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Scaling of normal stresses in the turbulent boundary layer PETER MONKEWITZ, Swiss federal Institute of Technology Lausanne (EPFL), HASSAN NAGIB, IIT, Chicago, USA — Concentrating on the canonical zero pressure gradient (ZPG) turbulent boundary layer (TBL), different scalings of normal stresses, in particular of $< u^2 >$, have been proposed. In the range of Reynolds numbers where measurements are available, the best data collapse is obtained by scaling stream-wise fluctuations with the free stream velocity U_∞. It is shown with the underlying RANS equations that this choice, together with the traditional Rotta outer scale $\delta^* U_\infty^+$ and the "log law" leads to a boundary layer thickness which decreases in the downstream direction. In other words, if one insists on both the traditional mean flow similarity and on scaling normal stresses with U_∞, all (growing) TBLs seen so far are very far from their true asymptotic (shrinking) state. Alternative assumptions/scalings and their consequences will be discussed.

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