GOES X-ray Sensor (XRS) Operational Data

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Important notes for users

This document covers operational data for GOES-1 through GOES-15 produced by the NOAA Space Weather Prediction Center (SWPC). Data and documentation for GOES-R (GOES-16 through -19) is at www.ngdc.noaa.gov/stp/satellite/goes-r.html.

Science-quality GOES data: Reprocessed science-quality data with multiple corrections and products is now available for GOES-13 through GOES-15. GOES-1 through -12 will be available later in 2022. Data is at the 'GOES 1-15 tab' at www.ngdc.noaa.gov/stp/satellite/goes-r.html. (See Section 2.1.)

SWPC scaling factors: The archived fluxes have all been scaled to GOES-7. (See Section 2.2)

> ***To get true fluxes for all data,*** *users must remove the SWPC scaling factors, divide the short band flux by 0.85 and divide the long band flux by 0.7. Such corrected fluxes and corresponding flare indices (e.g., an X2.1 flare) will agree with those of the GOES-R series.*

Time stamps: The raw data time stamps are offset 1.024 s after the integration periods. The timestamps for averaged data have a 1-3 s offset from the start of the data. (See Section 2.4)

Bandpass corrections: To adjust XRS-A for GOES-3 through GOES-12 to match GOES-13 through -15, multiply fluxes by 1.4. For GOES-1 and -2, both XRS-A and -B require special corrections, not provided here. (See Section 7.1)

Notification of Updates: If you wish to be notified of updates to GOES XRS (and/or Extreme Ultraviolet Sensor (EUVS)) data sets, please send an email to janet.machol@noaa.gov.

Version	Date	Description of major changes	author
1.5	14 June 2022	Updates to "Important Notes for Users" on first page, and Sections 2, 2.2, 3 and 7. New sections on science-quality data (Section 2.1) and XRS-A bandpass corrections (Section 2.3 and 7.1). Removed references to 'old' archive since all operational data has now been copied to the 'new' archive. Minor corrections throughout.	Machol
1.4.1	9 June 2016	Operational 3 s data for GOES-8 through -12 added to archive. Revised table of chronology of primary and secondary satellites. Added references and discussion of digitization.	Machol
1.4	4 March 2015	original	Machol

Contents

1. GOES X-ray Sensor (XRS)

This document discusses the GOES 1 through -15 operational XRS data produced by National Oceanic and Atmospheric Administration (NOAA) Space Weather Prediction Center (SWPC). This document discusses corrections that should be applied to this operational data for satellites where science-quality data (Section 2.1) is not yet available.

On each GOES satellite there are two X-ray Sensors (XRS) which provide solar X-ray fluxes for the wavelength bands of 0.5 to 4 Å (short channel) and 1 to 8 Å (long channel). Measurements in these bands have been made by NOAA satellites since 1974 and the design has changed little during that time period [Garcia, 1994]. The operational data came from the SWPC and is archived at the NOAA National Center for Environmental Information (NCEI) which was formerly the National Geophysical Data Center (NGDC). Figure 1 shows primary and secondary GOES satellites for XRS data since 1975 and 2021.

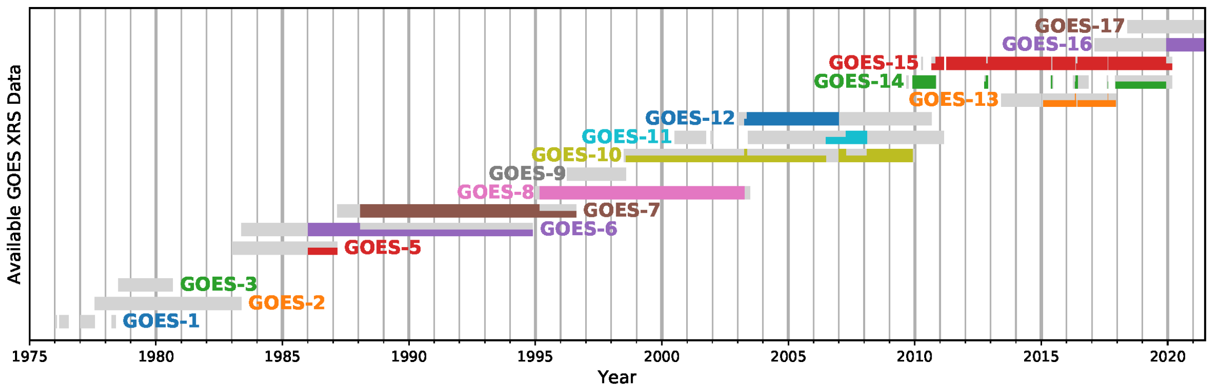

Figure 1. Primary (thick lines) and secondary (thin lines) GOES satellites for XRS data between 1975 and 2021. GOES-13 measurements were unstable for many years, but were stable after late 2014. XRS data goes back to 1974, but the designation of primary and secondary satellites prior to 1986 is not known.

The measurements are obtained from two gas-filled ion chambers, one for each band. Sweeper magnets deflect incoming electrons away from the assemblies so that only x rays are measured. The instruments are considered to not degrade. GOES 8 through -12 (GOES I-M series) and GOES-13 through -15 (GOES NOP series) have ion cell detectors and the detector/filter combinations that make the spectral bandpasses nearly identical between both satellite series (and to earlier XRS detectors). A description of the GOES-8 instrument is given by Hanser and Sellers [1996]. Although electronics are very different for the two series, the measurements agree across the full dynamic ranges except at the very lowest signal levels. For each sensor, the short wavelength cutoff is defined by the ion cell, while the long wavelength cutoff is defined by the thickness of the beryllium (Be) filter. Figure 2 shows the normalized detector responses for the short and long wavelength bands. The relative spectral contributions measured by the detectors are shown in Figure 3.

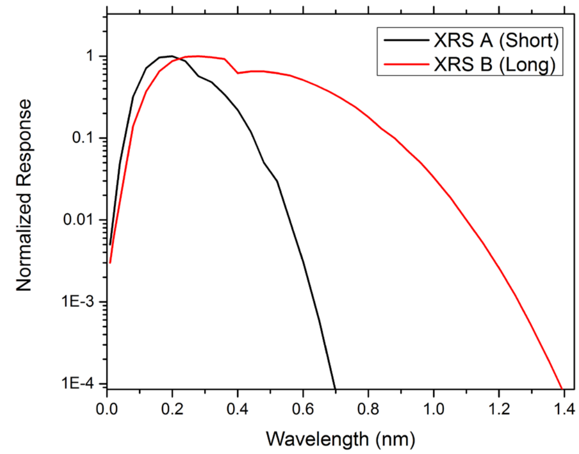

Figure 2. XRS detector responses.

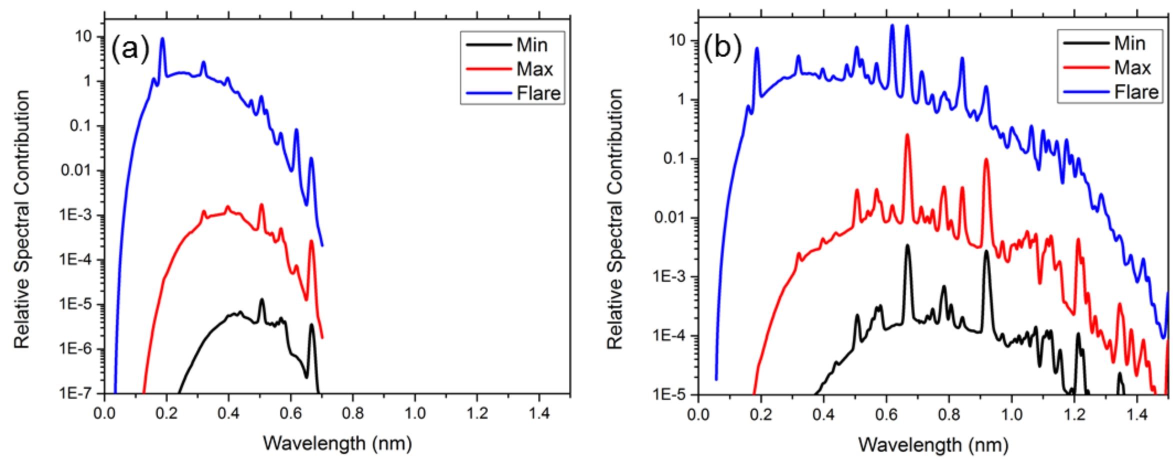

Figure 3. Relative spectral contributions for the XRS (a) short and (b) long channels. These are the detector responses multiplied by smoothed solar spectra for solar minimum, maximum, and flare conditions obtained from CHIANTI.

2. Data issues

2.1 Science-quality data

Reprocessed science-quality data should be used in place of the operational data if it is available for the satellite of interest. **Science-quality data is now available for GOES 13 through -15** and will become available for GOES 1 through -12 later in 2022. The science-quality data includes multiple corrections including those for SWPC scaling factors, XRS-A bandpass, time stamps, temperature effects, better quality flags, and other issues. Additionally, there are multiple data products (high time resolution, flare lists, 1-min averages, daily averages, backgrounds) as well as monthly plots for the science-quality data. The science-quality data and associated documentation is available from www.ngdc.noaa.gov/stp/satellite/goes-r.html on the 'GOES 1-15' tab.

2.2 Scaling factors and calibration

The operational XRS fluxes include scaling factors that were initially implemented by SWPC to get GOES-8 to agree with GOES-7. GOES-7 was the last of the spinning GOES satellites while GOES-8 was the first of the 3-axis-stabilized satellites. The scaling factors were retained by SWPC so that flare warning levels correspond to consistent flux values; e.g., an M5 X-ray alert from SWPC is based on a flux level of $5x10^{-5}$ W/m^2 for all satellites.

Since then rocket launches and comparisons with the new well-calibrated GOES-16 have confirmed that the GOES-8 through -15 sensors are accurate and that the use of scaling factors to match the old spinning satellites is not correct. The SWPC operational data discussed here still retains the scaling factors and conforms to the old style SWPC alert levels of C, M, and X. The next generation of satellites, GOES-R (GOES-16 through -19) has well-calibrated detectors and the measured irradiances from them do not include the SWPC scaling factors.

To get true fluxes for GOES-1 through -15 operational data, *users must remove the SWPC scaling factors from the data. To do this, divide the short band flux by 0.85 and divide the long band flux by 0.7.*

This true flux will then agree with GOES-R fluxes, and the corresponding flare and alert levels will agree with the ones now used by SWPC in the GOES-R era. A consequence of this is that the true irradiance of a particular class flare is now higher than in the past. Calibration differences between satellites are discussed by Neupert [2011]. A comparison of XRS data with Thermosphere Ionosphere Mesosphere Energetics Dynamics– Solar Extreme Ultraviolet Experiment (TIMED-SEE) measurements is given by Rodgers et al. [2006].

2.3 Bandpasses

As discussed in Section 7.1, the calculation of irradiance depends on a calibration factor with a bandpass in the denominator. To adjust XRS-A for GOES-3 through -12 to match GOES-13 through -15, multiply irradiances by 1.4. For GOES-1 and -2, both XRS-A and -B require special corrections, not provided here.

2.4 Time stamps

For GOES XRS, the data sampling rate depends on the satellite generation. For GOES-13 through -15, the data accumulation time is 2.048 s, and both the A and B channels take data simultaneously [Data and calibration handbook, 2009, Section 9.3]. The location of the time stamps is ***offset*** relative to the integration periods. As can be seen in Figure 4, for the raw data, the time stamps are 1.024 s ***after the end of the integration period***.

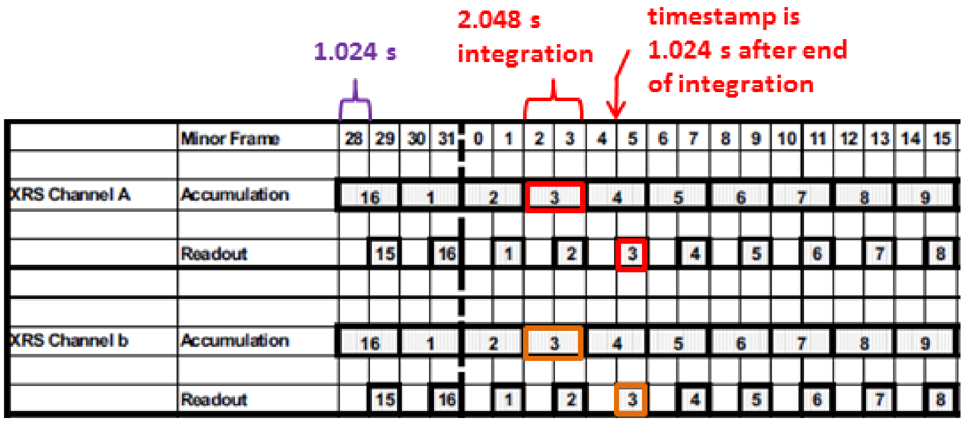

Figure 4. Sketch of XRS data integration and readout from the instrument. Telemetry minor frames are 1.024 s. As an example, the relative times for integration period '3' and its delayed timestamp are indicated.

For GOES-13 through -15, 1-minute averages are created by including all raw data with time stamps within a 1-minute window. The time stamp is set to the beginning of the 1-minute window. Five minute averages are created from averages of 1-minute averages, and time stamped at the beginning of the average. Because the raw data time stamps are offset after the data, the time stamps for the averaged data range from 1.024 to 3.072 s after the start of the included data. This is sketched in Figure 5.

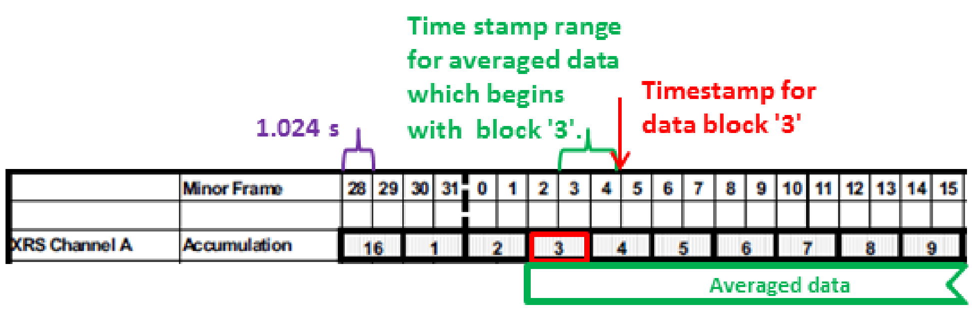

Figure 5. Sketch shows that timestamp for averaged data is offset 1.024 to 3.072 s after the start of the included data.

For satellites prior to GOES-13, the data accumulation time was 3 s. The time stamps are <3 s after the end of the accumulation period; the offset is not defined exactly because there was no on-board satellite clock. The actual sampling rate is 0.512 according to the GOES I-M DataBook [1996], but this raw data is only available by reprocessing the raw telemetry . The averages are created in the same way as for GOES-13 through -15.

2.5 Digitization

As described by Simões et al. [2015], the digitization of the GOES XRS data is larger than the Poisson noise from photon counting statistics. This can be problematic when differencing or taking derivatives of the flux data. GOES-8 through -12 had three different gain ranges and the digitization is apparent at the edges of these ranges. For GOES-10, the contractor changed the electronics to reduce the noise level of the XRS. This had the unintended consequence of enhancing the digital steps or quantization at low levels for the 1- and 5-minute averaged data.

2.6 Contamination

On rare occasions, when the X-ray sun is very quiet, bremsstrahlung contamination can be observed. This contamination is caused by energetic particles in the outer radiation belts and depends on satellite local time, time of year, and the local particle pitch-angle distribution. The X-ray sensors are also sensitive to background contamination due to energetic electrons that either deposit their energy directly in the telescope or strike the external structure and produce bremsstrahlung X-rays inside the ion chambers.

2.7 Saturation

During the most extreme flare events, the GOES XRS channels can saturate. As shown in Figure 6, during the 2003 Halloween storms, on GOES-12, the XRS long channel saturated at X17 and the short channel saturated at X5. Official flare classifications such as X17 are based on the long channel, and the short channel designations are given here just for convenience. On GOES-13 through -15, there has not been a solar flare that has saturated the XRS channels (as of February 2015), but it is expected that they will saturate at about the same flux levels. GOES-7 saturated several times in June 1991 at 0.00116 W/m^2 or X11.6 for the long channel and 0.00012 W/m^2 or X1.2 for the short channel.

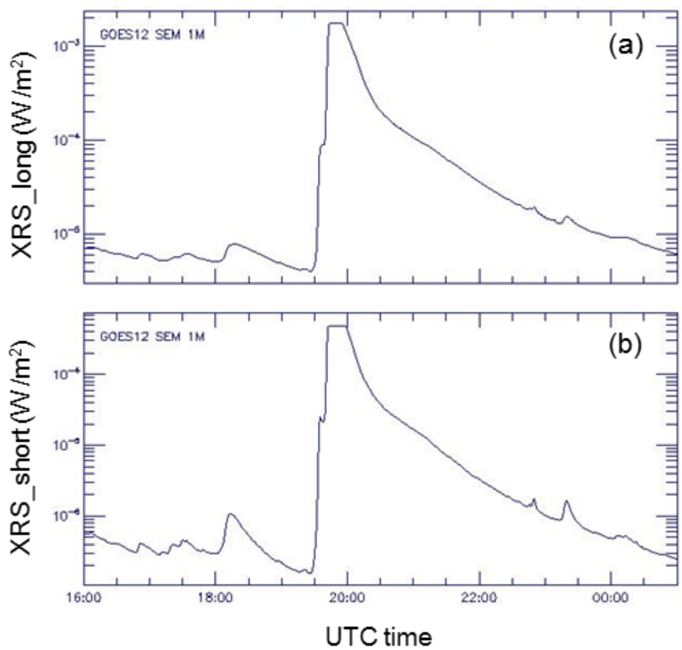

Figure 6. Saturation of the long (a) and short (b) channels on GOES-12 during a flare on 4 November 2003.

3. Data Access

For science-quality data, preferred access is through the GOES-R website as described in Section 2.1, which also provides access to higher level products, documentation and plots. Archived operational GOES XRS data is available from the links in the top table at
https://www.ngdc.noaa.gov/stp/satellite/goes/dataaccess.html

Directories of interest are:

./full	high time-resolution (either 2- or 3-sec data)
./avg	1-minute averaged data

./plots monthly plots

The operational data is provided in two formats: comma-separated values (csv) and netcdf (nc). In the csv files of averaged XRS fluxes, the flux columns are labeled correctly, but note that the column order changes for the different satellite series. The order of the columns for the different satellite series is:

GOES 6-7	xl(long)	xs(short)
GOES 8-12	xs(short)	xl(long)
GOES 13-15	A(short)	B(long)

4. Dates of GOES satellites with XRS sensors

Table 1 shows the approximate time ranges of operational data for the different satellites in the NCEI archive. At any time, one GOES satellite is designated as the primary and one satellite is the secondary. Secondary satellite measurements are used when the primary satellite cannot provide data due to eclipses or maintenance. Table 2 shows the chronology of primary and secondary GOES satellites for XRS measurements since 1986.

The GOES13 XRS had an electronics problem early in the mission -- it is suspected that a capacitor failed. This resulted in a changing calibration and period of data inversion (where flares appear as dips). GOES-13 measurements were unstable for many years, but were stable starting in late 2013.

Table 1. Approximate dates of GOES XRS sensors data in the NCEI archive. (Launch dates from http://www.osd.noaa.gov/download/JRS012504-GD.pdf and http://www.goes-r.gov/mission/history.html)

Satellite	*Launch Date*	*XRS data start date*	*XRS data end date*	*Full res.*	*Averaged data*	*Remarks*
GOES-15	2010-03-04	2010	present	2s	1min	
GOES-14	2009-06-27	2009	present	2s	1min	satellite in storage during some years
GOES-13	2006-05-24	2015	present	2s	1 min	unstable until ~2014
GOES-12	2001-07-23	2003	2007	3s	1, 5 min	3s data for 2003-2010
GOES-11	2000-05-03	2000	2008	3s	1, 5 min	3s data for 2006-2010
GOES-10	1997-04-25	1998	2009	3s	1, 5 min	3s data for 2001-2009
GOES-9	1995-05-23	1996	1998	3s	1, 5 min	no 3s data available
GOES-8	1994-04-13	1995	2002	3s	1, 5 min	3s data for 2001-2002
GOES-7	1987-02-26	1987	1996	3s	1, 5 min	
GOES-6	1983-04-28	1983	1994	3s	1, 5 min	averaged data starts in mid-1986
GOES-5	1981-05-22	1983	1987	3s	1, 5 min	averaged data starts in mid-1986
GOES-4	1980-09-09	-	-	-	-	no data
GOES-3	1978-06-15	1978	1980	3s	-	
GOES-2	1977-06-16	1977	1983	3s	-	
GOES-1	1975-10-16	1976	1977	3s	-	
SMS-2	1975-02-06	1974	1976	3s	-	
SMS-1	1974-05-17	1975	1975	3s	-	

Table 2. Chronology of designation of primary and secondary satellites for XRS measurements since 1986. Designations are unknown for period 1974-1986. (Table revised 7 June 2016)

Start Date	*Time*	*Primary*	*Secondary*	*Remarks*
2016-06-09	will be added after June 9	15	13	
2016-05-16	17:00	14	15	
2016-05-12	17:30	14	13	
2016-05-03	13:00	13	14	
2015-06-09	16:25	15	13	
2015-05-21	18:00	14	13	
2015-01-26	16:01	15	13	
2012-11-19	16:31	15	None	
2012-10-23	16:00	14	15	
2011-09-01	0:00	15	GOES-14	
2010-10-28	0:00	15	None	
2010-09-01	0:00	14	15	
2009-12-01	0:00	14	None	GOES-10 decommissioned
2008-02-10	16:30	10	None	GOES-11 XRS failure
2007-12-18	0:00	11	None	GOES-10 not tracked due to antenna problems
2007-12-05	0:00	11	10	
2007-11-21	0:00	11	None	GOES-10 not tracked due to antenna problems
2007-04-12	0:00	11	10	
2007-01-01	0:00	10	11	
2006-06-28	0:00	12	11	
2006-06-28	14:00	12	11	
2003-05-15	15:00	12	10	
2003-04-08	15:00	10	12	
1998-07-27	0:00	8	10	
1995-03-01	0:00	8	7	
1994-12-11	0:00	7	8	
1988-01-26	0:00	7	6	
1986-01-01	0:00	6	5	

5. Contacts

XRS data archive/access: sem.goes@noaa.gov

XRS calibrations: janet.machol@noaa.gov, courtney.peck@noaa.gov

XRS/EUVS mailing list for data updates: janet.machol@noaa.gov

6. Status flags for GOES 8-12

The definitions for the two status flags in the XRS 8-12 data are given in Table 3 and Table 4.

Table 3. Status word 1. AOCS is the Attitude and Orbit Control System. [Bornmann code, p.24]

bit	value	definition	likely XRS impact
0	1	No torquer current sign.	
1	2	Torquer current sign change.	
2	4	0.256 s Torquer 1 update	
3	8	20 minute Torquer 1 change	
4	16	AOCS anomaly	
5	32	AOCS, torquer, or patch status change	
6	64	Single bit error (corrected)	
7	128	Telemetry noise (more than 1 bit)	
8	256	Bad or wrong satellite identification	
9	512	goeslave restart	
10	1024	(unused)	
11	2048	Time jump	x
12	4096	Time reverse	x
13	8192	Frame count jump	x
14	16384	(unused)	
15	32768	EPS/HEPAD off	
16	65536	HEPAD off	
17	131072	EPS/HEPAD calibration on	
18	262144	EPS transient	
19	524288	S4, S3 ratio bad	

Table 4. Status word 2.

bit	value	definition	likely XRS impact
0	1	X ray off	x
1	2	X ray calibration	x
2	4	X ray transient	x
3	8	X ray Long saturation	x
4	16	X ray Short saturation	x
5	32	Long channel range change	x
6	64	Short channel range change	x
7	128	XRS elevation angle change	x
8	256	XRS pointing error (SADA, CASS, yoke)	x
9	512	Eclipse	x
10	1024	(unused)	
11	2048	Magnetometer 2 on	
12	4096	Magnetometer off	
13	8192	Magnetometer calibration	
14	16384	Magnetometer transient	
15	32768	Minor mag disturbance	
16	65536	(unused)	
17	131072	Timing suspect	x
18	262144	Dwell	
19	524288	(unused)	

7 Conversion of XRS measurements to X-ray fluxes

The GOES XRS fluxes are calculated from raw count measured with a 2.048 s cadence for GOES-13 through -15 and a 3-s cadence for the earlier satellites. The counts are converted to calibrated fluxes with the equation:

$$X\text{-}ray\ flux[\mathrm{W/m^2}] = S^* \left((\mathrm{Counts} - B\ [\mathrm{counts}]) * G\ [\mathrm{A/count}]\right) / C\ [\mathrm{A/(W/m^2)}] \qquad \text{(Eq. 1)}$$

where *S* is the SWPC scaling factor, *B* is the background, *G* is the gain and *C* is a units conversion factor. The initial values for the *G* and *C* are determined before launch. The background values, *B*, are really electronic offsets, and are measured when the satellite is pointed away from the Sun. The gain is also examined on orbit, but does not change much.

7.1 Bandpass corrections

For GOES-1 and -2, a solar spectrum was presumed for the calculation of the factor *C*, while for GOES-3 through -15 and GOES-R series (GOES-16 through -19), a flat spectrum is presumed. The bandpass used in the calculations for the XRS-B flat spectrum is the same for all of the satellites after GOES 2, however the bandpass for XRS-A varied for the different satellites. This is summarized in Table 5.

Table 5. Assumed bandpass and solar spectrum in Eq. 1

Satellite	XRS-A	XRS-B	Use of flat spectrum [2]
GOES 1, 2	0.5 - 4 Å	1 - 8 Å	no
GOES 3 - 12	0.5 - 3 Å [1][2]	1 - 8 Å	yes
GOES 13 - 19	0.5 - 4 Å	1 - 8 Å	yes

[1] Garcia 1994

[2] Neupert, 2011

The *C* factor includes a factor in the denominator for the width of the bandpass for GOES-3 through -19. To obtain consistent values of the X-ray fluxes between the different satellites, the bandpasses and spectrum must be the same.

The correction for GOES-3 through -12 to align the *C* factor in the X-ray flux calibrations with the later satellites adjusts the bandpass from 0.5 - 3 Å to 0.5 - 4 Å; the correction is $\Delta\lambda_{0.5\text{-}4} / \Delta\lambda_{0.5\text{-}3} = 1.4$. There remains a discrepancy in the XRS-A fluxes between the earlier satellites and the GOES-R satellites; the ratio of XRS-A for GOES-16/GOES-15 = 1.34; this at least partly due to slight differences in the detector response functions, but the source of this discrepancy remains under investigation. The correction for GOES 1 and 2 is more complicated and not provided here, however, this will be corrected in the forthcoming science-quality data and provided here at a later date.

7.2 Calibration tables for GOES-13 through -15

Values for the constants in Eq. 1 for GOES-13 through -15 are given in Table 6. The values for the *G* and *C* come from the GOES Data and Calibration Handbooks. The background counts changed over time and operationally were adjusted approximately once a year based on the weekly calibration background measurements. Typical background values are presented in this table.

Table 6. Counts to flux conversion factors for GOES-13, -14 and -15 XRS (as of 23 March 2017).

GOES sat	XRS channel	SWPC scaling factor	Background [counts]	Gain [A/counts]	Flux conversion [A/(W/m^2)]
15	A	0.85	17720	1.87e-15	1.141e-5
15	B	0.70	17700	1.87e-15	3.992e-6
14	A	0.85	16020	1.90e-15	1.117e-5
14	B	0.70	17200	1.91e-15	4.168e-6
13	A	0.85	15820	1.88e-15	1.171e-5
13	B	0.70	16200	1.88e-15	3.100e-6

7.3 Spectral response for GOES-13 through -15

As examples of the XRS response curves, the following two tables and figures show spectral response calibration data for GOES-13. Responsivity data for all three satellites can be found at https://satdat.ngdc.noaa.gov/sem/goes/data/science/xrs/xrs_responsivity/ The tables and figures are from the XRS/EUV Data and Calibration Handbook for F1(SN003).

Table 7. Calibration data for GOES-13 Channel A. (from the XRS/EUV Data and Calibration Handbook for F1(SN003))

Wavelength (nm)	Mu(Be) (cm^2/g)	Mu(Xe) (cm^2/g)	G(wavelength) ($A\text{-}m^2/W$)
0.01	0.1	1.16	1.167E-07
0.02	0.1	7.23	5.798E-07
0.03	0.1	21	1.244E-06
0.035799	0.1	33.1	1.564E-06
0.035801	0.1	5.94	6.948E-07
0.04	0.1	8	9.296E-07
0.05	0.1	14.7	1.674E-06
0.06	0.1	24.3	2.694E-06
0.07	0.1	37	3.963E-06
0.08	0.13	53.2	5.443E-06
0.09	0.19	73.1	7.065E-06
0.1	0.26	97.1	8.780E-06
0.11	0.35	126	1.053E-05
0.12	0.46	159	1.217E-05
0.13	0.59	197	1.367E-05
0.14	0.74	239	1.493E-05
0.15	0.91	275	1.566E-05
0.16	1.1	327	1.649E-05
0.17	1.3	383	1.705E-05
0.18	1.6	447	1.725E-05
0.19	1.9	518	1.727E-05
0.2	2.2	592	1.711E-05
0.21	2.6	673	1.667E-05
0.22	2.9	762	1.632E-05
0.23	3.4	725	1.540E-05
0.24	3.8	792	1.485E-05
0.25	4.4	625	1.359E-05
0.25899	4.8	660	1.310E-05
0.25901	4.8	231	1.020E-05
0.26	4.9	232	1.012E-05
0.27	5.5	255	1.000E-05
0.28	6.2	275	9.660E-06
0.29	6.9	303	9.398E-06
0.3	7.6	328	9.045E-06
0.31	8.4	357	8.613E-06
0.32	9.3	388	8.092E-06
0.33	10.2	421	7.578E-06
0.34	11.2	454	6.995E-06
0.35	12.2	491	6.446E-06
0.36	13.4	529	5.804E-06
0.38	15.8	609	4.671E-06
0.4	18.5	694	3.619E-06
0.42	21.5	791	2.708E-06
0.44	24.8	885	1.957E-06
0.46	28.5	991	1.355E-06
0.48	32.5	1090	9.081E-07
0.5	36.9	1190	5.841E-07
0.55	49.6	1500	1.630E-07
0.6	65	1860	3.461E-08
0.7	104	2740	6.831E-10
0.8	157	3710	3.294E-12

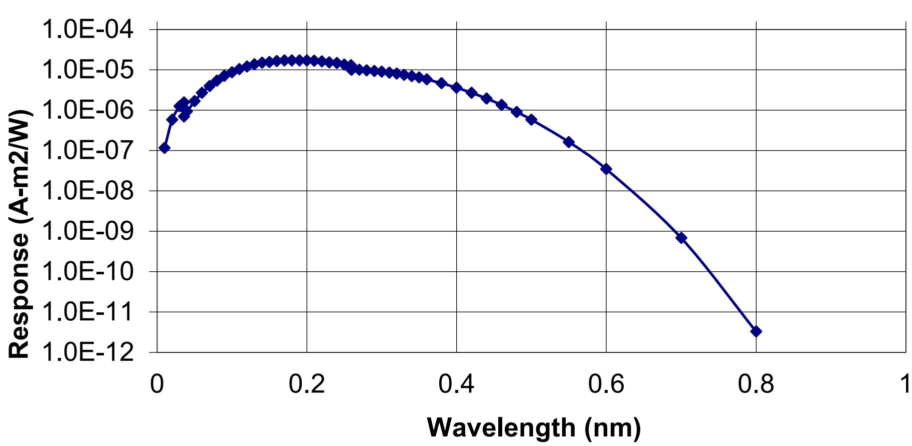

Figure 7. Calibrated response for GOES-13 Channel A. (from the XRS/EUV Data and Calibration Handbook for F1(SN003))

Table 8. Calibration data for GOES-13 Channel B. (from the XRS/EUV Data and Calibration Handbook for F1(SN003))

Wavelength (nm)	Mu(Be) (cm^2/g)	Mu(Ar) (cm^2/g)	G(wavelength) ($A\text{-}m^2/W$)	Wavelength (nm)	Mu(Be) (cm^2/g)	Mu(Ar) (cm^2/g)	G(wavelength) ($A\text{-}m^2/W$)
0.02	0.1	0.4	1.864E-08	0.5	36.9	296	4.036E-06
0.04	0.1	2.9	1.336E-07	0.52	41.7	328	3.952E-06
0.06	0.1	8.9	4.004E-07	0.54	46.9	363	3.836E-06
0.08	0.13	20	8.640E-07	0.56	52.5	399	3.689E-06
0.1	0.26	36	1.469E-06	0.58	58.5	438	3.520E-06
0.12	0.46	59	2.223E-06	0.6	65	479	3.330E-06
0.14	0.74	90	3.059E-06	0.62	72	522	3.124E-06
0.16	1.1	130	3.894E-06	0.64	79	568	2.925E-06
0.18	1.6	180	4.643E-06	0.68	95	667	2.498E-06
0.2	2.2	240	5.238E-06	0.72	113	778	2.078E-06
0.22	2.9	311	5.664E-06	0.76	134	903	1.671E-06
0.24	3.8	393	5.918E-06	0.8	157	1040	1.314E-06
0.26	4.9	489	6.038E-06	0.84	183	1187	9.998E-07
0.28	6.2	597	6.051E-06	0.88	211	1346	7.448E-07
0.3	7.6	720	6.002E-06	0.92	242	1516	5.376E-07
0.32	9.3	858	5.903E-06	0.96	275	1696	3.799E-07
0.34	11.2	1011	5.779E-06	1	311	1890	2.601E-07
0.36	13.4	1180	5.633E-06	1.04	351	2099	1.708E-07
0.38	15.8	1366	5.476E-06	1.08	393	2323	1.098E-07
0.38699	16.7	1435	5.419E-06	1.12	439	2561	6.766E-08
0.38701	16.7	153	3.730E-06	1.16	488	2813	4.040E-08
0.4	18.5	167	3.841E-06	1.2	540	3080	2.338E-08
0.42	21.5	189	3.966E-06	1.3	690	3800	4.824E-09
0.44	24.8	213	4.050E-06	1.4	860	4600	8.066E-10
0.46	28.5	239	4.088E-06	1.5	1050	5500	1.093E-10
0.48	32.5	267	4.086E-06	1.6	1270	6500	1.080E-11

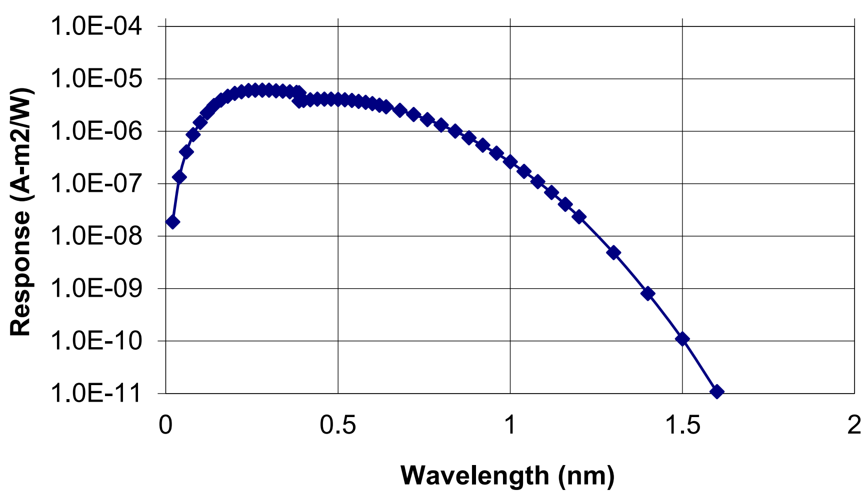

Figure 8. Calibrated response for GOES-13 Channel B. (from the XRS/EUV Data and Calibration Handbook for F1(SN003))

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