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Turbulent Mixing of Jet in Crossflow with Compound Angle Injection KEVIN RYAN, Stanford University, FILIPPO COLETTI, University of Minnesota, CHRISTOPHER ELKINS, JOHN EATON, Stanford University — A dominant feature governing the development of the jet in crossflow is a pair of longitudinal vortices that originate at the point of injection. These vortices cause a distortion of the jet and promote mixing of the jet and mainstream fluid. The vortex structure is significantly altered for jets with compound angle injection, with respect to jets with no skew relative to the mainstream flow. In skewed geometries, a single dominant vortex controls the development of the jet and mixing of the jet fluid with the mainstream. The 3D velocity and concentration fields were measured for a compound angle jet injected with a skew angle of 30 degrees relative to the incoming flow. Measurements were conducted using magnetic resonance imaging (MRI) techniques using water as the working fluid. The development of the vorticity was investigated at the point of injection. The effect of the single dominant vortex on the turbulent mixing of the jet fluid with the mainstream was evaluated using the scalar concentration field. Spreading of the jet due to turbulent mixing is shown to be highly asymmetric. Results obtained for the skewed jet were compared to an angled jet in crossflow with no skew.

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