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Influence of Neutral Pressure on Instability Enhanced Friction and Ion Velocities at the Sheath Edge of Two-Ion-Species Plasmas PATRICK ADRIAN, Massachusetts Institute of Technology, SCOTT BAALRUD, University of Iowa, TREVOR LAFLEUR, PlasmaPotential — Ions are well-known to enter the sheath at the Bohm velocity in single-ion plasmas. However, for two ion species plasmas, the ions' sheath edge speed has been observed to deviate from the individual Bohm velocity [1]. The Instability-Enhanced Friction (IEF) theory [2] accurately predicts this deviation by accounting for an enhanced friction between the ions that merges their velocities. The enhanced friction is caused by ion-ion two-stream instabilities in the presheath. Here we report an advancement of the IEF theory which includes the effect of neutral pressure when predicting sheath edge ion speed in a two ion species plasma [3]. The predictions for the ions' sheath edge flow were tested against Particle-in-Cell Monte-Carlo Collision (PIC-MCC) simulations for a range of neutral pressures and were shown to be accurate. The theory and simulations indicate that the two-stream instability can persist up to 10's of mTorr. This result implies ion-ion streaming instabilities can affect the ions' sheath edge flow speed in plasma based manufacturing devices, which can operate in the 10's of mTorr of pressure. [1] G. D. Severn, *et. al.*, PRL. 90, 145001 (2003) [2] S. D. Baalrud, *et. al.* PRL 103, 205002 (2009) [3] P. J. Adrian, *et. al.*, POP 24, 123505 (2017)

Patrick Adrian
Massachusetts Institute of Technology

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