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Large eddy simulation of channel flows with strip roughness[1]
NAMIKO SAITO, DALE PULLIN, California Institute of Technology — We describe a large-eddy-simulation (LES) study, at Reynolds number up to $Re_\tau = O(10^8)$, of turbulent flow in a long channel with the walls consisting of roughness strips. The strips are oriented either parallel or perpendicular to the flow resulting in repeated transitions of smooth and rough surfaces in the span-wise or stream-wise directions respectively. The present LES uses a wall model which contains Colebrook's empirical formula as a roughness correction to both the local, dynamic calculation of u_τ and also the LES wall boundary condition. This operates point-wise across wall surfaces, and hence changes in the outer flow can be viewed as a response to the overall roughness distribution. The results indicate that for the strips perpendicular to the flow, the recovery of the flow beyond a smooth to rough transition is faster than that of a rough to smooth transition.

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