Nicolás Pablo **Müller**

Postdoc - Fluid Dynamics

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I am currently a post-doctoral researcher at the Laboratoire de Physique de l'École Normal Supérieure (LPENS) in Paris, France. My scientific work is focused on theoretical and numerical studies of magnetic reversals in geodynamo. By means of high-resolution direct numerical simulations, I explore how the presence of a stably-stratified layer below the core-mantle boundary affects the reversal process.

I am also interested in the properties of two- and three-dimensional quantum turbulent flows. My main studies focused on the differences and similarities of the intermittent behavior in classical and quantum turbulence using velocity circulation statistics.

Personal Details

- **Date of Birth:** 23 August 1994
- **Nationality:** Argentina / Switzerland
- **Professional address:** 24 Rue Lhomond, 75005 Paris, France

Experience

Laboratoire de Physique de l'ENS — *Paris, France*

Postdoctoral Researcher — *September 2023 - Ongoing*

- Magnetic reversals in geodynamo with a stably-stratified layer.

Observatoire Côte d'Azur — *Nice, France*

Postdoctoral Researcher — *February 2023 - August 2023*

- Study of circulation statistics in two-dimensional classical and quantum turbulence.

Education

PhD in Physics — *Nice, France*

Observatoire de la Côte d'Azur - Supervisor: Giorgio Krstulovic — *2019 - 2022*

- Thesis Title: *Quantum vortices, statistics of velocity circulation and excitations in superfluid turbulence*

***Licenciatura* in Physics Science (equivalent to Master of Science in Physics)** — *Buenos Aires, Argentina*

University of Buenos Aires — *2014 - 2019*

- **(Equivalent to) MS.c Thesis:** *Critical transition between 2D-3D flows in quantum turbulence — 2018-2019*
- **(Equivalent to) BS.c Thesis:** *Design and construction of a robust illumination system for SPIM Microscopy — 2017*

Prices

Thesis Prize — *Nice, France*

UniCA Foundation - EDSFA — *2022*

- Best thesis of 2022 of the Fundamental and Applied Science Doctoral School (EDSFA)

Reviewer for scientific journals

American Physics Society

- Physical Review Letters
- Physical Review B

Participation in international conferences

Bridging Classical and Quantum Turbulence — *Cargèse, France*

Oral presentation — *4 - 14 July 2023*

- Title: *Are 2D classical and quantum turbulence equivalent? Insights from velocity circulation statistics.*

26th Rencontre du non-linéaire — *Paris, France*

Oral presentation — *28 - 30 Mars 2023*

- Title: *Vortex clustering, polarisation and intermittency of velocity circulation in quantum turbulence.*

School on Nonlinearity, complex phenomena and universality for waves — *Porquerolles, France*

Poster presentation — *15 - 20 May 2022*

- Title: *Anomalous scaling of velocity circulation in quantum turbulence.*

Quantum Fluids School — *São Carlos, Brazil*

Poster presentation — *20 February - 4 March 2022*

- Title: *Anomalous scaling of velocity circulation in quantum turbulence.*

GDR Turbulence — *Paris-Saclay, France*

Oral presentation — *27 - 29 October 2021*

- Title: *Intermittency of velocity circulation in classical and quantum turbulence.*

WINE Conference — *Online*

Poster presentation — *1 - 2 July 2021*

- Title: *Kolmogorov and Kelvin wave cascades in quantum turbulence.*

UK quantum fluids webinar series — *Online*

Oral presentation — *12 July 2021*

- Title: *Intermittency of velocity circulation in quantum turbulence.*

24th Rencontre du non-linéaire — *Online*

Poster presentation — *24 - 26 March 2021*

- Title: *Intermittency of velocity circulation in quantum turbulence.*

StatPhys 27 — *Buenos Aires, Argentina*

Oral presentation — *8 - 12 July 2019*

- Title: *Critical transition between 2D-3D flows in quantum turbulence.*

Publications

[1] **N. P. Müller** and G. Krstulovic. Exploring the equivalence between two-dimensional classical and quantum turbulence through velocity circulation statistics. *arXiv:2306.17735* (2023).

[2] **N. P. Müller**, Y. Tang, W. Guo, and G. Krstulovic. Velocity circulation intermittency in finite-temperature turbulent superfluid helium. *Physical Review Fluids* **7**, 15 (2022).

[3] **N. P. Müller** and G. Krstulovic. Critical velocity for vortex nucleation and roton emission in a generalized model for superfluids. *Physical Review B* **105**, 014515 (2022).

[4] J. I. Polanco, **N. P. Müller**, and G. Krstulovic. Vortex clustering, polarisation and circulation intermittency in classical and quantum turbulence. *Nature Communications* **12**, 7090 (2021).

[5] **N. P. Müller**, J. I. Polanco, and G. Krstulovic. Intermittency of Velocity Circulation in Quantum Turbulence. *Physical Review X* **11**, 011053 (2021).

[6] **N. P. Müller** and G. Krstulovic. Kolmogorov and Kelvin wave cascades in a generalized model for quantum turbulence. *Physical Review B* **102**, 134513 (2020).

[7] **N. P. Müller**, M.-E. Brachet, A. Alexakis, and P. D. Mininni. Abrupt Transition between Three-Dimensional and Two-Dimensional Quantum Turbulence. *Physical Review Letters* **124**, 134501 (2020).

[8] B. Moretti, **N. P. Müller**, M. Wappner, and H. E. Grecco. Compact and reflective light-sheet microscopy for long-term imaging of living embryos. *Applied Optics* **59**, D89–D94 (2020).

Skills

Languages

- Spanish (*Native*)
- English (*Fluent in written and spoken*)
- German (*Intermediate*)
- French (*Intermediate*)

Computational Fluid Dynamics: Parallel computing (OpenMP and MPI)

Programming languages: Python - Fortran - Julia - Matlab - LaTeX