Abstract Submitted
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DNS of turbulent Couette flow with transpiration - spectra and symmetry induced scaling laws.[1] SERGIO HOYAS, Instituto de Matematica Pura y Aplicada, UP Valencia, Spain, STEFANIE KRAHEBERGER, MARTIN OBERLACK, Chair of Fluid Dynamics, TU Darmstadt, Germany — We present DNS results of turbulent plane Couette flow with constant wall-normal transpiration for Reynolds numbers of $Re_\tau = 250, 500, 1000$ and several transpiration Reynolds numbers $Re_{tr} = V_0/U_w$. To obtain the DNS data, a pseudo-spectral code, which originally was developed at UP Madrid, see *(Hoyas and Jiménez 2006)*, is used for the simulations. Due to the lack of experimental and DNS data, the convergence of every simulation has been validated using the total shear stress equation and the relation between the friction velocities at the lower and upper wall.
Examining the spectra we found that the large and wide structures, which appear in pure Couette flow, see *(Avsarkisov et al. 2014)*, are destroyed as soon as transpiration velocity is different from zero. This and the presence of anomalous spectra near the blowing wall indicates the strong influence of suction on the whole flow, which was observed in *(Antonia et al. 1988)* as well. As classical scaling laws are not valid due to transpiration, new scaling laws of the mean velocity are derived using Lie symmetry methods. Additionally, suction creates a comparably larger u_τ which, in turn, causes a flat and long region in the indicator function for the largest transpiration rate.

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