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Turbulent structures in Kolmogorovian shear flows: DNS LAURETTE S TUCKERMAN, MATTHEW CHANTRY, PMMH (UMR 7636 CNRS - ESPCI - UPMC Paris 6 - UPD Paris 7 - PSL), DWIGHT BARKLEY, University of Warwick — Patterns of turbulent and laminar flow form a vital step in the transition to turbulent in wall-bounded shear flows. In flows with two unconstrained directions these patterns form oblique bands, whereas in pipe flow the structures are streamwise-localized puffs. To understand these structures we examine Waleffe flow, a sinusoidal shear flow, $U\sin\left(\frac{\pi}{2}y\right)$, driven by a body force and stress-free boundary conditions at $y=\pm1$. Introduced as a model for plane Couette flow we demonstrate the existence of turbulence bands which match those found in plane Couette flow, excluding the boundary layer regions of the latter flow. This agreement is reiterated in the studies of uniform turbulence and linear stability; highlighting the surprising unimportance of this region to transitional turbulence. Building upon this we consider two other canonical flows: plane Pouiseuille flow and pipe flow. Attacking these flows with the approach that succeeded in plane Couette flow we attempt to clarify the role of boundary layers to transitionally turbulent shear flows.

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