

README FOR STEREO PLASTIC PROTON PRELIMINARY DATA FILES

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On December 5, 2019, the PLASTIC instrument on STEREO A underwent a high background event, which is sporadically ongoing. The cause of the event is unknown and under investigation. The intensity of the background contribution is sensitive to the voltages applied within the instrument. This has necessitated placing the instrument into a different operational mode than in use previously. The new configuration provides proton data using reduced operational voltages, by utilizing position triggering rates.

A revised methodology has been required to retrieve the PLASTIC proton data products.

The data presented here are 'preliminary' in that we are still in an evaluation and validation stage.

If you have questions regarding the data and formats, please contact the PLASTIC Data System Manager: Dr. Lorna Ellis (lorna.ellis@unh.edu)

File Format:

Preliminary data sets are only provided as ASCII files, tab-delimited text.

File Naming convention:

STx_L2_PLA_1DMax_1min_YYYYMM_DOY_PRELIM_vxx.txt

Where:

- "STx" is given as "STA" or "STB" for STEREO A and STEREO B, respectively.
- "L2" indicates Level 2 data in the STEREO PLASTIC convention.
- "PLA" indicates Plasma and Suprathermal Ion Composition (PLASTIC) Investigation.
- "1DMax" indicates the proton V, Tkin, Vth, Np, and Pressures were calculated from a 1D Maxwellian fit, as described below.
- "1min" indicates the cadence interval (instrument cadence is 1 minute).
- "txt" indicates ASCII file.
- "YYYY", "MM", "DD", "DOY" represent Year, Month, Day of Month, and first Day of Year of data, respectively.
- "vxx", indicates Version number, with the processing version given by the "xx".

STEREO PLASTIC PROTON PARAMETERS FROM 1D MAXWELLIAN FITS:

Proton bulk parameters provided here (speed, density, thermal, pressure) are derived from a 1D Maxwellian fit to a single coincident rate, which has been corrected for background,

dead time, and detector efficiency. The N/S angle is derived from a peak fitting to the N/S (deflection) rate bins of the same rate. The E/W angle is currently not available, efforts to retrieve this parameter is in progress.

A three-width smoothing function has been applied to reduce 'jitter'.

Missing data is given as NaN.

Parameters in 1-minute data sets

The first set of parameters gives the time the data were acquired:

1. YEAR : Year of cycle start time
2. DOY : Day of year of cycle start time
3. hour : Hour of cycle start time
4. min : Minute of cycle start time
5. sec : Second of cycle start time
6. doy.frac : Fractional day of year
7. date and time : Cycle start time (format yyyy-mm-dd/hh:mm:ss)

The next set of parameters give the solar wind proton data:

8. Bulk speed [km/s] : Proton bulk speed (in the s/c frame)
9. N_p [1/cc] : Solar wind proton number density (protons per cubic centimeter)
10. T_{kin} [deg K] : Proton kinetic temperature
11. v_{th} [km/s] : Proton thermal speed, defined here as $\sqrt{2kT/m}$
12. DynPressure : Dynamic Flow Pressure (nominal alpha contribution assumed)
13. KinPressure : Kinetic Pressure (nominal alpha contribution assumed)

14. N/S Inst. [deg] : Ion North-South flow angle in the instrument coordinate system
15. N/S RTN [deg] : Estimate of flow angle in RTN (full transformation not performed in this version)
16. E/W Inst. [deg] : Ion East-West flow angle in the instrument coordinate system
17. E/W RTN[deg] : Ion East-West flow angle in the RTN coordinate system

The next set of parameters is for data quality information:

18. Stat_error : Relative statistical uncertainty of the peak of the proton distribution
19. RChi_sq : Reduced Chi-square of the 1D Maxwellian fit.
20. Quality Code : 7 = PRELIMINARY DATA
21. Roll_Flag : This flag indicates the s/c roll angle is not nominal, possibly due to a spacecraft maneuver. This may affect the accuracy of the derived parameters.

The next set of parameters provide spacecraft trajectory information:

- 22. Heliocentric Distance : Distance of the spacecraft from the center of the Sun.
- 23. Spcrft HCILong : Spacecraft longitude in the HCI coordinate system.
- 24. Spcrft. STA_HCILat : Spacecraft latitude in the HCI coordinate system.
- 25. Carr. Rot. : Carrington Rotation Number relative to the given spacecraft.

Coordinate Systems used here:

HCI Heliocentric Inertial

Carrington

RTN Radial-Tangential-Normal

R is the Sun to SC vector, $T = (\Omega \times R) / |(\Omega \times R)|$, where Ω is the Sun's spin axis (in J2000 GCI), i.e., roughly the orbital direction; N is the right-handed normal to complete the triad, essentially "north". The RN plane contains the solar rotation axis.