

Abstract Submitted
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The velocity field in the cavity between two square two-dimensional obstacles at the wall of a turbulent boundary layer. S. SIMOENS, Ecole Centrale de Lyon/UMR CNRS 5509, J. WALLACE, Univ. of Maryland — Measurements have been made of the scalar dispersion of smoke released from a two-dimensional slot in the wall perpendicular to a boundary layer flow with $R_\theta \approx 980$ and located parallel to and midway between two square obstacles placed on the wall. Two optical systems with CCD cameras facing each other have been used to measure simultaneously the velocity and scalar concentration fields, respectively, with PIV and Mie scattering diffusion to ultimately provide detailed information about the scalar fluxes for this environmentally relevant geometry. Here the results of the velocity field measurements in the streamwise plane will be reported for spacings between the obstacles of 1-8 obstacle heights. The mean flow measurements reveal the increased complexity of the canyon flow with increasing obstacle spacing. A primary vortex, with negative spanwise vorticity, occurs for all spacings, and its circulation region extends above the level of the tops of the obstacles. For spacings of $2h$ and greater, a secondary vortex with positive vorticity appears in the upstream corner of the canyon, and a tertiary vortex with negative spanwise vorticity begins to appear in the downstream corner for a $6h$ spacing. Spatial distributions of the turbulent kinetic energy and Reynolds shear stress fields will also be presented.

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