Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

High Reynolds number rough-wall turbulent boundary layers DOUGAL SQUIRE, CALEB MORRILL-WINTER, University of Melbourne, MICHAEL SCHULTZ, United States Naval Academy, NICHOLAS HUTCHINS, University of Melbourne, JOSEPH KLEWICKI, University of Melbourne, University of New Hampshire, IVAN MARUSIC, University of Melbourne — In his review of turbulent flows over rough-walls, Jimenez (2004) concludes that there are gaps in the current database of relevant experiments. The author calls for measurements in which δ/k and k^+ are both large—low blockage, fully-rough flow—and where δ/k is large and k^+ is small—low blockage, transitionally-rough flow—to help clarify ongoing questions regarding the physics of rough-wall-bounded flows. The present contribution details results from a large set of measurements carried out above sandpaper in the Melbourne Wind Tunnel. The campaign spans 45 rough-wall measurements using single and multiple-wire hot-wire anemometry sensors and particle image velocimetry. A floating element drag balance is employed to obtain the rough-wall skin friction force. The data span $20 < k_s^+ < 160$ and $30 < \delta/k_s < 200$ across a friction Reynolds number range of $2800 < Re_\tau < 30000$, targeting areas in the parameter space identified by Jimenez (2004) as being sparsely populated by pre-existing data. Smooth-wall data are also obtained across a similar Reynolds number range to enable comparison of smooth- and rough-wall structural features. Generally, the data indicate similarity in the outer-layer of smooth- and fully-rough wall-bounded flows.

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Date submitted: 31 Jul 2015 Electronic form version 1.4