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On the persistence of large-scale turbulent structures in turbulent Couette flow with wall-transpiration MARTIN OBERLACK, Tech Univ Darmstadt, SERGIO HOYAS, Univ. Politecnica de Valencia, STEPHANI KRAHEBERGER, Tech Univ Darmstadt, FLUID DYNAMICS GROUP, TU DARMSTADT TEAM, INSTITUTO DE MATEMATICA PURA Y APLICADA, UNIV. POLITECNICA DE VALENCIA TEAM — It has long been known that turbulent Couette flows (TCF) are dominated by large-scale turbulent structures of vortex-type in stream-wise direction (for an early experimental and numerical validation see e.g. Tillmark et al. 1995 and Bech et al. 1995), and a recent DNS study supports the persistence up to $Re_\tau = 550$ (Avsarkisov et al. 2014). In an ongoing DNS study the TCF is extended towards wall transpiration, i.e. blowing from below and suction at the top at constant velocity v_0. Even at small transpiration rates, i.e. $v_o/u_w \ll 1$, where u_w is the moving wall velocity, strong changes in the overall flow behavior is visible. E.g. a strong reduction of the mass-flux is observed. Beside interesting and new scaling issues, one of the most remarkable feature of this largely unexplored flow is, that even at the highest transpiration rates investigated so far, the footprints of the large turbulent rolls of the TCF are still visible at the highest Reynolds and transpiration number. Other quantities such as two-point auto-correlations, two-dimensional spectral energy densities and pre-multiplied spectra give a more detailed picture of the turbulent structure and support the finding of highly persisting large-scale turbulent structures in TCF with wall-transpiration.

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