Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Dynamics of L-H transition and hysteresis in a spatially averaged transport model[1] MIKHAIL MALKOV, PATRICK DIAMOND, University of California, San Diego — A zero-dimensional L-H transition model suggested by Kim and Diamond (2003) is studied analytically and numerically in detail. The dynamical system consists of three equations coupling the drift wave turbulence level, zonal flow speed and the pressure gradient. The fourth component, the mean shear velocity is slaved to the pressure gradient. The bursting behaviour characteristic for predator-prey models of the drift wave - zonal flow interaction is recovered near the transition to the quiescent H-mode. It occurs as strongly nonlinear relaxation oscillations. The latter, in turn, arise as a Hopf bifurcation (limit cycle) of an intermidiate (between the L and H modes) fixed point. The system is shown to remain at the H-mode fixed point even after the heating rate is decreased below the bifurcation point (hysteresis, subcritical bifurcation) but the basin of attraction of the H-mode shrinks rapidly with decreasing power. The shrinkage of the H-mode basin at the back-transition suggests that the hysteresis at the H-L transition may be less than what is often thought.

[1]Supported by US DoE.

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Date submitted: 21 Jul 2006 Electronic form version 1.4