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Structures Within Sub- and Supersonic Submerged Gas Jets JASON T. PARKER, SIMO A. MAKIHARJU, University of California, Berkeley — Sub- and supersonic submerged gas jets (SGJs) are used in steel making, underwater propulsion, and wastewater treatment. Prior experiments on SGJ dynamics have used optical techniques to study the gas-liquid interface, but to the authors' knowledge no experimental data exists for the internal phase fraction distribution. Observations by previous investigators suggest that a turbulence peak may explain jet pinch-off (JPO) onset and location. It is unclear whether coherent structures within the SGJ appear and grow before JPO. Crow and Champagne (1971) discovered coherent structures on the surface of a gas jet in air, suggesting that coherent structures may also exist inside a SGJ. Furthermore, validation of numerical models has relied on comparisons between CFD models and high-speed footage that only shows the boundary of the SGJ. In addition to providing a measurement of the internal phase fractions to probe SGJ physics, the present experiments provide validation data for CFD models. The tested gas exit velocities span Mach 0.6 to 1.4. We utilize 13kHz X-ray densitometry located 10-15 nozzle diameters downstream of the orifice to coincide with the predicted turbulence peak and the location of most frequent JPO.

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