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Mean momentum balance evolution in boundary layer transition RACHEL EBNER, University of New Hampshire, XIAOHUA WU, Royal Military College of Canada, JOSEPH KLEWICKI, University of New Hampshire — The mean momentum balance in the high Reynolds number turbulent boundary layer has a four layer structure. This structure reflects a specific magnitude ordering of the underlying dynamical mechanisms. The observed properties of the mean velocity and Reynolds stress profiles follow directly from this ordering of terms. The recent DNS of Wu and Moin (*JFM* **630**, 2009) is used to explore how the four-layer structure first forms. Specific and mathematically well-justified criteria are employed to identify the minimum Reynolds number at which the ordering of terms characteristic of the high Reynolds number state is first established. Physically, this ordering occurs owing to the inward localization of the mean viscous force in concert with the outward localization of mean inertia. Comparisons indicate that, while the characteristic four layer structure for boundary layers and channels is very similar at high Reynolds numbers, the approach to the these similar states occurs by a different route and at significantly different rates.

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