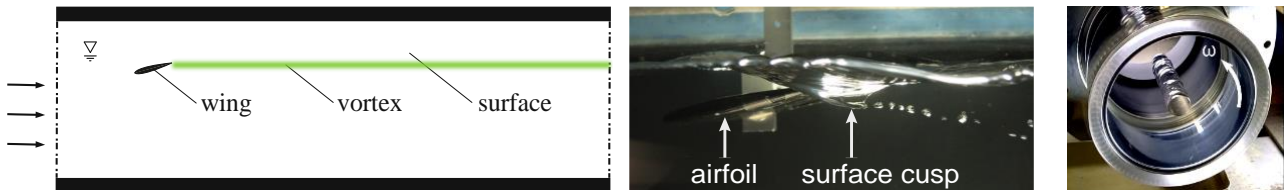


2-year postdoc position at IRPHE

Interaction between a vortex and a fluid interface



Description

Fluid vortices in environmental and engineering flows exist over a large range of scales, from huge tornadoes, through tip vortices in the wake of turbines, to the smallest eddies in turbulent regions at dissipation scale. Many situations involve vortical flows in which several immiscible fluids are present. They include floating bodies or bodies immersed at small depth which shed vortices under the water surface, or propellers and foils in the wake of which tip vortices may cavitate or simply trap atmospheric air into their core. In these instances, the presence of a liquid/gas interface located either in the vicinity of the vortex or within its core, significantly modifies its dynamics. Fundamental studies on the interplay between vorticity and interfaces are rare. The work proposed will investigate the interaction of a single fluid vortex and a liquid/gas interface in various configurations through theoretical/numerical modelling and stability analyses. The configurations include:

- a horizontal fluid vortex below an external liquid/gas interface;
- a fluid vortex with a gas cavity in the axis region, i.e., a two-phase vortex, where the only interface is located inside the vortex core;
- a two-phase vortex below an external liquid/gas interface.

Quasi-steady solutions will be derived for these configurations, and their stability with respect to long- and short-wave vortex perturbations will be investigated. The results will be compared to those obtained from water channel experiments and numerical simulations carried out by other participants in this project.

Framework

This work is part of a collaboration between the [Institut de Recherche sur les Phénomènes Hors Equilibre](#) (IRPHE) in Marseille, the [Institut Jean le Rond d'Alembert](#) in Paris and the [Laboratoire de Mécanique des Fluides et d'Acoustique](#) in Lyon. The postdoc position is based at IRPHE Marseille, with several planned visits to Paris and Lyon.

Qualifications

PhD in physics, engineering or related fields. Solid background in aerodynamics, vortex dynamics and possibly two-phase flows. Experience in theoretical stability analysis and use of asymptotic methods. Knowledge of numerical simulation is a plus. Good oral and written communication skills in English (delivering presentations, writing scientific articles).

Appointment 2 years

Start date October 2023

Salary (gross) 2466 €/month (less than 3 years after PhD), 2891 €/month (more than 3 years after PhD) + 5 k€/year for travel or other expenses

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Application A motivation letter, detailed CV and contact information of at least one person of reference should be sent by e-mail to the above contacts.

Deadline 21 June 2023