README FOR STEREO PLASTIC PROTON VALIDATED DATA FILES
Last update: December 28, 2009 (ABG, LE, KDS)

Data Usage:

Data provided by the PLASTIC team at the University of New Hampshire is under NASA contract NAS5-00132.

Proton data provided here is courtesy of K. Simunac, A. Galvin, and L. Ellis.

STEREO solar wind data presented are meant to provide an overview of large-scale solar wind behavior and for selection of interesting event periods.

These data are delivered to the public domain as soon as possible. Efforts are made to include the latest known calibration and background determinations, however, these are expected to undergo revision. We therefore suggest that users regularly return to this page, and check the "Modification History" at the end of this "Readme" file.

If used in presentations or publications:

We strongly suggest that Dr. Galvin (toni.galvin@unh.edu) and Dr. Simunac (K.Simunac@unh.edu) be contacted to ensure that you are working with the latest release.

Please acknowledge STEREO PLASTIC Investigation (A.B. Galvin, PI) and NASA Contract NAS5-00132.

For reporting purposes, we request bibliography information for any publication, etc., using these data. Please send information on the use of this data to the PLASTIC PI:

Dr. A.B. Galvin
toni.galvin@unh.edu

If you have questions regarding the data formats, please contact the PLASTIC Data System Manager:

Dr. Lorna Ellis
lorna.ellis@unh.edu

File Format:

ASCII files are tab-delimited text.
CDF files are Common Data Format.

File Naming convention:

STx_L2_PLA_1DMax_1min_YYYMMDD_Vvv.cdf
STx_L2_PLA_1DMax_1min_YYYMMDD_DOY_Vvv.txt
STx_L2_PLA_1DMax_10min_YYYYMM_Vxx.txt

STx_L2_PLA_1DMax_1hr_YYYY_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 N/S angle were calculated from a 1D Maxwellian fit, as described below.

"1min", "10min", "1hr" indicates the averaging interval (instrument cadence is 1 minute). Daily files are created in both CDF and ASCII formats. In addition, the ASCII data are provided in monthly "10 min" files and yearly "1 hr" files.

"YYYY", "MM", "DD", "DOY" represent Year, Month, Day of Month, and Day of Year, respectively.

"Vxx", indicates Version number, with the processing version given by the "xx."

"txt" or "cdf" indicates ASCII file and Common Data Format, respectively.

STEREO PLASTIC PROTON PARAMETERS FROM 1D MAXWELLIAN FITS:

Proton bulk parameters provided here (except E/W angle) are derived from a 1D Maxwellian fit to a single coincidence rate, and are corrected for background and dead time.

The E/W angle is derived from a double coincidence rate using a position mapping routine.

The proton velocity components are derived using the N/S and E/W angles.

The instrument has a one-minute measurement cadence.

The instrument's one minute measurement cycle consists of 128 logarithmically spaced energy-per-charge (E/Q) steps from ~80 keV/e down to ~0.3 keV/e. The “1 keV/q” corresponds to protons with bulk speed 438 km/s.

Missing data is given as -1E+31.

Parameters provided in the 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. millisec: Millisecond of cycle start time

7. date and time: Cycle start time (format yyyy-mm-dd/hh:mm:ss)

8. 1 keV/q time: Time in cycle corresponding to 1 keV/e (format yyyy-mm-dd/hh:mm:ss). This parameter is only provided for the 1-minute data sets.

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

9. Np[1/cc]: Solar wind proton number density in [protons per cubic centimeter]

10. Bulk speed [km/s]: Proton bulk speed (s/c frame) in kilometers per second

11. Tkin [deg K]: Proton kinetic temperature in degrees Kelvin

12. v_th [km/s]: Proton thermal speed in kilometers per second, defined here as sqrt(2kT/m)

13. N/S Inst. [deg]: Proton North-South flow angle in degrees in the INSTRUMENT COORDINATE SYSTEM. This coordinate system does not compensate for aberration (spacecraft movement) nor for spacecraft attitude. This parameter is included for verification purposes, only.

14. E/W Inst. [deg]: Proton East-West flow angle in degrees in the INSTRUMENT COORDINATE SYSTEM. This coordinate system does not compensate for aberration (spacecraft movement) nor for spacecraft attitude. This parameter is included for verification purposes, only. To decrease "jitter" a three-period moving average is used. This running average is also incorporated into the HERTN and RTN components.

15. Vr HERTN [km/s]: Proton radial velocity component in the HERTN system. The affects of aberration and spacecraft attitude have

been removed.

16. Vt HERTN [km/s]: Proton tangential velocity component in the HERTN system. The affects of aberration and spacecraft attitude have been removed.

17. Vn HERTN [km/s]: Proton normal velocity component in the HERTN system. The affects of aberration and spacecraft attitude have been removed.

18. N/S HERTN [deg]: Proton North-South flow direction, in degrees, in the HERTN system. The affects of aberration and spacecraft attitude have been removed.

19. E/W HERTN [deg]: Proton East-West flow direction, in degrees, in the HERTN system. The affects of aberration and spacecraft attitude have been removed.

20. Vr RTN [km/s]: Proton radial velocity component in the RTN system. The affects of aberration and spacecraft attitude have been removed.

21. Vt RTN [km/s]: Proton tangential velocity component in the RTN system. The affects of aberration and spacecraft attitude have been removed.

22. Vn RTN [km/s]: Proton normal velocity component in the RTN system. The affects of aberration and spacecraft attitude have been removed.

23. N/S RTN [deg]: Proton North-South flow direction, in degrees, in the RTN system. The affects of aberration and spacecraft attitude have been removed.

24. E/W RTN [deg]: Proton East-West flow direction, in degrees, in the RTN system. The affects of aberration and spacecraft attitude have been removed.

The next set of parameters is included in the "10min" and "1hr" files:

25. Num Cycles (Np, v_therm, temp): Number of 1-minute cycles used in average of Np, v_th, Tkin.

26. Num Cycles (Speed): Number of 1-minute cycles used in average of Bulk Speed.

27. Num Cycles (NS_inst):
Number of 1-minute cycles used in average of instrument coordinate system N/S flow angle.

28. Num Cycles (Vel. Com., Other Angles):
Number of 1-minute cycles used in average of velocity components, and other N/S, E/W flow angles.

The next set of parameters is for data quality control:

29. Error Code:
0 = no known issues
1 = Processing error, data removed
2 = Data Level 1 error
3 = Data overflow (rate compression code saturated)
4 = Data outside 3-sigma limit (1 hr window)
5 = Data gap (usually due to operations), data removed
6 = Jump in thermal speed, use caution on all parameters
7 = Suspicious thermal speed, use extreme caution on all parameters
8 = Removed through manual check

30. Caution Code:
The caution code is an indication of how sensitive the density value is to the method used for determining the background correction.
0 = no issues (<5% effect on density calculation)
1 = minor issues (5-10% effect on density calculation)
2 = use with caution (>10% effect on density calculation)

31. Attitude Flag (roll): This flag indicates the s/c roll is not nominal. Although efforts are made to correct the data, use all data with caution, particularly component and density values.

32. Attitude Flag (yaw): This flag indicates the s/c roll is not nominal. Although efforts are made to correct the data, use with caution.

33. Attitude Flag (pitch): This flag indicates the s/c roll is not nominal. Although efforts are made to correct the data, use with caution.

34. E/W Source Flag: Indicates which solar wind sector channel was used in the analysis.

35. E/W Missed Peak Flag:

0 indicates no issues.
>0 use with caution, as the peak of the speed distribution may not be represented.

36. Reduced Chi^2: Reduced Chi-square of the 1D Maxwellian fit.

37. E/W Rel Stat Uncertainty (%): An indication of the relative uncertainty from the number of counts available in determining the E/W flow direction (sqrt(n)/n), where n is the number of counts in the peak of the position array. Higher % indicates higher statistical uncertainty.

The next set of parameters provide Carrington Rotation and spacecraft trajectory information:

38. Carr. Rot.: Carrington Rotation Number relative to the given spacecraft.

39. Spcrft. Long. [Carr, degrees]: Carrington Longitude relative to the given spacecraft.

40. Heliocentric Distance [km]: Distance of the spacecraft from the center of the sun in kilometers.

41. Spcrft. Long. [HEE, degrees]: Spacecraft longitude in the HEE coordinate system, degrees.

42. Spcrft. Lat. [HEE, degrees]: Spacecraft latitude in the HEE coordinate system, degrees.

43. Spcrft. Long. [HEEQ, degrees]: Spacecraft longitude in the HEEQ coordinate system, degrees.

44. Spcrft. Lat. [HEEQ, degrees]: Spacecraft latitude in the HEEQ coordinate system, degrees.

45. Spcrft. Long. [HCI, degrees]: Spacecraft longitude in the HCI coordinate system, degrees.

46. Spcrft. Lat. [HCI, degrees]: Spacecraft latitude in the HCI coordinate system, degrees.

Coordinate Systems used here:

HCI Heliocentric Inertial

HEE Heliocentric Earth Ecliptic
HEEQ Heliocentric Earth Equatorial (or HEQ) Carrington
RTN Radial-Tangential-Normal, where R is the Sun to SC vector, T = (Omega x R)/|(Omega x R)|, where omega 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.
HERTN Heliocentric Ecliptic RTN. The RT plane is parallel to the ecliptic plane.

Modification History

Feb 2008 First issue of 1 Min data sets - BETA runs.
Aug 2008 Some changes in processing s/w.
Additional Error/Caution codes added.
Flow angles provided in instrument coordinates only.
Dec 2008 Issues identified for efficiencies used in low speed (< 300 km/s) conditions.
May 2009 Version 4
Flow angle and velocity components have been incorporated in both RTN and HERTN coordinate systems for STEREO A. These include compensations for s/c aberration and s/c attitude. QA flags expanded. S/C trajectory information included. Standardization of file naming convention for use by NSSDC. Identified outliers have been removed. There are still issues in the efficiency curves for low speeds. Suspect data have been removed, until efficiency curves are updated.
Jun 2009 Version 6
Contains extreme verification criteria and revised error code responses.
Dec 2009 Version 7
Updates to conversion and efficiency curves (to correct issues identified in Version 4).
Revisions to Maxwellian fitting procedure (using a “first guess” and changes in array of uncertainties); revisions in verification criteria (rchi^2 and “caution flag”). Purpose of changes is to reduce “data loss” in the automatic verification algorithms.