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Spatial and temporal properties of vorticity in high Reynolds number turbulent boundary layers[1] SPENCER ZIMMERMAN, University of Melbourne, JOSEPH KLEWICKI, University of Melbourne, University of New Hampshire — The Reynolds number dependence of the mean dynamics of turbulent wall-bounded flow has been shown to be intimately related to the properties of the vorticity field. For example, in aggregate, the spatial distribution and strength of the spanwise vorticity underpins the eventual shape of the mean velocity profile. Additionally, decomposition of the Reynolds stress gradient in the mean momentum equation reveals the dependence of this term on the alignment between the velocity and vorticity fields. Toward investigating the evolution with Reynolds number of the role of vorticity in the transport of momentum, simultaneous temporally-resolved measurements of the velocity and vorticity vectors have been acquired across a wide range of Reynolds numbers. These measurements allow for inspection of the magnitudes and length scales at which the various components of vorticity congregate as functions of both wall-distance and Reynolds number. In this presentation, various spatial and temporal properties of the vorticity and velocity fields are presented and discussed in the context of the leading balance structure of the mean momentum equation.

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