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Interaction of a vortex ring with single and multiple air bubbles
SUBHAJIT BISWAS, RAGHURAMAN N GOVARDHAN, Indian Institute of Science — Bubbly turbulent flows occur in many places such as in chemical reactors and in geophysical applications, besides interest from the drag reduction perspective using injected bubbles in a (water) boundary layer. In these flows, the bubbles interact with vortical structures in the flow, this being a two-way coupled interaction. Motivated by such complex interactions of bubbles with vortical structures in turbulent flows, we experimentally study an idealization of this, namely, the interaction of a vortex ring (in water) with single and multiple air bubbles. The main parameters in this case are the ring strength, and a ratio of the bubble volume to ring core volume. In these interactions, we are interested in both the vorticity dynamics and the bubble dynamics, and these are measured using time-resolved PIV and high speed shadowgraphy, respectively. We start with the interaction of a single bubble with a single vortex ring, followed by studies with two or many bubbles (bubble swarm), the latter being closer to the case of bubbly flows. The similarities and differences from the vorticity and bubble dynamics perspectives for the different cases will be presented at the conference.

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