Abstract Submitted
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Experimental Investigation of Two-Way Coupling in Particle-Laden Compressible Flows[1] JUAN SEBASTIAN RUBIO, Johns Hopkins University, MEET PATEL, JESSE CAPECELATRO, University of Michigan, JASON RABINOVITCH, Jet Propulsion Laboratory, California Institute of Technology, RUI NI, Johns Hopkins University — It is well known that, for particle-laden flows, increasing the particle volume fraction ϕ_v and mass loading ϕ_m, defined as the ratio of the specific masses of the particle and fluid phases, switches the dispersed phase from passively responding to the carrier phase (one-way coupling) to actively modulating surrounding flows (two-way coupling). However, it is still largely unknown how this two-way coupling could manifest in the compressible regime where the particle-gas slip velocity could reach from transonic to supersonic speeds. In the present study, two-way coupling effects in compressible flows are investigated via ultra-high-speed particle tracking of an underexpanded sonic jet seeded with inertial particles. The emergence of bow shocks around individual particles significantly modulates the Mach disk location and fluctuation. This may provide new insights in the modeling of two-way coupling. The experimental results in this study are compared with the numerical simulations performed at the University of Michigan. Further details are found in the companion presentation titled, "Numerical Simulation of Particle-Laden Underexpanded Jets."

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