Abstract Submitted
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The Far Field Structure of a Jet in Cross-Flow NICOLAS LANITIS, Department of Engineering, University of Cambridge, Cambridge CB2 1PZ, UK, JAMES DAWSON , Department of Energy and Process Engineering, Norwegian University of Science and Technology, 7491 Trondheim, Norway — Stereoscopic PIV measurements were performed in the far field of a cross-flow jet. Measurements were taken in a water channel in the spanwise-wall normal plane (y-z) containing the Counter-Rotating vortex pair (CVP). The jet's Reynolds number was $Re_{jet} = 2\times10^4$ and had an exit diameter of $d_j = 4mm$. Measurements were taken for a jet to cross-flow velocity ratio of $V_r = 10$ at three downstream positions of $x/d_j = 30, 55, 85$ and for a $V_r = 15, 20$ at $x/d_j = 85$. Two point spatial correlations hint at the presence of arch shaped structures titled in the streamwise x-direction on the windward side of the CVP as well as straight vortex tubes extending into the wake. The arched shaped structure is compounded by PDFs of the location of streamwise vorticity peaks (vortex tubes) in the instantaneous field indicating the presence of a vortex structure aligned in the spanwise direction. This information together with the use of High Speed Stereoscopic PIV and Taylor's Hypothesis, which allowed for the extraction of 3D structures, led to the development of an eddy model comprised of hairpin, roller and wake structures to predict turbulence statistics of a jet in cross-flow.

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