The in-plane electric field and its role in the ion dynamics in collisionless magnetic reconnection

RUSSELL KULSRUD, Princeton University and PPPL/CMSO, DMITRI UZDENSKY, Princeton University/CMSO, MASAAKI YAMADA, PPPL/CMSO — A potential in-plane electric field, observed in numerical simulations and detected by spacecraft in the Earth magnetosphere, plays an important role in the dynamics of collisionless magnetic reconnection. In particular, it pulls the ions into the layer, effectively resulting in ion heating. Building on our previous work, we discuss the physics of the in-plane electric field and its relation to the quadrupole magnetic field. We also present a formalism (within the electron-MHD approach) for calculating it analytically for a given structure of the in-plane magnetic field. We emphasize the role of this electric field on the ion dynamics and heating.

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