Abstract Submitted
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Demonstration of anisotropic fluid closure capturing the kinetic structure of magnetic reconnection[1] OBIOMA EGEDAL, MIT, JAN EGEDAL, UW-Madison, VYACHESLAV LUKIN, NRL, WILLIAM DAUGHTON, LANL — Weakly-collisional magnetic reconnection, a process linked to solar flares, coronal mass ejections, and magnetic substorms, has been widely studied through fluid and kinetic simulations. While two-fluid models often reproduce the fast reconnection rate of kinetic simulations, significant differences are observed in the structure of the reconnection regions [1]. Recently, new equations of state that accurately account for the development of anisotropic electron pressure due to the electric and magnetic trapping of electrons have been developed [2]. Using these equations of state, guide-field fluid simulations have been shown to reproduce the detailed reconnection region observed in kinetic simulations [3]. Implementing this two-fluid simulation using the HiFi framework [4], we study the force balance of the electron layers in guide-field reconnection and derive scaling laws for the heating observed in these layers.

[1] Daughton W et al., Phys. Plasmas 13, 072101 (2006).
[2] Le A et al., Phys. Rev. Lett. 102, 085001 (2009).
[3] Ohia O, et al., Phys. Rev. Lett. In Press (2012).
[4] Lukin VS, Linton MG, Nonlinear Proc. Geoph. 18, 871 (2011)

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