

# 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 Emmanuel 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

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### 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

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### 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

2014 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

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### 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

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**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

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**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**)