Abstract Submitted
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Analysis of the stability and sensitivity of jets in crossflow MARC REGAN, KRISHNAN MAHESH, Univ of Minnesota - Twin Cities — Jets in crossflow (transverse jets) are a canonical fluid flow in which a jet of fluid is injected normal to a crossflow. A high-fidelity, unstructured, incompressible, DNS solver is shown (Iyer & Mahesh 2016) to reproduce the complex shear layer instability seen in low-speed jets in crossflow experiments. Vertical velocity spectra taken along the shear layer show good agreement between simulation and experiment. An analogy to countercurrent mixing layers has been proposed to explain the transition from absolute to convective stability with increasing jet to crossflow ratios. Global linear stability and adjoint sensitivity techniques are developed within the unstructured DNS solver in an effort to further understand the stability and sensitivity of jets in crossflow. An Arnoldi iterative approach is used to solve for the most unstable eigenvalues and their associated eigenmodes for the direct and adjoint formulations. Frequencies from the direct and adjoint modal analyses show good agreement with simulation and experiment. Development, validation, and results for the transverse jet will be presented. Supported by AFOSR (Iyer, P. S. & Mahesh, K. 2016 A numerical study of shear layer characteristics of low-speed transverse jets. J. Fluid Mech. 790, 275-307)

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