

Abstract Submitted  
for the DFD20 Meeting of  
The American Physical Society

**Influence of surface roughness on co-supporting cycle in a turbulent plane Couette-Poiseuille flow**<sup>1</sup> JEONG HYUN KIM, YOUNG MO LEE, JAE HWA LEE, Ulsan National Institute of Science and Technology — Direct numerical simulations of fully developed turbulent plane Couette-Poiseuille flows (C-P flows) with and without a two-dimensional rod-roughened wall are performed to investigate the influence of the surface roughness on the flows. The Reynolds number based on the centerline laminar velocity and channel half-height is  $Re=7200$ . When the surface roughness is imposed in the C-P flow with the smooth wall, the magnitude of the Reynolds shear stress decreases in the outer layer due to weakened very-large-scale motions (VLSMs) and roll-cell mode near the channel centerline. Although the congregation of the near-wall small-scale motions by the roll-cell mode contributes to the formation of the VLSMs and the VLSMs, in turn, generate the roll-cell mode in the smooth-wall C-P flow, the weakened congregation motions of the small-scales by influence of the surface roughness reduces the strength of the VLSMs and roll-cell pattern.

<sup>1</sup>This research was supported by the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2019R1A2C1083858) and partially by the National Supercomputing Center with supercomputing resources including technical support (KSC-2019-CRE-0170).

Jeong Hyun Kim  
Ulsan National Institute of Science and Technology

Date submitted: 31 Jul 2020

Electronic form version 1.4