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Momentum transport and non-local transport in heat-flux-driven magnetic reconnection in HEDP[1] CHANG LIU, Princeton University, WILL FOX, AMITAVA BHATTACHARJEE, Princeton Plasma Phys Lab — Strong magnetic fields are readily generated in high-energy-density plasmas and can affect the heat confinement properties of the plasma. Magnetic reconnection can in turn be important as an inverse process, which destroys or reconfigures the magnetic field. Recent theory [1] has demonstrated a novel physics regime for reconnection in high-energy-density plasmas where the magnetic field is advected into the reconnection layer by plasma heat flux via the Nernst effect. In this work we elucidate the physics of the electron dissipation layer in this heat-flux-driven regime. Through fully kinetic simulation and a new generalized Ohm's law, we show that momentum transport due to the heat-flux-viscosity effect [2] provides the dissipation mechanism to allow magnetic field line reconnection. Scaling analysis and simulations show that the characteristic width of the current sheet in this regime is several electron mean-free-paths. These results additionally show a coupling between non-local transport and momentum transport, which in turn affects the dynamics of the magnetic field.
[1]A.S. Joglekar, A.G.R. Thomas, W. Fox, and A. Bhattacharjee, Phys. Rev. Lett. 112, 105004 (2014).
[2]C. Liu, W. Fox, and A. Bhattacharjee, Phys. Plasmas 22, 053302 (2015).

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