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TH/P4-23: Edge Sheared Flows and Blob Dynamics

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A study of sheared flows in the edge and scrape-off layer (SOL) and their interaction with blob-filaments is presented. Edge sheared flows are believed to be important for the L-H, and H-L transitions. Blob generation and dynamics impacts both the (near-separatrix) scrape-off-layer (SOL) width critical for power handling in the divertor, and the interaction of plasma in the far SOL with plasma-facing components. These topics are critical for ITER and future devices. A fluid-based 2D curvature-interchange model embedded in the SOLT code is employed to study these issues. Sheared binormal flows both regulate the power flux crossing the separatrix and control the character of emitted turbulence structures such as blob-filaments. At a critical power level (depending on parameters) the laminar flows containing intermittent, but bound, structures give way to full-blown blob emissions signifying a transition from quasi-diffusive to convective transport. In order to diagnose sheared flows in experiments and assess their interaction with blobs, a blob-tracking algorithm has been developed and applied to both NSTX and Alcator C-Mod data. Blob motion and ellipticity can be affected by sheared flows, and are diagnosed and compared with seeded blob simulations. A picture of the interaction of blobs and sheared flows is emerging from advances in the theory and simulation of edge turbulence, combined with ever-improving capabilities for edge diagnostics and their analysis.

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