Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Validating a 0D predator-prey model for LH Transition with its 1D-2D supersets: effects of heating and fueling on Hysteresis and transition dynamics[1] MIKHAIL MALKOV, PATRICK DIAMOND, KAZUHIRO MIKI, UCSD — The LH transition crucially depends on the heat and particle deposition, transport and electric field shear suppression. Despite the inhomogeneity of these phenomena, a popular 0D predator-prey model seems to capture the essential transition dynamics, including the limit cycle pre-H-mode oscillations (or I-mode). However, its predictions regarding hysteresis are inconclusive. This is understandable at least because of the known deep fuel lowering of the transition threshold. The readily available fueling devices are the edge neutral penetration and an internal deposition via the supersonic molecular beam injection (SMBI). This suggests a minimal extension of the 0D model by using bi-modal particle distributions. To formulate this extension accurately, a step-by-step comparison with a 1D treatment is required. Fortunately a suitable 1D numerical model has been recently developed specifically for the LH transition studies. In this work, we use the 1D model for the following purposes. First, we explore fueling effects as occurring both by edge neutral penetration, and internal deposition (SMBI) at a finite depth within the separatrix. Second, as the 0D model responds positively to the oscillating heating power, we include a periodic repetitive SMBI firing.

[1]Supported by the US DoE

Mikhail Malkov
UCSD

Date submitted: 10 Jul 2013 Electronic form version 1.4