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Pattern formation in plane Couette flow turbulence YOHANN DUGUET, PHILIPP SCHLATTER, DAN S. HENNINGSON, KTH Mechanics, Stockholm, Sweden — Plane Couette flow is the flow between two counter-sliding plates of velocity U separated by a gap $2h$. Despite the linear stability of the laminar base flow, sustained turbulence is observed experimentally above $Re \sim 300$, where $Re = \frac{Uh}{\nu}$ (ν is the kinematic viscosity of the fluid). Whereas featureless turbulence is seen for $Re \geq 400$, lower-Re experiments have shown the appearance of turbulent stripes, inclined with respect to the base flow, interspersed with quiescent, nearly laminar regions. Direct numerical simulation using a spectral code in an unusually large computational domain ($800h$ in length and $356h$ in width with periodic boundary conditions) is performed here to highlight the large-scale self-organisation of the flow, out-of-reach in former simulations. The system evolves towards a fragmented large-scale pattern, where several competing inclinations can coexist. We suggest a new way to study the angle selection of those turbulent patterns, based on the computation of edge states in a smaller computational domain of size $80h \times 80h$. We can show that angles close to $40°$ are prefentially chosen by the system close to the threshold and that this range of angles increases with the amplitude ofthe initial perturbation. This demonstrates that the pattern selection is linked to the subcritical nature of the transition process.

Dan Henningson
KTH Mechanics

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