

The National Geophysical Data Center (NGDC) is pleased to provide the historical daily space environment data derived from the GOES and made available by the Space Environment Center, now the Space Weather Prediction Center. The daily values consist of the following:

GOES >1 MeV Proton Fluence:	Jan 1, 1987 - Present
GOES >10 MeV Proton Fluence:	Jan 1, 1987 - Present
GOES >100 MeV Proton Fluence:	Jan 1, 1987 - Present
GOES >2 MeV Electron Fluence:	Jun 22, 1987 - Present
GOES X-ray Background:	Apr 25, 1983 - Present

Also included are hourly and daily x-ray background values from the SOLRAD mission from 14 Mar 1968 to 28 Feb 1973 for the 1-8 A and 8-20 A bands.

NOTE: GOES8 proton fluence values begin with Feb 1, 1995 data.  
GOES8 x-ray data began with Mar 1, 1995 data.  
GOES9 primary satellite April 1996.  
GOES8 back to primary satellite 27 July, 1998.

#### 1. GOES X-RAY BACKGROUND

The GOES x-ray background levels are computed by averaging the 1-minute data for 3 eight-hour periods through the day (00-08, 08-16, 16-24). The lowest of the three averages is used as the x-ray background level for that day. The units are in Watts/meter<sup>2</sup>. Missing data are indicated by "--" and background levels below B1.0 (1.0E-07 W/m<sup>2</sup>) are unreliable. After 22 Sep 86 the lower limit of the background level was changed to A1.0 (1.0E-08 W/m<sup>2</sup>).

Level	Range
A	F < 1.0E-07 (Not reported below 1.0E-08)
B	1.0E-07 <= F < 1.0E-06
C	1.0E-06 <= F < 1.0E-05

#### 2. PROTON FLUENCE

Daily proton fluences are the residuals after the background is subtracted; therefore, it is not easy to make any meaningful interpretation of them. They are provided as a tool to distinguish when events occur. Anyone interested in detailed analysis should refer to the cognizant scientist within NGDC. An updated algorithm for calculating the proton flux went into effect 16 Jan 1990, resulting in lower flux/fluence values. Proton fluences are provided for the >1, >10, and the >100 MeV protons. The units are protons/cm<sup>2</sup>-day-sr. Missing data are indicated by "--".

#### ELECTRON FLUENCE:

The electron fluence values are provided in units of electrons/cm<sup>2</sup>-day-sr. Note that the GOES electron detector responds significantly to

protons above 32 MeV and the electron data are considered "contaminated" whenever a significant solar proton event is in progress. Contaminated electron fluences are indicated by a '-999' value whenever the >10 MeV proton flux exceeds  $3.0E+05$  protons/cm<sup>2</sup>-day-sr. Missing electron flux values are indicated by "--".

FILE FORMAT: *daily fluence listing.txt*

COLUMN	FORMAT	DESCRIPTION
1- 6	I6	Date (yymmdd)
7- 8	2X	Blank
9-15	E7.1	Daily x-ray background
16-17	2X	Blank
18-24	E7.1	>1 MeV proton fluence
25-26	2X	Blank
27-33	E7.1	>10 MeV proton fluence
34-35	2X	Blank
36-42	E7.1	>100 MeV proton fluence
43-44	2X	Blank
45-51	E7.1	>2 MeV electron fluence (-999 for contaminated data)

Missing data are shown as blanks.

SOLRAD DATA:

The source of data are the Naval Research Laboratory's SOLRAD 9 (1968-17A) and SOLRAD 10 (1971-058A) satellites. Both satellites carried detectors sensitive to the 0.5-3A, 1-8A, 8-16A, 1-20A, and 44-60A bands. Each 1-minute data from the 0.5-3A, 1-8A, and 8-16A detectors were stored in the satellite memory which was capable of retaining up to 14.25 hours of data. Therefore, a continuous record of the x-ray emission from the sun, except for gaps due to satellite night and charged particle interference, was available for these 3 bands. The data represented here extends from 14 Mar 68 to 28 Feb 73.

A complete description of the SOLRAD-9 satellite is given in the NRL Report Number 6800 entitled "The NRL SOLRAD-9 Satellite, Solar Explorer B, 1968-17A." The description for SOLRAD-10 is given in the NRL Report Number 7408 entitled "The NRL SOLRAD-10 Satellite, Solar Explorer 44, 1971-058A."

The data from the 1-8A detector were converted to a 1-8A energy flux using a  $2.0 \times 10^{-6}$  degree Kelvin 'gray body' approximation. The daily averages include data obtained during solar flares, but the data contaminated by charged particle interference were excluded whenever possible. The data from the 8-16A detector were converted to an 8-20A energy flux using a  $2.0 \times 10^{-6}$  degree Kelvin 'gray body' approximation. The daily x-ray background levels were computed by averaging the hourly values in three 8-hour periods (01-08, 09-16, and 17-24). The lowest value of the three became the x-ray background of the day. This is the same procedure for producing the GOES x-ray background. The daily values are given in units of Watts/meter\*2.

Daily Values

The 1-8A band of x-ray background levels are described the same way as the GOES x-ray background levels using the following table:

Level	Range
A	1.0E-08 <= F < 1.0E-07
B	1.0E-07 <= F < 1.0E-06
C	1.0E-06 <= F < 1.0E-05
M	1.0E-05 <= F < 1.0E-04

The 8-20A band data are given in exponential form only.

The SOLRAD directory contains annual tables of the 1-8A and 8-20A daily x-ray background levels in the SOLRAD.YY files, where YY is the year of the data. There is also a plot file for both ranges in the SOLRAD.PLT file. The format for the plot file is as follows:

COLUMN	FORMAT	DESCRIPTION
1 - 6	I6	Date (yymmdd)
7 - 8	2X	Blank
9 - 18	E10.4	1-8A daily x-ray background level (Wm-2)
19 - 20	2X	Blank
21 - 30	E10.4	8-20A daily x-ray background level (Wm-2)

Hourly Values

The hourly values for both channels are given in exponential form only. Hourly average data for 0000-0059 are denoted as hour 0, 0100-0159 denoted as hour 1, etc.

The 1972 and 1973 data are from SOLRAD 10. During periods for which SOLRAD 10 data are not available, SOLRAD 9 values were used for the 1-8A hourly averages. These values are preceded by a minus (-) sign. Data not available from either satellite will appear as '0.0000e-00' in the data.

Type PKUNZIP SRDYyyy.ZIP to extract the monthly files of the hourly averages.

Format for SOLRAD Hourly X-ray Background Data:

COLUMN	FORMAT	DESCRIPTION
1 - 6	I6	Date (yymmdd)
7 - 10	4X	Blank
11 - 12	I2	Hour of the day
13 - 23	11X	Blank
24	A1	'-' if SOLRAD 9 data used for SOLRAD 10 (after 1971)

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25 - 34	E10.4	1-8A daily x-ray background level (Wm-2)*
35 - 46	12X	Blank
47 - 56	E10.4	8-20A daily x-ray background level (Wm-2)*
57 - 71	15X	Blank
72 - 73	I2	Number of minutes of data to form the average

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\* Missing data indicated by 0.0000 for 1968-1971 and 0.0000e-00 after 1971.