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DNS of turbulent channel flow subject to a model dynamically rough wall BEVERLEY MCKEON, California Institute of Technology — While there is an extensive literature on the influence of surface roughness on wall turbulence, the influence of a spatially-distributed roughness with a time-varying amplitude, a "dynamically rough" wall, has not been so extensively explored. There are fundamentally interesting questions about the influence of a roughness timescale and structured energy addition on the development of the near-wall flow as well as potential applications in flow control for this kind of wall actuation. Results from a Direct Numerical Simulation of a linearized model of dynamic wall roughness in a turbulent channel flow with $Re_\tau \sim 500$ are presented. The channel flow DNS of Flores & Jimenez (2006) was modified to incorporate a time-dependent boundary condition in which the no-slip and impermeability constraints are replaced with a specific temporally-harmonic distribution of streamwise and wall-normal velocities at the wall, which can be considered as a crude linearized approximation to boundary conditions corresponding to dynamic roughness linearized about the turbulent mean velocity profile. It is shown that a global response to this forcing occurs when the first harmonic of the forcing frequency is excited. This work was performed as part of the CTR Summer program 2008. The generosity of Javier Jimenez in allowing the use of the DNS code is gratefully acknowledged.

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