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Turbulent Mixing of an Angled Jet in Various Mainstream Conditions KEVIN RYAN, FILIPPO COLETTI, CHRISTOPHER ELKINS, JOHN EATON, Stanford University — The angled jet in crossflow has been studied in detail with specific emphasis on the turbulent mixing of the jet fluid with the mainstream flow. The interaction of the upstream boundary layer with the jet shear layer results in complex vortex patterns that cause large mean distortion of the jet and rapid turbulent mixing. Most previous studies have been conducted in flat plate flows with little attention paid to the characteristics of the boundary layer. The present study examines the effect of mainstream geometric changes on the jet trajectory, counter-rotating vortex pair strength, and turbulent mixing. Seven cases were examined including flat plate boundary layers with three different thicknesses, adverse and favorable pressure gradient cases, and flows with concave and convex streamwise curvature. Full field, 3D mean velocity and scalar concentration fields were measured using magnetic resonance imaging (MRI) techniques in a water flow. The distortion of the streamtube initiated at the hole exit was examined for each of the seven cases. The degree of mixing was quantified by measuring the amount of mainstream fluid entrained into the jet as well as the turbulent diffusivity as a function of streamwise position.

Kevin Ryan
Stanford University

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