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In-plane electric field and its effects on ion dynamics¹ JONG-SOO YOO, MASA AKI YAMADA, HANTAO JI, CLAYTON MYERS, JONATHAN JARA-ALMONTE, Princeton Plasma Physics Laboratory — The in-plane electric field is a signature of two-fluid effects in the diffusion layer [1]. The interaction of ions with this electric field leads both to ion acceleration and heating downstream [2]. The measured two-dimensional (2-D) floating potential profile in Helium discharges indicates that the magnitude of the in-plane electric field (250 - 800 V/m) is larger than the out-of-plane reconnection electric field (100 - 200 V/m). For a quantitative study of ion dynamics under the in-plane electric field, local ion velocity distributions along all three (radial, axial, and toroidal) directions are measured by Ion Dynamics Spectroscopy Probes (IDSPs), from which ion flow velocities and associated temperatures are determined. The strong in-plane electric field accelerates ions up to a significant fraction (0.4 - 0.6) of the upstream Alfvén velocity generating fast ion outflows. 2-D profiles of the ion temperature of different directions are considerably different, implying kinetic effects and temperature anisotropy.

[1] Yamada et al, Rev. Mod. Phys., 2010.

[2] Drake et al, J. Geophys. Res., 2008.

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