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**Two-Stream Instabilities and Enhanced Friction Forces in the Two Ion Species Plasma Presheath** SCOTT D. BAALRUD, Department of Physics and Astronomy, University of Iowa, TREVOR LAFLEUR, LPP-CNRS, Ecole Polytechnique, WILLIAM FOX, KAI GERMASCHEWSKI, Space Science Center, University of New Hampshire — A recent theory proposes that ion-ion two-stream instabilities can arise in the presheath of plasmas with two ion species under certain conditions and that these instabilities rapidly enhance the frictional coupling between the ion species [1]. These predictions were later confirmed experimentally [2]. However, recent work has questioned the validity of this theory based on PIC simulations that did not observe instabilities [3]. Using exact numerical solutions of the dispersion relation, we show that the source of this apparent discrepancy is a lower electron temperature in the simulations. Although the previous approximate instability criterion derived in Ref. [1] predicts instability at the lower electron temperature, we show here that the results of Ref. [3] are in fact consistent with the instability bounds of the exact theory. Furthermore, we find that the exact theory still predicts instability at the measured electron temperature [2]. Finally, we conduct new PIC simulations of the presheath and directly identify ion-ion two-stream instabilities and enhanced friction forces.

[1] Baalrud, Hegna and Callen, PRL 103, 205002 (2009).

[2] Yip, Hershkowitz and Severn, PRL 104, 225003 (2010).

[3] Gudmundsson and Lieberman, PRL 107, 045002 (2011).

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