Streamwise Lumley Decomposition of the Turbulent Round Jet
AZUR HODZIC, CLARA M. VELTE, Tech Univ of Denmark, WILLIAM K. GEORGE, Imperial College London — Stream-wise Lumley decomposition was performed from data acquired using 2C-PIV, in order to decompose the far-field of a free turbulent axi-symmetric jet at a Reynolds number of 20 000. The equilibrium similarity scaling yields a homogeneous turbulent field leaving only the radial direction non-homogeneous. Fourier modes are used to decompose the flow in the new homogeneous stream-wise direction, while proper orthogonal decomposition (POD) is used to decompose the field in the inhomogeneous radial direction. The scaling allows spectral analysis and energy density spectra to be performed which together with Reynolds stresses are decomposed to reveal their modal building blocks and energy contributions. The results from the decomposition reveal that the number of modes needed to reconstruct the field varies with radial position. Explanations for these results will be presented and discussed.

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