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Effects of spanwise topographic heterogeneity on amplitude and frequency modulation of streamwise velocity fluctuations.[1] ANKIT AWASTHI, UT Dallas, MATTHEW SUBDBERG, UT Dalla, WILLIAM ANDERSON, UT Dallas — We present results on the effects of topographic height, and spanwise heterogeneity, on amplitude and frequency modulation of small-scale structures in the roughness sublayer due to large-scale structures in the logarithmic region of turbulent channel flows. This work follows preceding contributions on amplitude and frequency modulation in smooth wall turbulent boundary layers (Mathis et al., J. Fluid Mech.,**628**, 2009a, 311-337 and Ganapathisubramani et al., J. Fluid Mech., **712**, 2012, 61-91). We have considered three topographic cases with different characteristics from homogeneous (sandpaper), to two spanwise heterogeneous cases where the height amplitude is increased (this topographic configuration induces turbulent secondary flows, which are known to alter the outer-layer flow characteristics). Indeed, pre-multiplied energy spectra across wavelength and elevation (so-called spectrograms) illustrate how turbulent energy is redistributed with systematic modification to the underlying topography. We have determined how the large-scale (low-pass filtered) streamwise velocity modulates the amplitude and frequency response of small-scale (high-pass filtered) signal. We find that outer-layer topographic-induced perturbations completely alter the intensity of amplitude and frequency modulation. This highlights the passive-actuator-like role of roughness heterogeneity, and underpins the need to incorporate such functional dependence in the development of wall models for LES.

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