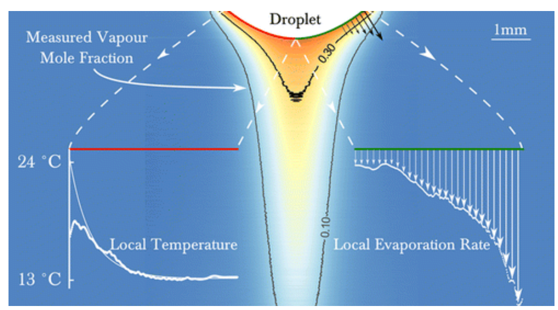
Post-doc opening in Université libre de Bruxelles,
TIPs laboratory (https://sites.google.com/site/tipsulbacbe/):
Experimental study of the vapour cloud surrounding evaporating droplets

The framework for this study is an international project (16 partners) together with ESA, the main goal of which is to perform evaporating droplet studies in microgravity. To this end, the TIPs laboratory is involved in two flight opportunities. The first one is a sounding rocket experiment (MASER), which is tentatively scheduled for 2019. The second is even longer term and is targeting 2023. Meanwhile, it is clear that besides the possibility of participating to parabolic flights, most of the research will be carried out in the laboratory, with a view towards the development of these future experiments.

Some of the promising goals of this combination of ground and microgravity experiments is to fully understand the influence of gravity on the evaporation dynamics of sessile droplets (i.e. droplets in contact with a substrate), on their typical instabilities such as hydro-thermal waves, on the dynamical wetting of the substrate by the droplet, and on mixture effects including nanoparticle deposition characteristics (the so-called "coffee-stain" effect). In addition, a firm goal for the project is to generate a well-defined benchmark which can be used to validate numerical codes and theoretical models.

Our main contribution to this collaborative project consists in using Mach-Zehnder interferometry in order to measure the vapour concentration in the gas around the droplet (the "vapour cloud"). This is based on the technique we recently developed in Dehaeck et al., Langmuir 30(8), 2014. For a movie illustrating this measurement method, and more generally the different situations we are studying using interferometry, please visit http://micromilli.ulb.be/usecases/details/Interferometry.



While this already enabled us getting a better understanding of the evaporation of pure pending droplets (see the falling vapour plume in the figure), we now want to apply this promising technique to other, more complicated, cases to elucidate the basic fluid physics at play there. One such new targets is the evaporation of a binary mixture droplet, for which the method will lead to the evolution of the concentration field within the droplet (hence a real-time assessment of the coffee-stain effect). Other interesting subjects are the evaporation of non-axisymmetric droplets (e.g. due to pinning defects) or to examine which influence neighbouring droplets and their own vapour clouds have on each other.

The post-doctoral researcher, who should not have lived or worked more than 24 months in Belgium during the past 3 years, is expected to hold a PhD in experimental fluid dynamics, preferably connected to some of the topics mentioned in this announcement. The candidate should be a physicist, chemist, or mechanical engineer, with strong interest in measurement techniques, transport phenomena, wetting and interface science, nonlinear dynamics, heat transfer with phase change, … Although not central to the project, some skills in modeling (theory or numerics) is certainly an advantage.

The initial contrat is for 2 years, starting as soon as possible. The firm deadline for applications is August 31st, 2017, and should include: i) detailed CV and list of publications; ii) the names and full coordinates of three academic referees able to recommend your application; iii) a motivation letter describing why you are interested by our project and how it fits to your previous research experience. This material should be sent by email to pcolinet@ulb.ac.be and sam.dehaeck@gmail.com.