

Contents

Part I Invited Lectures

Environmental Fluid Mechanics: Applications to Weather Forecast and Climate Change	3
Leonardo Di G. Sigalotti, Eloy Sira, Jaime Klapp and Leonardo Trujillo	
Turbulent Diffusion of Heat at High Rayleigh Numbers	37
Joseph J. Niemela	
Numerical Simulation of Sliding Drops on an Inclined Solid Surface	47
Marco Maglio and Dominique Legendre	
Fluids in Cosmology	71
Jorge L. Cervantes-Cota and Jaime Klapp	
Fluid Mechanics and Systems Biology for Understanding the Cosmic Distribution of Life: A Review	107
Julián Chela-Flores	
The Impact of Computational Fluid Mechanics on Cancer Research	121
Dimas C. Belisario and Leonardo Di G. Sigalotti	
Growth of Bubbles in Reservoirs and Its Consequences on the Foam Formation.	141
Abel López-Villa and Abraham Medina	
Theoretical Physics of Granular Fluids and Solids	165
Leonardo Trujillo and Leonardo Di G. Sigalotti	
Shock Structure and Acoustic Waves in a Supersonic Jet	193
Catalina Stern Forgach and José Manuel Alvarado Reyes	

Complex Fluids, Soft Matter and the Jamming Transition Problem	211
Alberto A. Díaz and Leonardo Trujillo	
A Multiphase Approach to Model Blood Flow in Micro-Tubes	235
T. M. Mubita, L. R. Rojas-Solórzano and J. B. Moreno	
Perspective: The Breakup of Liquid Jets and the Formation of Droplets	249
José R. Castrejón-Pita and Ian M. Hutchings	
Experimental Investigation of Thermal Diffusion in Binary Fluid Mixtures	259
Humberto Cabrera	
Stellar Mass Accretion Rates from Fragmentation of a Rotating Core	271
Jaime Klapp, Leonardo Di G. Sigalotti and Miguel Zavala	
Biocompatible Treatment of Extra Heavy Oil Produced in Venezuela	289
Ledys Y. Sánchez, Efrén D. J. Andrades, Erick A. Pacheco, Hilda C. Grassi, Carlos R. Vera-Lagos and Victor J. Andrades-Grassi	
Dynamical Behaviour of As(V) and Se(IV) Adsorption in Biofilters: Analysis of Dimensions, Flux and Removal Percentage	297
Jaime Klapp, Carlos E. Alvarado-Rodríguez and Elizabeth Teresita Romero-Guzmán	
 Part II Drops, Particles and Waves	
The Geometry of Drop-Formed Vortex Rings.	307
Franklin Peña-Polo, Armando Blanco and Leonardo Di G. Sigalotti	
Hydrodynamics of Multiple Coalescence Collisions of Liquid Drops: From the Modelling of the Coalescence Phenomenon to Flocculation of Drops in 3D Using the SPH Formalism	315
Alejandro Acevedo-Malavé	
A Three-Dimensional SPH Approach for Modelling the Collision Process Between Liquid Drops: The Formation of Clusters of Unequal-Sized Drops	325
Alejandro Acevedo-Malavé	

Numerical Simulations of Freely Oscillating Drops	335
Jorge Troconis, Armando Blanco, Dominique Legendre, Leonardo Trujillo and Leonardo Di G. Sigalotti	
Brownian Dynamics Simulation by Reticular Mapping Matrix Method	345
Eric Plaza	
Faraday Wave Patterns on a Triangular Cell Network	357
Franklin Peña-Polo, Iván Sánchez and Leonardo Di G. Sigalotti	
 Part III Multiphase and Multicomponent Flow	
Gas-Liquid-Solid Volumetric Phase Distribution Estimation in a Cold Slurry Bubble Column System for Hydro-Conversion Processes	369
Miguel V. Paiva-Rojas, Virginia Contreras-Andrade and Solange C. Araujo	
Feasibility of Slug Flow Simulation Using the Commercial Code CFX	379
Mauricio A. Labarca, Juan J. González and Carlos Araujo	
Heavy Oil Transportation as a Solid-Liquid Dispersion	389
Adriana Brito, H. Salazar, Ramón Cabello, Jorge Trujillo, L. Mendoza and L. Alvarez	
Comprehensive Evaluation of Gas-Liquid Cyclonic Separation Technologies	397
Yessica Arellano, Adriana Brito, Jorge Trujillo and Ramón Cabello	
Geometric Design Optimization of a Prototype Axial Gas-Liquid Cyclonic Separator	409
Luis D. Pérez Guerra, Jorge Trujillo and William Blanco	
Effect of Hydrotreating Reaction Conditions on Viscosity, API Gravity and Specific Gravity of Maya Crude Oil	423
Yanet Villasana, Sergio Ramírez, Jorge Ancheyta and Joaquín L. Brito	
Mechanistic Model for Eccentric Annular Gas-Liquid Flow in Horizontal Pipelines	431
Adriana Brito, Nelson MacQuhae, Francisco García, Nelson Fernández and José Colmenares	

Scaling Properties in the Adsorption of Ionic Polymeric Surfactants on Generic Nanoparticles of Metallic Oxides by Mesoscopic Simulation	443
Estela Mayoral and Eduardo Nahmad-Achar	
Effect of Mixtures of Polysorbate 80 and Low Molecular Weight Alcohols on Density and $^{\circ}$API Gravity of Treated Venezuelan Extra Heavy Oil	453
Efrén D. J. Andrades, Ledys Y. Sánchez, Hilda C. Grassi, Erick A. Pacheco, Silvia E. Andrades-Grassi and Gerardo E. Medina-Ramírez	
 Part IV Granular and Porous-Media Flow	
On the Construction of a Continuous Theory for Granular Flows. . . .	463
Juan C. Petit, Juan F. Marín and Leonardo Trujillo	
Integral Representation for Continuous Matter Fields in Granular Dynamics.	473
Juan F. Marín, Juan C. Petit, Leonardo Di G. Sigalotti and Leonardo Trujillo	
Numerical SPH Calculations of Fluid Flow Through Saturated and Non-Saturated Porous Media	481
Estela Mayoral, Mario A. Rodríguez-Meza, Eduardo de la Cruz-Sánchez, Jaime Klapp, Francisco Solórzano-Araujo, César Ruiz-Ferrel and Leonardo Di G. Sigalotti	
 Part V Astrophysical and Relativistic Flow	
Propagation of Longitudinal Waves in Super-Radially Expanding Solar Plumes.	499
Leonardo Di G. Sigalotti, Jordan A. Guerra and Hailleen Varela	
Comparing Accretion Centres Between Rotating and Turbulent Cloud Cores	509
Guillermo Arreaga-García and Jaime Klapp	
Statistical Methods for the Detection of Flows in Active Galactic Nuclei Using X-Ray Spectral Lines	521
Luis F. Pérez and José M. Ramírez	

**Reproducing the X-Ray Soft Step @ 0.9 keV Observed
in the Spectrum of Ark 564 Using Reflection Models 529**
José M. Ramírez and Snell Rojas

**Dynamics of Relativistic, Dissipative and Anisotropic
Self-Gravitating Fluids 535**
Orlenys Troconis

**Hydrodynamic Version of the Equation of Motion
of a Charged Complex Scalar Field 545**
Mario A. Rodríguez-Meza and Tonatiuh Matos

Computational and Experimental Fluid Mechanics with
Applications to Physics, Engineering and the
Environment

Sigalotti, L.D.G.; Klapp, J.; Sira, E. (Eds.)

2014, XXIII, 554 p. 195 illus., 109 illus. in color.,

Hardcover

ISBN: 978-3-319-00190-6