Jorge Sandoval

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Research Experience

2026 **EPSRC Postdoctoral Fellow, University of Dundee (UK)**: Research in Numerical Fluid Mechanics and Dynamical Systems in Wave-Current Boundary Layers.

2023-2025 **Postdoctoral Research Assistant, University of Dundee (UK)**: Research in Numerical Fluid Mechanics and Dynamical Systems as part of the EPSRC-funded project "Saving energy via drag reduction: a mathematical description of oscillatory flows".

2019 **Full-time Research Engineer Internship, University of Edinburgh (UK)**: Conceptualisation of numerical models to represent the interaction between waves and strong currents in tidal channels

2017-2019 **Research Engineer, Marine Research and Innovation Center (Chile)**: i) High-fidelity numerical and experimental analysis of marine hydrokinetic turbines. ii) Field measurements for hydrodynamic characterisation of the Magellan Strait and Fitz-Roy Channel.

Education

University of Edinburgh - Universidad Católica de Chile *Edinburgh, UK – Santiago, Chile*
PhD in Engineering (Joint Degree UoE-UC) *2019 – 2025*

- **Supervisors**: Professors David Ingram (UoE) and Cristián Escauriaza (UC)
- **Thesis title**: Unsteady three-dimensional flows dominated by free-surface dynamics: numerical insights for fluvial and coastal applications

Universidad Católica de Chile *Santiago, Chile*
MSc in Civil and Environmental Engineering *2015 – 2018*

- **Supervisors**: Professors Cristián Escauriaza (UC) and Emannuel Mignot (INSA-Lyon, France)
- **Thesis title**: Field and numerical investigation of transport mechanisms in a surface storage zone

Universidad Católica de Chile *Santiago, Chile*
Bachelor and professional degree in Civil Engineering *2009 – 2015*

- Specialisation in Hydraulic Engineering

Publications

Published

Sandoval, J., Eaves, T. Edge states and the periodic self-sustaining process in the Stokes boundary layer. *Journal of Fluid Mechanics*. 2025;1022:A10. doi:10.1017/jfm.2025.10725

Sandoval, J., Soto-Rivas, K., Gotelli, C., Escauriaza, C. (2021). Modeling the wake dynamics of a marine hydrokinetic turbine using different actuator representations. *Ocean Engineering*, 222 https://doi.org/10.1016/j.oceaneng.2021.108584

Winckler, P., Molteni, F., Reyes, M., Gubler, A., **Sandoval, J.**, & Aleixo, R. (2021). Is Rhodamine a good tracer to predict coal transport in water?. *Obras y Proyectos*, (30), 16-29.

Sandoval, J.., Mignot, E., Mao, L., Pastén, P., Bolster, D., Escauriaza, C. (2019). Field and Numerical Investigation of Transport Mechanisms in a Surface Storage Zone. *Journal of Geophysical Research: Earth Surface, 124*. https://doi.org/10.1029/ 2018JF004716

Vargas, X. M., McPhee, J. T., Vicuña, S., Suarez, F., Meza, F., Daniele, L., Rondanelli, R., Lagos, M. Z., Mendoza, P., Bambach, N., Boisier, J. P., Cepeda, J. A., Vásquez, N. P., Morales, D., **Sandoval, J.**, Negri, A., & Caro, A. (2017). Actualización balance hídrico en Chile. Metodología y desafíos en modelación. *Proceedings of XXIII Congreso Chileno de Ingeniería Hidráulica*

Gironás, J., **Sandoval, J.** (2017). Riesgo de origen hidrometeorológico en la ciudad de Santiago. *Santiago Resiliente*

In Preparation

Sandoval, J., Ingram, D. , Escauriaza, C. A single-phase Level-Set method for unsteady free surface flows in generalised curvilinear coordinates: geometric-based reinitialisation and physically-consistent dynamic boundary conditions. In preparation for the *Journal of Computational Physics*

Sandoval, J., D. , Eaves, T. Edge states in a boundary layer under the action of spanwise oscillation. In preparation for the *Journal of Fluid Mechanics*

Sandoval, J., D. , Eaves, T. Drag reduction in boundary layer flows under spanwise oscillation: edge states and Self-sustaining Process disruption mechanisms. In preparation for the *Journal of Fluid Mechanics*

Grants and Funded Projects

UKRI Mathematical Sciences Small Grant, UK Research and Innovation - (EPSRC)
Co-lead investigator. Funded original research in Wave-Current Boundary Layers. Awarded £100,000 over 12 months (2026). Competitive grant supporting mathematical sciences research

Conferences and Presentations

Invited Talks

***Transition to turbulence in the Stokes Boundary Layer: Edge States and Periodic Self-Sustained Process (PSSP)* (Autumn 2025)** . Mathematics Seminar at the University of Dundee, UK.

***Three-dimensional turbulent flows dominated by free-surface dynamics: new insights for fluvial and coastal applications in renewable energy* (Autumn 2023)**. Institute for Infrastructure and Environment seminar at the University of Edinburgh, UK.

***Modelling of Hydrodynamic Processes in Aquatic Systems: From Contaminant Transport in Rivers to Marine Energy.* (Spring 2020)**. Civil Engineering Seminar at the University of Concepción, Chile.

Contributed Oral Presentations

European Fluid Dynamics Conference *Dublin, Ireland, 2025*
Transition to turbulence in the Stokes Boundary Layer: Edge States and the Periodic Self-Sustained Process (PSSP)

European Fluid Dynamics Conference *Dublin, Ireland, 2025*
Edge states in an oscillating boundary layer

International Couette-Taylor Workshop *Durham, UK, 2025*
Transition to turbulence in the Stokes Boundary Layer: Edge States and the Periodic Self-Sustained Process (PSSP)

SIAM Conference on Applications of Dynamical Systems *Denver, CO, USA, 2025*
Transition to turbulence in the Stokes Boundary Layer: Edge States and the Periodic Self-Sustained Process (PSSP) **(awarded with a travel fund by SIAM)**

Scottish Fluid Mechanics Meeting *Glasgow, UK, 2025*
Transition to turbulence in the Stokes Boundary Layer: Edge States and the Periodic Self-Sustained Process (PSSP)

American Physical Society - Division of Fluid Dynamics Meeting *Salt Lake City, UT, USA, 2024*
Transition to turbulence in the Stokes Boundary Layer: Edge States and Unsteady Self-Sustained Process (USSP)

Bifurcations and Instabilities in Fluid Dynamics *Edinburgh, UK, 2024*
Transition to turbulence in the Stokes boundary layer. Part 2: Edge States

American Physical Society - Division of Fluid Dynamics Meeting *Washington, DC, USA, 2023*
Vortical dynamics of supercritical flows in the vicinity of hydraulic structures

American Physical Society - Division of Fluid Dynamics Meeting *Phoenix, AZ, USA, 2021*
Hydrodynamics of Mixing and Transport in Transient Storage Zones

American Physical Society - Division of Fluid Dynamics Meeting *Phoenix, AZ, USA, 2021*
Turbulent transport dynamics in open-channel floodplains for different submergence conditions

American Physical Society - Division of Fluid Dynamics Meeting *Seattle, WA, USA, 2020*
Wake dynamics in horizontal hydrokinetic tidal turbines using three coupled DES-Actuator Model approaches

River Flow meeting, IAHR 9th international conference on fluvial hydraulics *Lyon, France, 2018*
Turbulent flow dynamics and mass transport processes in a natural storage zone using field data and numerical simulations

American Physical Society - Division of Fluid Dynamics Meeting *Portland, OR, USA, 2016*
Turbulent Coherent-Structure Dynamics in a Natural Surface-Storage Zone **(awarded with a travel fund by APS)**

Poster Presentations

Scottish Fluid Mechanics Meeting *Edinburgh, UK, 2024*
A single-phase Level-Set method for unsteady free surface flows: geometric-based reinitialisation and physically-consistent dynamic boundary conditions

American Geophysical Union (AGU) Fall Meeting *Washington D.C., USA, 2018*
A coupled DES - Actuator Lines Model to represent the interaction between tidal flows and Marine Hydrokinetic Turbines

American Geophysical Union (AGU) Fall Meeting *San Francisco, CA, USA, 2015*
Hydrodynamic characterization of a surface storage zone in a natural stream

Teaching Experience

Lecturer

2021	**Fluid Mechanics**	*Universidad Diego Portales*

Teaching Assistant

2023-2024	**Partial Differential Equations III**	*University of Edinburgh*
2022-2023	**Computational Fluid Dynamics V**	*University of Edinburgh*
2022-2023	**Marine Renewable Resource Assessment**	*University of Edinburgh*
2022-2023	**Fluid Mechanics IV**	*University of Edinburgh*
2015-2017	**Fluvial Hydraulics**	*Universidad Católica de Chile*
2016	**Hydrological Modelling**	*Universidad Católica de Chile*
2014-2016	**Hydraulic Design and Analysis**	*Universidad Católica de Chile*
2013-2016	**Fluid Mechanics**	*Universidad Católica de Chile*

Workshops and Courses

CISM-ECCOMAS Advanced course on "Machine Learning for Fluid Mechanics" *Udine, Italy, 2023*
Introduction to advanced machine learning methods and their application to complex fluid mechanics problems, including modelling, control, turbulence closures, and shape optimisation.
Coordinators: Professor **Bernd R. Noack** (Harbin Institute of Technology Shenzhen, China) and Professor **Steven Brunton** (University of Washington, USA)

CISM-ECCOMAS International Summer School on "Coherent Structures in Unsteady Flows: Mathematical and Computational Methods" *Udine, Italy, 2019*
Introduction to coherent structures and their modern computational tools.
Organiser: Professor **George Haller**, ETH Zurich, Switzerland

Summer Institute on Earth-Surface Dynamics *Minneapolis, MN, USA, 2018*
Mathematical tools for Earth casting, focusing on landscape connectivity and how signals (e.g. climate change) propagate through and are recorded in Earth-surface systems.
Organiser: Professors **Chris Paola** and **Vaughan Voller**, University of Minnesota, USA

Other Professional Experience

2017	**Project Engineer, UC Climate Change Center (Chile)** – Hydrological modelling of surface processes for the National Water Balance Project using VIC
2015–2016	**Project Engineer, Hydraulic Models Laboratory, DICTUC** – Construction, testing, and operation of physical models of hydraulic structures
2016	**Project Engineer, Research Centre for Integrated Disaster Risk Management** – Numerical modelling of flood events in urban areas

Professional Skills

Language

English (proficient) and **Spanish** (native)

Computer Skills

Advance knowledge: Fortran, Python, Matlab, Linux Environment, HEC-RAS, MPI, Tecplot and Pointwise

Basic knowledge: C, C++, OpenFOAM, Star-CCM+, CAD environment, Iber, VIC hydrological model

Awards

Award for excellence in teaching assistant career - School of Engineering at Universidad Católica de Chile (2015)

Padre Hurtado Scholarship - Universidad Católica de Chile (2009)

Referees

Tom Eaves (teaves001@dundee.ac.uk). Lecturer at the School of Science and Engineering, University of Dundee **(PI, Postdoctoral Research Assistant position project)**

David Ingram (david.ingram@ed.ac.uk). Professor of Computational Fluid Dynamics at School of Engineering, University of Edinburgh **(PhD supervisor)**

Cristián Escauriaza (cescauri@ing.puc.cl). Associate professor at Hydraulic and Environmental Engineering Department, Universidad Católica de Chile **(PhD and MSc supervisor)**