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Inertial Particle Caustics around a vortex RAVICHANDRAN SIVARAMAKRISHNAN, RAMA GOVINDARAJAN, TIFR Centre for Interdisciplinary Sciences, TIFR Hyderabad — Caustics are formed when particles with different velocities end up in the same location in space. Inertial particle caustics are thought to be responsible for the rapid onset of rainfall in vigorously convecting clouds. It is generally also believed that caustics are effective only at large Stokes numbers. We study inertial particles caustics in the canonical flow of a single vortex. We also show what kinds of vortices can have caustics around them. For point vortices, we show the existence of critical Stokes numbers below which there can be no caustics. We find that the value of the critical Stokes number depends on the initial conditions chosen for the particles. The existence of a critical Stokes number translates to the existence of definite regions around vortices where particles have to start in order to form caustics. We use this fact to perform simulations with many vortices in a periodic box. We use the lagrangian tracking technique of Osiptsov to track the densities associated with the particles. These simulations show that the effect of caustics on particle clustering is more complicated than is generally believed. While larger particle inertia leads to a larger number of very "dense" particles, we find that smaller inertia can lead to higher average densities.

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