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Wall-attached structures of velocity fluctuations in turbulent Couette-Poiseuille flows[1] JUN HYUK HWANG, HYEON GYU HWANG, JAE HWA LEE, Department of Mechanical Engineering, UNIST — Direct numerical simulations (DNSs) of turbulent Couette-Poiseuille flows (CP-flows) under the moving wall conditions in the opposite direction to the main flow are performed to examine the turbulent characteristics of asymmetric wall-bounded flows. As the moving wall velocity increases, the positions for the maximum mean velocity and zero mean shear rates are shifted to the stationary wall, creating asymmetric shear layers. Although the friction Reynolds numbers on both walls increase, the logarithmic layer is elongated and shortened on the moving and stationary walls respectively. Furthermore, inspection of the turbulent intensities shows that the turbulent activity increases and decreases near the moving and stationary walls. The wall-attached structures in the CP-flows are self-similar with respect to their heights (l_y) and population density is inversely proportional with l_y in the logarithmic layer. The turbulent characteristics of the asymmetric wall-bounded flows are closely associated with difference of the wall-attached structures between the moving and stationary walls.

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