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Extracting a mix parameter from 2D radiography of variable density flow[1] SUSAN KURIEN, FORREST DOSS, DANIEL LIVESCU, Los Alamos National Laboratory — A methodology is presented for extracting quantities related to the statistical description of the mixing state from the 2D radiographic image of a flow. X-ray attenuation through a target flow is given by the Beer-Lambert law which exponentially damps the incident beam intensity by a factor proportional to the density, opacity and thickness of the target. By making reasonable assumptions for the mean density, opacity and effective thickness of the target flow, we estimate the contribution of density fluctuations to the attenuation. The fluctuations thus inferred may be used to form the correlation of density and specific-volume, averaged across the thickness of the flow in the direction of the beam. This correlation function, denoted by b in RANS modeling, quantifies turbulent mixing in variable density flows. The scheme is tested using DNS data computed for variable-density buoyancy-driven mixing. We quantify the deficits in the extracted value of b due to target thickness, Atwood number, and modeled noise in the incident beam. This analysis corroborates the proposed scheme to infer the mix parameter from thin targets at moderate to low Atwood numbers. The scheme is then applied to an image of counter-shear flow obtained from experiments at the National Ignition Facility.

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