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How inertia and topology influence single-particle irreversibility in turbulence ANDREW BRAGG, JOSIN TOM, Duke University — It has recently been suggested that the irreversibility of a single fluid particle in turbulence may be quantified by considering the evolution of its power, which has been shown to posses a negatively skewed Probability Density Function (PDF). This has been interpreted in terms of flight-crash events, wherein fluid particles tend to gain energy slowly and lose it fast. Furthermore, it has been argued that the dynamical origin of the negative skewness is the predominance of vortex stretching over compression in turbulence. Here, we consider the irreversibility of a single inertial particle in turbulence. We find that weak inertia can enhance the irreversibility through the way that inertia causes the particles to preferentially interact with the topology of the turbulent flow. When inertia is moderate to strong, the irreversibility is significantly reduced since the inertial particles have a damped response to the flight-crash events in the flow. By following the fluid power along inertial particle trajectories, we also probe whether vortex stretching really is the cause of the negative skewness of the fluid power, or whether the dynamical origin is in fact the self-amplification of the strain field.

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