

KlimaCampus Kolloquium

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at the Invitation of the Meteorological Institute of
Universität Hamburg

Turbulence Without Linear Instability: The Transitions in Pipe Flow and Boundary Layers

The transition to turbulence is usually associated with sequences of instabilities, a typical example being Rayleigh–Benard convection. Boundary layer flows, parallel shear flows and most prominently pipe flow do not fall into this category: there is no linear instability of the laminar profile that could give initiate a cascade of progressively more complex flow states. Moreover, the turbulence in the transition region is not homogeneous but patchy and shows stripes and turbulent patches and puffs. In recent years a consistent picture of the fundamental processes underlying this transition has emerged. Its key features include fully nonlinear, three-dimensional flow states that have been identified numerically, their long-wavelength instabilities that give rise to spatial patterns, and analogies to directed percolation that explain the statistical properties of the spatio-temporal dynamics.

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