

README FOR STEREO PLASTIC DAILY SUPRATHERMAL HE⁺ RELATIVE FLUXES

Last update: November 06, 2017 (BEK, LE, ABG)

Data Usage:

Data provided by the PLASTIC team at the University of New Hampshire is under NASA Grants NNX15AU01G and 80NSSC17K0556.

Helium (He⁺) data provided here is courtesy of B. Klecker, L. Ellis, and A. B. Galvin.

STEREO pick up (He⁺) data presented here are meant to provide an overview of the long-term behavior of He⁺ pickup ions and are useful for the selection of interesting event periods.

The data set provides 24h averages of efficiency corrected He⁺ counts per second in four ranges of V/V_{sw} . These values are proportional to the differential energy flux (J E) of pickup He⁺.

As an example, the relative differential energy flux in the velocity range $1.85 > V/V_{sw} > 1.44$, i.e. just below the expected He⁺ PUI cutoff at $V/V_{sw} = 2$, is shown for the time period 2007 to 2017 in Fig. 1 on page 4. The pronounced peaks in the relative differential energy flux show the transition of STEREO-A through the neutral helium focusing cone. (c.f. Möbius et al., 2010, AIP Conf. Proc. 1216, pp 363-366) and the information on PUI He⁺ on the STEREO web pages at UNH (http://stereo.sr.unh.edu/data/PLASTIC_Resources/PickupIons_plots.htm).

These data are delivered to the public domain on a regular basis. 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 make sure to get the most recent revision.

If used in presentations or publications:

We strongly suggest that Dr. A. B. Galvin (toni.galvin@unh.edu) and Dr. B. Klecker (berndt.klecker@mpe.mpg.de) be contacted to ensure that you are working with the latest release.

Please acknowledge STEREO PLASTIC Investigation (A.B. Galvin, PI), NASA Grants NNX15AU01G and 80NSSC17K0556.

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 Naming convention:

STx_L3_PLA_HePlus_24hr_YYYY_Vyy.txt

Where:

"STx" is given as "STA" or "STB" for STEREO A and STEREO B, respectively.

"L3" indicates Level 3 data in the STEREO PLASTIC convention.

"PLA" indicates Plasma and Suprathermal Ion Composition (PLASTIC) Investigation.

"HePlus" indicates singly ionized helium (He^+) as determined by PLASTIC.

"24hr", indicates the time averaging interval of 24 hours.

"YYYY" represents Year

Note: Higher time resolutions (e.g. 1 hour, minimum: 10 minutes) are also available on request. Please contact the PI.

The ASCII data with 24 hour averages are provided in yearly "24hr" files.

"Vyy", indicates Version number, with the processing version given by "yy."

"txt" indicates ASCII file.

STEREO PLASTIC DAILY SUPRATHERMAL He^+ RELATIVE FLUXES

The data set provides the relative differential energy flux (J^*E) of He^+ in 4 ranges of V/V_{sw} . The identification of He^+ is based on the measurement of energy per charge (E/q), time-of-flight (TOF), and total energy (SSD) of ions with the PLASTIC sensor. These data include double (E/Q , TOF) and triple coincidences ($(E/Q, \text{TOF}, \text{SSD})$) (see e.g. Galvin et al., Space Sci. Rev. 136, p 437-468, 2008).

The proton bulk parameters V_{sw} , V_{therm} and Density (N_p), also provided in this file, are derived from a 1D Maxwellian fit to a single detector rate (no coincidence required), and are corrected for background and dead time. The software version number used to derive the proton bulk parameters is shown in the file header (c.f. section on File Format). The most recent update of the proton bulk parameters can be found on the following STEREO website:

http://stereo-ssc.nascom.nasa.gov/data/ins_data/plastic/level2/Protons/

File Format

1. Header Lines

The 3 header lines of the yearly files include information on spacecraft (A or B), production date, calibration file version, proton bulk parameter version number, PUI production version number, and the range of V/V_{sw} covered.

The parameters provided in the 24-hour data sets are indicated in line 3 of the File Header:

The first set of 7 parameters gives the time the data were acquired:

1. YY: Year of start time of averaging period
2. MM: Month of start time of averaging period
3. DD: Day of start time of averaging period
4. doy: Day of year of start time of averaging period (Jan-1 = 1)
5. HH: Hour of start time of averaging period
6. Min: Minute of start time of averaging period
7. doy: Day of year of start time of averaging period (Jan-1 = 1, decimal).

The next set of 3 parameters provide average solar wind proton bulk parameters. The version number of proton bulk parameters is shown in line 1 of the file header (version V06 and later).

8. V_{sw} [km/s]: Proton bulk speed (s/c frame)
9. V_{therm} [km/s]: Proton thermal speed, defined here as $\sqrt{2kT/m}$, with T proton kinetic temperature.
10. N_p [1/cc]: Solar wind proton number density (protons per cm^3)

The next set of 8 parameters provide the He^+ relative energy flux and the number of counts in 4 ranges of V/V_{sw} (s/c-frame) as indicated in line 3 of the File Header.

11. Relative He^+ energy flux in the velocity range $8.00 > V/V_{sw} > 3.50$
12. Total counts for $8.00 > V/V_{sw} > 3.50$
13. Same as 11 for $3.50 > V/V_{sw} > 2.50$
14. Total counts for $3.50 > V/V_{sw} > 2.50$
15. Same as 11 for $2.50 > V/V_{sw} > 1.85$
16. Total counts for $2.50 > V/V_{sw} > 1.85$
17. Same as 11 for $1.85 > V/V_{sw} > 1.44$
18. Total counts for $1.85 > V/V_{sw} > 1.44$

Note: the energy cutoff of the PUI He^+ flux in the spacecraft frame is expected at $V/V_{sw}=2$.

Modification History

For the extraction of He⁺ data from PLASTIC raw data files the program pha_play is used (c.f. <http://stereo-ssc.nascom.nasa.gov/software.shtml>). The different versions of the data files have been generated with different versions of pha_play. Other differences are the energy per charge range used and the maximum range of V/Vsw. The modification history is summarized in the following Table.

Version Number	pha_play	ESA STEPS	Max V/Vsw	Minimum Averaging Time (min)	Date
01	pha_play_20080922	00-71	10.0	60	March 2008
02	pha_play_20120228	00-71	10.0	60	March 2012
03	pha_play_20120402	00-91	8.0	10	April 2012
04	pha_play_20120402	00-91	8.0	10	April 2012
05	This version number is not used for HePlus				
06	pha_play_20120402*	00-91	8.0	10	April 2014

(*) Using also 2013 and 2014 updates of pha_play (does not affect PUI He+).

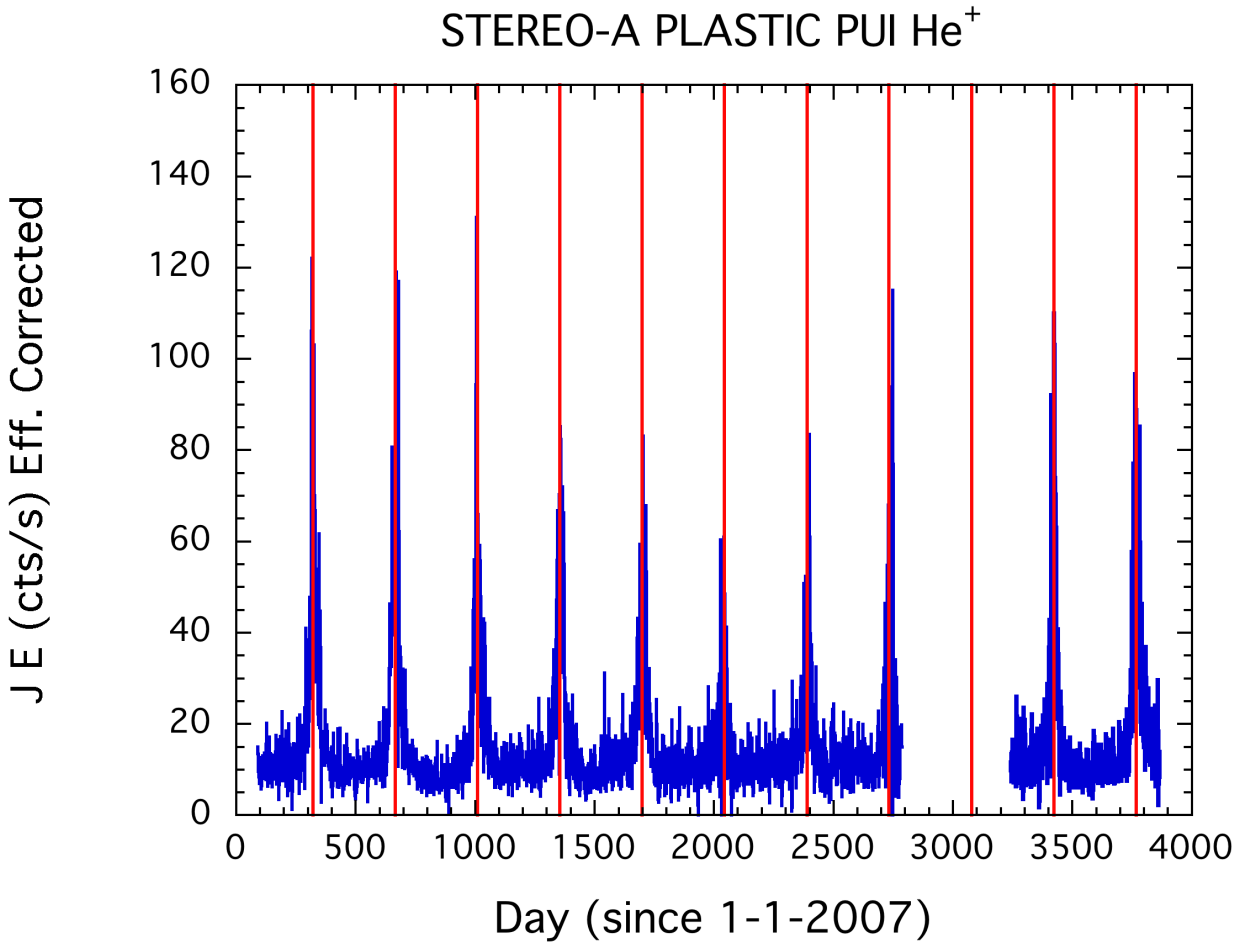


Fig. 1: Pickup He⁺ relative differential energy flux in the velocity range $1.85 > V/V_{sw} > 1.44$, i.e. just below the expected He⁺ PUI cutoff at $V/V_{sw} = 2$, is shown for the time period 2007 to 2017. The pronounced peaks in the relative differential energy flux show the transition of STEREO-A through the neutral helium focusing cone. The extended data gaps during 2014 and 2015 are due to the solar conjunction.