INTERNSHIP PROPOSAL

(One page maximum)

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Internship location: Unité de Mécanique de Lille, campus de Villeneuve d'Ascq
Collaboration : V. Bertola (Univ. Liverpool)

Thesis possibility after internship: YES
Funding: YES/NO If YES, which type of funding:

Elastic turbulence in Taylor Couette flow

One of the most remarkable effects of highly viscous polymer solutions that has been recently observed in experiments is the development of an elastic turbulence regime in the limit of strong elasticity. The flow of polymer solution in this regime displays irregularities typical of turbulent flows even at low velocity and high viscosity (i.e., for vanishing Reynolds number). As a consequence of turbulent motion at small scales, elastic turbulence can reveal as an efficient technique for mixing in very low Reynolds flows (e.g., in microchannels). Despite its great technological interest, elastic turbulence is still only partially understood from a fundamental point of view.
During this internship, we will build on the results obtained in a previous internship that demonstrated the numerical reproducibility of elastic turbulence in a 2D Taylor-Couette system (fig. 1), in order to extend the simulations to a 3D geometry that could be compared with the experimental setup of V. Bertola. The analysis will focus on the turbulent statistical properties that represent the most comparable indicators between numerical simulations and experimental measurements.

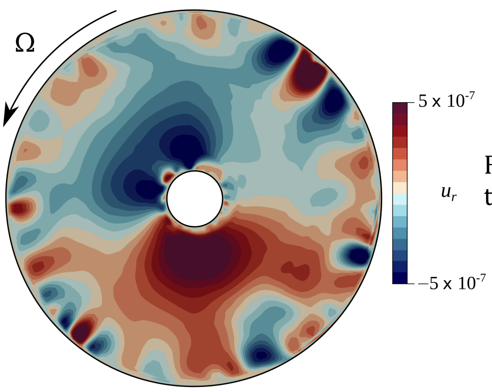

Figure 1: Velocity fluctuations generated by developed elastic turbulence in a 2D Taylor-Couette setup.

$Re = \frac{\Omega R_{out}^2}{\nu_s} = 10^{-4}$, $Wi = \Omega\lambda = 106.8$, $\Gamma = R_{in}/R_{out} = 0.15$

This project is conceived as a continuation of a Master 2 internship funded by Fédération Lilloise de Mécanique in 2020/2021. Within the framework of the international collaboration with experimental researchers and theoreticians, a CSC funding has been secured, allowing to inscribe this project within a solid long-term research environment.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Soft Matter and Biological Physics: YES
Quantum Physics: NO Theoretical Physics: YES