R7

A Finite Element for Nonlocal Elastic Analyses
F. Marotti de Sciarra

Coupled Analysis of a Pre-stressed Concrete Containment
T. Koudelka, T. Krejčí and J. Kruis

Effect of Aggregates and ITZ on Visco-damaged Response of Concrete at the Meso Scale Level
G. Xotta, V.A. Salomoni and C.E. Majorana

Analysis of Rock Massif Based on the Theory of Damage
J. Kruis and T. Koudelka

Radiation Damage Assessment on Nuclear Facilities using Monte Carlo Technique
B. Pomaro, V.A. Salomoni, F. Gramegna, G. Prete and C.E. Majorana

Subloading Surface Plasticity Model Algorithm for 3D Subsidence Analyses Above Gas Reservoirs
V.A. Salomoni and R.L. Fincato

20:30 - 23:00 **Conference Banquet**

Wednesday, June 22nd

08:00 - 10:00 TECHNICAL SESSIONS

Optimum Design and Control of Coupled Problems I

WeM01
Room: R1

Coefficients Identification for Ship Manoeuvring Simulation Model based on Optimization Techniques
K.T. Tran, A. Ouahsine, H. Naceur, F. Hissel and A. Pourplanche

Integration of Multiobjective Evolutionary Algorithms and CAE Systems in Shape Optimization of Selected Coupled Problems
A. Dlugosz and T. Burczynski

Evolutive, Iterative Aerodynamical Global Optimization, with Weak Aerodynamics/Structure Interactions
A. Nastase

Sensor Network Optimization for Damage Detection on Aluminium Stiffened Helicopter Panels
C. Sbarufatti, A. Manes and M. Giglio

Solving the Dilemma of Contradictory Goals
O. Frommann

Numerical Methods for Coupled Problems V

WeM02
Room: R2

Modelling of Simultaneous Induction Hardening in Monolithic Formulation
P. Karban, I. Doležel and B. Ulrych

Simulation of the scattering of pressure waves provided by thin absorbent rigid screens

A. Tadeu, P. Amado Mendes, J. António and L. Godinho

Numerical Simulation of Aileron Buzz using an Adaptive-grid Compressible Flow Solver for Dynamic Meshes
G. Forestieri, A. Guardone, D. Isola, F. Marulli and G. Quaranta

Gradient Plasticity in the Context of Isoclinic and Arbitrary Rotated Intermediate Configurations
C. Broese and Ch. Tsakmakis

3D Anisotropic Adaptive Meshing and Stabilised Finite Element Methods for Multiphase Flows at Low and High Reynolds Number
E. Hachem, S. Feghali, H. Shaw, H. Digonnet and T. Coupez

Solution of Dendritic Growth in a Binary Alloy by a Novel Point Automata Method
A.Z. Lorbiecka and B. Šarler

Coupled Problems in Geomechanics I

WeM03
Room: R3

Water Retention in Unsaturated Soils Subjected to Wetting and Drying Cycle
W. Arairo, F. Prunier and I. Djeran-Maigre

Scale Considerations for the Study of Evaporation Effects on Soil Mechanical Behaviour
O. Mora and N. Obregón

Some Consequences of the Qualitative Analysis of the Point-Symmetric Coupled Consolidation Models
E. Imre and S. Fityus

Shear Deformable Beams on Nonlinear Viscoelastic Foundation under Moving Loading
E.J. Sapountzakis and A.E. Kampitsis

Dynamic Behaviour of Saturated Poroelastic Layers with Embedded Wall Submitted to Seismic Actions
J.C. Grazina and P.L. Pinto

Hierarchical Hybrid Simulation of Biofilm Growth Dynamics in 3D Porous Media
G. Kapellos, T. Alexiou and S. Pavlou

Coupled Solution Strategies II

WeM04
Room: R4

Higher Order Time Integration Schemes for Thermal Coupling of Flows and Structures
V. Kazemi-Kamyab, A.H. van Zuijlen and H. Bijl

Static-dynamic Coupling of Structural Codes for the Simulation of Impact
J-D. Garaud and J. Rannou

Multi-level and Quasi-Newton Acceleration for Strongly Coupled Partitioned Fluid-structure Interaction
J.J. Kreeft, M. Weghs, A.H. van Zuijlen and H. Bijl

O-PALM: an Open Source Dynamic Parallel Coupler
A. Piacentini, Th. Morel, A. Thévenin and F. Duchaine

Comparisons of Coupling Strategies for Massively Parallel Conjugate Heat Transfer with Large EDDI Simulations
S. Jauré, F. Duchaine and L.Y. Gicquel

Mixing Snapshots and Fast Time Integration of PDEs
M-L. Rapún, F. Terragni and J.M. Vega

Fluid-Structure Interaction II **WeM05 Room: R5**

Modeling of Airblast Propagation through an Enclosed Structure
J.A. Sherburn, D.H. Nelson, C.D. Price and T.R. Slawson

Vortex-induced Vibrations of an Elastically Mounted Cylinder with Low Mass-ratio at Re=3900
Y. Jus, E. Longatte, J-C. Chassaing and P. Sagaut

Surrogate-enhanced Simulation of Aircraft in Trimmed State
A.K. Michler

Investigating the Effect of Rotational Degree of Freedom on a Circular Cylinder at Low Reynolds Number in a Cross Flow
S.H. Madani, J. Wissink and H. Bahai

A Two Dimensional Simulation of Flow Around an Oscillating Circular Cylinder at Re=100
K. Angelopoulos, J. Wissink and H. Bahai

Computational Modelling of Biofilm Growth
A. Bolea Albero and M. Böl

IS - Interaction with Time Resolved Turbulent Flow Fields **WeM06 Room: R6**
Invited Session organized by Dörte Carla Sternel

Efficient Partitioned Techniques for Fluid-structure Interactions
V. Kazemi-Kamyab, J.J. Kreeft, T. Scholcz, M. Weghs, A.H. van Zuijlen and H. Bijl

Numerical Simulation of Fluid–Structure Interaction using Large–Eddy Simulation
M. Breuer, G. De Nayer and M. Münsch

Keynote Lecture: Adaptive Multi-Scale Simulation of Turbulent Flow and Acoustics
S.P. Roller, H. Klimach and D.F. Harlacher

Analysis of Uniform and Adaptive LES in Natural Convection Flow
A. Hauser and G. Wittum

Interaction with Time Resolved Turbulent Flow Fields
D.C. Sternel

Thermo-Mechanochemical Problems **WeM07 Room: R7**

Thermo-hydro-mechanical Modeling of Partially Saturated Heterogeneous Porous Media

G. Rastiello, F. Meftah, S. Dal Pont, J.L. Tailhan and P. Rossi

Coupled Reactive Transport Modeling - The Program Transport
V. Žabka and J. Šembera

Thermoelastic Stress Analysis for a Tube under General Mechanochemical Corrosion Conditions
Y. Pronina

Numerical Simulation of Particulate Erosion in a Compressor Blade
M. Suzuki and M. Yamamoto

A Three-dimensional Finite Element Meso-scale modelling of Thermo-hygro-mechanical (THM) Behaviour of Concrete at High Temperature
T.T. Le, H. Boussa and F. Meftah

10:00 - 10:30 Coffee-break

10:30 - 12:30 **WeMP**
Plenary Lectures III **Room: R1**

Vibrations of Structures containing Compressible Fluids
R. Ohayon

Model Problems in Magneto-hydrodynamics: Individual Numerical Challenges and Coupling Possibilities
R. Codina*, S. Badia and R. Planas*

hp-Adaptive Finite Elements for Coupled Wave Propagation Problems
L. Demkowicz

12:30 - 14:00 Lunch Time

14:00 - 16:00 **WeAP**
Plenary Lectures IV **Room: R1**

Coupled Problems on the Cellular and Sub-Cellular Scale
W.A. Wall*, C.J. Cyron, T. Klöppel, C. Meier and K. Müller*

A Computational and Experimental Modeling of the Physics of Nonlinear Sloshing and Internal Wave Breaking
K.C. Park*, J.A. González, Y.Y. Kim and S.H. Kwo*

Multiphysical Coupled Processes in Underground Nuclear Waste Disposal Problems
L. Laloui

16:00 - 16:30 Coffee-break

16:30 - 18:30 TECHNICAL SESSIONS

Optimum Design and Control of Coupled Problems II

WeA01
Room: R1

Model Order Reduction of Systems for Active Vibration and Noise Control
M. Kurch, H. Atzrodt, V. Carli, O. Heuss and J. Mohring

Computational Fluid Dynamics for the Simulation and Optimization of Pleated Filters
O. Iliev, R. Kirsch, M. Kabel, Z. Lakdawala and E. Toroshchin

Nonlinear Dynamic Analysis of Soil – Pile - Structure Interaction
G.P. Pittos, G.M. Stavroulakis and M. Papadrakakis

Method for Estimating Parameters of Coupled Problem of Interaction of Gas Flows Loaded by Solid Particles with Solids
A.V. Nenarokomov, O.M. Alifanov, E.A. Artiukhine, I.V. Repin and D.M. Titov

Optimal Control Hydrodynamic Flow using the Adjoint Approach
M. Louaked

Thermo-Hydromechanical Problems II

WeA02
Room: R2

Mass, Heat and Momentum Transfer in Natural Draft Wet Cooling Tower with Flue Gas Discharge
A.F. Klimanek and R.A. Bialecki

Evaluation and Improvement of the THM Modelling Capabilities for Rock Salt Repositories
A. Pudewills

Thermomechanics of Continua with Boundary Energies
A. Javili and P. Steinmann

Three Domain Thermal and Mechanical Fluid-Structure Interaction Analysis Applied to Cooled Rocket Thrust Chambers
D. Kowollik, M.C. Haupt and P. Horst

A Finite Element Modeling of Thermo-hydro-mechanical Behaviour and Numerical Simulations of Progressive Spalling Front
M.T Phan, F. Meftah, S. Rigobert, P. Autuori, C. Lenglet and S. Dal Pont

A New Strategy for Simulation of Polymers in Fire Situations
J. Marti, E. Oñate and S.R. Idelsohn

Coupled Problems in Geomechanics II

WeA03
Room: R3

Numerical Modeling of Shallow Landslide Impacts on Flexible Protection Systems and Its Validation with Full-scale Testing
A. von Boetticher, A. Volkwein, R. Wüchner, K-U. Bletzinger and C. Wendeler

Impact of the Leakage Location on the Flow of a Leaking Pipe Buried in an Unsaturated Porous Media
H. Aghakhani and S.M. Hosseinalipour

A Coupled Meshfree-Finite Element Contact Formulation for Soil-Sructure Interaction
G. Haikal

An Optimized Return Mapping Algorithm for the Barcelona Basic Model
M. Pertl, M. Hofmann and G. Hofstetter

Micro-Scale Model for Slurry Flow and Deposition in Porous Substrates
K. Khodosevich, J. Rice, N. Blackman, A. Joshi and A. Schermerhorn

Coupled Solution Strategies III

WeA04
Room: R4

The Influence of Different Time Integration Schemes in ALE Description Applied to Moving Meshes
F. Flitz, D.C. Sternel and M. Schäfer

Solving Porous Media Problems in Graphics Processing Units with a Domain Decomposition Approach
G.M. Stavroulakis, M. Papadrakakis and A. Karatarakis

Periodic Solutions for Acousto-Elastic Scattering Problems by Controlling the Time-Dependent Equations
S. Mönkölä and S. Kähkönen

A Substructuring FE Model for Structural-acoustic Problems with Modal-based Reduction of Poroelastic Interface
R. Rumpler, J-F. Deü and P. Göransson

A New Numerical Scheme for a Linear Fluid-structure Interaction Problem
M. González and V. Selgas

Partitioned Time Integration Methods for Hardware in the Loop based on Linearly Implicit L-stable Rosenbrock methods
O.S. Bursi, C. Jia and Z. Wang

Proper Generalized Decomposition (PGD) to solve Mixed Convection Problem
A. Dumon, C. Allery and A. Ammar

Fluid-Structure Interaction III

WeA05
Room: R5

Numerical Study of the Fluid-structure Interaction in the Diffuser Passage of a Centrifugal Pump
A. Fontanals, A. Guardo, M. Coussirat and E. Egusquiza

FSI Simulations for Explosions Very Near Reinforced Concrete Structures
M.A. Price, A. Lee, O. Soto and O.Y. Chong

Non-linear Dynamic Soil Response Underneath a Vertical Breakwater Subjected to Impulsive Sea Wave Actions
M.M. Stickle, P. de la Fuente and C. Oteo

3D FSI Modeling of Tank Imposion
K. Kamran, R. Rossi, S.R. Idelsohn and E. Oñate

A Numerical Procedure for Assessing Structural Response of an Offshore Pipeline during Launching Operations
J.C. Mosquera, A.F. Samartín and J.G. García Palacios

Acoustic Behaviour of Panel Absorbers using the MFS
J. António

Multiscale Problems

WeA06
Room: R6

Magnetization Model for Particle-based Simulations of Magnetorheological Fluids
H. Lagger, J. Peguiron, C. Bierwisch and M. Moseler

Multi-scale Modelling of Coupled Thermal and Structural Effects on Heterogeneous Materials using Structural Based Enrichment
M.F. Macri and A.G. Littlefield

Fabrication and Multiscale Mechanical Characterization of Ti Alloy/Al_2O_3 Functionally Graded Materials for Orthopaedic Applications
D. Carnelli, E. Bertarelli, D. Gastaldi, T. Villa, F. Casari, A. Molinari and P. Vena

Fluid-structure Interaction in Submerged Structures
C. Valero, E. Egusquiza, A. Guardo and X. Huang

Multi-scale and Coupled Modeling of Shockwave Interaction with Strain Rate Sensitive Polymers
R. Barsoum

Multiphysics Problems **WeA07**
Room: R7

Mathematical Formulation of a Coupled Dynamic Model for Environmental Business Action Planning
S.A. David, C. de Oliveira and D.D. Quintino

Coupled Model of Terrestrial Particulate Organic Carbon Processing, Hydrodynamics and Sediment Transport in Tropical Streams
F.J. Guerrero-Bolaño, N. Obregón-Neira, J.F. Gonçalves-Junior and A. Torres-Abello

A Model of Multi-disciplinary Behavior Coupling in IC Engine
X.D. Dai and Y.B. Xie

Modernizing Science & Engineering Software Systems
L. Favre, L. Martinez and C. Pereira

Multi-Physics Modelling and Simulation of Sand Transfer around Cube
K. Matsui, M. Suzuki and M. Yamamoto

Recurrence Plots Analysis of Pressure Fluctuations in Fluidized Beds
M.M. Tahmasebpoor, R. Sotudeh-Gharebagh, R. Zarghami and N. Mostoufi

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