

Abstract Submitted  
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**Turbulent particle clustering in a fully developed square channel flow.**<sup>1</sup> LAURA VILLAFANE, ANDREW BANKO, CHRIS ELKINS, JOHN EATON, Stanford University — Particle-turbulence interactions are investigated in a fully developed turbulent channel air flow to determine the gas phase effect on the particle concentration and velocity fields. The experimental apparatus is a vertical channel with square cross section. The Reynolds number based on channel width is about  $10^4$ . The 12  $\mu\text{m}$  nominal diameter nickel particles are smaller than the Kolmogorov length scale and the corresponding Stokes number is of the order of one. Low volume and mass loading ratios are considered. Under these conditions preferential concentration is expected to be strong while the effect of particles on the gas flow negligible. The square channel flow contains mean secondary flows not present in high aspect ratio channels studied previously. These will increase transport of particles away from the walls and raise turbulence levels in the central region. Current experiments are focused on the statistics of the particle phase including particle concentration inhomogeneities and particle velocities. The particle concentration field is analyzed from high resolution laser illuminated planar images. Particle velocity distributions are measured by PIV techniques and compared to the carrier-phase mean velocities from aerodynamic pressure measurements in the unladen case. The effect of increasing mass loading ratio on the particle velocities is analyzed.

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