Kinetic models of solar wind current sheets

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Current sheets in the collisionless solar wind usually have kinetic spatial scales. In-situ measurements show that these current sheets are often approximately force-free, i.e. the directions of their current density and magnetic field are aligned, despite the fact that the plasma beta is found to be of the order of one. The measurements also often show systematic asymmetric spatial variations of the plasma density and temperature across the current sheets, whilst the plasma pressure is approximately uniform. Neukirch et al. (2020) found exact equilibrium models of force-free collisionless current sheets which allowed for asymmetric plasma density and temperature gradients. These models assumed that the form of the distribution function for electrons and ions is the same. In this contribution we generalise this approach to current sheets with static ions. As a consequence the force-free condition is only satisfied approximately and quasi-neutrality requires the presence of a nonvanishing electric potential.

References

[1] T. Neukirch, I. Vasko, A. Artemyev and O. Allanson, Astrophys. J. **891**, 86 (2020)