

# Non-equilibrium formulation for inertial particles in turbulent swirling flows

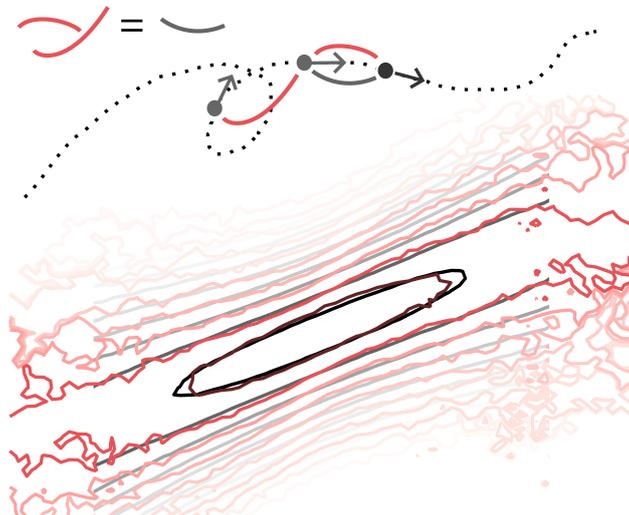
Bernardo Luciano Español

Universidad de Buenos Aires (UBA), Facultad de Ciencias Exactas y Naturales,  
Departamento de Física, Ciudad Universitaria, 1428 Buenos Aires, Argentina;  
[bespanol@df.uba.ar](mailto:bespanol@df.uba.ar)

Wednesday, March 4th (2026), 16:30 Paris Time  
[LMFL Fluid Mechanics Webinar Link](#)

## Abstract

Inertial particles transported by turbulent flows exhibit complex multiscale dynamics. Combining numerical simulations and laboratory experiments, we analyze particle velocity increments across scales and show that these dynamics are consistent with an approximate Markovian process, enabling a coarse-grained Fokker–Planck description with scale-dependent drift and diffusion coefficients. In this talk, I will first motivate the analysis in scale space and describe how the drift and diffusion coefficients can be computed directly from data, followed by a discussion of their interpretation. In particular, I will highlight how their structure reveals the coupling between particle inertia and turbulent intermittency. Finally, I will briefly outline how entropy can be computed for these stochastic scale dynamics, showing how this perspective enables the study of turbulent transport within a nonequilibrium thermodynamic framework.



Scientific contact: [Francesco Romanò](#)