A new inner heliosphere proton core dataset from the Helios mission

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Get the data

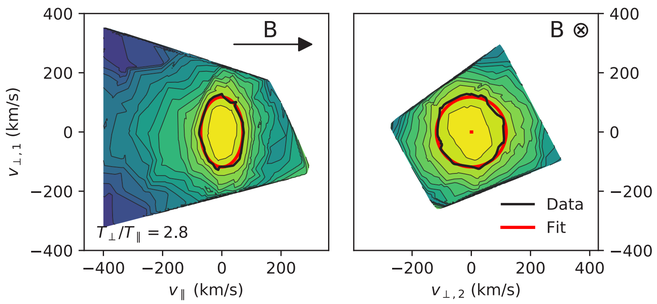
https://www.davidstansby.com/corefit

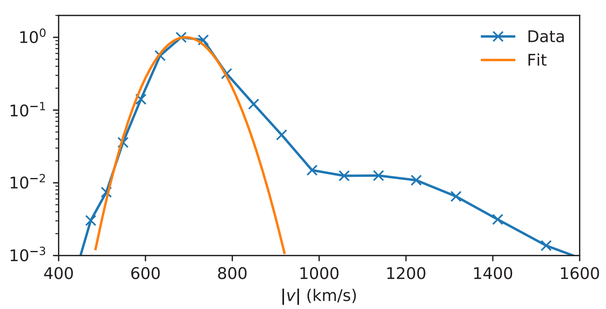
Method & Results

We took all the original Helios 3D ion distribution functions and fitted them with bi-Maxwellians:

$$f \propto \frac{n}{\sqrt{T_\perp T_\perp T_\parallel}} \exp\left[-\frac{m}{2k_B}\left\{\frac{(v_\parallel - u_\parallel)^2}{T_\parallel} + \frac{(v_{\perp 1} - u_{\perp 1})^2 + (v_{\perp 2} - u_{\perp 2})^2}{T_\perp}\right\}\right]$$

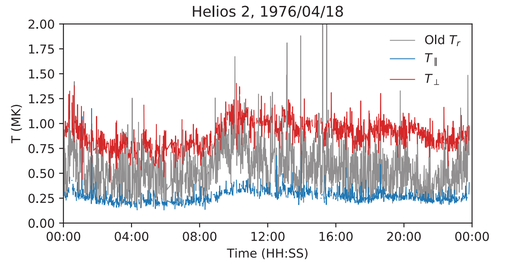
- ~1.8 million distribution functions fitted in total
- Gives n_p, v_r v_t v_n, $T_\perp$,$T_\parallel$ for each fit
- Fits done in linear space to minimise influence of proton beam and alpha particles
- Data provided with corresponding **B** values





What's new?

- All resulting data openly available for other researchers to use
- All fitting source code released, making data easily reproducible
- n_p is only for proton core, and does not contain varying contributions from proton beam
- First public release of $T_\perp$,$T_\parallel$ for inner heliosphere (only T_r available previously)



New science highlights

1. Number density structures are hotter than surrounding slow wind *(Stansby et al. 2018 A&A)*
2. Radial evolution of n, $T_\perp$& $T_\parallel$ in pure fast solar wind *(Perrone et al. presentation)*
3. Using temperature anisotropy as a proxy for solar wind source *(Stansby et al. presentation)*