Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

**Ion thermal and dispersion effects in Farley-Buneman instabilities**[1] SANDEEP LITT, ANDREI SMOLYAKOV, University of Saskatchewan, EHAB HASSAN, WENDELL HORTON, University of Texas, UNIVERSITY OF SASKATCHEWAN TEAM, UNIVERSITY OF TEXAS TEAM — Farley Buneman instability is most commonly observed in the collisional part of ionospheric E-layer and solar chromosphere. Despite high collisionality, the kinetic effects associated with finite temperature are important for determination of the mode frequencies and growth rate, especially for largely unmagnetized ion component. The kinetic theory offers a comprehensive tool for studies of thermal effects but remains to be a challenge even for modern computers. Alternatively, we develop an extended ion fluid model that incorporates ion thermal and kinetic effects via the linear closures for higher order moments. The ion thermal effects on dynamics of FB type modes are investigated in the short wavelength region using the first and second order closure and the full kinetic response. It is shown that the ion thermal effects are primarily reasons for mode cutoff at shorter wavelength and FB instability is limited by the finite range of wavevectors. The proposed fluid like equations with closures could be useful alternative for the analysis of weakly driven situations, in contrast to the PIC simulations which can handle strongly driven cases but are noisy near the marginal stability boundary. Our results also indicate that the mode growth rate is a nonmonotonic function of the wave vector and also depends on the collisionality. The critical phase velocity (or threshold) for the unstable modes is shown to be modified due to the ion thermal effects.

[1]NSERC

Andrei Smolyakov
University of Saskatchewan

Date submitted: 24 Jul 2015 Electronic form version 1.4