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Reduced Kinetic MHD model of an L-mode RAHUL GAUR, IAN ABEL, WILLIAM DORLAND, University of Maryland, College Park — Knowledge of the L-mode edge is crucial to understanding the transport and stability of an L-mode plasma and the $L-H$ transition. Experiments have shown that the density fluctuations become large ($O(1)$) and average gradients steepen as we move from the core to the edge of an L-mode plasma. Trying to understand such a system solely using fluid equations will neglect important kinetic effects such as Landau resonances and trapped particle modes. We present a computationally efficient and first-principles model of such a plasma. Our model consists of a closed set of hybrid fluid-kinetic equations. We assume $O(1)$ corrections to the distribution function and electromagnetic fluctuations. These fluctuations have a wavelength comparable to the perpendicular length scale and evolve on a parallel streaming time scale at the speed of sound. The model comprises a kinetic equation for the ions, fluid-like equations for the electron density and temperature, and a vorticity equation for the electrostatic potential. To validate our model, we examine the behaviour of zonal flows and Geodesic Acoustic modes, reproducing known results. To understand the physics of large-scale fluctuations in the edge, we examine the linear stability of ITG modes and Trapped-Particle Modes in our system.

Rahul Gaur
University of Maryland, College Park

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