# Neutral and plasma particle transport during the ELM-cycle; toward a dynamic pedestal/SOL model*

T.D. Rognlien and G.D. Porter

*Lawrence Livermore National Laboratory, Livermore, CA 94550*

During an edge localize mode (ELM) cycle in tokamaks, pedestal plasma number density and energy are ejected into the scrape-off layer (SOL). The energy is lost to the surrounding material surfaces, but the hydrogenic particles are believed to be mostly recycled, thereby contributing to the pedestal density buildup prior to the next ELM. The buildup of the tokamak pedestal density following ELM ejection might arise from neutral fueling or a possible inward transport of scrape-off layer plasma. We evaluate the impact of plasma recycling as neutrals at material surfaces and the subsequent time-dependent penetration of the neutrals to the pedestal region using the time-dependent 2D UEDGE transport code. The simulation models quasi-steady-state discharges with regularly-spaced bursts of ELMs and the net pumping of all walls and pumps averaged over an ELM cycle is just sufficient to remove the small neutral beam particle source. An important experimental signature of such recycling is the time response of the H-$\alpha$ radiation coming mainly from the divertor region, a common experimental signature of ELM plasma ejection; comparisons will be made with existing line-integrated H-$\alpha$ data from DIII-D. The second pedestal fueling process considers inward plasma transport. Here it is important distinguish between a net inward plasma transport at the separatrix from the near balancing of outward diffusion and inward convection (a pinch) that still results in a small, but finite outward plasma flux. The presence of a pinch term balancing outward diffusion has been inferred from an interpretive analysis [1], and pinch mechanism has been proposed from the paleoclassical model [2]. Here we analyze a pinch mechanism associated with (anomalous or neoclassical) perpendicular ion viscosity in UEDGE that occurs when cross-field particles drifts are included and discuss its relation to the interpretive model in Ref. [1]. Quantitative comparisons are made of the relative roles of neutral penetration and net plasma transport at the separatrix.

[1] W.M. Stacey and R.J. Groebner, Phys. Plasmas **16** (2009) 102504.

[2] J.D. Callen et al., Nucl. Fusion **50** (2010) 064004.

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