CFC 2025
Technical Programme

Last updated: 2026-11-02 06:02

Monday, 17/03/2025

Mon, 17/03/2025 16:30 - 19:30
Registration

Mon, 17/03/2025 19:30 - 21:30
Welcome Cocktail

Tuesday, 18/03/2025

Tue, 18/03/2025 08:00 - 08:45

Registration

Tue, 18/03/2025 08:30 - 09:00 Norteamérica

Opening Ceremony

Tue, 18/03/2025 09:00 - 10:00 Norteamérica

PL1 - Plenary Lecture I

Prof. Philippe Devloo (UNICAMP/Civil Engineering, Brazil)
Chaired by: Prof. Diego Celentano (Pontificia Universidad Católica de Chile)

On the use of HDiv Spaces in Computational Fluid Mechanics

***P. Devloo**

Tue, 18/03/2025 10:00 - 10:30

Coffee Break

Tue, 18/03/2025 10:30 - 12:30 Norteamérica

MS004A - Complex Fluid Flows in Engineering: Modeling, Simulation and Optimization I

Main Organizer: Prof. Stefanie Elgeti (RWTH Aachen)
Chaired by: Prof. Stefanie Elgeti (RWTH Aachen), Dr. Felipe González (RWTH Aachen)

Weakly Imposed Kinematic Condition on Free Surface Coupled with Fluid Flow in Finite Element Framework

***Y. Yang,** J. Nam

Thermofluid Simulation of Single-Strand Deposition in the Context of FDM 4D Printing

***F. González,** S. Elgeti, M. Behr

Dip Coating of Discrete Object

D. Yu, J. Song, ***J. Nam**

Numerical Simulation of a Fume Treatment Filter System

F. Bacchi, M. Valenzuela Pino, ***A. Scarabino**

Unstructured Space-Time Meshes for Accurate and Automated Handling of Moving Boundaries in Fluid Flow Simulation

***M. Behr**

Density Based Topology Optimization of Fluid Flow Problems

***B. Lazarov**

Tue, 18/03/2025 10:30 - 12:30 Parinacota

MS013A - Hyperbolic Equations: Novel Methods and Applications I

Main Organizer: Prof. Elena Gaburro (University of Verona)
Chaired by: Prof. Elena Gaburro (University of Verona), Prof. Eleuterio F. Toro (University of Trento)

A High-Order Matrix-Free Finite Element Method for Hyperbolic Problems

***S. Tokareva**

Finite Element ALE Hydrodynamics with Sharp Curved Material Interfaces and Complex Domains

N. Atallah, G. Scovazzi, ***V. Tomov**

Implicit Shock Tracking for Flows with Shocks Attached to Surfaces Using Mesh-Based Parametrization

***A. Perez-Reyes,** M. Zahr

High-Order Implicit Shock Tracking for time-dependent flows

***C. Naudet,** M. Zahr

Monolithic Convex Limiting for Implicit Finite Element Discretizations of the Compressible Euler Equations

***D. Kuzmin,** P. Moujaes

A New Locally Divergence-Free Path-Conservative Central-Upwind Scheme for Ideal and Shallow Water Magnetohydrodynamics

***A. Chertock**

Tue, 18/03/2025 10:30 - 12:30 Tupungato

MS017A - Mathematics, Algorithms, and Software for Predictive Digital Twins in CFD I

Main Organizer: Dr. Irina Tezaur (Sandia National Laboratories)
Chaired by: Prof. Omar Ghattas (The University of Texas at Austin), Dr. Irina Tezaur (Sandia National Laboratories)

Enhancing CFD simulations for Digital Twins by combining model order reduction and scientific machine learning **Keynote**

***G. Rozza**

Domain decomposition-based coupling of subdomain-local reduced order models (ROMs) in fluid mechanics using the Schwarz alternating method

C. Wentland, F. Rizzi, J. Barnett, ***I. Tezaur**

Interpretable data-driven reduced-order models using kernel methods

***A. Diaz,** P. Blonigan, S. McQuarrie

Tue, 18/03/2025 10:30 - 12:30 Sudamérica

MS001A - Advanced Computational Modelling of Free Surface Flows And Applications I

Main Organizer: Prof. Allan Peter Engsig-Karup (Technical University of Denmark)
Chaired by: Prof. Allan Peter Engsig-Karup (Technical University of Denmark), Prof. Onno Bokhove (University of Leeds)

Comparative Study on Wave Reflection Coefficients for V-Shaped and Flat-Front Wave Absorbers

R. Muñoz, M. Rosas, ***F. Pierart**

Analysis of Coupling Methods of Phase-Resolving Coastal Wave Models

***J. Galaz Mora,** M. Kazolea, A. Rousseau

Numerical Analysis of a Spatially Developing Capillary Jet

A. Mostafavi, M. Ranjbar, V. Yurkiv, A. Yarin, ***F. Mashayek**

A Comparative Evaluation of The Interface Capturing Schemes in A Bundle Bubbly Flow

***T. Fukuda,** S. Uesawa, S. Yamashita, T. Suzuki

Simulation of Drainage in a Tank Using the Level Set Method

***N. Mena,** R. Arrau, J. Ramos, M. Marian

Tue, 18/03/2025 10:30 - 12:30 Centroamérica

MS023A - Particle Methods in Computational Fluid Dynamics and Fluid-Structure Interactions I

Main Organizer: Prof. Jean Philippe Ponthot (University of Liège)
Chaired by: Prof. Jean Philippe Ponthot (University of Liège), Dr. Alessio Alexiadis (University of Birmingham)

An MPI-Parallel Meshfree Generalization of the Finite Volume Method **Keynote**

***F. Breiden,** M. Schweitzer

Numerical Modeling of Water Tank Sloshing Using the Material Point Method

***G. Sanchez,** F. Zabala, R. Rodari

Surface Tension Simulation: A pairwise force approach

***E. Santacruz-Yunga,** E. Plaza, C. Trejo-Soto

A fluid-particle interaction method for the simulation of 3D fluids laden with particles

A. Müller, ***E. Campello,** H. Gomes

Recent Advances in the Particle Finite Element Method for Fluid-Structure Interactions and Multi-Physics Problems

M. Lacroix, E. Fernandez, S. Février, L. Papeleux, R. Boman, ***J. Ponthot**

Tue, 18/03/2025 10:30 - 12:30 Llaima

MS009A - Finite Element Methods in Fluid Mechanics I

Main Organizer: Dr. Federico Fuentes (Pontificia Universidad Catolica de Chile)
Chaired by: Dr. Federico Fuentes (Pontificia Universidad Catolica de Chile)

Reliable Simulations of Industrial Fluid Flow Applications **Keynote**

***R. Scott**

Computing Energy Stability Limits in Ducts of Arbitrary Cross-Section

***V. Iligaray,** D. Aballay, F. Fuentes

Energy Stability of Pressure-Driven Flows Between Concentric Cylinders

***D. Aballay,** V. Iligaray, F. Fuentes

Finite Element Solution of the Reynolds-Orr Energy Eigenvalue Problem

***W. Imbachi Quinchua,** F. Fuentes Caycedo

A Property-Preserving Stabilized Continuous Galerkin Method for Convection-Dominated Flows

***A. Blanco-Casares,** O. Lehmkuhl, D. Mira

Tue, 18/03/2025 10:30 - 12:30 Calbuco - Puyehue

MS005A - High-Fidelity Simulations, Machine-Learning Techniques and Active Control I

Main Organizer: Prof. Vladimir Golubev (ERAU)
Chaired by: Prof. Vladimir Golubev (ERAU), Prof. Ivette Rodriguez (Universitat Politècnica de Catalunya)

Synthetic Jet Actuators in Active Flow Control Simulations

***V. Golubev**

Lift Enhancement of a Rotating and Translating NACA 0015 Airfoil Using Dual Synthetic Jets

***F. Aguirre,** L. Silva

Mesh-Free Pressure Field Reconstruction from Image Velocimetry Data Using SIREN

***R. Miotto,** W. Wolf, F. Zigunov

On a probabilistic closure for Algebraic Surrogate Models of Turbulent Flows

B. Eiximeno, M. Sanchis-Agudo, A. Miró, ***I. Rodriguez,** R. Vinuesa, O. Lehmkuhl

Rank reduction autoencoder for the generative design of power transformer

***S. Rodriguez,** L. Achour, C. Ghnatios, A. Ammar, F. Chinesta

Remaining Useful Life of Oil-Immersed Transformers: A Combined CFD and Surrogate Model

***L. Achour ,** S. Rodriguez, C. Ghnatios, A. Ammar, F. Chinesta

Tue, 18/03/2025 12:30 - 14:00

Lunch Break

Tue, 18/03/2025 14:00 - 15:00 Norteamérica

SPL01 - Semi-Plenary I

Prof. María Fernandino (NTNU)
Chaired by: Prof. Marek Behr (RWTH Aachen University)

Phase-Field Methods for Interfacial Flows with Phase Change

***M. Fernandino**

Tue, 18/03/2025 14:00 - 15:00 Sudamérica

SPL02 - Semi-Plenary II

Prof. Santiago Badia (Monash University)
Chaired by: Dr. Roberto Cabrales (Universidad de Tarapacá)

Recent Advances in Unfitted Finite Element Methods

***S. Badia**

Tue, 18/03/2025 15:00 - 15:30

Coffee Break

Tue, 18/03/2025 15:30 - 17:30 Norteamérica

MS004B - Complex Fluid Flows in Engineering: Modeling, Simulation and Optimization II

Main Organizer: Prof. Stefanie Elgeti (RWTH Aachen)
Chaired by: Prof. Marek Behr (RWTH Aachen University), Dr. Felipe González (RWTH Aachen)

Automatic generation of adjoint lattice Boltzmann methods through reverse mode alogorithmic differentiation in OpenLB

***S. Ito,** A. Kummerländer, F. Bukreev, M. Krause

Shape Optimization of Printing Nozzles for Extrusion-Based Additive Manufacturing

***S. Tillmann,** F. Gonzalez, S. Elgeti

Thixotropy on Fluid Dynamics in Battery Electrode Slot Coating

***S. Oh,** J. Nam

An open-source framework for the capture of turbulent non-isothermal CO2 flows captured by an axial fan

***A. BENCHIKH LE HOCINE,** S. PONCET

Combined influence of surface texturing and electro-rheological lubricant behaviour on hybrid spherical journal bearing

***M. Marian,** A. Tomar

Optimization of a centrifugal blower using a gradient-based approach

R. Lavimi, A. Benchikh Lehocine, ***S. Poncet,** B. Marcos, R. Panneton

Tue, 18/03/2025 15:30 - 17:30 Parinacota

MS013B - Hyperbolic Equations: Novel Methods and Applications II

Main Organizer: Prof. Elena Gaburro (University of Verona)
Chaired by: Dr. Gino Montecinos (Universidad de La Frontera), Prof. Elena Gaburro (University of Verona)

High Order Accurate ADER Finite Volume Schemes Based on Novel Genuinely Multidimensional Riemann Solvers
***E. Gaburro,** M. Dumbser, M. Ricchiuto

On the Riemann Problem and Solution Nonuniqueness in Nonconservative Hyperbolic Systems
***A. Aleksyuk**

A Flux-Vector Splitting Scheme for the Shallow Water Equations: Assessment of an Approximate Riemann Solver
***C. Castro,** E. Toro, A. Siviglia

Adaptive Water Wave Simulations in GeoClaw with Hyperbolic-Dispersive Models
***C. Muñoz-Moncayo,** D. Ketcheson

A Multilayer Shallow Water Model for Tsunamis and Coastal Forest Interaction
***R. Bürger, *E. Fernández-Nieto,** J. Moya

Tue, 18/03/2025 15:30 - 17:30 Tupungato

MS017B - Mathematics, Algorithms, and Software for Predictive Digital Twins in CFD II

Main Organizer: Dr. Irina Tezaur (Sandia National Laboratories)
Chaired by: Dr. Irina Tezaur (Sandia National Laboratories), Prof. Omar Ghattas (The University of Texas at Austin)

Large Eddy Simulation Reduced Order Models (LES-ROMs) for Turbulent Flows Keynote
***T. Iliescu**

A graph neural network surrogate for microstructure evolution in metal additive manufacturing
Y. Qin, A. Hikmet, ***G. Biros**

A Digital Twin for Real Time Bayesian Inference and Prediction of Tsunamis
***O. Ghattas,** S. Venkat, S. Henneking, M. Fernando

Optimal Experimental Design with Digital Twins
N. Aretz, ***S. Leyffer**

Tue, 18/03/2025 15:30 - 17:30 Sudamérica

MS001B - Advanced Computational Modelling of Free Surface Flows And Applications II

Main Organizer: Prof. Allan Peter Engsig-Karup (Technical University of Denmark)
Chaired by: Prof. Onno Bokhove (University of Leeds), Prof. Allan Peter Engsig-Karup (Technical University of Denmark)

Interfacial energy exchange in free-surface turbulence
A. Calado, ***E. Balaras**

Subspace Acceleration for Efficient Nonlinear Water Wave Simulation
***R. Sørensen,** A. Engsig-Karup, M. Guido, D. Kressner

A High-Order Steady-State Solver to the Incompressible Navier-Stokes Equations with a Free Surface
***S. Minniti,** J. Visbech, A. Engsig-Karup

Electromagnetic damping of liquid metal free surface instability
***A. Brekis**

Data Driven Multi-Fidelity Modeling for Advanced Free Surface Simulations
***A. Melander,** A. Engsig-Karup

Tue, 18/03/2025 15:30 - 17:30 Centroamérica

MS023B - Particle Methods in Computational Fluid Dynamics and Fluid-Structure Interactions II

Main Organizer: Prof. Jean Philippe Ponthot (University of Liège)
Chaired by: Prof. Jean Philippe Ponthot (University of Liège), Ms. Farah Breiden (University of Bonn)

Coupling Particle Methods with Discrete Multiphysics Keynote
***A. Alexiadis**

Effect of Interfacial Charge Inversion on the Transport of Nanoconfined electrolyte solutions.
***H. Zambrano,** J. Walther, A. Rojano

Analysis of the Scouring Phenomenon Caused by Tsunami Effects Using the Smoothed Particle Hydrodynamics (SPH) Method
***P. Rivera,** R. Aránguiz

Fully Lagrangian Vortex Particle Methods for 2D and 3D Flows Simulation and their Efficient Implementations
***I. Marchevsky,** G. Shcheglov

Tue, 18/03/2025 15:30 - 17:30 Llaima

MS009B - Finite Element Methods in Fluid Mechanics II

Main Organizer: Dr. Federico Fuentes (Pontificia Universidad Catolica de Chile)
Chaired by: Mr. Manuel Sanchez (Pontificia Universidad Catolica de Chile)

On the analysis and approximation of some models of fluids over weighted spaces on convex polyhedra

***E. Otarola,** A. Salgado

Symplectic Hamiltonian hybridizable discontinuous Galerkin methods for linearized shallows-water equations

***C. Núñez,** M. Sánchez

A DPG method for the streamfunction formulation of Stokes equations

***T. Fuehrer,** P. Herrera, N. Heuer

Space-time least-squares finite elements for evolution equations

T. Führer, R. González, ***M. Karkulik**

hp-DG Time Stepping Method with Continuous/Discontinuous Galerkin Methods for Nonlinear Parabolic Delay Problems

***R. Devi,** D. Pandey

Tue, 18/03/2025 15:30 - 17:30 Calbuco - Puyehue

MS025A - Polytopal Methods for PDES in Fluid Mechanics I

Main Organizer: Prof. David Mora (Universidad del Bío-Bío)
Chaired by: Prof. David Mora (Universidad del Bío-Bío), Dr. Gonzalo Rivera (Universidad de Los Lagos)

An HHO-DDR polytopal method for the Brinkman problem that is robust in pure Stokes and Darcy regimes Keynote

***J. Droniou,** D. Di Pietro

A Reynolds-semi-robust and pressure-robust Hybrid High-Order method for the time dependent incompressible Navier–Stokes equations on general meshes

***D. Castanon Quiroz,** D. Di Pietro

Nonconforming Virtual Element Methods for the Oseen Eigenvalue Problem

A. Dibyendu, F. Lepe, ***G. Rivera**

A Reynolds-Semi-Robust Hybrid High-Order Scheme for the Unsteady Navier-Stokes Problem

L. Beirão da Veiga, D. Di Pietro, J. Droniou, K. Haile, ***T. Radley**

Stream virtual elements for the Navier-Stokes system

***D. Mora,** A. Silgado

Wednesday, 19/03/2025

Wed, 19/03/2025 08:00 - 09:00

Registration

Wed, 19/03/2025 09:00 - 10:00 — Norteamérica

PL02 - Plenary Lecture II

Prof. Beatrice Riviere (Rice University)

Chaired by: Dr. Marcela Cruchaga (Universidad de Santiago de Chile)

Computational Methods for Two-Phase Flows at the Pore Scale

***B. Riviere**

Wed, 19/03/2025 10:00 - 10:30

Coffee Break

Wed, 19/03/2025 10:30 - 12:30 — Norteamérica

MS004C - Complex Fluid Flows in Engineering: Modeling, Simulation and Optimization III

Main Organizer: Prof. Stefanie Elgeti (RWTH Aachen)

Chaired by: Dr. Felipe González (RWTH Aachen), Prof. Marek Behr (RWTH Aachen University)

Topology Optimization of Hydrogen Heat Exchangers Considering Two Fluids

***J. Rothkegel Ide,** P. Duysinx

Approximate Critical Damping Factor for Vibration of Intelligent Completion Control Lines

T. Eduardo, A. Braga, ***A. Nieckele**

Modeling, Simulation, and Optimization in Manufacturing: Selected Applications in Lubricated Orthogonal Cutting and Extrusion

***S. Elgeti,** J. Lee, F. Zwicke, M. Riegler, J. Saelzer, G. Polus, A. Zabel

Numerical simulation of pressure-drop in large tube U-bends of air cooled supercritical CO2 gas coolers

***S. Hosseinnia,** L. Amiri, S. Poncet

Advances in Vortical Structure Analysis for Superior Heat Transfer in Pin-Fin Microchannels

***J. Jaseli?nait?,** M. Šeporaitis

Wed, 19/03/2025 10:30 - 12:30 — Parinacota

MS013C - Hyperbolic Equations: Novel Methods and Applications III

Main Organizer: Prof. Elena Gaburro (University of Verona)

Chaired by: Prof. Dmitri Kuzmin (TU Dortmund University), Dr. Gino Montecinos (Universidad de La Frontera)

Low-Dissipation Central-Upwind Schemes

***A. Kurganov**

Positivity Preserving Central WENO Schemes for Polydisperse Sedimentation Models

***J. Barajas-Calonge,** R. Bürger, P. Mulet, L. Villada

High-order finite difference scheme for Nonlocal macroscopic models of multi-population pedestrian flows

***L. Villada osorio,** P. Goatin, D. Inzunza

Finite volume scheme for time-dependent bottom detection via optimal control problem on Boussinesq-Peregrine equations

***G. Montecinos**

Variational Derivation and Compatible Discretizations of the Maxwell-GLM System Keynote

***M. Dumbser**

Wed, 19/03/2025 10:30 - 12:30 Tupungato

MS010A - Fluid-structure interaction: Methods and applications I

Main Organizer: Dr. Laura Battaglia (CIMEC)
Chaired by: Dr. Laura Battaglia (CIMEC), Dr. Luciano Garelli (CIMEC-CONICET)

Reduced Order Modelling (ROM) of Fluid-Structure Interaction (FSI) for Turbulent Flow Problems **Keynote**

***T. Kvamsdal,** V. Tsiolakis, H. van Brummelen, E. Fonn, A. Rasheed

Evaluating the impact of topographic features on wake recovery in a single turbine located on a hill

***A. Torrejón,** L. Silva-Llanca, S. Montecinos, C. Meneveau

CFD and experimental study of a model-scale two-body hinged raft wave energy converter

***J. walther,** G. KOVACS, Y. shao, R. BLOOM

Modeling of Simplified Water Alkaline Electrolyzers using Code Saturne

***L. Garelli,** G. Rios Rodriguez, M. Storti

Experimental and Computational Assessment of an Energy-Saving Innovation in a Customised Testing Cabin

G. Henshaw, A. Deyranlou, K. Rimmer, R. Fitton, ***A. Keshmiri**

Wed, 19/03/2025 10:30 - 12:30 Sudamérica

MS019A - Modern numerical methods and simulation techniques for complex flow problems I

Main Organizer: Prof. Thomas Wick (Leibniz Universität Hannover (LUH))
Chaired by: Prof. Thomas Wick (Leibniz Universität Hannover (LUH)), Dr. Henry von Wahl (Friedrich Schiller University Jena)

Obtaining Reliable Simulations in Incompressible Flows

L. Rebholz, R. Scott, ***H. von Wahl**

On an Improved Global Linelet Preconditioner for Large-Scale Incompressible Flow Simulations

***R. de Olazábal,** R. Borrell, O. Lehmkuhl

Leveraging Truncated Hierarchical B-splines for Efficient Stokes Solutions

***D. Velasco Vega,** K. Shepherd, C. Goats

On AI friendly, high order mass weighted upwind schemes

***T. Berres**

Three-dimensional fluid–structure interaction numerical solver with Navier’s slip interface condition

***K. T?ma**

Space-time modeling, Galerkin finite element discretizations, and numerical solution of non-Newtonian fluids using internal variables

P. Junker, ***T. Wick**

Wed, 19/03/2025 10:30 - 12:30 Centroamérica

MS027A - The human circulation and associated diseases: models, methods and simulations. I

Main Organizer: Prof. Lucas Omar Müller (University of Trento)
Chaired by: Prof. Eleuterio F. Toro (University of Trento), Dr. Christian Contarino (Computational Life)

Exploring Graph Neural Networks for Simulating Cerebral Microcirculatory Blood Flow

P. Botta, P. Vitullo, T. Ventimiglia, ***A. Linninger,** P. Zunino

Estimating Fluid Exchange between Brain and Subarachnoid Space using Poroelasticity and Finite Elements

***F. Costanzo,** B. Ghitti, M. Jannesari, P. Drew

A 0-D Computational Model of Aspiration Thrombectomy with Collapsible Vessels

***A. Pradhan,** F. Mut, J. Cebral

A multiscale framework for modeling blood flow in the cardiovascular system

***G. Bertaglia,** L. Pareschi

Subject-specific modeling of infant aortic haemodynamics: Assessment of aortic conduit and reservoir functions under hypoplastic left heart syndrome condition

***J. Orera,** J. Ramirez, P. Lamata, J. Murillo†

Wed, 19/03/2025 10:30 - 12:30 Llaima

MS007A - Computational Methods in Fundamental and Applied Aerodynamics I

Main Organizer: Prof. Christian Muñoz (Universidad Tecnológica Metropolitana)
Chaired by: Prof. Christian Muñoz (Universidad Tecnológica Metropolitana), Dr. Matias Oscar Avila Salinas (Barcelona SuperComputing Center)

Analysis and Control of Dynamic Stall in a Simplified Vertical Axis Wind Turbine Setup: Large Eddy Simulation and Linear Stability Theory

Keynote

L. Souza, R. Miotto, ***W. Wolf**

Impact of 2.5D Domain Thickness on the Accuracy of VAWT CFD

***J. Isla,** G. Cornejo, I. Cornejo

A large eddy simulation environment for offshore wind farm flows, using the new open source code SOD2D

***M. Avila,** O. Lehmkuhl, H. Owen, R. Chavez

A numerical study on the performance of hydrogen-lubricated journal bearings with surface micro-textures

***A. TOMAR,** M. Marian

An exploration of the Glowinski-Le Tallec splitting strategy for approximating the solution of singular nonlinear PDEs

***Q. SHENG**

Wed, 19/03/2025 12:30 - 13:30

Lunch Break

Wed, 19/03/2025 13:30 - 14:30 Norteamérica

SPL03 - Semi-Plenary III

Prof. Harald van Brummelen (Eindhoven University of Technology)
Chaired by: Dr. Rekha Rao (Sandia National Laboratories)

Phase-Field Models of Binary Fluids in (Soft-)Wetting

***H. van Brummelen**

Wed, 19/03/2025 13:30 - 14:30 Centroamérica

SPL04 - Semi-Plenary IV

Dr. Rajesh Ransing (Swansea University)
Chaired by: Prof. Alvaro Coutinho (COPPE/Federal University of Rio de Janeiro)

Physics-Corrected Graph Network Simulators (GNS) for Modelling Fluid Flow

P. Pe, ***R. Ransing**

Wed, 19/03/2025 13:30 - 14:30 Sudamérica

SPL05 - Semi-Plenary V

Prof. William Wolf (University of Campinas)
Chaired by: Dr. Luciano Garelli (CIMEC-CONICET)

Shock-boundary layer interactions in supersonic turbine cascades

***W. Wolf**

Wed, 19/03/2025 14:45 - 16:45 Norteamérica

MS016A - Joint Brazil-Chile-Inria MS on Innovative Numerical Methods for Fluids I

Main Organizer: Dr. Frederic Valentin (LNCC)
Chaired by: Dr. Miguel A. Fernández (Inria)

Solving flow in large-scale heterogeneous fractured porous media with the robust and efficient domain decomposition preconditioner PETSc-HPDDM

Keynote

P. Jolivet, M. Kern, F. Nataf, ***G. Pichot,** R. Zanella, D. Zegarra Vasquez

Non-overlapping domain-decomposition multiscale preconditioners for flows in porous media

***F. Sousa,** P. Carvalho, P. Carvalho, F. Rocha, R. Ausas, G. Buscaglia, R. Guiraldello, F. Pereira

Robust polygonal element method for urban flow modeling

M. Boutilier, ***K. Brenner,** V. Dolean, W. Fkaier

A finite element approximation for an optimal control problem on Navier-Stokes-Brinkman equations

***J. Aguayo**

Numerical simulation of incompressible fluid flow in a volume-changing domain using a capacitance function

***M. Correa,** L. Abdala, C. Mady

Wed, 19/03/2025 14:45 - 16:45 Parinacota

MS006A - Computational Fluid Mechanics with Free and Moving Boundaries: Methods and Applications I

Main Organizer: Dr. Rekha Rao (Sandia National Laboratories)
Chaired by: Phd. Alec Kucala (Sandia National Labs), Dr. Rekha Rao (Sandia National Laboratories)

Approximation and Coalescence of Multiples Bubbles in Two-Phase Flows **Keynote**

***G. R. Anjos,** D. B.V. Santos, G. R.G. Sousa, A. E. M. Santos

Towards a Coupled Semi-Lagrangian, Conforming Transient h-r Unstructured Adaptive Mesh Refinement (cThruAMR) Method for Multiphase Flow Problems

***D. Noble**

Stabilized Simulation of Deformable Capsules Flowing Through a Pipe

***J. Bagge,** Z. Du, G. Biros

Free vibrations of a flexible cylinder immersed in a confined viscous fluid

***M. Puscas,** R. Lagrange

Wed, 19/03/2025 14:45 - 16:45 Tupungato

MS010B - Fluid-structure interaction: Methods and applications II

Main Organizer: Dr. Laura Battaglia (CIMEC)
Chaired by: Dr. Luciano Garelli (CIMEC-CONICET), Dr. Laura Battaglia (CIMEC)

Stabilized Hyper-Elastic Solid-Shell formulation for Embedded Fluid-structure interaction problems **Keynote**

***A. Aguirre,** R. Zorrilla, J. Baiges, R. Codina

Study of Immersed Solids in Vortex Induced Vibrations

***P. Moreno Oliva,** M. Cruchaga

A novel approach for the mechanical characterization of single-cells through microfluidic devices

***A. Abarca-Ortega,** C. Velasquez, B. González-Bermúdez, G. Plaza

Embedded Finite Volume Technique for Fluid/Rigid-Body Interaction Problems

***E. Zamora,** L. Battaglia, M. Cruchaga, M. Storti

Wed, 19/03/2025 14:45 - 16:45 Sudamérica

MS024A - Physics-based and Data-driven Low-order Modeling for Turbulent Flows I

Main Organizer: Dr. Benjamin Herrmann (Pontificia Universidad Católica de Chile)
Chaired by: Dr. Benjamin Herrmann (Pontificia Universidad Católica de Chile), Eng. Erick Kracht (University of Chile)

Data-driven approaches for simulation, modeling and control of complex fluid flows **Keynote**

***A. Nair**

Connecting modal decompositions with instantaneously present flow structures via explainable AI

***B. Reyes,** A. Cremades, R. Vinuesa, B. Herrmann

Cause-and-effect approach to reduced-order modeling of turbulence

***Á. Martínez-Sánchez,** A. Lozano-Durán

Data-Driven Reduced Order Modeling of Extreme Events in Turbulent Flows

***N. Zolman,** S. Mokbel, S. Otto, N. Kutz, S. Brunton

A High Reynolds Number Data-Driven Modification to the Spalart-Allmaras Turbulence Model

***C. Jordan,** M. Barone, E. Parish

Wed, 19/03/2025 14:45 - 16:45 Centroamérica

MS027B - The human circulation and associated diseases: models, methods and simulations. II

Main Organizer: Prof. Lucas Omar Müller (University of Trento)
Chaired by: Prof. Giulia Bertaglia (University of Ferrara), Prof. Eleuterio F. Toro (University of Trento)

Multiscale Computational Modeling for Cardiogenic Shock: Integration of Circulatory Support and Pharmacological Strategies

***C. Contarino,** F. Chifari

Optimizing the Outcome of veno-venous Extracorporeal Membrane Oxygenation via Patient-Specific CFD

B. Ondrusova, M. Leoni, J. Szasz, J. Meier, ***L. Gerardo-Giorda**

Computational Model of Stented Coronary Arteries: Influence of Hemodynamics and Pharmacokinetics on Restenosis

***A. Ranno,** F. Vogt, K. Linka, M. Behr

AI-Informed Physics-Based Models for Pulmonary Perfusion and Ventilation Estimates from Non-Contrast Imaging

***J. Cisneros,** C. Herrera, Y. Liu, E. Castillo

Wed, 19/03/2025 16:45 - 17:15

Coffee Break

Wed, 19/03/2025 17:30 - 18:30 Norteamérica

PL03 - Plenary Lecture III

Prof. Rainald Löhner (George Mason University)
Chaired by: Dr. Franco Perazzo (Universidad Técnica Federico Santa María)

Timestepping for Barely Coupled Multiphysics

***R. Lohne**

Wed, 19/03/2025 20:00 - 23:00

Banquet Dinner

Thursday, 20/03/2025

Thu, 20/03/2025 08:00 - 09:30

Registration

Thu, 20/03/2025 09:30 - 11:30 Norteamérica

MS016B - Joint Brazil-Chile-Inria MS on Innovative Numerical Methods for Fluids II

Main Organizer: Dr. Frederic Valentin (LNCC)
Chaired by: Dr. Rodolfo Araya (Universidad de Concepcion)

Recent Advances in Scientific Machine Learning for Coupled Fluid Flow and Transport

***A. Coutinho**

Multiscale Five-field Composite Mixed Finite Elements for Biot Problems Based on General Polyhedral Partitions

M. Correa, O. Durán, A. Farias, ***S. Gomes,** J. Lee

Post-processing for the Dual Variables From a Primal Hybrid Solution of the Biot System

***G. Taraschi,** M. Correa

A Multiscale Hybrid Method

G. Barrenechea, A. Gomes, ***D. Paredes**

Recent results on the multiscale hybrid-mixed method for Stokes and Brinkman equations

R. Araya, C. Harder, A. Poza, ***F. Valentin**

Thu, 20/03/2025 09:30 - 11:30 Parinacota

MS006B - Computational Fluid Mechanics with Free and Moving Boundaries: Methods and Applications II

Main Organizer: Dr. Rekha Rao (Sandia National Laboratories)
Chaired by: Dr. David Noble (Sandia National Laboratories), Dr. Rekha Rao (Sandia National Laboratories)

Modeling Direct Ink Write of sinusoidal patterns using the conformal decomposition finite element method

***A. Kucala,** R. Rao, M. Golobic, T. Weisgraber

Extrusion Models for Viscoelastic Fluids

***R. Rao,** W. Ortiz, S. Lindberg, M. Hamersky

Simulation of open channel flow and rotating sliding mesh with open source CFD code CAFFA3D

***R. Pienika,** J. Cataldo, H. Ramos

Moving Boundaries with Reactions

***V. Voller,** E. Detournay

Numerical and Experimental Analysis of Sloshing in Rectangular Tanks Subjected to Vertical Imposed Motion

***O. González Cofré,** M. Cruchaga, M. Lacroix, E. Fernández Sanchez, J. Ponthot, D. Celentano

Thu, 20/03/2025 09:30 - 11:30 Tupungato

MS010C - Fluid-structure interaction: Methods and applications III

Main Organizer: Dr. Laura Battaglia (CIMEC)
Chaired by: Dr. Luciano Garelli (CIMEC-CONICET), Dr. Laura Battaglia (CIMEC)

Efficient Fluid-Structure Interaction Simulations Using Homogenized Lattice Boltzmann Methods in OpenLB

***A. Kummerländer,** F. Bukreev, S. Ito, M. Krause

Wall Modelled Large Eddy Simulation Approach with Incompressible Homogenized Lattice Boltzmann Method Using OpenLB

***F. Bukreev,** A. Kummerländer, S. Ito, M. Krause

A Highly Parallelizable Robin-Robin Loosely Coupled Method for Practical Applications in Fluid-Poroelastic Structure Interaction

***Y. Wang**

Thu, 20/03/2025 09:30 - 11:30 Sudamérica

MS024B - Physics-based and Data-driven Low-order Modeling for Turbulent Flows II

Main Organizer: Dr. Benjamin Herrmann (Pontificia Universidad Católica de Chile)
Chaired by: Dr. Aditya Nair (University of Nevada Reno), Eng. Erick Kracht (University of Chile)

Sparse sensor placement for turbulent flow field reconstruction based on mean-flow-linearized dynamics

***E. Kracht,** S. Brunton, B. McKeon, B. Herrmann

Nonlinear Reduced-Order Models of Turbulent Channel Flow Using Mean-Flow-Based Balanced Modes

***I. Addison-Smith,** B. Herrmann

Reduced Order Modeling of Roughness Sublayer Turbulence Using Resolvent Analysis

***M. Chan,** U. Piomelli, B. McKeon

Resolvent analysis for the study of intermittent bursting in channel flow

***E. Ballouz,** S. Dawson, J. Bae

Resolvent Analysis of the Atmospheric Boundary Layer

***L. Freire,** M. Ribeiro, M. Araújo, L. Souza

Thu, 20/03/2025 09:30 - 11:30 Centroamérica

MS015A - Innovative numerical methods for non-Newtonian or non-homogeneous flows I

Main Organizer: Dr. Douglas Pacheco (RWTH Aachen University)
Chaired by: Dr. Douglas Pacheco (RWTH Aachen University), Dr. Ernesto Castillo (University of Santiago de Chile)

An adaptive superconvergent variational multiscale finite element method based on local residual minimization for generalized Newtonian fluids

N. Barnafi, E. Castillo, ***P. Vega**

A VMS Finite Element Formulation for the Numerical Simulation of Phase Change Problems with Variable Density

***R. Cabrales,** E. Castillo, J. Gutierrez-Santacreu

Unconditionally stable, linearized IMEX schemes for incompressible flows with variable density

***N. Espinoza-Contreras,** D. Pacheco

A fully decoupled and unconditionally stable IMEX method for dispersed multi-phase flows

***D. Pacheco**

A temperature reconstruction framework for food freezing process in mixed turbulent flows by FV-URANS forward simulations and data assimilation techniques with optimal sensor placements

***D. Rivera,** E. Castillo, F. Galarce

Thu, 20/03/2025 09:30 - 11:30 Llaima

MS011A - Forward and inverse problems in biofluids and biomechanics I

Main Organizer: Ms. Anna Ranno (RWTH Aachen University)
Chaired by: Ms. Anna Ranno (RWTH Aachen University), Dr. Felipe Galarce (Pontificia Universidad Católica de Valparaíso)

A Novel SPH Model for Thrombus Formation

S. Laha, G. Fourtakas, P. Das`, ***A. Keshmiri**

Multifidelity approaches for computational fluid dynamics in cardiovascular applications

***P. Africa,** S. Rathore, G. D'Inverno, S. Salavatidezfouli, G. Rozza

A comprehensive study of blood flows reconstruction from 4D-flow data in large arteries using variational data assimilation tools

***F. Galarce**

Non-invasive Estimation of Pressure Curves in Arteries Using Physics-Informed Neural Networks

***S. Jara,** F. Galarce, H. Mella, R. Ñanculef, F. Sahli, I. Valverde, S. Uribe, J. Sotelo

Eulerian Description of Flow-Induced Red Blood Cell Deformation for Computational Hemolysis Prediction

***N. Dirkes,** M. Behr

Thu, 20/03/2025 11:30 - 12:00

Coffee Break

Thu, 20/03/2025 12:00 - 13:00 Norteamérica

PL04 - Plenary Lecture IV

Prof. Eleuterio F. Toro (University of Trento)
Chaired by: Prof. Nelson Orlando Moraga Benavides (Universidad de La Serena)

Hyperbolic systems: fluxes, fluctuations and computational algorithms

***E. Toro**

Thu, 20/03/2025 13:00 - 14:00

Lunch Break

Thu, 20/03/2025 14:00 - 15:00 Norteamérica

SPL06 - Semi-Plenary VI

Dr. Laura Battaglia (CIMEC)
Chaired by: Dr. Miguel A. Fernández (Inria)

Computational Modeling and Experimental Validation of Free Surface Flows and Related Problems

***L. Battaglia**

Thu, 20/03/2025 14:00 - 15:00 Sudamérica

SPL07 - Semi-Plenary VII

Dr. Gabriel R. Barrenechea (University of Strathclyde)
Chaired by: Dr. Felipe Galarce (Pontificia Universidad Católica de Valparaíso)

Positivity-preserving Discretisations Without Mesh Restrictions

***G. Barrenechea**

Thu, 20/03/2025 15:15 - 17:15 Norteamérica

MS016C - Joint Brazil-Chile-Inria MS on Innovative Numerical Methods for Fluids III

Main Organizer: Dr. Frederic Valentin (LNCC)
Chaired by: Dr. Frederic Valentin (LNCC)

An adaptive stabilized finite element method for Darcy's equations with pressure-dependent viscosities

***R. Araya,** A. Poza, C. Carcamo

Enhanced mass conservation in low-order fictitious domain methods

***M. Fernández**

Numerical approximation for a coupled fluid flow problem arising from reverse osmosis modeling

***M. Solano**

Weakly imposed slip conditions in Navier-Stokes, analysis and turbulence modeling

A. Bansal, ***N. Barnafi,** D. Pandey

Thu, 20/03/2025 15:15 - 17:15 Parinacota

MS003A - Heat Transfer, Combustion and Fire Dynamics I

Main Organizer: Dr. Franco Perazzo (Universidad Técnica Federico Santa María)
Chaired by: Dr. Franco Perazzo (Universidad Técnica Federico Santa María), Prof. Diego Celentano (Pontificia Universidad Católica de Chile)

Score-Based Diffusion Models with Autocorrelation Regularization for Fluid Flow Prediction

***W. Genuist,** É. Savin, F. Gatti, D. Clouteau

A study on ignition criteria of wood boards when exposed to firebrands-like and flames-like incident heat fluxes in numerical simulations using FDS

W. Oliveira, R. Helfenstein, M. Beshir, P. Reszka, ***F. Centeno**

Effect of Hydrogen use on the Characteristics of a Natural Gas and Hydrogen Combustion Process

***M. Otero Iregui,** O. López Mejía, C. Sedano Quiroz

Sparse Sensor Placement and Physics Informed Neural Networks for Temperature and Velocity Fields Reconstruction in Axisymmetric Flames

***C. López,** B. Herrmann, R. Demarco, F. Escudero

Slip-Flow and Axial Diffusion Effects in Conjugate Heat Transfer: An Integral Transform and FEM Analysis

M. Brito, ***D. Chalhub**

Thu, 20/03/2025 15:15 - 17:15 Tupungato

MS020A - Multiphase flow and transport at microscale and in porous media I

Main Organizer: Dr. Pablo Gamazo (Universidad de la República)
Chaired by: Dr. Pablo Gamazo (Universidad de la República), Prof. Pablo A. Kler (CIMEC (UNL-CONICET))

Preliminaries Results on the Use of Non-Uniform Algebraic Dynamic Multilevel and Multiscale Method as a Preconditioner for the Numerical Simulation of Two-Phase Flows in Porous Media

J. Araujo dos Santos, D. Elisiáario de Carvalho, R. Willmersdorf, A. Echevarria Antunes, J. Pereira Rodrigues, ***P. Maciel Lyra**

3D Numerical prototyping of universal droplet generators

D. Harispe, ***P. Kler**

Efficient GPU-Based Eulerian TVD Methods for Macrodispersion Analysis in 2D and 3D Heterogeneous Porous Media

***L. Bessone,** P. Gamazo, J. Ramos, E. Alvareda

GPU resolution of reactive transport problems with variable porosity for porous media with high heterogeneity

***P. Gamazo,** L. Bessone, J. Ramos, A. Saracho, E. Alvareda

Thu, 20/03/2025 15:15 - 17:15 Sudamérica

MS002A - Advances in Numerical Methods for Coupled Flows in Civil and Environmental Engineering I

Main Organizer: Dr. Jorge Molina (University of Granada)
Chaired by: Dr. Jorge Molina (University of Granada), Dr. Rafael Bravo Pareja (University of Granada)

A Coupled Model for Cohesionless Sediment Transport in Non-Saturated Conditions
***J. Molina,** P. Ortiz, R. Bravo

Effects of varying sea breeze profiles on the coastal Stratocumulus dissipation
***F. Rojas,** M. Zamora Zapata

Enhancing Surrogate Modeling for Turbidity Currents via Super-Resolution with Diffusion Models
R. Sousa, A. Cortes, ***R. Velho,** G. Barros, F. Rochinha, A. Coutinho

Reduced Order Modelling for Water Waves using Incompressible Navier-Stokes Simulation
***A. Engsig-Karup,** A. Melander

Numerical Analysis of the Onset and Development of Sandy Bed Erosion Due to Pipeline Leaks
***S. Avendaño,** Y. Niño

A Coupled Non-Oscillatory Model for Geysering-Induced Flow Propagation in Reduced-Depths
***R. Bravo Pareja,** J. Molina Moya, P. Ortiz

Thu, 20/03/2025 15:15 - 17:15 Centroamérica

MS015B - Innovative numerical methods for non-Newtonian or non-homogeneous flows II

Main Organizer: Dr. Douglas Pacheco (RWTH Aachen University)
Chaired by: Dr. Ernesto Castillo (University of Santiago de Chile), Dr. Douglas Pacheco (RWTH Aachen University)

Non-residual-based stabilization formulation for liquid-solid phase-change flows including macrosegregation scenarios
***E. Castillo,** R. Cabrales, D. Pacheco

Fully decoupled fractional-step method for non-linear viscoelastic flows in phase change
***I. Aguirre,** E. Castillo, D. Pacheco

Non-Newtonian convective solid-liquid phase changes at low and high temperatures described by fast-accurate finite volume method
J. Jaime Rojas, L. Poblete Rojas, ***N. Moraga Benavides**

Anderson Acceleration Method in FVM for Non-Newtonian Convective Problems: Thermal Coupling and Phase Change
***F. Díaz,** E. Castillo, R. Cabrales, N. Moraga

Thu, 20/03/2025 15:15 - 17:15 Llaima

MS011B - Forward and inverse problems in biofluids and biomechanics II

Main Organizer: Ms. Anna Ranno (RWTH Aachen University)
Chaired by: Dr. Felipe Galarce (Pontificia Universidad Católica de Valparaíso), Ms. Anna Ranno (RWTH Aachen University)

Computational analysis of turbulent flow structures in the left ventricle using a fluid-structure interaction model of the mitral valve **Keynote**
***J. Hoffman,** J. Kronborg

Resistive valves in electro-fluid-structure interaction models of the heart
***M. Bucelli,** L. Dede'

Identification of the Unloaded Configuration Considering Surrounding Tissue Interactions in Cardiovascular Mechanics
***J. Jilberto,** W. Zhang, D. Nordsletten

A Diffusion-Inertia Model for Respiratory Aerosol Deposition
***M. Giordano,** J. Miranda?Fuentes, J. Jacob

Thu, 20/03/2025 17:15 - 18:00 Norteamérica

- Closing Ceremony and Farewell Coffee