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Evidence of an asymptotic geometric structure to the Reynolds stress motions in turbulent boundary layers[1] JOSEPH KLEWICKI, University of New Hampshire/Melbourne, JIMMY PHILIP, CALEB MORRILL-WINTER, University of Melbourne — Recent results suggest that the uv motions in turbulent wall-flows asymptotically exhibit self-similar geometric properties. Herein we use time series from high resolution boundary layer experiments up to high Reynolds numbers to discern additional properties associated with the uv signals. Their space filling properties are shown to reinforce previous observations, while the uv skewness profile suggests that the size and magnitude of these motions are correlated on the inertial domain. The size and length scales of the negative uv-motions are shown to increase with distance from the wall, while their occurrences decreases. A joint analysis of the signal magnitudes and their corresponding lengths reveals that the length scales that contribute most to $\langle -uv \rangle$ are distinctly larger than their average size. The u and v cospectra, however, exhibit invariance across the inertial region when their wavelengths are normalized by the width distribution, $W(y)$, of the scaling layer hierarchy surmised from analysis of the mean momentum equation. This distribution is associated with scale dependent zero-crossings in the contributions to $\langle -uv \rangle$, and derivative cospectra of $\langle -uv \rangle$ support the existence of this structural detail.

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