LABEX CAPRYSSES Postdoctoral fellow position (F/M)

Title	Analysis and physical modelling of a turbulent wake growth in a turbulent free-stream	
Duration	12 months, full time, starting mid-Fall 2023	
Contacts	Nicolas Mazellier +33 2 38 49 43 87 nicolas.mazellier@univ-orleans.fr Azeddine Kourta +33 2 38 49 45 13 azeddine.kourta@univ-orleans.fr	Pierre-Yves Passaggia +33 2 38 49 46 74 pierre-yves.passaggia@univ-orleans.fr
Location	PRISME (UPRES 4229) 8 rue Léonard de Vinci 45072 Orléans Cedex 2 FRANCE http://www.univ-orleans.fr/fr/prisme	

Research activities:

The goal of this project aims at performing a physical analysis of a generic turbulent wake spreading in a turbulent free stream. This flow configuration is representative of real-life operating conditions for industrial and natural applications such as road vehicles, wind turbines, or buildings to only cite a few. More precisely, there are two objectives to this fundamental research work: (*i*) identify and (*ii*) characterise the mechanisms associated with the entrainment across the Turbulent-Turbulent Interface (TTI) which separates turbulent regions with different turbulent and therefore, physical properties. While the current state of the art regarding road vehicles and wind turbines essentially accounts for inviscid wake physics, this project will aim at determining physical models capable of accurately predicting turbulent mechanisms controlling the wake characteristics. This work is supported by the ANR LabEx CAPRYSSES, regarding near- and far-wake flows and their impact in terms of aerodynamics performances. The project will beneficiate from recent developments from our group for the analysis of Turbulent-Non Turbulent Interfaces (TNTI) [1], which will be extended to the more challenging case of the TTI.

The first phase of the project will aim developing and evaluate *a priori* and *posteriori* detection methods of the TTI for a canonical external flow. To do so, a seeding technique based on weekly diffusive passive tracers will be tested. This tagging method will allow for identifying the regions of interest for the analysis. Simultaneously, a triple or quadruple exposure stereo Particle Image Velocimetry method will allow for tracking the motion of the interface together with the velocity field across the interface. The *a priori* tagging method will be used as a reference method for validating the *a posteriori* analysis using the PIV where quantities such as small-scale anisotropy, seems particularly relevant to detect the TTI [2]. New potential candidates, such as the fluctuating pressure and its gradients, will be considered to estimate the position of the TTI. The second part of the project will be dedicated to the analysis of a two-dimensional bluff body immersed in a homogeneous and isotropic turbulent free-stream where the turbulence intensity and the integral lengthscale will be varied [3].

The tasks for this position include:

- (i) Provide key insights and assist in the initial design of the experiment.
- (ii) Analyse large datasets of Eulerian and Lagrangian turbulent fields.
- (iii) Leader and source of proposition for the physical analysis.
- (iv) Efficient communication regarding scientific results and publications.
- (iv) Communicate and interact with other researchers within a diverse and dynamic environment.

Skills:

• Postdoctoral candidate with a PhD in computational fluid dynamics and/or applied mathematics, physics, and aerodynamics.
• Solid knowledge in experimental fluid dynamics methods (PIV/PTV) and fundamentals of turbulence.
• Strong knowledge of signal processing techniques, and MATLAB.
• Knowledge in numerical methods and/or computational fluid dynamics is also a strong plus.

How to candidate:

The initial appointment is 12 months and could be extended upon mutual agreement with a startup monthly gross salary of 2,488€/month. Research activities will take place at PRISME laboratory, located at Polytech'Orléans, in Orléans (France). The postdoctoral associate will be expected to interact with experimental fluid dynamicists and turbulence theorists to carry work involving both experimental and numerical methods. Candidates from under represented backgrounds such as minorities and women are strongly encouraged to apply.

To apply, please send a full curriculum vitæ and cover letter with links to publications and PhD thesis as well as a list of at least two references to pierre-yves.passaggia@univ-orleans.fr, azeddine.kourta@univ-orleans.fr and nicolas.mazellier@univ-orleans.fr before October 15th 2023. The position is expected to begin immediately after hiring.

References:

[1] Stella, F., Mazellier, N. & Kourta, A. (2017) Scaling of separated shear layers: an investigation of mass entrainment, Journal of Fluid Mechanics, 826:851-887

[2] Kankanwadi, K. S., & Buxton, O. R. (2022). On the physical nature of the turbulent/turbulent interface. *Journal of Fluid Mechanics*, *942*.

[3] Passaggia, P. Y., Mazellier, N., & Kourta, A. (2021). Aerodynamic drag modification induced by free-stream turbulence effects on a simplified road vehicle. *Physics of Fluids*, *33*(10), 105108.