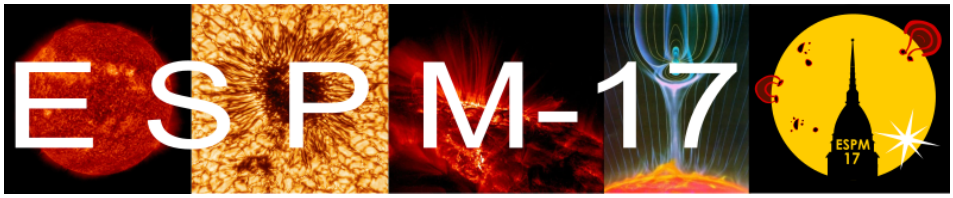

Contribution ID: **329** Type: **Poster**

Kinetic Models of Solar Wind Current Sheets

In-situ measurements of kinetic-scale collisionless current sheets in the solar wind have shown that such current sheets are often approximately force-free despite having a plasma beta of the order of one. Statistical analyses have found that the plasma density and temperature can vary across a current sheet in an anti-correlated manner such that the plasma pressure remains essentially uniform across the sheet.

Kinetic models of force-free collisionless current sheets have been developed which allow for asymmetric plasma density and temperature profiles. The earliest of these models introduced the required asymmetry by adding an additional term to both the ion and electron distribution functions. Recent models instead try to introduce the required asymmetries by modifying only the electron distribution function. However, the resulting equilibrium problem is non-linear in nature. An approximate solution was found under the assumption that the magnetic field is unchanged.

We present an improved approximate solution which drops this assumption and allows for changes in the magnetic field. We also present the results of a full numerical solution to the non-linear equilibrium problem. It is shown that, for the given forms of the electron and ion distribution functions, it does not seem possible to model the observed electron density and temperature asymmetries correctly when only the electron distribution function is modified.

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Session Classification: Coffee break and poster session 2

Track Classification: Space weather and the solar-heliospheric connections