Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Analysis of different responses of ion and electron in six-field two-fluid ELM simulations[1] CHENHAO MA, PKU/LLNL, XUEQIAO XU, LLNL — We report simulation results of a Landau-Fluid (GLF) extension of the BOUT++ six-field two-fluid Braginskii model which contributes to increasing the physics understanding of ELMs. Landau-Fluid closure can fill the gap for parallel dynamics between hot, collisionless pedestal region and cold, collisional SOL region in H-mode plasmas. Our goal is extending the classical parallel heat flux with Landau-Fluid closures and making comparisons with other closure models. Our simulations show that for weakly collisional pedestal plasmas, the calculated growth rate with Landau-Fluid closure introduces more effective damping on the peeling-ballooning modes than that with the classical thermal diffusivity. Further nonlinear simulation shows that ELM size with Landau-Fluid Closure is smaller than that with classical thermal diffusivity. We find an ELM crash has two phases: fast initial crash of ion temperature perturbation on the Alfven time scale and slow turbulence spreading. Turbulence transport phase is a slow encroachment of electron temperature perturbation due to the ELM event into pedestal region which is due to a positive phase shift around $\pi/2$ between electron temperature and potential on pedestal region while ion temperature is in-phase with potential.

[1]This work was performed under the auspices of the U.S. DoE by LLNL under Contract DE-AC52-07NA27344 and also supported by the China Scholarship Committee under contract N0.2011601099.

Chenhao Ma
PKU/LLNL

Date submitted: 11 Jul 2013 Electronic form version 1.4