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Turbulent flow past three-dimensional patches of roughness MANUEL FERREIRA, BHARATHRAM GANAPATHISUBRAMANI, Univ of Southampton — Generally, investigations of flows over rough surfaces tend to focus on regular arrays of uniform obstacles (such as cubes or cylinders) or irregular distributions. This approach has led to significant progress in this field of research but so far has been unable to provide an accurate representation of flows past more complex topologies that are of a finite size. In this context, wind tunnel experiments are conducted of flows over three-dimensional patches of roughness. Randomly generated rough patches with large relative height ($h/\delta \approx 0.1$) are placed within a turbulent boundary layer. The characteristics of the finite patch of roughness are systematically varied by altering both frontal solidity (λ_F) and plan solidity (λ_P) over a large range ($\lambda_F \approx 0.05$-0.25 and $\lambda_P = 0.10$-0.38) from sparse to dense. Measurements are made using a floating-element force balance for all cases to study the behaviour of the drag with varying λ_F and λ_P. Additionally, high-resolution planar Particle Image Velocimetry (PIV) are carried out for selected cases in two different planes, streamwise wall-normal plane at the spanwise centerline of the patch as well as wall-parallel plane at $y/h \approx 3$.

Manuel Ferreira
Univ of Southampton

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