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Comparison between turbulent boundary layers and channels from direct simulation[1] JAVIER JIMENEZ[2], SERGIO HOYAS, MARK P. SIMENS, YOSHINORI MIZUNO, U. Politecnica de Madrid — Results are presented from a new simulation of the ZPG turbulent boundary layer at $Re_\theta = 1000 - 2100$, and compared to turbulent channels at similar Reynolds numbers. Even the low order statistics differ between the two flows, including within the buffer layer. The pressure and the transverse velocity fluctuations are stronger in boundary layers, even if the wall-parallel scales derived from the spectra and the two-point correlations are similar in both cases. On the other hand, the streamwise fluctuation intensities are roughly similar in both flows, but their scales are shorter and narrower in boundary layers. The differences are traced to an excess of turbulent energy production in the outer part of the boundary layer, compared to channels, associated with the stronger wake component of the mean velocity profile. Most of this excess is compensated by stronger pressure fluctuations and by the pressure-strain term, which redistribute the energy to the transverse components. The differences persist in higher Reynolds numbers experiments, suggesting caution in mixing results from different flows when documenting,for example, Reynolds number effects.

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[2]also CTR Stanford

Javier Jimenez
U. Politecnica de Madrid

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