Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Subgrid scale models for large eddy simulations of a confined rectangular jet ANUP GOKARN, FRANCINE BATTAGLIA, RODNEY FOX, JAMES HILL, Iowa State University — Large eddy simulations are performed and compared with experimental data obtained for a liquid-phase turbulent flow in a rectangular duct. Three streams initially separated by two splitter plates enter the duct and mix, with the central stream having a higher velocity than the outer streams. All simulations are for water at a Reynolds number of 50,000 (based on hydraulic diameter and flow rate). The numerical formulation is based on the pressure Poisson equation and employs a sixth-order compact finite-difference scheme for the spatial derivatives and a third-order compact Runge-Kutta scheme for the time derivative on a partially-staggered variable arrangement. Four subgrid scale models are tested: the standard Smagorinsky model, the dynamic eddy viscosity model, the mixed model and the structure function model. Wall functions are also tested. One-point and two-point statistical correlations such as mean velocity, velocity fluctuations, Reynolds stresses, dissipation rate and the turbulent kinetic energy are compared against those obtained from the experiments.

Anup Gokarn
Iowa State University

Date submitted: 12 Aug 2005 Electronic form version 1.4