Abstract Submitted
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Caustics and the growth of droplets[1] RAMA GOVINDARAJAN, S RAVICHANDRAN, TIFR Centre for Interdisciplinary Sciences, Hyderabad, India, SAMRIDDHI RAY, International Centre for Theoretical Sciences, TIFR, Bangalore, P DEEPU, TIFR Centre for Interdisciplinary Sciences, Hyderabad, India — Caustics are formed when inertial particles of very different velocities collide in a flow, and are a consequence of the dissipative nature of particle motion in a suspension. Using a model vortex-dominated flow with heavy droplets in a saturated environment, we suggest that sling caustics form only within a neighbourhood around a vortex, the square of whose radius is proportional to the product of circulation and particle inertia. Droplets starting close to this critical radius congregate very close together, resulting in large spikes in (Lagrangian) number density. Allowing for merger when droplets collide, we show that droplets starting out close to the critical radius display a much more rapid growth in size than those starting elsewhere, and a large fraction of the large droplets are those that originate within the caustics-forming region. We test these predictions in a two-dimensional simulation of turbulent flow. We hope that our study will be of interest in long-standing problems of physical interest such as the mechanism of broadening of droplet spectra in a turbulent flow.

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