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Enhancing scalar diffusion in grid-generated turbulence[1] DANA DUONG, STAVROS TAVOULARIS, Univ of Ottawa — Once a scalar plume injected from a concentrated source in grid turbulence reaches the "far field", its growth rate becomes proportional to the growth rate of the integral length scale of turbulence and so the scalar in an initially thin plume would take a long distance to get mixed with the surrounding fluid. In the present study, we devised means of spreading the plume in the "near field", thus reducing the mixing distance. We injected passively heat from an electrically heated ribbon, placed closely behind a perforated plate that was inserted across the flow in a wind tunnel, and then passed the plume through an array of transverse cylinders, located closely downstream of the source. Measurements of velocity and temperature were obtained with hot-wire anemometers, cold-wire thermometers and thermistors. Different array designs were tested and one design was found to produce far field plumes that were twice as wide as in unobstructed grid turbulence. The cost in terms of kinetic energy loss and the disturbance to the turbulent field were also documented.

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