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On the interaction of two scalar plumes in a turbulent flow BING-CHEN WANG, SHAHIN OSKOUIE, Univ. of Manitoba, EUGENE YEE, Defence R&D Canada-Suffield — Direct numerical simulation is used to study the interaction of two plumes released by two point sources in the context of a turbulent open channel flow. This study is inspired by the classical experiment in quantum physics, Young's double-slit interference experiment on light and energy. The results of the first-order concentration statistics show that in the convective range, the two ground plumes mix faster in the spanwise direction, however, in the turbulent diffusion range, the elevated plumes spread and mix faster. It is observed that streamwise evolution of the second-order correlation function at the midpoint between the two plumes exhibits four distinct mixing stages for both ground and elevated sources. The second-order correlation function demonstrates that the degree of mixing is minimum at the midpoint between the two plumes and is maximum at plume fringes. In general, the elevated plumes exhibit higher degree of mixing in comparison with the ground plumes due to the meandering effects. The scatterplots prove that the higher order statistics of the concentration can be predicted by the knowledge of the first and second-order statistics.

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