Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Parallel flow acceleration at the presence of magnetic trapping in an open field line plasma ZEHUA GUO, XIANZHU TANG, CHRIS MCDEVITT, Los Alasmo National Laboratory — Tokamak scrape-off layer (SOL) plasma spans a range of collisionality that poses a challenge for both kinetic and fluid modeling. In high-performance shots, the SOL plasma can be sufficiently hot that although the electrons remain a nearly isotropic Maxwellian distribution, the ions can become anisotropic due to magnetic trapping of the $1/R$ toroidal field around the mid-plane. Similarly the electrons and ions tend to have different temperatures. Capturing the physics hence requires at least three temperatures, $T_e, T_{\perp_i}, T_{\perp_e}$. The ion parallel flow acceleration, which is closely tied to ambipolar potential, becomes particularly interesting in comparison with the standard SOL fluid model predictions. Here we illustrate the underlying physics in a simplified linear geometry where the combined effect of magnetic trapping and plasma sheath is resolved by kinetic simulations. Specifically, we find that parallel flow is accelerated across the transonic point far away from the sheath entrance. Remarkably, a modified CGL model with collisional effect is found to be useful for understanding the new physics results. Work supported by OFES.

Zehua Guo
Los Alasmo National Laboratory

Date submitted: 12 Jul 2013 Electronic form version 1.4