

Portfolio

Visualization of a Confined Submerged Jet Impinging a Water/Air Free Surface Using DPIV and PLIF

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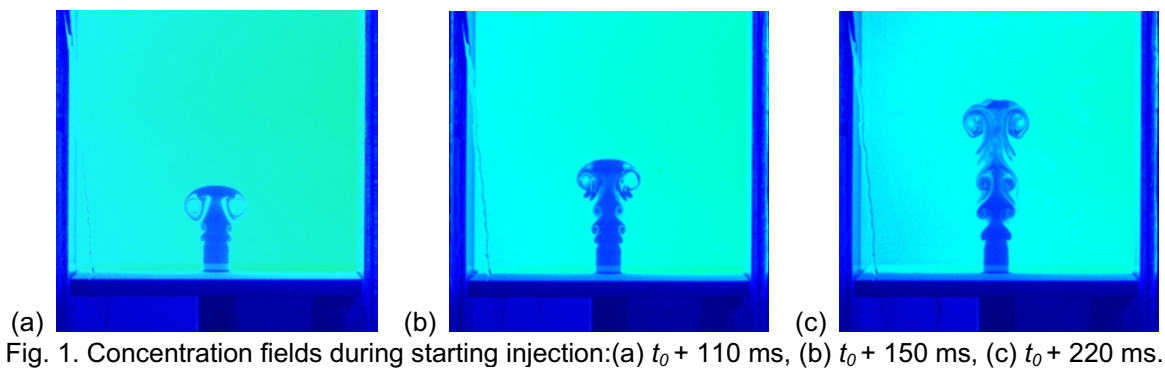


Fig. 1. Concentration fields during starting injection: (a) $t_0 + 110$ ms, (b) $t_0 + 150$ ms, (c) $t_0 + 220$ ms.

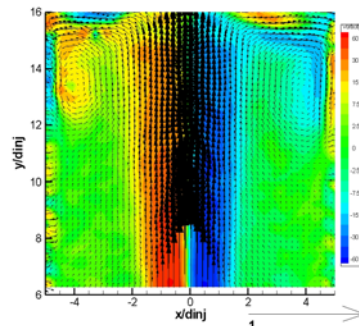


Fig. 2. Mean velocity field under the free surface ($d_{inj} = 10$ mm, $V_{inj} = 1$ m/s): vector field and vorticity.

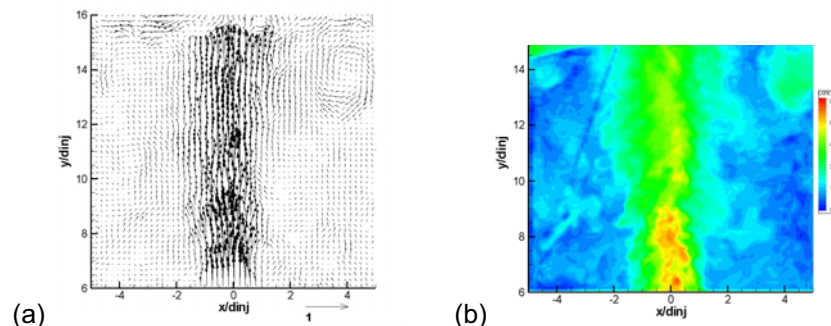


Fig. 3. Simultaneous instantaneous fields: (a) velocity and (b) concentration.

These figures show a turbulent submerged water jet ($Re = 10000$) entering a rectangular cavity and impinging a water/air free surface, observed thanks to Particle Image Velocimetry (PIV) and Laser-Induced Fluorescence (LIF). Figure 1 displays the starting injection with the development of a vortex ring, the classical ring due to Kelvin-Helmholtz interactions between "pure" water jet and ambient dyed water. Figure 2 shows mean velocity vectors and vorticity field in the upper part of the cavity, with the free jet zone and lateral vortices located between the surface and the vertical walls. Nevertheless these structures do not actually occur simultaneously on both sides of the jet, as it can be seen on instantaneous fields (Fig. 3). The jet is perturbed because of turbulent instabilities and free surface fluctuations. Indeed sequences of instantaneous fields reveal how vortices generated by impingement near the free surface are displaced and sent deeper in the cavity by movements of the interface.