Investigation of Turbulent Laminar Patterns in Poiseuille-Couette flow

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Laminar-turbulent intermittency has recently been observed in the transitional regime of pipe (1-3) and plane Couette flow (4-8). While many studies focus on behavior of these patterns in plane Couette flow, little attention has been paid to transition in cases of Poiseuille – Couette flow. In this study, we examine behavior of turbulent laminar patterns in Poiseuille-Couette flow, including pure Poiseuille and Couette flows at two limits. Direct Numerical Simulation (DNS) is used to simulate a Poiseuille-Couette channel at a size of 16πh x 2h x 2πh (corresponding to a resolution of 512 x 129 x 128) in x, y and z directions, respectively, with periodic boundary condition employed in the x and z directions (h is half of the channel height). The Reynolds number in friction wall parameters is 300, and the flow is at transitional regime in all simulations. Behavior of laminar-turbulent patterns as the flow goes from Couette to Poiseuille will be presented in details. This would shed some light on the effect of different types of flow on these transition patterns, as well as how these patterns vary from Poiseuille flows to Couette flows.

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