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Experimental test of instability enhanced collisional friction for determining ion loss in two ion species plasmas[1] GREG SEVERN, Physics, University of San Diego, CHI-SHUNG YIP, NOAH HERSHKOWITZ, Engineering Physics, University of Wisconsin-Madison — Recent experiments have shown that ions in weakly collisional plasmas containing two ion species of comparable densities nearly reach a common velocity at the sheath edge. A new kinetic theory of Baalrud et al. suggests that collisional friction between the two ion species enhanced by a two stream instability reduces the drift velocity of each ion species relative to each other near the sheath edge, and finds that the difference ($\Delta V = V_2 - V_1$) in velocities at the sheath edge depends on the relative concentrations of the species, and on the ion temperatures. The difference is small when the concentrations are comparable and is large, with each species reaching its own Bohm velocity, when the relative concentration differences are large. To test these findings, ion drift velocities were measured near the near sheath edge in Argon-Xenon plasmas as a function of the concentration ratio using the laser-induced fluorescence technique. We showed that the predictions are in excellent agreement with our measurements. These are the first experimental tests of the new model.

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