UNIVERSITÉ CÔTE D'AZUR	Research internship at Physics Institute of Nice (INPHYNI)	cnrs

Measurement of sharply varying free-surface profiles

Start: 01/01/2023 or later
Duration: 4 to 6 months
Level: Master 2 (possibility to pursue a PhD on the subject with the funding of the ANR IJET project)
Main supervisor: H. Yoshikawa (Harunori.Yoshikawa@univ-cotedazur.fr)

A circular hydraulic jump occurs when a vertical liquid jet impinges on a horizontal surface, e.g., when water from a faucet strikes the bottom of a kitchen sink. At a certain radial position, the profile of the liquid surface varies sharply. Despite various efforts during the last sixty years to understand this daily phenomenon, the complete theoretical description of its formation has not been established. To examine different existing theories, experimental determination of the profile of hydraulic jumps is essential. Measuring the profile of a liquid layer surface by non-intrusive techniques, however, remains challenging when the profile variation occurs with a large spatial gradient. In INPHYNI, we are developing an optical technique allowing this measurement, which explores the refraction of scanning laser beams at a liquid-air interface.

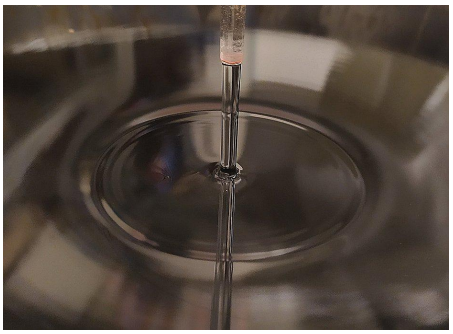

Figure: a circular hydraulic jump of water on a glass plate

Activities
The hired master student will tackle the inverse problem, i.e., the reconstruction of surface profiles from experimental images of refracted laser beams, by developing numerical codes for image analysis. In experiments, the student will vary different parameters and study their effects on the jump profile. Models will eventually be tested to rationalize the experimental data.

Profiles/Skills
The candidate must have a background in physics of fluids. Good knowledge of programming in common language (e.g., Matlab, Python) is essential for a successful internship.

Working environment
The student will integrate the Complex Fluids research group of the Physics Institute of Nice (INPHYNI, Nice, France) and will work with H. Yoshikawa, M. Argentina, F. Celestini, C. Brouzet and C. Raufaste. He will also interact with partners from Lille University in the context of the ANR project IJET https://anr.fr/Project-ANR-21-CE30-0014 .