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Perturbation of turbulent channel flow structure by a cylindrical roughness element G. PATHIKONDA, K.T. CHRISTENSEN, Univ. of Illinois — The existence and dynamic significance of coherent structures in turbulent wall-bounded flows has led to substantial interest in both understanding and perhaps manipulating these structures. To this end, the current work investigates the perturbing influence of a single, wall-mounted cylindrical element in the log layer of a fully-developed turbulent channel flow ($\mathrm{Re}_\tau \sim 1250$), and the latter's response and subsequent evolution. Hot-wire measurements were made in the wake of these elements ($\sim$ 250 viscous wall units tall; approximately 20% of the channel half-height) at various streamwise positions. Mean and spectral statistics of the fluctuating streamwise velocity indicate preferential and inhomogeneous modifications to the incident flow by the cylinder. Subsequent recovery in pre-multiplied spectra of the perturbed flow downstream suggests a biased environment conductive to structures corresponding to the very-large-scale motions (superstructures). Though in an inhomogeneous manner, the flow was found to continuously recover towards the unperturbed incident flow with increasing downstream distance.

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