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Velocity scaling in very-rough-wall channel flows DAVID BIRCH, University of Surrey, JONATHAN MORRISON, Imperial College London — Fully-developed turbulent channel flow over mesh-type and grit- type surface roughness topologies is compared at similar roughness Reynolds numbers ku_τ/ν (where k is the roughness height) in order to investigate the effect of the specific roughness geometries upon outer layer similarity for cases where $k/h > 3\%$, where h is the channel half- height. Outer-scaled mean velocity profiles are found to collapse for $y/h > 0.15$, while for $y/h < 0.15$ the flow is subject to local inhomogeneities stemming from the individual roughness element wakes. Outer-scaled self-similarity is observed in the second and fourth velocity moments for $y/h > 0.2$, while the third moment collapses only for $y/h > 0.4$. With the inner length-scale defined as $(y - d)/y_0$ (where d is the zero-plane offset and y_0 is the roughness length scale, found to be $0.0026h$ and $0.0085h$ for the grit and mesh surfaces, respectively), the mean velocity over the grit surface exhibits inner-scaled similarity for $(y - d)/h < 0.06$, while no region of inner-scaled self-similarity was apparent over the mesh surface.

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