

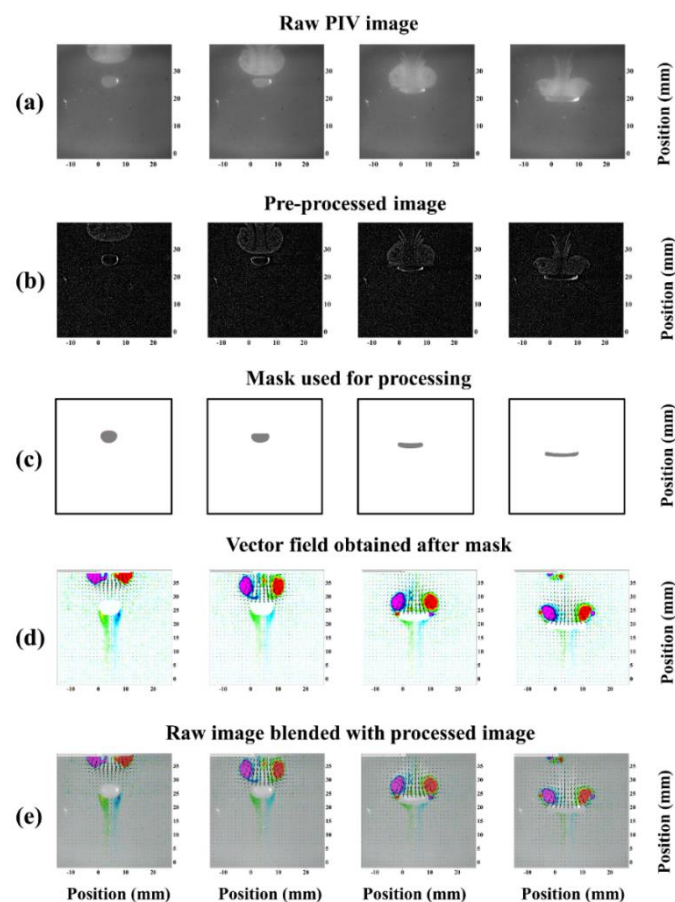
On the dynamics of vortex droplet co-axial interaction: insights into droplet and vortex dynamics

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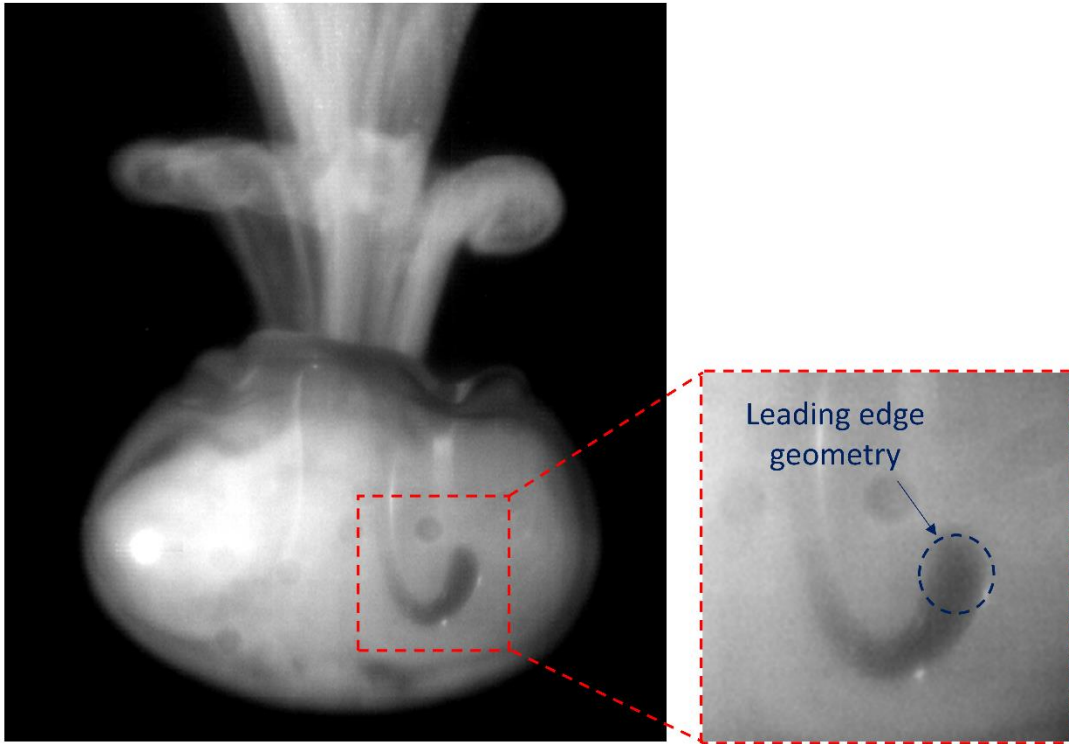
Supplementary figures

Some scattering from the droplet occurred during the PIV measurements as the light scattering from the oil droplet also enters the camera sensor (see supplementary Fig. S1), causing an error in PIV measurements. Therefore, to avoid these errors, a mask covering the droplet periphery during each time instant was used up to the droplet deformation stage, as it was found that the scattering were more significant during this stage. Moreover, it was difficult to apply

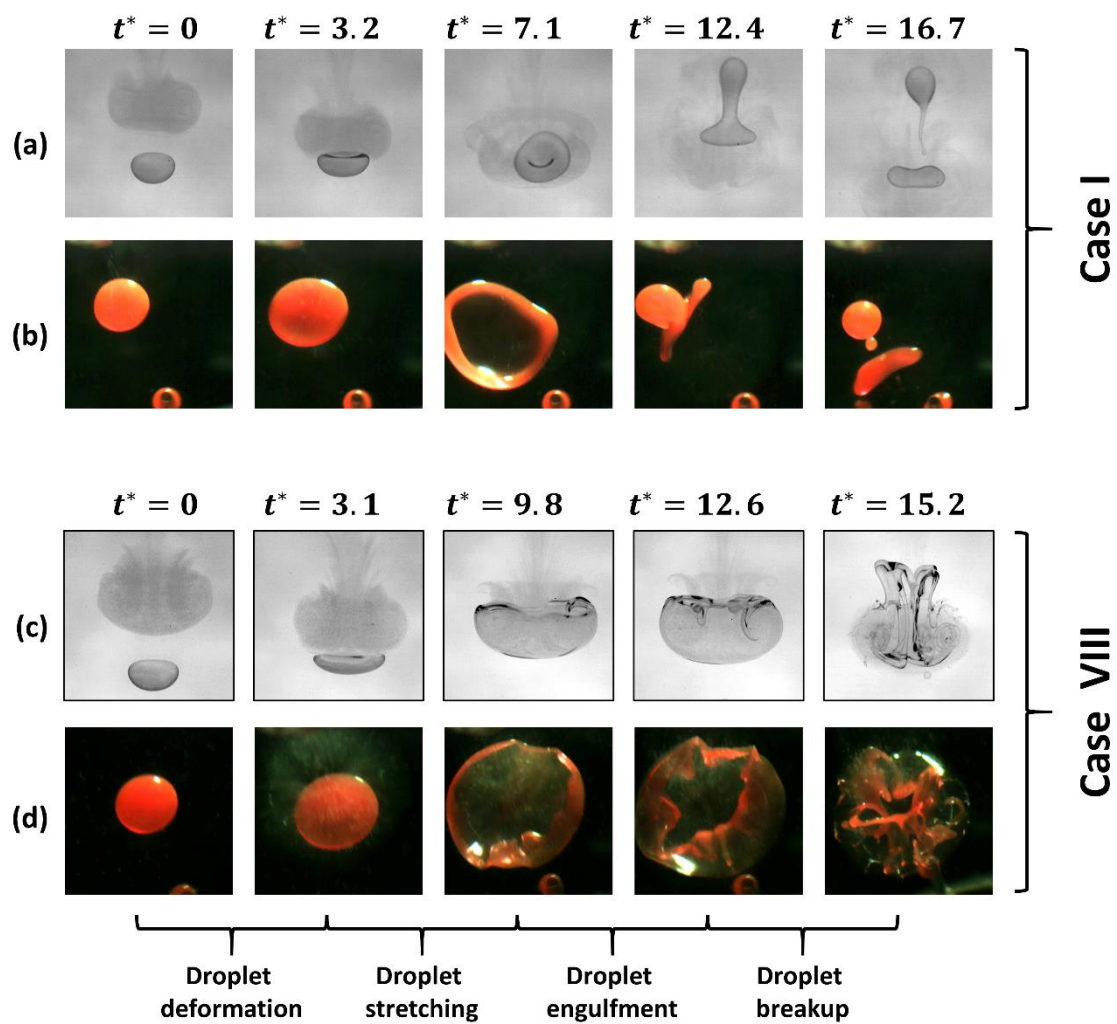


SUPPLEMENTARY FIGURE S1. Scattered/emitted light from the droplet during PIV/LIF imaging. (a) Raw PIV image (b) Pre-processed image (c) Mask used for avoiding vector calculation near droplet region (d) PIV processed image (e) PIV image blended with raw image.

a mask in later stages when the primary droplet gets engulfed into the vortex core in the form of multiple cylindrical ligaments, which further disintegrates into tiny daughter droplets. To further avoid these issues in PIV and LIF measurements, a small amount of dye was added in the oil fluid, which reduces the light scattering. We had used a 530 ± 10 nm band-pass filter for PIV imaging to avoid the fluorescent light and 570 ± 10 nm for LIF imaging to avoid the noise during measurements.



SUPPLEMENTARY FIGURE S2. Geometry of droplet leading edge assumed equivalent to a spherical shape.



SUPPLEMENTARY FIGURE S3. (a,c) Side-view and (b,d) Top-view image for case-I and case-VIII, respectively. For case I, engulfment is not uniform from all directions and breakup mode is also different when compared to Case VIII.