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Numerical simulation of pulsatile flow in rough pipes CHENG CHIN, JASON MONTY, ANDREW OOI, SIMON ILLINGWORTH, IVAN MARUSIC, ALEX SKVORTSOV, The University of Melbourne — Direct numerical simulation (DNS) of pulsatile turbulent pipe flow is carried out over three-dimensional sinusoidal surfaces mimicking surface roughness. The simulations are performed at a mean Reynolds number of $Re_\tau \approx 540$ (based on friction velocity, u_τ, and pipe radii, δ) and at various roughness profiles following the study of Chan et al. (JFM 771, 743 - 777, 2015), where the size of the roughness (roughness semi-amplitude height h^+ and wavelength λ^+) is increased geometrically while maintaining the height-to-wavelength ratio of the sinusoidal roughness element. Results from the pulsatile simulations are compared with non-pulsatile simulations to investigate the effects of pulsation on the Hama roughness function, ΔU^+. Other turbulence statistics including mean turbulence intensities, Reynolds stresses and energy spectra are analysed. In addition, instantaneous phase (eg. at maximum and minimum flow velocities) and phase-averaged flow structures are presented and discussed.

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