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Anisotropic electron fluid closure relevant to collisionless dynamics in magnetized plasma[1] JAN EGEDAL, University of Wisconsin-Madison, ARI LE, Sciberquest, Inc, WILLIAM DAUGHTON, Los Alamos National Laboratory — Spacecraft data show that electron pressure anisotropy develops in collisionless plasmas. This is in contrast to the results of "Braginskii-type" investigations, which suggest this anisotropy should be small. However, such theoretical studies exclude the effects of dynamic electron trapping, which is a non-linear effect and is, therefore, eliminated when linearizing the underlying kinetic equations. A general analytic model is derived for the electron guiding center distribution of an expanding flux tube including trapping as a principle driver of pressure anisotropy [1]. While the work is inspired by the problem of magnetic reconnection, the resulting closure obtained for the electron fluid equations is general and is likely applicable to fast dynamics in magnetically confined fusion plasmas.

[1] Egedal J, Le A, and Daughton W, "A review of pressure anisotropy caused by electron trapping in collisionless plasma, and its implications for magnetic reconnection," (2013) Phys. Plasmas, 20, 061201.

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