

Jonathan M. O. Massey, Ph.D.

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Summary

Computational physicist specialising in fluid dynamics. Postdoctoral fellow at Stanford University's Center for Turbulence Research combining data-rich simulations with experimental datasets to develop theoretical insight and low-cost statistical inference tools. Experienced in mathematical modelling of complex physical systems, designing and delivering research agendas, and building high-performance computing workflows for large-scale datasets through scientific software development.

Education

- **Ph.D. in Engineering & the Environment** — University of Southampton, UK
Nov 2019—Nov 2023
 - Thesis: Effect of roughness on aquatic locomotion
 - Built HPC simulation pipelines and analysis workflows on an in-house open-source solver
- **B.Eng. (Hons) Ship Science (First Class)** — University of Southampton, UK
Oct 2016—Jun 2019
 - Thesis: Effect of the diameter chord ratio on the performance of vertical-axis wind turbines

Relevant Employment & Experience

- **CTR (Center for Turbulence Research) Postdoctoral Fellow** — Stanford University
Nov 2025—Present
 - Develop models and inference tools for wall-pressure fluctuations in turbulent flows using direct numerical simulation and high-Reynolds-number experiments
 - Build workflows to extract, validate, and compare pressure statistics across large simulation and experimental datasets
 - Implemented a CUDA Poisson solver for turbulence analysis, reducing runtime from 3 days to 4 hours while preserving agreement with the CPU baseline
- **FPCE (Flow Physics & Computational Engineering) Postdoctoral Fellow** — Stanford University
Aug 2024—Nov 2025
 - Developed signal-processing pipelines and statistical analysis workflows for fluid-dynamics experiments
 - Used historical datasets and noise-rejection methods to quantify measurement uncertainty and support experimental design
 - Led modelling work in the SAPPHiRE campaign on wall-pressure fluctuations in canonical turbulent flows
- **Visiting Researcher** — Marine Transport Technology Group, TU Delft
Jan 2023—Jan 2024
 - Developed and implemented stability-analysis tools for periodic flows with moving boundaries

Core Skills

- **Mathematical modelling:** Formulation of complex physical problems as tractable predictive models grounded in first principles, asymptotic reasoning, and data.
- **Statistical inference:** Extraction of physical trends and uncertainty from large simulation and experimental datasets for model construction and hypothesis testing.
- **Machine learning / AI:** Use of modern data-driven methods and scientific ML tools to analyse large datasets, build predictive models, and accelerate scientific workflows.
- **Scientific computing:** Development of efficient, reusable computational workflows for simulation, analysis, and visualisation of large scientific datasets.

- **High-performance computing:** Use of parallel and accelerated computing tools to scale analysis and modelling workflows to large datasets and computationally intensive problems.
- **Signal processing:** Analysis of noisy multiscale data using spectral, statistical, and filtering methods to isolate relevant physical structure.
- **Literature synthesis:** Rapid assimilation of new technical fields and integration of ideas across theory, numerics, and experiment.
- **Independent research:** Definition and execution of open-ended technical projects with minimal supervision, from problem framing to delivery.
- **Cross-functional collaboration:** Work across theory, computation, and experiment, coordinating with collaborators from different technical backgrounds.
- **Scientific communication:** Clear presentation of complex technical ideas in papers, talks, and collaborative research settings.

Technical Skills

- **Programming languages:** Python (NumPy, scikit-learn, PyTorch, h5py), Fortran, Julia
- **High-performance computing:** Slurm, MPI/OpenMP, CUDA

Invited Talks

- **Two Parts: Fish, Then Fluctuations** – Princeton University, 2026
- **Data-Driven Origin of Large-Scale Shear Stress and Pressure Fluctuations** – University of Cambridge, 2025
- **Resolvent Analysis of a Swimming Foil** – TU Delft, 2023

Select Publications (See Google Scholar for full list)

- Massey, J.M.O., Smits, A.J., McKeon, B.J.
Two-component inner–outer scaling model for the wall-pressure spectrum at high Reynolds number. *Journal of Fluid Mechanics* (under review)
- Massey, J.M.O., Klewicki, J.C., McKeon, B.J.
Behind the logarithmic growth of the inner-normalised wall-pressure variance. CTR Brief; extension under review in *Journal of Fluid Mechanics*
- Jaroslowski, T.M., Cabrera-Booman, F., Massey, J.M.O., McKeon, B.J.
Wall-shear-stress measurement and characterisation at high Reynolds numbers. Manuscript in preparation for *Journal of Fluid Mechanics*
- Bernades, M., Massey, J.M.O., McKeon, B.J., Jofre, L.
Data-augmented resolvent analysis of wall-bounded high-pressure transcritical flow. *Journal of Fluid Mechanics* (rebuttal stage)
- Massey, J.M.O., Ganapathisubramani, B., Weymouth, G.D.
A systematic investigation into the effect of roughness on self-propelled swimming plates. *Journal of Fluid Mechanics*, 2023

Service

- Peer reviewer for *Journal of Fluid Mechanics*, *Physical Review Fluids*, and CTR Briefs
- Mentor for pre-college researcher at Stanford CTR
- Community college outreach and collaboration with visiting researchers