Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Interscale Transport of the Reynolds Shear Stress in Wall-bounded Flows[1] RAMIS ÖRLÜ, Linné FLOW Centre, KTH Mechanics, GIOLE FERRANTE, ANDRES MORFIN, Università di Bologna, TAKUYA KAWATA, Tokyo University of Science, PHILIPP SCHLATTER, P. HENRIK ALFREDSSON, Linné FLOW Centre, KTH Mechanics — The interplay between the inner and outer layers in wall-bounded turbulent flows has become one of the focus areas with the advent of high-fidelity numerical and experimental data of sufficient scale separation, i.e. high enough Reynolds number. The general view is that the inner layer behaves autonomously in terms of its near-wall cycle and the outer layer exhibits independence of the details of the inner layer. At the same time, strict inner scaling for the near-wall region does not hold, due to the top-down influence from the large-scale structures further away from the wall. Recently, bottom-up influence (inverse energy transfer) has been observed, but primarily studied in terms of the turbulent kinetic energy. Here, using numerical simulation data from both a plane Couette flow and a turbulent boundary layer, the interscale transport of the Reynolds stress is examined. Besides the classical interscale transport of turbulent kinetic energy towards smaller scales, also an inverse interscale transport of the Reynolds shear stress was observed. The spectral, scale-by-scale, analysis also indicates how inter-scale transport and turbulent diffusion explains the mismatch between the locations of the outer peaks in the Reynolds shear stress production and cospectrum.

[1]HIRETURN project funded through the Swedish Research Council (VR)

Ramis Örlü
Linné FLOW Centre, KTH Mechanics

Date submitted: 30 Jul 2019 Electronic form version 1.4