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Systematic Variability of the He+ Pickup Ion Velocity Distribution Function Observed with SOHO/CELIAS/CTOF

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The 1D Velocity Distribution Function (VDF) of He^+ pickup ions shows two distinct populations that reflect the sources of these ions. The highly suprathermal population is the result of the ionization and pickup of almost resting interstellar neutrals that are injected into the solar wind as a highly anisotropic torus distribution. The nearly thermalized population is centered around the solar wind bulk speed and is mainly attributed to inner-source pickup ions that originate in the inner heliosphere.

Current pickup ion models assume a rapid isotropization of the initial VDF by resonant wave-particle interactions, but recent observations by Drews et al. (2015) of a torus-like VDF strongly limit this isotropization. This in turn means that more observational data is needed to further characterize the kinetic behavior of pickup ions.

The Charge-Time-Of-Flight sensor on-board SOHO offers unrivaled counting statistics for He^+ and a sufficient mass-per-charge resolution. Thus, the He^+ VDF can be observed on comparatively short timescales. We combine this data with the magnetic field data from WIND via an extrapolation to the location of SOHO.

On the one hand we investigate the 1D VDF of He^+ pickup ions with respect to different magnetic field orientations. Our findings complement on previous studies with other instruments that show an anisotropy of the VDF that is linked to the initial torus VDF. On the other hand we find a significant modification of the VDF during stream-interaction region. This may be linked to a different cooling behaviour in these regions and/or the absence of inner-source He^+ during these times. Here, we report on our preliminary results.