

Space Weather Highlights
07 December - 13 December 2015

SWPC PRF 2102
14 December 2015

Solar activity was at low levels and only C-class flare activity was observed throughout the period, the largest of which was a C7 flare at 12/1346 UTC from Region 2470 (N13, L=087, class/area=Dkc/270 on 13 Dec). No Earth-directed coronal mass ejections (CMEs) were observed this period.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels every day of the summary period with a peak flux of 10,700 pfu observed at 09/1455 UTC.

Geomagnetic field activity was quiet to active levels on 07-08 Dec due to waning coronal hole high speed stream effects prior to the summary period. Unsettled to active field conditions were observed on 10-11 Dec, with an isolated period of G1 (Minor) geomagnetic storm levels observed between 10/0300-0600 UTC, due to the influence of a positive polarity coronal hole high speed stream.

Space Weather Outlook
14 December - 09 January 2016

Solar activity is expected to be at low levels throughout the outlook period with only C-class flare activity expected.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach high levels on 14-20, 29-31 Dec and 03-09 Jan. Low to moderate electron flux levels are expected throughout the remainder of the period.

Geomagnetic field activity is likely to reach G1 (Minor) geomagnetic storm levels on 16 Dec and 06 Jan due to the influence of recurrent coronal hole high speed streams. Active field conditions are likely on 15, 17-18, 27-28 Dec and 01, 03-04, 07-08 Dec due to coronal hole high speed stream effects. Quiet to unsettled levels are expected for the remainder of the period.



Daily Solar Data

Date	Radio Flux 10.7cm	Sun spot No.	Sunspot Area (10 ⁻⁶ hemi.)	X-ray Background Flux	Flares							
					X-ray			Optical				
					C	M	X	S	1	2	3	4
07 December	101	50	130	B2.4	2	0	0	1	0	0	0	0
08 December	111	58	160	B2.3	3	0	0	1	0	0	0	0
09 December	109	77	190	B3.0	3	0	0	4	0	0	0	0
10 December	109	86	280	B2.5	1	0	0	2	0	0	0	0
11 December	114	77	170	B3.8	2	0	0	2	1	0	0	0
12 December	117	89	290	B5.0	12	0	0	2	0	0	0	0
13 December	123	74	430	B4.3	1	0	0	2	1	0	0	0

Daily Particle Data

Date	Proton Fluence (protons/cm ² -day-sr)			Electron Fluence (electrons/cm ² -day-sr)		
	>1 MeV	>10 MeV	>100 MeV	>0.6 MeV	>2MeV	>4 MeV
	07 December		9.5e+05	1.2e+04	2.7e+03	
08 December		6.4e+05	1.1e+04	2.7e+03		3.4e+08
09 December		8.8e+05	1.2e+04	2.8e+03		3.4e+08
10 December		1.0e+06	1.2e+04	2.8e+03		8.4e+07
11 December		1.6e+06	1.2e+04	2.6e+03		1.4e+08
12 December		5.4e+05	1.1e+04	2.6e+03		2.0e+08
13 December		4.7e+05	1.2e+04	2.7e+03		3.5e+08

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	07 December	16	4-3-3-3-4-3-2-2	35	3-3-4-6-6-4-4-2	20
08 December	9	4-2-0-2-2-1-2-1	17	3-2-1-5-5-2-1-1	11	4-3-2-2-3-1-2-2
09 December	6	2-2-0-1-2-2-3-1	6	0-1-0-1-3-3-2-1	8	2-3-1-1-2-2-3-2
10 December	18	2-4-3-4-2-3-3-4	34	2-4-5-5-6-4-4-2	23	3-5-4-3-3-3-4-4
11 December	14	4-2-2-3-2-3-3-3	39	3-4-6-6-5-5-2-2	20	4-3-3-3-3-4-3-4
12 December	8	2-3-2-2-2-2-2-1	20	2-2-5-5-4-3-2-1	12	3-4-3-2-2-3-2-2
13 December	6	3-2-2-2-1-1-1-0	11	2-3-4-4-2-2-0-0	15	3-3-2-2-2-1-1-1



Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
07 Dec 0615	EXTENDED WARNING: Geomagnetic K = 5	06/0433 - 07/1700
07 Dec 0615	EXTENDED WARNING: Geomagnetic K = 4	05/0833 - 07/2100
07 Dec 1003	ALERT: Electron 2MeV Integral Flux \geq 1000pfu	07/0945
07 Dec 1652	EXTENDED WARNING: Geomagnetic K = 4	05/0833 - 08/1000
07 Dec 1652	EXTENDED WARNING: Geomagnetic K = 5	06/0433 - 08/0700
07 Dec 1945	WATCH: Geomagnetic Storm Category G1 predicted	
08 Dec 0503	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	07/0945
08 Dec 1314	CANCELLATION: Geomagnetic Storm Category G1 predicted	
08 Dec 2000	WATCH: Geomagnetic Storm Category G1 predicted	
09 Dec 0502	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	07/0945
09 Dec 2006	WARNING: Geomagnetic K = 4	09/2005 - 10/1300
10 Dec 0415	ALERT: Geomagnetic K = 4	10/0414
10 Dec 0431	WARNING: Geomagnetic K = 5	10/0430 - 1400
10 Dec 0435	ALERT: Geomagnetic K = 5	10/0435
10 Dec 0512	EXTENDED WARNING: Geomagnetic K = 4	09/2005 - 10/2300
10 Dec 1046	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	07/0945
10 Dec 1319	EXTENDED WARNING: Geomagnetic K = 5	10/0430 - 11/0700
10 Dec 1319	EXTENDED WARNING: Geomagnetic K = 4	09/2005 - 11/1000
11 Dec 0656	EXTENDED WARNING: Geomagnetic K = 5	10/0430 - 11/1400
11 Dec 0656	EXTENDED WARNING: Geomagnetic K = 4	09/2005 - 11/1900
11 Dec 1111	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	07/0945
11 Dec 1614	EXTENDED WARNING: Geomagnetic K = 4	09/2005 - 12/0400
11 Dec 1616	WARNING: Geomagnetic K = 5	11/1615 - 2000
12 Dec 0346	EXTENDED WARNING: Geomagnetic K = 4	09/2005 - 12/1500
12 Dec 0846	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	07/0945

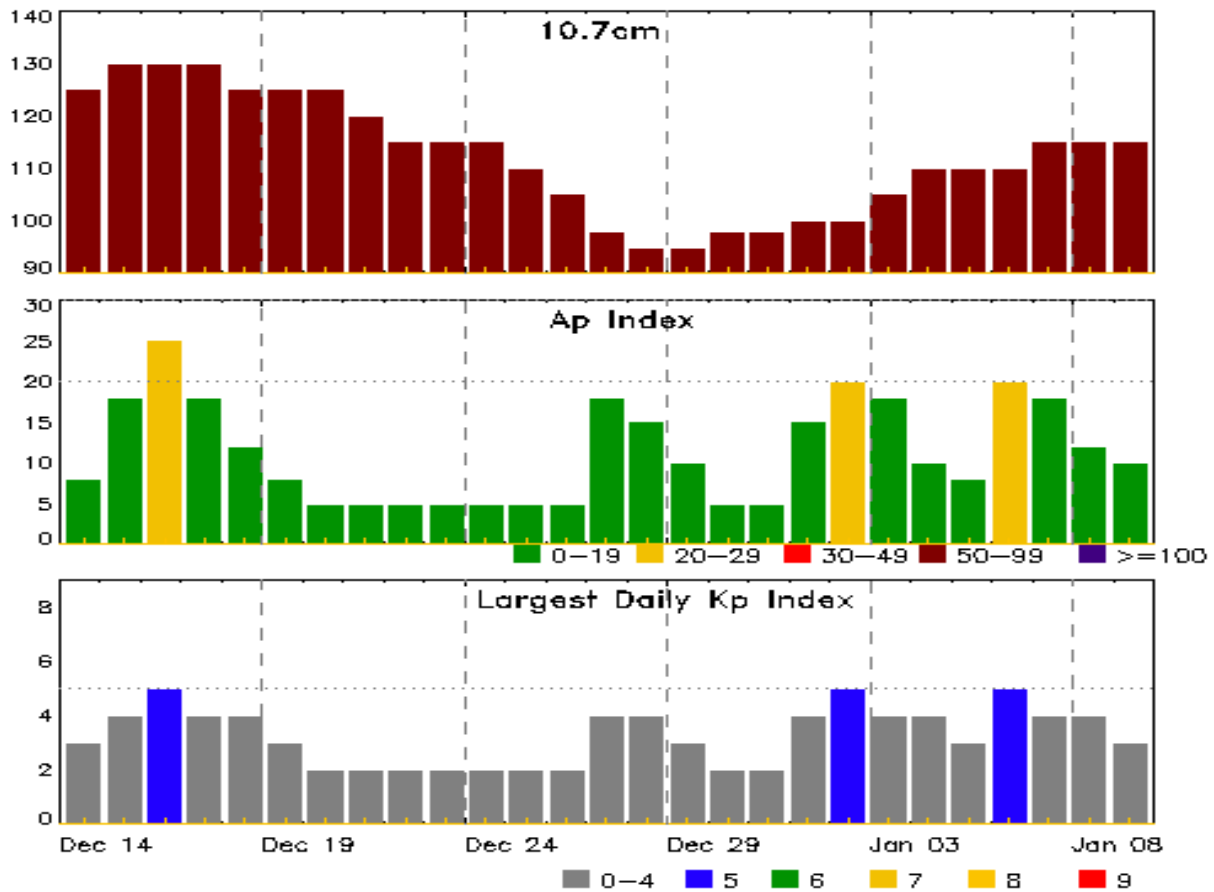


Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
12 Dec 1457	EXTENDED WARNING: Geomagnetic K = 4	09/2005 - 13/0100
13 Dec 0500	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	07/0945
13 Dec 2116	WATCH: Geomagnetic Storm Category G1 predicted	



Twenty-seven Day Outlook



Date	Radio Flux 10.7cm	Planetary A Index	Largest Kp Index	Date	Radio Flux 10.7cm	Planetary A Index	Largest Kp Index
14 Dec	125	8	3	28 Dec	95	15	4
15	130	18	4	29	95	10	3
16	130	25	5	30	98	5	2
17	130	18	4	31	98	5	2
18	125	12	4	01 Jan	100	15	4
19	125	8	3	02	100	20	5
20	125	5	2	03	105	18	4
21	120	5	2	04	110	10	4
22	115	5	2	05	110	8	3
23	115	5	2	06	110	20	5
24	115	5	2	07	115	18	4
25	110	5	2	08	115	12	4
26	105	5	2	09	115	10	3
27	98	18	4				



Energetic Events

Date	Time			X-ray	Optical Information			Peak		Sweep Freq	
	Begin	Max	Half	Class	Integ Flux	Imp/ Brtns	Location Lat CMD	Rgn #	Radio Flux		Intensity
			Max						245	2695	II

No Events Observed

Flare List

Date	Time			X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
	Begin	Max	End				
07 Dec	0323	0330	0337	B7.6			2463
07 Dec	0349	0419	0447	C1.1			2465
07 Dec	0729	0733	0739	B3.9			2465
07 Dec	0901	0904	0910	B3.7			2465
07 Dec	1139	1149	1155	B3.4			2465
07 Dec	1434	1441	1449	B3.4			2465
07 Dec	1819	1826	1832	B4.2			2462
07 Dec	2239	2250	2313	C1.0	SF	S09E25	2463
08 Dec	0912	0916	0922	B3.6			2463
08 Dec	1313	1317	1322	B4.1			
08 Dec	1705	1724	1735	C1.0			2463
08 Dec	1859	1914	1928	C6.7			2463
08 Dec	2240	2255	2305	C4.5	SF	S13E20	2466
09 Dec	0317	0340	0352	C1.4			2466
09 Dec	0806	U0809	0815		SF	S11E14	2466
09 Dec	0854	0858	0901	B6.7	SF	S12E15	2466
09 Dec	0919	0924	0930	B4.7			2466
09 Dec	0932	0935	0938	B6.4			2466
09 Dec	1049	1100	1104	C1.2	SF	S12E13	2466
09 Dec	1207	1212	1214	C1.2	SF	S12E12	2466
09 Dec	1219	1222	1227	B8.3			2468
10 Dec	0031	0036	0041	B5.4			2468
10 Dec	0719	0725	0732	B6.9			2468
10 Dec	0741	0750	0757	C3.9	SF	S14E76	2468
10 Dec	1647	1705	1712	B5.7	SF	S06E30	2465
11 Dec	0029	0036	0043	B7.8			2467
11 Dec	0247	0251	0255	B5.7			2468
11 Dec	0301	0307	0312	B8.1	SF	S06E24	2465
11 Dec	0422	0447	0515	C1.4			2468
11 Dec	1110	1116	1121	B8.8			
11 Dec	B1309	U1309	A1326		SF	S06E20	2465



Flare List

Date	Time			X-ray Class	Imp/ Brtns	Optical		Rgn #
	Begin	Max	End			Location Lat CMD		
11 Dec	1648	1716	1728	C5.6	1F	S06E16		2465
12 Dec	0309	0316	0321	C2.0				2465
12 Dec	0403	0431	0506	C1.8				2463
12 Dec	0505	0528	0540	C5.2				2468
12 Dec	0605	0613	0622	C4.2				2469
12 Dec	0720	0721	0724		SF	S07E10		2465
12 Dec	0736	0741	0747	C1.6				2469
12 Dec	0918	0925	0932	C1.3				2466
12 Dec	B1027	U1030	A1034		SF	S13E50		2468
12 Dec	1139	1145	1153	C2.1				2468
12 Dec	1336	1346	1357	C7.8				2470
12 Dec	1519	1522	1530	C1.0				2470
12 Dec	1709	1712	1716	B9.4				2470
12 Dec	1726	1734	1752	C1.7				2465
12 Dec	1809	1817	1823	C2.8				2469
12 Dec	1911	1914	1916	B6.3				
12 Dec	1932	1945	2015	C1.1				2470
13 Dec	0825	1034	1128	C5.3				2468
13 Dec	0837	0838	0840		SF	S14E36		2468
13 Dec	0940	U1023	1247		1F	S14E36		2468
13 Dec	1110	1110	1118		SF	N21E63		2469
13 Dec	2142	2146	2151	B7.6				2463



Region Summary

Date	Location		Sunspot Characteristics				Flares											
	Lat CMD	Lon	Helio 10 ⁻⁶ hemi.	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
								C	M	X	S	1	2	3	4			
<i>Region 2462</i>																		
03 Dec	N09E68	214	10	1	Hax	1	A											
04 Dec	N09E54	216	40	1	Hax	1	A	1				1						
05 Dec	N09E42	215	30	2	Hax	3	A											
06 Dec	N09E29	215	10	2	Axx	1	A											
07 Dec	N09E16	215	10	4	Hrx	2	A											
08 Dec	N08E02	215	10	1	Hrx	1	A											
09 Dec	N10W10	214	0	2	Axx	2	A											
10 Dec	N10W24	215	plage															
11 Dec	N10W38	216	plage															
12 Dec	N10W52	217	plage															
13 Dec	N10W66	217	plage															
								1	0	0	1	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 215

<i>Region 2463</i>																		
03 Dec	S09E76	206	20	4	Hax	1	A											
04 Dec	S09E62	208	80	6	Dao	4	B	1				5						
05 Dec	S11E52	205	130	10	Dao	7	B	1				5						
06 Dec	S11E39	205	110	12	Eso	6	B	1				4						
07 Dec	S11E24	207	80	12	Eso	6	B	1				1						
08 Dec	S09E06	211	50	5	Hax	3	A	2										
09 Dec	S09W07	211	30	4	Hsx	4	A											
10 Dec	S08W20	211	20	5	Cro	3	B											
11 Dec	S08W35	213	20	6	Cro	3	B											
12 Dec	S09W49	214	20	4	Cro	3	B	1										
13 Dec	S09W62	213	10	4	Cro	2	B											
								7	0	0	15	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 211



Region Summary - continued

Date	Location		Sunspot Characteristics					Flares																
	Lat CMD	Lon	Helio 10 ⁻⁶ hemi.	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical													
								C	M	X	S	1	2	3	4									
Region 2464																								
05 Dec	S12E68	189	10	1	Axx	1	A	1																
06 Dec	S12E53	191	10	2	Axx	1	A																	
07 Dec	S12E39	192	0		Axx	1	A																	
08 Dec	S12E18	192	plage																					
09 Dec	S12E13	191	plage																					
10 Dec	S10E03	188	10	1	Bxo	3	B																	
11 Dec	S10W10	188	20	2	Cro	3	B																	
12 Dec	S09W23	188	10	3	Bxo	3	B																	
13 Dec	S10W38	189	plage																					
								1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Still on Disk.
Absolute heliographic longitude: 188

Region 2465																								
07 Dec	S05E58	173	40	2	Hax	1	A	1																
08 Dec	S05E50	167	80	6	Cao	6	B																	
09 Dec	S06E35	169	90	5	Cso	6	B																	
10 Dec	S05E24	167	80	7	Cso	5	B					1												
11 Dec	S05E09	169	50	2	Hax	2	A	1				2	1											
12 Dec	S05W05	170	30	2	Hax	3	A	2				1												
13 Dec	S06W17	168	20	5	Cao	4	B																	
								4	0	0	4	1	0	0	0	0	0	0	0	0	0	0		

Still on Disk.
Absolute heliographic longitude: 170

Region 2466																								
08 Dec	S13E18	199	20	6	Cro	8	B	1				1												
09 Dec	S13E05	199	50	5	Dai	12	B	3				4												
10 Dec	S13W09	200	30	6	Dao	8	B																	
11 Dec	S13W22	200	10	4	Bxo	4	B																	
12 Dec	S13W35	200	10	1	Axx	1	A	1																
13 Dec	S13W49	200	plage																					
								5	0	0	5	0	0	0	0	0	0	0	0	0	0	0		

Still on Disk.
Absolute heliographic longitude: 199



Region Summary - continued

Date	Location		Sunspot Characteristics				Flares										
	Lat CMD	Lon	Helio 10 ⁻⁶ hemi.	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical						
								C	M	X	S	1	2	3	4		
Region 2467																	
09 Dec	S06E16	188	20	3	Cro	3	B										
10 Dec	S05E01	190	20	4	Cro	4	B										
11 Dec	S05W15	193	0		Axx	1	A										
12 Dec	S05W30	195	plage														
13 Dec	S05W45	196	plage														
								0	0	0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 190

Region 2468																	
10 Dec	S15E65	128	120	4	Dao	3	B	1				1					
11 Dec	S14E52	126	70	4	Dao	4	B	1									
12 Dec	S15E39	126	40	3	Dao	5	B	2				1					
13 Dec	S15E26	125	40	2	Cao	4	B	1				1	1				
								5	0	0	3	1	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 125

Region 2469																	
12 Dec	N18E67	98	100	6	Dso	3	B	3									
13 Dec	N18E56	95	90	6	Dso	8	B					1					
								3	0	0	1	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 95

Region 2470																	
12 Dec	N13E76	89	80	4	Hsx	1	A	3									
13 Dec	N12E64	87	270	6	Dkc	6	B										
								3	0	0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 87

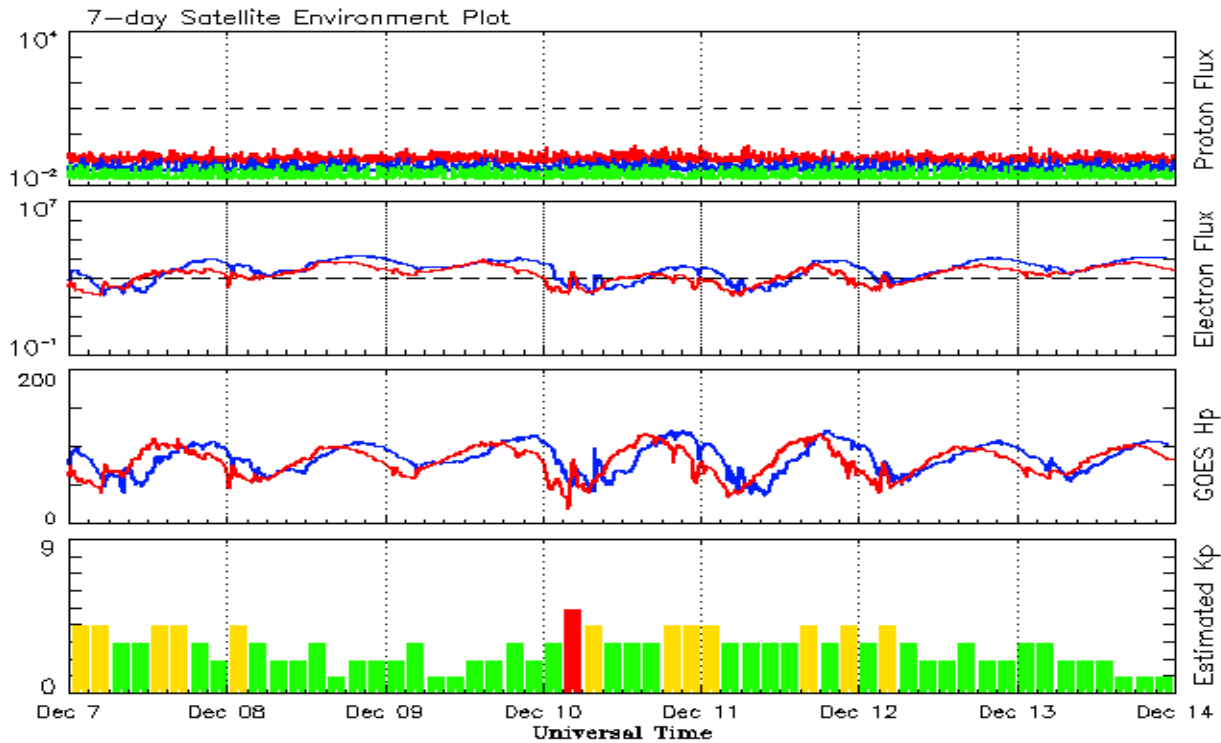


Recent Solar Indices (preliminary)
Observed monthly mean values

Month	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed values		Ratio	Smooth values		Penticton	Smooth	Planetary	Smooth
	SEC	RI	RI/SEC	SEC	RI	10.7 cm	Value	Ap	Value
2013									
December	118.2	90.3	0.76	115.4	75.9	147.7	135.9	5	7.5
2014									
January	125.9	81.8	0.65	117.7	77.3	158.6	137.3	6	7.1
February	174.6	102.3	0.59	119.5	78.3	170.3	138.6	12	6.9
March	141.1	91.9	0.65	123.2	80.8	149.9	140.8	6	7.2
April	130.5	67.5	0.65	124.8	69.8	144.3	143.5	9	7.5
May	116.8	67.5	0.64	122.3	69.0	130.0	144.7	7	7.9
June	107.7	61.7	0.66	121.4	68.5	122.2	145.5	7	8.4
July	113.6	60.1	0.64	120.4	67.6	137.3	145.2	5	8.8
August	106.2	64.1	0.70	115.1	65.0	124.7	142.8	9	8.9
September	127.4	78.0	0.69	107.4	61.1	146.1	140.1	11	9.3
October	92.0	54.0	0.66	101.7	58.4	153.7	138.4	10	9.9
November	101.8	62.2	0.69	97.9	56.8	155.3	137.4	10	10.1
December	120.0	67.7	0.65	95.2	55.3	158.7	137.0	12	10.5
2015									
January	101.2	55.8	0.66	92.1	53.6	141.7	135.8	10	11.0
February	70.6	40.0	0.63	88.3	51.7	128.8	133.8	10	11.5
March	61.7	32.7	0.62	84.2	49.3	126.0	131.2	17	12.0
April	72.5	45.2	0.75	80.5	47.3	129.2	127.3	12	12.4
May	83.0	53.3	0.71	77.5	45.6	120.1	123.3	9	12.7
June	77.3	39.9	0.53			123.2		14	
July	68.4	39.8	0.58			107.0		10	
August	61.6	38.8	0.63			106.2		16	
September	72.5	46.9	0.65			102.1		16	
October	59.5	37.0	0.62			104.1		15	
November	61.8	37.9	0.61			109.6		13	

Note: Values are final except for the most recent 6 months which are considered preliminary.
Cycle 24 started in Dec 2008 with an RI=1.7.





*Weekly Geosynchronous Satellite Environment Summary
Week Beginning 07 December 2015*

The proton flux plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by the SWPC Primary GOES satellite, near West 75, for each of three energy thresholds: greater than 10, 50, and 100 MeV.

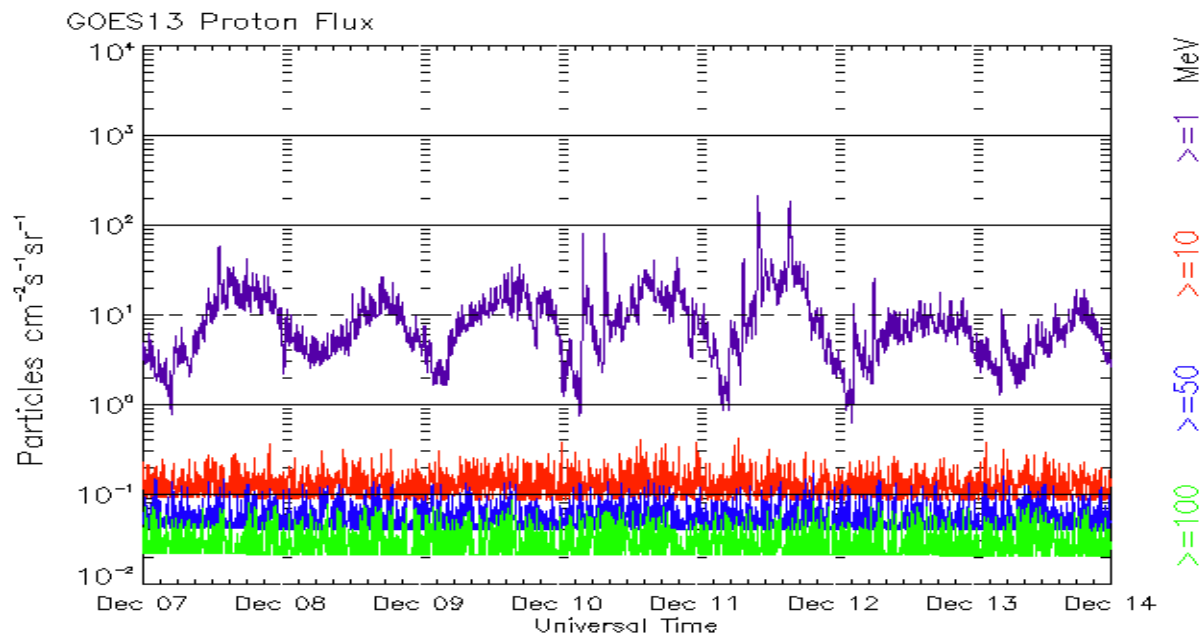
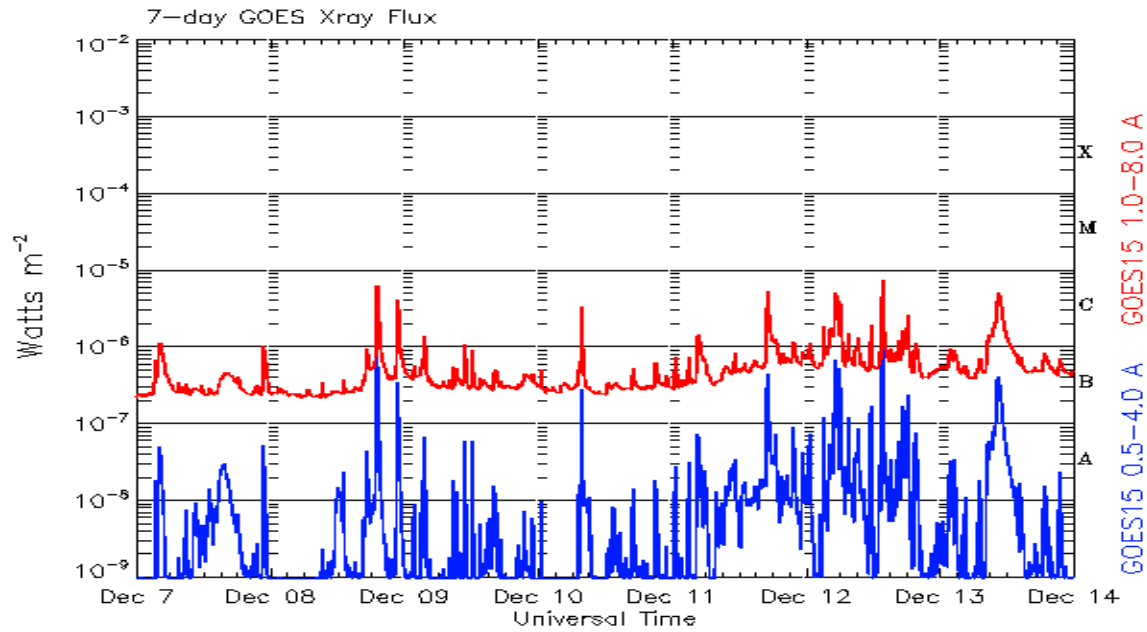
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

The Hp plot contains the five minute averaged Hp magnetic field component in nanoteslas (nT) as by the SWPC Primary GOES satellite. The Hp component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

The Estimated 3-hour Planetary Kp-index is derived at the NOAA Space Weather Prediction Center using data from the following ground-based magnetometers: Boulder, Colorado; Chambon la Foret, France; Fredericksburg, Virginia; Fresno, California; Hartland, UK; Newport, Washington; Sitka, Alaska. These data are made available thanks to the cooperative efforts between SWPC and data providers around the world, which currently includes the U.S. Geological Survey, the British Geological Survey, and the Institut de Physique du Globe de Paris.

The data included here are those now available in real time at the SWPC and are incomplete in that they do not include the full set of parameters and energy ranges known to cause satellite operating anomalies. The proton and electron fluxes and Kp are 'global' parameters that are applicable to a first order approximation over large areas. H parallel is subject to more localized phenomena and the measurements generally are applicable to within a few degrees of longitude of the measuring satellite.





*Weekly GOES Satellite X-ray and Proton Plots
Week Beginning 07 December 2015*

The x-ray plots contains five-minute averages x-ray flux (Watt/m^2) as measure by the SWPC primary GOES X-ray satellite, usually at West 105 longitude, in two wavelength bands, 0.05 - 0.4 and 0.1 - 0.8 nm. The letters A, B, C, M and X refer to x-ray event levels for the 0.1 - 0.8 nm band.

The proton plot contains the five-minute averaged intergral flux units (pfu = protons/ cm^2 -sec -sr) as measured by the primary SWPC GOES Proton satellite for each of the energy thresholds: >1 , >10 , >30 , and >100 MeV. The P10 event threshold is 10 pfu at greater than 10 MeV.



Preliminary Report and Forecast of Solar Geophysical Data (The Weekly)

Published every Monday by the Space Weather Prediction Center.

U.S. Department of Commerce
NOAA / National Weather Service
Space Weather Prediction Center
325 Broadway, Boulder CO 80305

Notice: The 27-day Outlook, Satellite Environment, X-ray and Proton plots have been redesigned. Comments and suggestions are welcome SWPC.Webmaster@noaa.gov

The Weekly has been published continuously since 1951 and is available online since 1997.

<http://spaceweather.gov/weekly/> -- Current and previous year

<http://spaceweather.gov/ftpmenu/warehouse.html> -- Online archive from 1997

<http://spaceweather.gov/ftpmenu/> -- Some content as ascii text

<http://spaceweather.gov/SolarCycle/> -- Solar Cycle Progression web site

<http://spaceweather.gov/contacts.html> -- Contact and Copyright information

http://spaceweather.gov/weekly/Usr_guide.pdf -- User Guide

