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Scaling of transitionally-rough flow structures in DNSes of channels with riblets up to $Re_\tau \approx 550$ GARCÍA-MAYORAL RICARDO, JAVIER JIMÉNEZ, U. Politécnica Madrid — The linear, drag-reducing effect of vanishingly small riblets breaks down once their size is in the transitionally-rough regime. We have previously reported that this breakdown is caused by the additional Reynolds stresses produced by the appearance of elongated spanwise rollers just above the riblet surface. These rollers are related with the Kelvin–Helmholtz instability of free shear layers, and to similar structures appearing over other rough and porous surfaces. However, because of the limited $Re_\tau \approx 180$ in our previous DNSes, it could not be determined whether those structures scaled in inner or outer units. Furthermore, it is questionable if results in the transitionally-rough regime at $Re_\tau \approx 180$ can be extrapolated to configurations of practical interest. At such small Reynolds numbers, roughness of transitional size can perturb a large portion of the boundary layer, which is not the case in most industrial and atmospheric applications. To clarify these issues we have conducted a set of DNSes at $Re_\tau \approx 550$. Our results indicate that the spanwise rollers scale in wall units, and support the validity of the extrapolation to configurations of practical interest.

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