Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

The use of experimental data as the inlet to direct numerical simulations of turbulent channel flow[1] CALLUM ATKINSON, EZHILSABAREESH KANNADASAN, LTRAC, DMAE, Monash University, ADRIAN LOZANO-DURAN, Center Turbulence Research, Stanford University, PETER SCHMID, Department of Mathematics, Imperial College London, JAVIER JIMENEZ, E.T.S. Ingenieros Aeronauticos, Universidad Politecnica de Madrid, JULIO SORIA, LTRAC, DMAE, Monash University — In the direct numerical simulation (DNS) of turbulence it is the large scales that require large computational domains and long simulation times to attain the correct statistically stationary state. In contrast experimental measurements struggle to resolve down to the dissipative flow scales, but have far less trouble capturing the large scales. In this work we demonstrate how large scale information from planar experimental measurements can be fed into a turbulent channel flows DNS to reduce the required computational time and domain for a given friction Reynolds number. The effect of inlet resolution and required spanwise extent are examined by generating synthetic experimental fields from streamwise periodic channel flow DNS at Reτ =180 and 550 and using this data as the inlet to a channel flow DNS with inlet-outlet boundary conditions. When fully resolved inlet data is used the streamwise domain of the inlet-outlet DNS can be reduced to 1/16 of the periodic domain with minimal influence on the flow statistics and can even withstand a halving of the spanwise domain.

[1]The authors acknowledge the support of The Australian Research Council through a Discovery Grant and the European Research Council through the advanced grant COTURB

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Date submitted: 31 Jul 2019 Electronic form version 1.4