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Global stability of inertial particle trajectories in a two dimensional flow SENBAGARAMAN SUDARSANAM, PHANINDRA TALLAPRAGADA, Mechanical Engineering, Clemson University — The trajectories of inertial particles moving even in a two dimensional fluid flow exhibit complex dynamics, in particular preferential clustering in some sub domains of the fluid. This preferential clustering is influenced by the vorticity field. Based on the Maxey-Riley equation, several Eulerian criteria have been proposed in the past that classify the fluid region into local stable and unstable regions which roughly act as attracting and repelling regions for inertial particles. We demonstrate through examples that the locally unstable regions of the fluid domain can nevertheless act as global attractors. This global stability of unstable regions can partly explain the experimental evidence that particle clustering in fluids is more robust than usually predicted. The example relies on fluid flow generated by point vortices. Such vortex fields are often encountered in several microfluidic flows where the manipulation of the motion of inertial particles has several important applications.

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