

Abstract Submitted
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The influence of coherent structures on the turbulent dispersion of a passive scalar plume¹ CHRISTINA VANDERWEL, STAVROS TAVOULARIS, University of Ottawa — We investigated the influence of coherent structures on the dispersion of a passive scalar by studying instantaneous measurements of a plume of dye released in uniformly sheared flow generated in a water tunnel. Measurements were performed using simultaneous stereo particle image velocimetry and planar laser-induced fluorescence to obtain instantaneous concentration and velocity maps in cross-sections normal to the flow direction. Coherent vortices were observed to effectuate scalar transport by inducing motions which displaced dyed fluid. Dye was observed to preferentially congregate within vortex cores and far away from vortices, whereas regions adjacent to vortices were less likely to contain dye. A conditional eddy analysis demonstrated that counter-rotating vortex pairs associated with hairpin vortices were responsible for both large Reynolds stress events and large scalar flux events. This observation was supported by the fact that the Reynolds stress was found to be correlated with the scalar flux.

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Christina Vanderwel
University of Ottawa

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