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Vorticity dynamics in the interaction of a single bubble with a vortex ring RAGHURAMAN GOVARDHAN, NARSING JHA, Indian Institute of Science — Bubbly turbulent flows occur in a number of engineering applications, such as in drag reduction using bubbles. In the present work, we study an idealization of this problem, namely, the interaction of a single bubble with a single vortex ring. The vortex ring is generated in water using a piston-cylinder arrangement, and an air bubble is injected close to it. The changes in vorticity during the interaction are measured using time-resolved PIV, while the bubble dynamics are visualized using high speed imaging. Interactions are studied over a large range of Weber numbers, which is defined using the vortex ring strength. The results show that the interactions can significantly affect the vortex ring, including reduction in its convection speed, and fragmentation of its core with a resultant large decrease in its enstrophy. We present vorticity fields during the interaction over a range of Weber numbers to help understand the physics of the interaction. The present results for the bubble ring interactions show many phenomena also seen in bubbly turbulent flows such as reduction in enstrophy, which suggests that results from the present study may help to better understand interaction of bubbles with vortical structures in turbulent flows.

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