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Ion-Neutral Collision effects on Streaming Instabilities in the Pre-Sheath of Low Temperature Plasmas PATRICK ADRIAN, SCOTT BAALRUD, University of Iowa, TREVOR LAFLEUR, Laboratoire de Physique des Plasmas, CNRS, Sorbonne Universites, UPMC Univ Paris 06, Univ Paris-Sud, Ecole Polytechnique, 91128 Palaiseau, France — Ion-ion streaming instabilities are present in the pre-sheaths of multi-ion-species plasmas and have been theorized to cause an anomalous frictional force that merges ion flow speeds together.[1] If the neutral pressure is sufficiently high, ion-neutral collisions will damp the two stream instability and decrease the frictional force felt by ions. We present different models for the ion velocity near the sheath - pre-sheath boundary taking into account both two stream instabilities and neutral collisions. We consider different ion-neutral collision models for the collision term, $\frac{\partial f}{\partial t}|_c$, in the kinetic equation, which yield modifications to the linear dielectric response function of the plasma. We present new PIC-MCC simulations and compare with theoretical predictions for: (1) the presence of instability, (2) the observed growth rates, (3) and the flow speeds of the ions through the pre-sheath.

[1] Baalrud S D, Hegna C C and Callen J D 2009 Phys. Rev. Lett. 103 205002

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