The effect of background turbulence on differential diffusion in a turbulent jet[1] THOMAS LAVERTU, ADAM WAHAB, LAURENT MYDLARSKI, Dept. of Mechanical Engineering, SUSAN GASKIN, Dept. of Civil Engineering and Applied Mechanics, McGill University — Whenever multiple scalars of unequal molecular diffusivities are mixed in a turbulent flow, differential diffusion may occur[2]. The present work studies differential diffusion of two scalars in a round, turbulent (water) jet of Reynolds numbers up to $Re_D (\equiv U_j D/\nu) \approx 10,600$. The jet issues into an approximately isotropic, turbulent background flow generated by a random synthetic jet array[3]. By means of laser-induced fluorescence, punctual concentration measurements are made radially across the jet's cross-section, yielding instantaneous concentrations of each scalar (c_1 and c_2). Statistics of the instantaneous, normalized concentration difference ($z \equiv c_2/\langle c_2 \rangle - c_1/\langle c_1 \rangle$) are employed to quantify the effects of differential diffusion. The effect of the background turbulence on the differential diffusion will be discussed. In particular, these results will be compared with previous work done in a quiescent background.

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