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Degeneracy of turbulent states in 2D channel flow[1] VILDA MARKEVICIUTE, RICH KERSWELL, University of Cambridge — Flows outside the laminar regime in 2D channels have received only limited attention until recently. In 2018, Falkovich and Vladimirova (Phys. Rev. Lett. 121,164501, 2018) studied pressure-gradient-driven 2D channel flows which reached fully turbulent regimes up to a Reynolds number Re = 3.2x10^5 and suggested a power law relationship between the pressure gradient and volume flux of the flow. We revisit the problem but now with the flow driven by constant volume flux. Our DNS study reveals a degeneracy of turbulent states over the range Re $\in$ [2.1x10^4, 7.2x10^4) with symmetric and asymmetric states (based on the mean shear on each of the channel walls) co-existing for at least 1.2x10^4 channel transit times. The symmetric states correspond to the remarkably simple travelling wave structure observed by Falkovich and Vladimirova while the asymmetric states first transition to turbulence near one of the channel walls only. The bistability of these states is established by finding an unstable edge state which separates the two turbulent attractors. In this talk, the asymmetric path to turbulence is presented and the implications to the bistability of the states are discussed.

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Vilda Markeviciute
University of Cambridge

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