

Poloidal Flows, Asymmetries and Multiscale Organisation in Interplaying Core–edge–SOL Turbulent Plasmas

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A central challenge in the years to come is to start providing a unified view of magnetised plasma turbulence in regimes of experimental relevance –with near-critical parameters and flux-driven self-organisation–when multiple scales and disparate regions of the plasma self-consistently interplay.

We here present a comprehensive discussion of turbulence properties when confined core, edge and Scrape-Off-Layer (SOL) regions interplay, based on well-diagnosed ToreSupra discharges and flux-driven gyrokinetic computations recently extended to modelling the outer edge and SOL regions where commonly assumed separations of scales tend to break down. Various regimes of electrostatic turbulence: Ion Temperature Gradient (ITG) and Trapped Electron Mode (TEM) are investigated in near-critical flux-driven regimes. Advanced statistical properties of transport, rotation and poloidal asymmetries are analysed and detailed confrontation with high-precision reflectometry is presented, through the use of dedicated synthetic diagnostics.

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