Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

DIII-D L-mode edge instabilities simulated in BOUT++[1] ERIC BASS, CHRISTOPHER HOLLAND, Univ of California - San Diego, TIANYANG XIA, XUEQIAO XU, Lawrence Livormore National Laboratory — The well-known shortfall in predicted DIII-D tokamak L-mode edge transport [1] is investigated using various one and two-fluid models implemented in the BOUT++ code [2]. Five- [3] and six-field [4] models employed here contain the essential physics of peeling-ballooning modes, common in the H-mode edge, as well as drift-wave instabilities, predicted by various gyrokinetic and gyrofluid codes to dominate in the benchmark L-mode shot under investigation. We examine the extent to which instabilities driven at the separatrix can account for the systematic under-prediction of transport by these previous efforts. The focus is on the unstable linear spectrum for two domains: including and not including the separatrix. We compare one-fluid results (resistive ballooning unstable), two-fluid results (varying stability characteristics), and predictions from the gyrokinetic code GYRO [5] (driftwave dominant), to establish which models make meaningful contact with the experiment in which regimes and locations. We comment on numerical pitfalls within BOUT++ revealed in the present study. [1] T. L. Rhodes et al., Nucl. Fusion 51, 063022 (2011) [2] Dudson et al., Comp. Phys. Comm. V.180 (2009) 1467. [3] T.Y. Xia and X.Q. Xu, Phys. Plasmas 20, 052102 (2013) [4] T.Y. Xia, X.Q. Xu and P.W. Xi, Nucl. Fusion 53, 073009 (2013) [5] J. Candy and R.E. Waltz J. Comput. Phys. 186, 545 (2003)

[1]Prepared by UCSD under Contract DE-FG02-06ER54871 and by LLNL under Contract DE-AC52-07NA27344

Eric Bass
Univ of California - San Diego

Date submitted: 23 Jul 2015 Electronic form version 1.4