Abstract Submitted
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Similarity of Turbulent Energy Scale Budget Equation of a Round Turbulent Jet[1] HAMED SADEGHI, Mr, PHILIPPE LAVOIE, ANDREW POLLARD, Prof — A novel extension to the similarity-based form of the transport equation for the second-order velocity structure function of $\langle(\delta q)^2\rangle$ along the jet centreline (see Danaila et al., 2004) has been obtained. This new self-similar equation has the desirable benefit of requiring less extensive measurements to calculate the inhomogeneous (decay and production) terms of the transport equation. According to this equation, the normalized third-order structure function can be uniquely determined when the normalized second-order structure function, the power-law exponent of $\langle q^2\rangle$ and the decay rate constants of $\langle u^2\rangle$ and $\langle v^2\rangle$ are available. In addition, on the basis of the current similarity analysis, the similarity assumptions in combination with power-law decay of mean velocity ($U \propto (x - x_0)^{-1}$) are strong enough to imply power-law decay of fluctuations ($\langle q^2\rangle \propto (x - x_0)^m$). The similarity solutions are then tested against new experimental data, which were taken along the centreline of a round jet at $Re_D = 50,000$. For the present set of initial conditions, $\langle q^2\rangle$ exhibits a power-law behaviour with $m = -1.83$.

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