README FOR STEREO PLASTIC ON-BOARD PROTON VALIDATED DATA FILES

Last update: January 5, 2011 (ABG, LE, LK)

Important Note: During January, February, and March 2007, Spacecraft B was frequently in the magnetotail. Therefore, use data from that time with caution. See Kistler, L. M., et al. (2010), Escape of O^+ through the distant tail plasma sheet, Geophys. Res. Lett., 37, L21101, doi:10.1029/2010GL045075.

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 Lynn Kistler 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 "Read_me" file.

If used in presentations or publications:

We strongly suggest that Dr. Kistler (Lynn.Kistler@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_OBMom_1min_valid_YYYMMDD_Vvv.cdf
STx_L2_PLA_OBMom_1min_valid_YYYMMDD_DOY_Vvv.txt
STx_L2_PLA_OBMom_10min_valid_YYYYMM_Vxx.txt
STx_L2_PLA_OBMom_1hr_valid_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.

"OBMom" indicates the data were derived from the on-board moments calculation.

"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 ON-BOARD MOMENTS:

The proton bulk parameters provided here are derived from an on-board calculation that computes weighted sums of the proton counts in each energy/angle bin. The sums are over the energy step, and the azimuthal (E/W nominal) and polar (N/S nominal) directions. Ground calibrations are then applied to account for instrument asymmetries not included in the on-board calculation. The proton velocity components are corrected for spacecraft aberration.

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 (protons per cubic centimeter)

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

11. Tkin [deg K]: Proton kinetic temperature

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

13. N/S Inst. [deg]:
    Proton North-South flow angle 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 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.

15. Vr HERTN [km/s]:
    Proton radial velocity component in the HERTN system. The effects of

aberration and spacecraft attitude have been removed.

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

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

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

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

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

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

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

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

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

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

25. Num Cycles:
    Number of 1-minute cycles used in average.

26. Error: Poor Statistics: 0=no error. 1=possible error. Poor statistics. Density probably too low.

27. Velocity Standard Deviation: Standard deviation of velocity.

28. 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.

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

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

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

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

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

33. Heliocentric Distance [km]: Distance of the spacecraft from the center of the Sun.

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

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

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

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

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

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

Coordinate Systems used here:

HCI Heliocentric Inertial
HEE Heliocentric Earth Ecliptic
HEEQ Heliocentric Earth Equatorial (or HEQ)
Carrington
RTN Radial-Tangential-Normal

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.

STEREO PLASTIC SENSOR INFLIGHT PERFORMANCE

PLASTIC is a novel sensor in that each flight unit functions like three separate instruments: a solar wind proton/alpha monitor, a solar wind composition (m, m/q) experiment, and a low energy m/q sensor for observing ions from opposite the Sun-spacecraft direction. Multi-functionality gives rise to a need for multiple geometric factors and fields-of-view within the same instrument. The first major subdivision within the instrument is based upon the in-ecliptic (azimuth) field-of-view. The region that covers the Sun-spacecraft line +/- 22.5 degrees is the Solar Wind Sector (SWS). The remaining portion is called the Wide Angle Partition (WAP). The SWS can be further subdivided into two entrance apertures (Main Channel and Small Channel) with different geometric factors. The Main channel geometric factor allows for sufficient counting statistics of heavy solar wind ions. The switch to the smaller geometric factor S-channel prevents the saturation of the electronics and controls the lifetime fluence on the MCP and SSD detectors. The Schannel is the primary channel for solar wind protons and often alphas. The PLASTIC Entrance System's electro-static analyzer (ESA) steps through 128 logarithmically spaced energy per charge (E/Q) steps from about 80 keV/e, down to about 0.3 keV/e in a one-minute cadence. At the start of each 1-minute ESA sweep the Small channel is off, and the Main channel is open. Upon reaching a set (but command-able) count threshold, the Main channel is electrostatically closed and the S channel is enabled. Extended analysis of in-flight data indicates a major variance in the performance of the S-channel instrumental response (geometrical factor, E/Q, and polar and azimuth angular response) from expectations based upon the pre-flight testing and calibrations. The effect is attributed to insufficient fringe-field control within the aperture section of the Entrance System. The results provided here are based upon an extensive inflight calibration of the S-channel response which has been performed by the PLASTIC team utilizing Main channel data (which is unaffected) and confirming results by cross-calibrations of early mission data with Wind SWE (courtesy K. Ogilvie and A. Lazarus) and SOHO PM (courtesy F. Ipavich). We extend special thanks to our Wind and SOHO colleagues for the use of their data.

Modification History

Jan 2011

First issue of validated data.