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Direct Numerical Simulations of transverse acoustic forcing in fully developed channel flow turbulence ANDREA GRUBER, SINTEF, MELISSA KOZUL, JAMES R. DAWSON, NTNU — Hydrogen-firing of gas turbines is a promising direction for clean and efficient carbon-free power generation. However, premixed combustion of undiluted hydrogen in low-emission combustion systems can result in unstable operating modes for gas turbines and their development must solve issues posed by flame flashback (off-design upstream propagation), and flame combustion dynamics (coupling of longitudinal or transversal acoustic waves with fluctuating heat release). The causal relationship between longitudinal acoustically-induced bulk flow fluctuations (due to combustion dynamics) and the occurrence flashback in gas turbine burners has been established for some time (Fritz et al., *J Eng Gas Turbines Power* 2004) while the key role of the near-wall 'streaks' of the turbulent boundary layer in controlling the flashback process was only explained more recently (Gruber et al., *J Fluid Mech* 2012). In this context, it is important to examine the effect of transversal acoustic waves, resulting from azimuthal modes resonating in annular combustors, on the characteristic streaky structure of near-wall turbulence. We present DNS results from an idealized channel flow configuration that employs periodic boundary conditions in the streamwise and spanwise directions, where sinusoidal pseudo-acoustic waves are imposed transversally to the bulk flow, mimicking a limit cycle. We report the response of the near-wall streaks of the velocity field to the frequency and amplitude of the imposed acoustic waves.

Andrea Gruber
SINTEF

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