Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Study of turbulent mixing in a confined planar wake YING LIU, HUA FENG, RODNEY FOX, MICHAEL OLSEN, JAMES HILL, Iowa State University — Liquid-phase turbulent transport and mixing for a Reynolds number of 37,500 in a confined planar wake were investigated using particle image velocimetry (PIV) and planar laser-induced fluorescence (PLIF). The velocity and concentration field data were analyzed for flow statistics such as mean velocity, Reynolds stress, spreading rate, turbulent kinetic energy, turbulence dissipation rate, mixture-fraction mean, mixture-fraction variance and one-point concentration PDF. CFD models, including a two-layer $k - \varepsilon$ turbulence model, gradient-diffusion models that close the scalar fluxes, and a scalar dissipation rate model that are used in a RANS/PDF scheme, were validated against PIV/PLIF data collected at six downstream locations. Low-Reynolds-number effects on turbulent mixing were taken into consideration through the mechanical-to-scalar time-scale ratio. The experimental and computational results were found to be in good agreement.

James Hill
Iowa State University

Date submitted: 06 Aug 2005 Electronic form version 1.4