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Lagrangian Coherent Structures (LCS) in crossflow jets subject to very strong Favorable Pressure Gradient (FPG)[1] GERMAN SALTAR RIVERA, CHRISTIAN LAGARES, GUILLERMO ARAYA, University of Puerto Rico - Mayaguez — Incompressible jets transversely issuing into a spatially-developing turbulent boundary layer is one of the most challenging types of three dimensional flows due to its thermal-fluid complexity and technological applications: film cooling of turbine blades, fuel injection, thrust vector control, chimney plumes, among others. Complex interactions between the jet and the crossflow create a variety of coherent structures which govern the flow's transport properties, most notably, the counter-rotating vortex pair (CVP). The CVP's influence in the thermal transport of a turbulent round jet in a crossflow with a strong FPG has been previously studied by Quinones & Araya (2017). The FPG exhibited a damping effect on the CVP wake development and a wall-normal stretch on its geometry. To expand upon this work, we conduct Direct Numerical Simulation (DNS) at different jet velocity ratios (i.e., VR = 0.5, 1 and 2) and make use of the Finite-Time Lyapunov Exponent (FTLE) as well as the Finite-Space Lyapunov Exponent (FSLE) to detect and evaluate LCS. The main purpose is to shed light of the combined effect of crossflow-jet and strong FPG on passive scalar transport.

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