Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Uncertainty analysis of planar laser-induced fluorescence measurements[1] STAVROS TAVOULARIS, CHRISTINA VANDERWEL, University of Ottawa — We present a thorough analysis of the uncertainty of the planar laser-induced fluorescence (PLIF) method. We consider the measurement of concentration maps in cross-sections parallel to and normal to the axis of a slender plume containing Rhodamine 6G as a passive scalar tracer and transported by a turbulent shear flow. In particular, we identify two previously unexplored sources of error contributed by non-uniformity of the concentration across the laser sheet and by secondary fluorescence. We propose new methods to evaluate and correct for these sources of error and demonstrate that the corrected concentration measurements accurately determined the injected dye mass flow rate of the plume in the far field.

[1]Supported by NSERC

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Date submitted: 15 Jul 2014 Electronic form version 1.4