Exponent®
Engineering & Scientific Consulting

Ruy Ibanez, Ph.D.

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Professional Profile

Dr. Ibanez has professional and academic experience in analyzing fluid mechanics and structures, including fluid-structure interaction (FSI) analyses. His projects have involved structural analysis of oil and gas offshore systems, fluid mechanics related to biomedical and mixing in biophysical applications, oceanographic fluid flow research and experimental research of the transition to instability in density varying fluid flows. Projects have involved use of computational, analytic and experimental approaches. Tools used in the projects included Flexcom, Abaqus, ANSYS Fluent, COMSOL, Python, MATLAB, CNC Machining, CAD design and CAM using Autodesk and SolidWorks.

Prior to joining Exponent, Dr. Ibanez worked on structural analyses of oil and gas offshore systems involving global riser analysis and component design support. His work was performed for various offshore operators. The analyses consisted of strength and fatigue assessments to determine the feasibility of riser systems for the intended operations.

During his doctoral degree, Dr. Ibanez researched fluid flows in the context of biophysical applications. He developed an experimental model of peristaltic pumping in the inner ear, which was complemented with analytic and numerical analysis using COMSOL simulations. His findings demonstrated that peristaltic pumping may be a key mechanism in the function of the inner ear. He also studied oscillating flows in looped channels where bifurcations are present. These looped channel systems are present in microfluidic applications and biological systems. Using an experimental model, he was able to determine that the geometric features of bifurcations can lead to an oscillating flow to become rectified such that a net flow inside the loop is produced. He complemented his experimental findings by developing an analytical model and using numerical simulations in ANSYS Fluent to determine the underlying mechanism that produced the rectification effect.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Rochester, 2023

M.S., Mechanical Engineering, University of Rochester, 2019

B.S., Physics, University of Texas, Austin, 2015

Prior Experience

Engineer, 2H Offshore, 2022-2023

Graduate Research Assistant, University of Rochester, 2017-2022

Graduate Research Assistant, Baylor University, 2015-2017

Research Assistant, University of Texas at Austin, 2013-2015

Professional Affiliations

ASME (American Society of Mechanical Engineers)

APS (American Physical Society)

Publications

R. Ibanez, A. Raghunandan, DH Kelley. Geometry-induced rectification of looped oscillatory flows. Phys. Rev. Fluids 2023; 8, 113101. doi:10.1103/PhysRevFluids.8.113101

R Ibanez, DH Kelley. A bioinspired apparatus for modeling peristaltic pumping in biophysical flows. Bioinspiration & Biomimetics 2022; 17 (6), 066023.

R Ibanez, M Shokrian, JH Nam, DH Kelley. Simple analytic model for peristaltic flow and mixing. Physical review fluids 2021; 6 (10), 103101.

R Ibanez, J Kuehl, K Shrestha, W Anderson. Brief Communication: A nonlinear self-similar solution to barotropic flow over varying topography. Nonlinear Processes in Geophysics 2018; 25:201-205.

R Ibanez, HL Swinney, B Rodenborn. Observations of the stratorotational instability in rotating concentric cylinders. Physical Review Fluids 2016; 1 (5), 053601.

Presentations

Ruy Ibanez, Mohammad Shokrian, Jong-Hoon Nam, Douglas H. Kelley; Simple Analytic Model for Peristaltic Flow and Mixing; SB3C; Cambridge, MD, 2022.

Ruy Ibanez, Mohammad Shokrian, Jong-Hoon Nam, Douglas H. Kelley; Experimental modeling of fluid homeostasis in the mammalian hearing organ; American Physical Society Division of Fluid Dynamics; Seattle, WA, 2019.

Ruy Ibanez, Catherine A. Knox, Jong-Hoon Nam, Douglas H. Kelley; Experimental modeling of fluid homeostasis in the mammalian hearing organ; American Physical Society Division of Fluid Dynamics; Atlanta, GA, 2018.

Ruy Ibanez Amador, Douglas Kelley, Jong-Hoon Nam; Experimental modeling of fluid homeostasis in the mammalian hearing organ; American Physical Society March Meeting; Los Angeles, CA, 2018.

Ruy Ibanez, Joseph Kuehl, Kalyan Shrestha, William Anderson; A nonlinear self-similar solution to barotropic flow over rapidly varying topography; American Physical Society Division of Fluid Dynamics; Denver, CO, 2017.

Ruy Ibanez, Joseph Kuehl; A nonlinear self-similar solution to barotropic flow over rapidly varying topography; American Physical Society Division of Fluid Dynamics; Portland, OR, 2016.

Ruy Ibanez, Harry L. Swinney, Bruce Rodenborn; Observation of the Stratorotational Instability in Flow between Rotating Concentric Cylinders; American Physical Society March Meeting; San Antonio, TX, 2015.

Project Experience

Performed global riser analysis for various offshore operators where the analysis was focused on intervention operations. Scopes included riser strength and fatigue analysis during connected and disconnected operations.

Supported offshore equipment design by providing loading analyses for design phase surface equipment in offshore riser systems. The resulting assessment aided collaborators in adjusting design capacities to accommodate extreme loading scenarios.

Experimentally researched oscillating fluid flows in closed loop systems using custom designed equipment. The experimental results were complemented with analytical and computational analyses. The study found an unexpected mechanism for producing a net flow in a looped channel, whose applications are linked to microfluidics and biological fluid flows.

Studied peristaltic pumping in biophysical and biomedical contexts using experiments, analytical models and numerical simulations. The study enhanced current understanding of the mammalian inner ear functions.

Developed analytical models for oceanographic fluid flows over a varying topography. The study resulted in advances toward deeper understanding and improved modeling of flows in oceanographic applications.

Investigated transition to unstable flow in density varying rotating fluids using experiments. The results advanced the understanding of the underlying mechanisms in the formation of planets.

Peer Reviews

Journal of Fluid Mechanics