Abstract Submitted
for the APR06 Meeting of
The American Physical Society

Simulation of plasma and impurity parallel flows, blob dynamics and cross-field transport asymmetry effects in tokamak SOL[1] A.YU. PIGAROV, S.I. KRASHENINNIKOV, G. YU, UCSD, B. LABOMBARD, MIT, T.D. ROGNLIEN, LLNL — Recent experiments on several tokamaks have showed strong cross-field (CF) plasma convection due to intermittency (e.g., blobs) as well as the existence of large-Mach-number parallel plasma flows (LPPFs) in the SOL. Here we, firstly, report on the progress in our studies of dynamics and stability of coherent structures (blobs, dips) based on comprehensive 2D edge turbulence models. Secondly, multi-fluid 2D simulations of edge plasma and neutral gas transport are performed with the UEDGE code to explore potential driving mechanisms of LPPFs. We employ multi-ion diffusive-and-convective model for anomalous CF plasma transport. The model introduces asymmetric (ballooning-like) 2D profiles for CF transport coefficients, which are adjusted to match a representative set of experimental data. The UEDGE results on LPPFs are presented for SN L-mode shots in NSTX, C-Mod, and DIII-D tokamaks. The roles of asymmetric intermittent CF transport, magnetic configuration and classical drifts in affecting the plasma flows are highlighted. The influence of these flows on divertor detachment, material migration, and main chamber recycling are discussed. Finally, we analyze the behavior of impurity ions in the SN SOL. Impurity sources and parallel flows of impurity ions are simulated with UEDGE under assumption of high LFS/HFS asymmetry of CF transport. Simulations show that in L-mode shots all charge states of impurity ions are highly entrained by background plasma flows. In the far SOL, impurity ions tend to have the same flow velocity as the deuterium ions, so that impurities are highly supersonic when the deuterium plasma flow is near-sonic. The outboard main-chamber wall can be an important net source of impurities, whereas both divertors can behave as net sinks for impurities. Work performed under USDoE grant DE-FG02-04ER54739.

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Date submitted: 28 Feb 2006 Electronic form version 1.4