

Abstract Submitted
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Near Wall measurement in Turbulent Flow over Rough Wall using microscopic HPIV¹ SIDDHARTH TALAPATRA, Johns Hopkins University, JIARONG HONG, Johns Hopkins University, JOSEPH KATZ, Johns Hopkins University — Using holographic PIV, 3D velocity measurements are being performed in a turbulent rough wall channel flow. Our objective is to examine the contribution of coherent structures to the flow dynamics, momentum and energy fluxes in the roughness sublayer. The 0.45mm high, pyramid-shaped roughness is uniformly distributed on the top and bottom surfaces of a 5X20cm rectangular channel flow, where the Re_τ is 3400. To facilitate recording of holograms through a rough plate, the working fluid is a concentrated solution of NaI in water, whose optical refractive index is matched with that of the acrylic rough plates. The test section is illuminated by a collimated laser beam from the top, and the sample volume extends from the bottom wall up to 7 roughness heights. After passing through the sample volume, the in-line hologram is magnified and recorded on a 4864X3248 pixels camera at a resolution of $0.74\mu\text{m}/\text{pixel}$. The flow is locally seeded with $2\mu\text{m}$ particles. Reconstruction, spatial filtering and particle tracking provide the 3D velocity field. This approach has been successfully implemented recently, as preliminary data demonstrate.

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