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Relaminarization of the vortex structure in a low velocity ratio jet in crossflow[1] GRAEME WATSON, LORENZ SIGURDSON, Vortex Fluid Dynamics Lab, Mechanical Engineering, University of Alberta — We have explored in a wind tunnel the stabilizing effect of an annular synthetic jet on the vortex structure of an elevated jet in crossflow (JICF) with Reynolds numbers $O(10^3)$. The synthetic jet was coaxial to the elevated JICF to provide added momentum to the flow. It was observed that an initially turbulent JICF can be made steady and relaminarized in its near field*. This effect was observed for all forcing frequencies up to the limiting operational frequency of the synthetic jet apparatus. A similar relaminarization behavior was also observed for an unforced elevated JICF near a jet to free stream velocity ratio of one. Hot-wire anemometry measurements in the near-field of the synthetic jet were used to determine the momentum flux required for forced relaminarization. A simple model based on an empirical weighting was used to combine the momentum flux from the synthetic jet and JICF flows to determine a unified momentum velocity ratio*. We compare the momentum velocity ratio at the onset of forced relaminarization of JICFs operating at different initial velocity ratios.
*J. Diep, G. Watson, and L. Sigurdson, "Concentric synthetic jet control of a low velocity ratio elevated jet in crossflow", submitted.

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