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Turbulent transport and mixing of a passive scalar in a confined liquid wake JAMES HILL, KATRINE NILSEN, BO KONG, RODNEY FOX, MICHAEL OLSEN, Iowa State University — Turbulent mixing and transport of a passive scalar has been studied in a confined rectangular liquid wake at Reynolds number 37,500. Large-eddy simulations (LES) of transport and mixing of the passive scalar were performed and the results were compared to velocity and concentration data from simultaneous particle image velocimetry (PIV) and planar laser induced fluorescence (PLIF) measurements. Single-point statistics of velocity and concentration from the LES were validated by the experimental data. Two-point spatial correlations of turbulent velocity, passive scalar, and joint velocity-scalar fields were computed from both simulation and experimental data and the results were compared. In this way information was obtained about LES' ability to predict the important coherent structures of the flow and their contribution to the scalar transport. The simultaneous PIV/PLIF data also provided the opportunity to evaluate turbulent fluxes, turbulent Schmidt number and two components of the turbulent diffusivity tensor. Comparison of these quantities between simulation and experiment provides important insight into the turbulent transport processes of the wake and how LES performs in predicting these. The simulation results showed overall good agreement with the experimental data.

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