Post-doctoral position at IUSTI Marseille

Mixing in sheared particulate suspensions

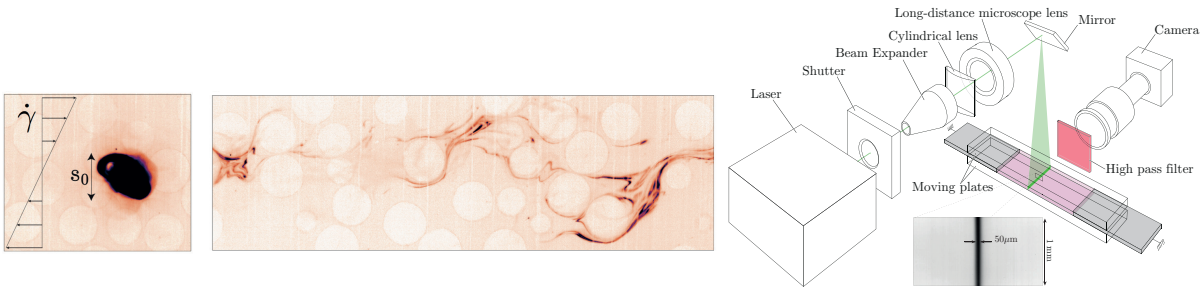

Figure 1: (left) Mixing of a drop of dye in a sheared particulate suspension. (right) Experimental set-up.

keywords: mixing, low Reynolds number flow, particulate suspensions.

A one year postdoctoral position in experimental Physics is immediately available at IUSTI-CNRS Lab in Marseille under the supervision of **Bloen Metzger** and **Henri Lhuissier.**

Sheared particulate suspensions constitute a very unique system where efficient mixing spontaneously occurs even under low Reynolds number conditions. The intense dispersion and mixing properties of sheared suspensions arise from the presence of particles which confer to the interstitial fluid a stochastic component. **Understanding how mixing proceeds in sheared particulate suspensions represent the overall goal of this project**. This information is crucial for predicting the transport of drugs or oxygen in blood flow, the homogenization of adjuvants during concrete preparation or the transport of nutrients inside certain biological cells.

We have recently shown that the presence of particles within a shear flow changes the nature of the flow kinematics: stretching of fluid elements is linear in a pure shear flow, it becomes exponential in the presence of particles [1]. This change is expected to have a dramatic impact on mixing and could be at the origin of the substantial transfer intensification observed in sheared particulate suspensions.

The goal here is to clarify and quantify these effects by **measuring the evolution of the concentration distribution of an initially segregated scalar** (blob of dye, bleached line) that is sheared in a suspension of spherical particles. Challenging experiments, involving a density and index matched suspension, laser-induced-fluorescence and photo-bleaching technics, will be undertaken to resolve small length-scales, those at which mixing, *i.e.* significant diffusive broadening of the filaments of dye, occurs. **These measurements will be compared to the theoretical predictions inferred from the knowledge of the flow kinematics**.

Contracts are for one year and the salary is 2423-2843 Euros/month depending on the candidate qualifications. Candidates with a strong taste for experiments, soft matter physics and fluid mechanics are welcome to send us a CV and a letter of recommandation from their previous advisor.

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[1] M. Souzy, H. Lhuissier, E. Villermaux, B. Metzger 2016 Stretching and Mixing in sheared suspensions, *J. Fluid Mech.* **812, 611-635.**