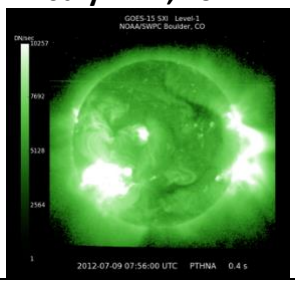
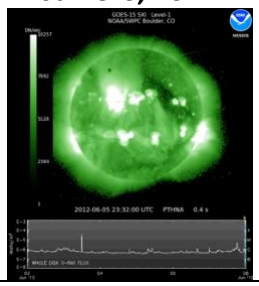
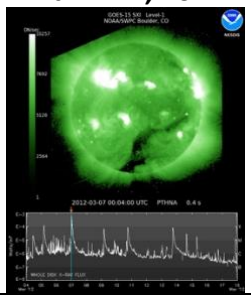
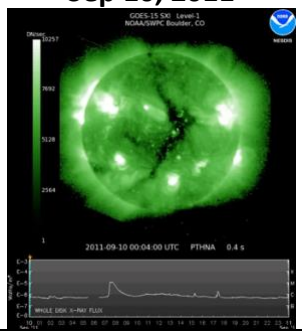
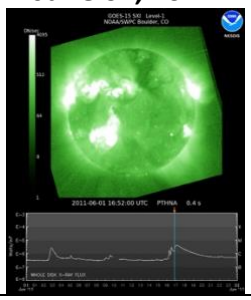
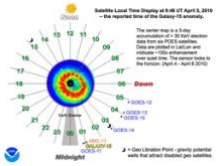
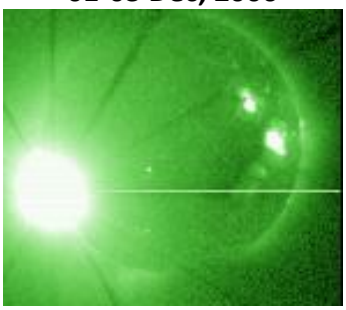
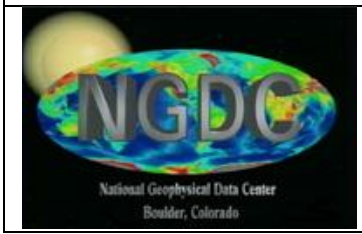
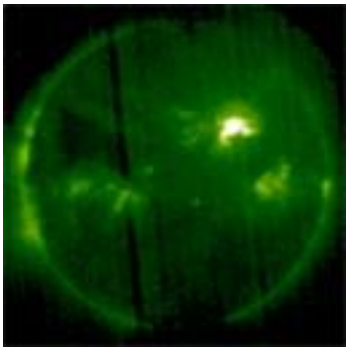
SXI Special Events – list

June 18-21, 2015 	**4-day movie with a coronal structure observed by GOES-15.** Filename: sxi_15_20150618_FunInTheSun.webm
July 1-14, 2012 	**14-day movie that includes this spectacular event, subsampled every four images for this exposure sequence** Filename: sxi_15_20120701_ThowingSparks.[webm, mp4, wmv] **3-day movie that includes all images of this exposure sequence** Filename: sxi_15_20120708_ThowingSparks.[webm, mp4, wmv]
Jun 3-6, 2012 	**Sample movies combining SXI images with solar X-ray measurements from GOES-15 showing a Venus Transit** Filenames: venus_2012_sxi_g15_cs_latest_03days.[mp4, mpg, webm] sxi_15_2012_VenusTransit.[mp4, mpg, webm]
Mar 4-17, 2012 	**14-day movie combining SXI images with solar X-ray measurements from GOES-15** Filename: sxi_15_20120304_20120317.[mp4, webm, mpg] The cadence of SXI movies can be affected by changes in the SXI exposure sequence that take place when an event is in progress.
Sep 10, 2011 	**Sample movie SXI images with solar X-ray measurements from GOES-15 showing eruptive prominence and M1.1 flare** **[hyperlink]**

June 01, 2011 	**Sample movie showing a lunar eclipse and C4.1 flare [hyperlink]**
April 3-5, 2010 	Galaxy-5 anomaly identified on April 5, 2010 0948 UT by Intelsat (see Galaxy-15 wiki page). Since commands can be weeks apart it is uncertain when the failure actually occurred. April 3, 2010 GOES-13 SXI movies [hyperlinks]: Flare Sequence and Flare Sequence combined with whole disk X-rays from XRS
01-03 Dec, 2006 	**December 2006 Flare Activity**: An exceptionally active solar region (930) rotated onto the solar disk at a time when solar cycle 23 was theoretically approaching minimum levels. Region 930 continued to generate flares over the ensuing two weeks and resultant ion storms were also recorded by GOES. One such storm had sufficient energy to be recorded at ground level by neutron monitoring stations. On December 5th 2006 at 10:18 UT region 930 generated an X9 flare that can be seen in both the sequence of GOES-13 SXI images. *GOES 13 SXI sustained damage to several pixels of its detector while observing this X9 flare event. The source of the damage was the large X-ray flux of the flare convolved with the observing sequence. At the time, the susceptibility of the detector to radiation damage was not well understood or constrained. The type of damage affects 8 lines of pixels across the CCD and is unlikely to recover. Operational constraints and updates to on-board observing sequence software will enable the SXI to continue its mission without further damage to its detector. The impact on observations and prediction is currently being assessed as the new sequence software and operational constraints are developed. In addition, ground algorithms will be developed to minimize the appearance of the 'lost' lines through interpolation or other means.* Filenames: SXI_20061201_000000_AA_G13_CS1_10D.MPG SXI_20061201_000000_BB_G12_TST_10D.MPG SXI_20061203_000000_AA_G13_CS1_14D.MPG SXI_20061203_000000_BB_G12_TST_14D.MPG
	**SXI Kiosk Movie:** This movie contains images and footage of GOES-12 and SXI from launch to operations. It has been shown at the NOAA booth at many conferences. Filename: SXI_KIOSK_V1.MPG

Jan 2005



Mo	Dy	Begin	Max	End	Reg#	Lat	CMD	X-class
Jan	15	0022	0043	0102	0720	N14	E08	**X 1.2**
Ion Storm								
Jan	15	1947	2007	2028	0720	N15	W05	**X 2.6**
Ion Storm								
Jan	17	0659	0952	1007	0720	N15	W25	**X 3.8**
Ion Storm								
Jan	19	0803	0822	0840	0720	N15	W51	**X 1.3**
Ion Storm								
Jan	20	0227	0636	0701	0726	N14	W61	**X 7.1**
Ion Storm, Ground Level Enhancement								

Martin Luther King Storm: Solar active region 0720 rotated onto the east limb on January 10th and put on a pyrotechnic display uncharacteristic for this phase of the solar cycle before disappearing beyond the west limb on January 23rd. On January 15th this region released the first of five X-class solar flares. The last of those flares, January 20th, was associated with an extraordinary ion storm whose effect reached Earth's surface.

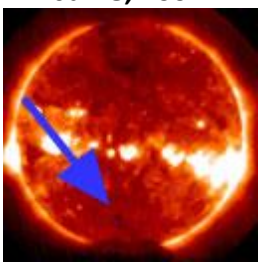
The movie perfectly illustrates the cause-and-effect relationship between intense solar activity and satellite disruptions. The flares on January 17th and 20th are closely followed by noise in the SXI telescope resulting from energetic ions penetrating SXI. Ions with sufficient energy and atomic number can penetrate satellite components and deposit charge along their path. Sufficient charge deposition can introduce erroneous information into solid state memory devices. The common term for this is Single Event Upset (SEU), and the classic example of their occurrence comes from the operational history of TDRS-1.
X-rays from the January 20th X7.1 flare began to arrive at 0636 UT, enhanced energetic ion levels began at 0650 UT. Therefore, the fastest ions traveled the Earth-Sun distance (150 million km or 93 million miles) in approximately 22 minutes, indicating a speed approximately 40% that of light.

Filename: SXI_SPECIAL_20050114_000000_BB_G12_AR2_08D.[mpg, mp2, jpg.zip]

This high cadence sequence covers only January 20th. These X-ray images show both the eruption of the flare and the resultant relativistic ions smashing into SXI & GOES-12 like bugs on a windshield.

Filename: SXI_SPECIAL_20050120_000000_BB_G12_AR2_01D.[mpg, mp2, jpg.zip]

Jun 8, 2004



Venus Transits the Solar Disk: This transit of Venus is the first in 122 years. In SXI images, Venus appears as a dark disk about 1/30th the Sun's apparent diameter. Since the Sun's corona extends well above the disk, Venus was visible in silhouette for approximately 9 hours, versus the 6 hours seen from Earth. The path across the disk is from the southeast to the southwest.

Filename: SXI_SPECIAL_20040608_VENUS_09H.[mpg, mp2, jpg.zip]

CR #2006

27-day movie that shows begins Aug 3, 2003 and shows one complete rotation -- Carrington Rotation #2006

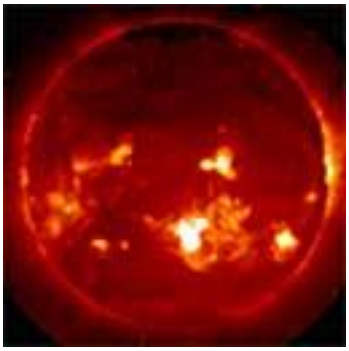
Filename: SXI_SPECIAL_20030803_181324_BB_G12_CS1_27D,[mpg, mp2, jpg.zip]

Carrington Rotations #2003 and #2004

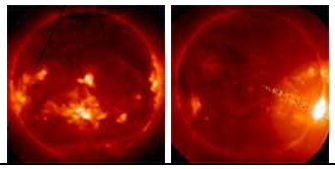
27-day movie that shows two complete rotations of the sun side-by-side -- Carrington Rotation #2003-2004.

Filename: SXI_SPECIAL_CR2003_CR2004_BB_G12_CS1_27D.[MP2, mpg, jpg.zip]

Oct-Nov 2003



Mo	Dy	Begin	Max	End	Reg#	Lat	CMD	X-class
Oct	19	1629	1650	1704	0484	N08	E58	**X 1.1**
Oct	22	1947	2007	2028	0486			**M 9.9**
Oct	23	0819	0835	0849	0486	S21	E88	**X 5.4**
Oct	23	1950	2004	2014	0486	S17	E84	**X 1.1**
Oct	24	0227	0254	0314	0486	S19	E72	**M 7.6**
Oct	26	0557	0654	0733	0486	S15	E44	**X 1.2**
Oct	26	1721	1819	1921	0484	N02	W38	**X 1.2**
Ion Storm								
Oct	26	2134	2140	2148	0484			**M 7.6**
Oct	27	0921	0927	0932	0486	S16	E26	**M 5.0**
Oct	27	1227	1243	1252	0486	S17	E25	**M 6.7**
Oct	28	0951	1110	1124	0486	S16	E08	**X17.2**
Ion Storm, Ground Level Enhancement								
Oct	29	2037	2049	2101	0486	S15	W02	**X10.0**
Ion Storm, Ground Level Enhancement								
Nov	02	1703	1725	1739	0486	S14	W56	**X 8.3**
Ion Storm, Ground Level Enhancement								
Nov	03	0109	0130	0145	0488	N10	W83	**X 2.7**
Nov	03	0943	0955	1019	0488	N08	W77	**X 3.9**
Nov	04	1929	1953	2006	0486	S19	W83	**X28.0**
Ion Storm								
Nov	05	1046	1052	1056	0486	S16	W90	**M 5.3**

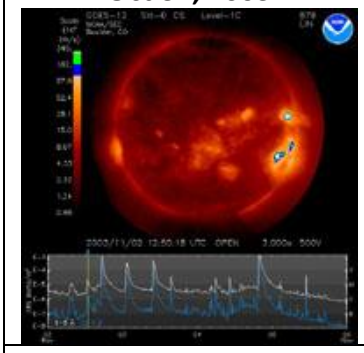


The Great Halloween Solar Storm of 2003: A series of solar active regions unleashed an extraordinary display of solar activity in October and November of 2003. These solar storms disrupted airline communications and GPS and disabled the ADEOS-II satellite. GOES X-ray sensors saturated at X17 during the November 4th flare but estimates of the actual peak range from X28 to X45 which made this the largest flare ever recorded. The GOES-12 SXI was not operational during the first of these large events, due to the ongoing diagnosis of a power system anomaly. However, on Oct 28th SXI was reactivated at 1633 UT. The noise in the images at the beginning of this movie are due to energetic particles from the Oct 28th and 29th solar ion storms.
Filenames: SXI_SPECIAL_20031028_163326_BB_G12_CS1_09D.[mpg, mp2, jpg.zip] and SXI_SPECIAL_20031028_163326_BB_G12_CS1_09D_wcaption.MP2

Movie uses a high cadence of images of October 28-29: to highlight the exchange of solar material between region #0486 (southern hemisphere) and region #0488 (northern hemisphere).
Filename: SXI_SPECIAL_20031028_163326_BB_G12_CS1_02D.[mpg, mp2, jpg.zip]

Movie starting on October 31st, and highlighting the final six days of this active interval.
Filename: SXI_SPECIAL_20031031_000222_BB_G12_CS1_06D.[mpg, mp2, jpg.zip]

Oct 31, 2003

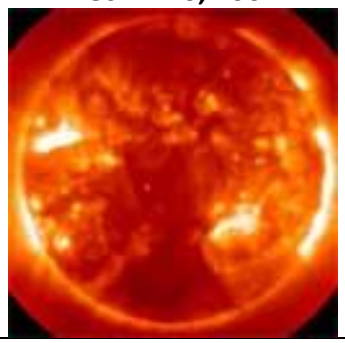


GOES-13 SXI/XRS Movie Prototype: This data visualization prototype was created as a possible means of browsing large volume data sets. The movie linked here combines SXI data with the classic XRS (whole disk X-ray sensor) data. The search for innovative data products was supported in part by the GOES-R Risk Reduction program.
Filename: SXI_PROTOTYPE_20031031_000222_BB_G12_CS1_04D.[JPG, mpg]

May 25, 2003

24-day movie showing a flaring "sigmoid" region, large coronal hole, eruptive prominence, etc.
Filename: SXI_SPECIAL_20030525_000000_BB_G12_CS1_24D.[mpg, mp2, jpg.zip]

10-day movie focused on the disk passage of the flaring "sigmoid" region
Filename: SXI_SPECIAL_20030523_000000_BB_G12_CS1_10D.[mpg, mp2, jpg.zip]

Dec 11-16, 2001 	**Movie made during post launch testing, prior to light leak problem.** Filename: SXI_SPECIAL_20011211_000000_BB_G12_CS1_06D.[MP2, mpg, jpg.zip]
Nov 21, 2001  Begin 1207 Max 1458 End 1650 Region 9704 Lat S14 CMD W19 X-class C4.7	**SXI vs. SXT Comparison, Large Scale View of Small Flare - Four Hours:** This sequence spans approximately four hours (2001-11-21 13:18 to 2001-11-21 16:53). The SXI images are displayed in tandem with images from the SXT instrument onboard Yohkoh. The movie shows a zoomed view of region 9704 as it produces a small (C4.7) flare. Produced by Dr. Steven Hill, the SXI project manager at NOAA's Space Weather Prediction Center. Filename: SXI-SXTA_20011121_130020237_DA_12map2s.mpeg
Oct 22, 2001  Begin Max End Region Lat CMD X-class 0022 0040 0048 9658 N17 W57 M1.0 0344 0359 0423 9669 N14 W12 C6.8 1136 1141 1145 9672 S18 E19 C5.6 1205 1217 1230 9669 N11 W19 C7.5 1427 1508 1531 9672 S21 E18 M6.7 1744 1759 1814 9672 S18 E16 X1.2 2057 2106 2114 C7.9	**Coronal Mass Ejections Movie w/Coronagraph- One Day:** This sequence spans one day (2001-10-22). The SXI images are displayed in tandem with the coronagraph images from the LASCO C2 instrument onboard SOHO. The movie shows the relationship between X-ray flares viewed by SXI and the resultant effect on the extended corona. Produced by Dr. Steven Hill, the SXI project manager at NOAA/SWPC. Filename: SXI-24H_20011022_000244069_BA_12_C2.mpg
Oct 19 - Dec 05, 2001 	**Coronal Hole Movie - Two Solar Rotations (~54 days):** This movie was created from images taken with SXI in the OPEN (unfiltered) configuration. The images were deconvoluted, as described in the example above. The sequence spans approximately two solar rotations -- 2001-10-19 00:03:44 to 2001-12-05 22:13:09. Coronal holes appear dark. Produced by Dr. Steven Hill, the SXI project manager at NOAA/SWPC. Filename: SXI-50D_20011019_000344834_DA_12.mpeg

GOES-13 SXI 1st image – Jul 06, 2006

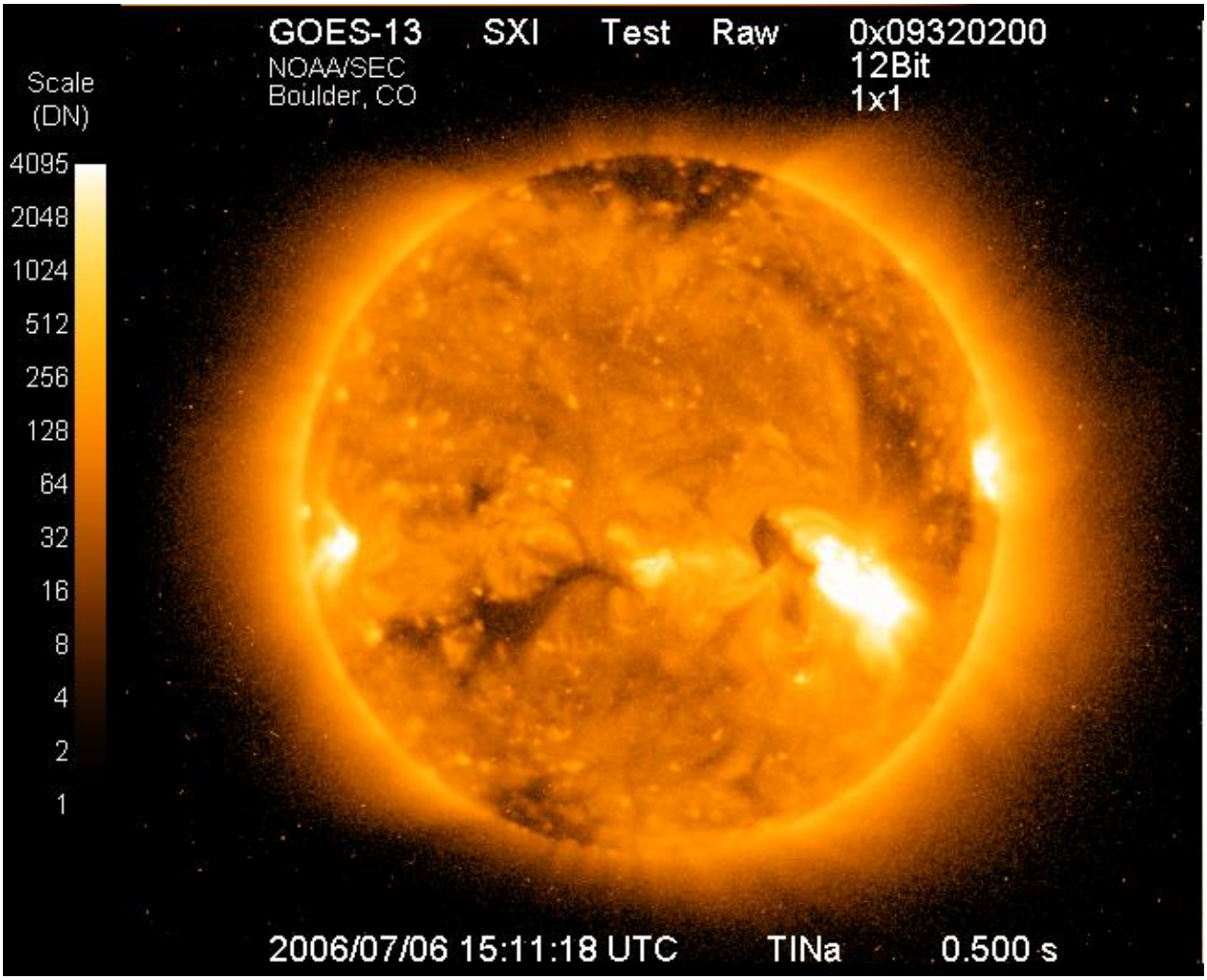
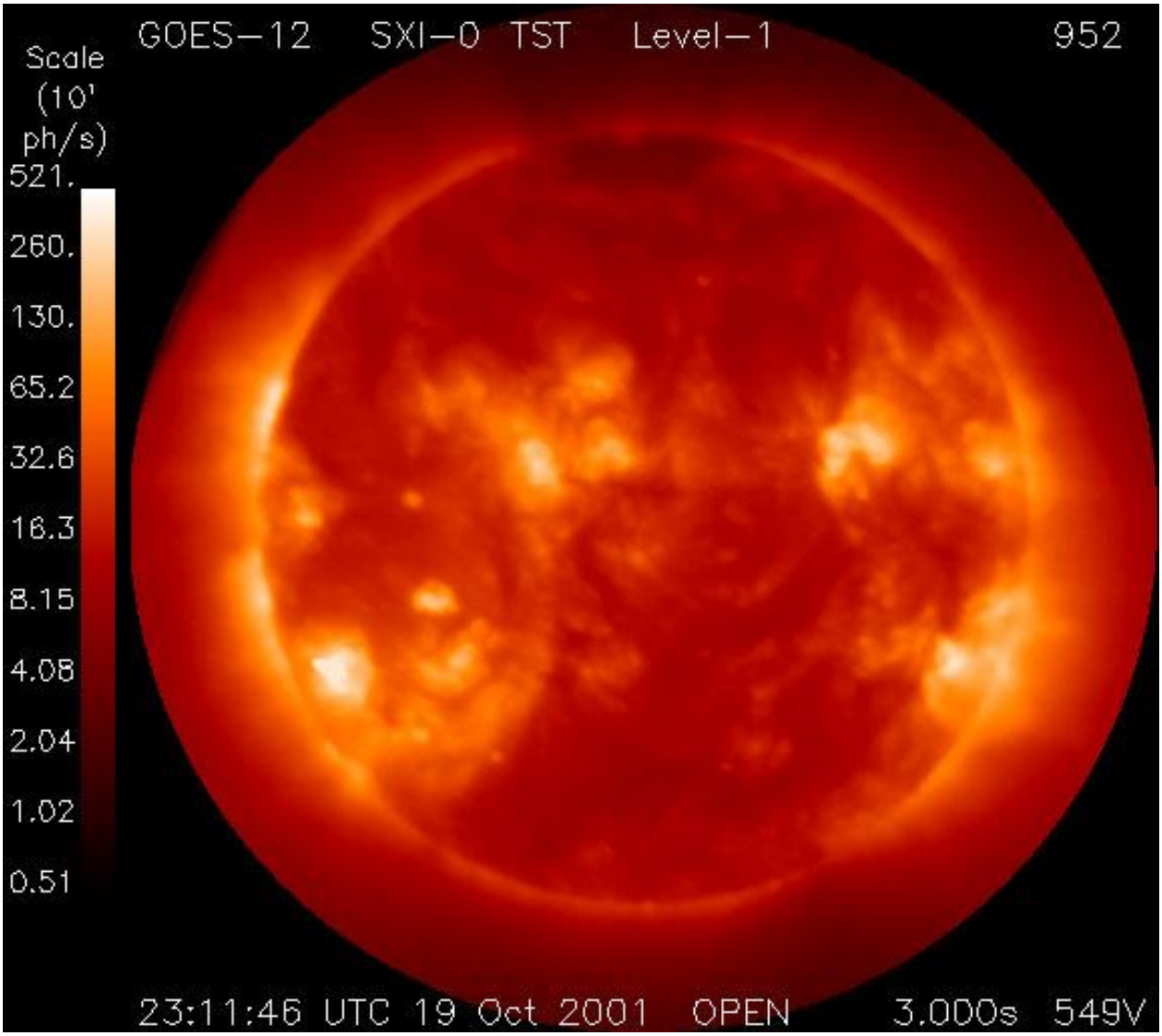
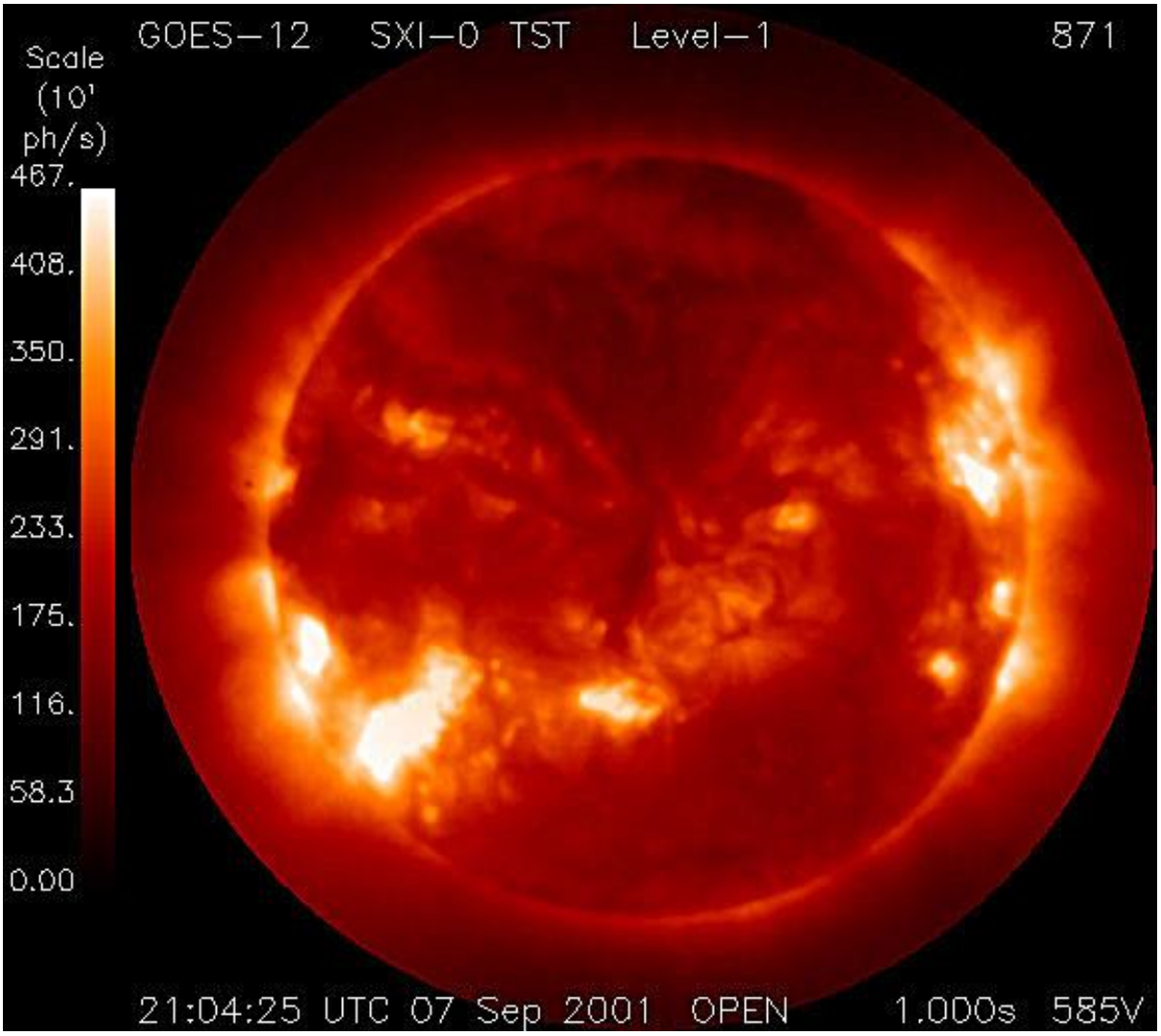


Image enhancement using deconvolution and multi-image composite

To address the wide dynamic range of features on the sun, it is sometimes necessary to combine two images, one short exposure and one long exposure, into what is known as a composite image. The overexposed regions from the long exposure are replaced with those properly exposed from the shorter exposure. In addition, all optical instruments have a natural 'blurring' or point-spread function. A composite image is particularly amenable to removal of the point-spread function of the instrument. This was done by a mathematical process called deconvolution.



September 7, 2001 -- First released SXI image – GOES-12



This X-ray image of the Sun was taken by the SXI instrument oboard GOES-12 on September 7, 2001 at 21:04:25 Universal Time.

Image Annotation:

- **Scale**: The color scale along the left side of this image is detected photons/second/pixel.
- **GOES-12**: The satellite platform for SXI.
- **Level-1**: Indicates that this is a processed image.
- **871**: Indicates which suite of image exposure setting was used.
- **OPEN**: Indicates that no filter was in place when the image was taken.
- **1.000s**: Is the exposure time in seconds.
- **585V**: Is a gain level in volts, this is set to optimize image quality.