README FOR STEREO PLASTIC DAILY SUPRATHERMAL HE Efficiency
Last update: October 17, 2019 (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 Efficiency data provided here is courtesy of B. Klecker, L. Ellis, and A. B. Galvin.

The detection efficiency of the PLASTIC sensor system for ions is subject to time variations, because of a slow degradation of the microchannel plates (MCP) during flight. This degradation can be partly compensated by an increase of the MCP HV supply voltage. Therefore, in order to obtain absolute fluxes, the efficiency needs to be continuously monitored during flight. To obtain this efficiency for He^+ on a daily basis, the ratio of single and coincidence rates in the solar wind (SW) main channel of the PLASTIC time-of-flight system are used, at an energy just below the He^+ cutoff energy. Thus, the variation of the He^+ cutoff energy with solar wind speed provides the energy dependence of the He^+ efficiency. For details of the sensor system, see Galvin, et al., Space Sci. Rev. 136, 2008.

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:

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

Dr. Lorna Ellis
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STEREO PLASTIC DAILY SUPRATHERMAL HE$^+$ Efficiency

The time variation and energy dependence of the efficiency, eps(t, E_{tot}), is reconstructed using one hour averages of single and coincidence rates for 7 energy bands in total energy between 7 and 13 keV/nuc with a bandwidth of 1 keV/nuc (i.e. 7±0.5, 8±0.5, … 13±0.5 keV/nuc). The energy E_{tot} is computed from the post-acceleration voltage (PAC, nominally 20 KV) and for an energy of He$^+$ corresponding to 1.8 x Vsw, where Vsw is the solar wind proton bulk velocity (i.e. an energy just below the cutoff energy of pickup He$^+$ at 2 x V/Vsw). Thus, the variation of the He$^+$ cutoff energy with solar wind speed provides the energy dependence of the He$^+$ efficiency. With mass M and charge Q and energy per charge (E/Q) the total energy E_{tot} is given by

E_{tot} = (E/Q + PAC) *Q/M, with M=4 and Q=1 for He$^+$.

In a first step of the procedure eps(t, E_{tot}) is obtained on a daily basis by 11-day boxcar averages of the relevant one hour average rates. In a second step data gaps in time are interpolated by assuming an exponential decrease of the efficiency with time. The energy dependence is fitted by a 3-parameter non-linear fit with fit function

Eps(Etot) = A * (1 - exp (-B * E_{tot}))^C

that is based on pre-flight calibration measurements. The energy range of the fit is 7 to 13 keV/nuc, the efficiencies at 15 and 20 keV/nuc are obtained by extrapolation. In order to avoid unrealistically high efficiency at high energies, the extrapolation is limited to an increase of 5% between 13 and 15 keV/nuc and 15 and 20 keV/nuc, respectively.

Note: On August 19, 2014 the PLASTIC data on STEREO-A were turned off. The extended data gap in the years 2014 and 2015 (days 2788 - 3242; 2014-08-019 - 2015-11-016) is due to the solar conjunction.

File Naming convention:

STx_L3_PLA_HEEFF_RevYY.txt

Where

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

"YY" indicates the Revision number.

File Format

File Header
Line 1: processing information
Line 2: Header for 12 data columns
Line 3: energy unit (keV/nuc)

Columns:

1	Year:	year of data set
2	Day:	day count since January 1 2007 (=1)
3	Date:	DD-MON-YY
4 - 12	Efficiency for He$^+$, 7 - 20 keV/nuc total energy	