Abstract Submitted
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Dynamics of Coaxial Transverse Jets[1] ELIJAH HARRIS, DAVID D. W. REN, ANN KARAGOZIAN, University of California, Los Angeles — The present experimental study investigates shear layer instabilities, structural dynamics, and mixing characteristics of a coaxial gaseous jet injected normally into crossflow via acetone PLIF and stereo PIV. The coaxial jet is tested in a suction configuration, where the core jet, in the absence of the outer suction, has a naturally convectively unstable (CU) upstream shear layer (USL) at a jet-to-crossflow momentum flux ratio of J=41, with an asymmetric mean cross-section. For isolated suction in the upstream or downstream edge of the jet, systematically increasing the suction can enhance the jet cross-sectional symmetry and improve molecular mixing. Velocity field based POD modes demonstrate enhancement of traveling wave structures and periodicity along the USL with suction upstream, and upright wake dynamics when suction is applied downstream. With strong enough suction upstream, the USL instabilities undergo a transition from CU to absolutely unstable flow, while the USL instabilities are largely unaffected by suction downstream. These induced alterations to the instabilities along the coaxial transverse jet's USL have qualitative consistency with a counter-current shear layer analogy[2] from linear stability theory.

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[2]Shoji, et al., **JFM**, 890, A7, 2020

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