Force-free Collisionless Current Sheets: A Systematic Method for Adding Asymmetries

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Recent observations have shown that current sheets in the solar wind can have systematic spatial asymmetries in their particle density and temperature while the pressure remains constant. For one-dimensional current sheets the magnetic field has to be force-free, but known self-consistent equilibrium particle distribution functions for force-free current sheets usually lead to spatial density and temperature structures that are either constant or vary symmetrically in space. Using a specific ad hoc example, Neukirch et al. (2020) showed that it is possible to introduce spatial asymmetries into the density and temperature profiles without changing the magnetic field structure.

In this contribution, a systematic method will be presented that can in principle be used to construct particle distribution functions leading to density and temperature asymmetries of the form given in Neukirch et al. (2020). We will show how it explains why the known examples work and present some results of our attempts to find new examples.

References

[1] T. Neukirch, I. Y. Vasko, A. V. Artemyev and O. Allanson, The Astrophysical Journal **891**(1), 86 (2020)