

**Space Weather Highlights**  
**16 May - 22 May 2016**

**SWPC PRF 2125**  
**23 May 2016**

Solar activity was low with only B-class and C-class flare activity observed. Regions 2544 (N20, L=295, class/area=Dai/160 on 16 May) and 2546 (S07, L=223, class/area=Cho/550 on 21 May) produced three low-level C-class flares between them, with the largest being a C1.8 at 16/1525 UTC from Region 2544. No Earth-directed coronal mass ejections (CME) were observed during the reporting period.

No proton events were observed at geosynchronous orbit. However, there was a slight enhancement on 16 May from a long duration C3 flare that occurred previous to the reporting period. The greater than 10 MeV proton flux reached a maximum of 1 pfu at 16/0030 UTC.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels on 16, 17, and 19 May and moderate levels on 18, 20-22 May.

Geomagnetic field activity was mostly at quiet to unsettled levels from 16-20 May with an isolated period of active conditions on 17 May in response to a positive polarity coronal hole high speed stream (CH HSS). G1 (Minor) geomagnetic storm levels were observed during the 0600-0900 UTC synoptic period on 21 May due to influences from another positive polarity CH HSS.

**Space Weather Outlook**  
**23 May - 18 June 2016**

Solar activity is expected to be very low (B-class flares) to low (C-class flares) levels throughout the outlook period.

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 28-29 May, 01 Jun, 03-09 Jun, 12-13 Jun, and 18 Jun. Moderate flux levels are expected for the remainder of the outlook period.

Geomagnetic field activity is expected to reach G2 (Moderate) geomagnetic storm levels on 04 Jun and G1 (Minor) geomagnetic storm levels on 05 Jun due to the influence of a negative polarity CH HSS. Active geomagnetic levels are expected on 26 May, 30-31 May, 02-03 Jun, 06 Jun, 11-13 Jun, and 17-18 Jun due to various recurrent CH HSSs.



### *Daily Solar Data*

Date	Radio Flux 10.7cm	Sun spot No.	Sunspot Area (10 <sup>-6</sup> hemi.)	X-ray Background Flux			Flares						
							X-ray			Optical			
				C	M	X	S	1	2	3	4		
16 May	102	76	760	B2.8	2	0	0	7	0	0	0	0	
17 May	103	36	660	B2.6	1	0	0	0	0	0	0	0	
18 May	102	28	590	B2.2	0	0	0	0	0	0	0	0	
19 May	99	38	530	B1.9	0	0	0	0	0	0	0	0	
20 May	100	43	610	B1.8	0	0	0	2	0	0	0	0	
21 May	98	17	550	B1.7	1	0	0	5	0	0	0	0	
22 May	97	15	480	B1.6	0	0	0	1	0	0	0	0	

### *Daily Particle Data*

Date	Proton Fluence (protons/cm <sup>2</sup> -day -sr)			Electron Fluence (electrons/cm <sup>2</sup> -day -sr)		
	>1 MeV	>10 MeV	>100 MeV	>0.6 MeV	>2MeV	>4 MeV
	16 May	1.6e+06	3.5e+04	3.0e+03	2.3e+07	
17 May	5.8e+05	1.4e+04	3.1e+03	3.9e+07		
18 May	2.3e+05	1.3e+04	2.9e+03	3.2e+07		
19 May	1.9e+05	1.3e+04	2.9e+03	4.1e+07		
20 May	1.4e+05	1.3e+04	2.9e+03	1.9e+07		
21 May	3.6e+05	1.2e+04	3.0e+03	1.3e+07		
22 May	1.5e+05	1.3e+04	3.2e+03	1.7e+07		

### *Daily Geomagnetic Data*

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	16 May	15	3-3-3-3-4-2-3-2	19	3-3-3-5-4-3-2-2	13
17 May	14	2-3-4-2-3-2-3-3	19	1-3-5-5-3-2-2-2	13	2-3-4-3-3-2-3-3
18 May	12	2-4-2-3-4-1-1-1	17	3-3-4-5-4-1-0-1	8	2-3-2-3-3-1-1-1
19 May	8	1-1-3-2-3-2-2-2	18	2-1-5-5-4-2-2-0	8	1-1-3-2-3-2-2-1
20 May	6	2-2-2-2-2-0-1-2	7	2-3-2-3-2-0-0-1	6	3-2-2-1-1-0-1-2
21 May	16	3-2-5-2-3-3-3-1	27	2-3-5-5-4-5-3-2	15	3-3-5-2-3-3-3-1
22 May	5	1-2-1-3-2-1-0-1	14	2-3-3-5-4-1-0-0	7	2-3-2-3-2-1-1-0

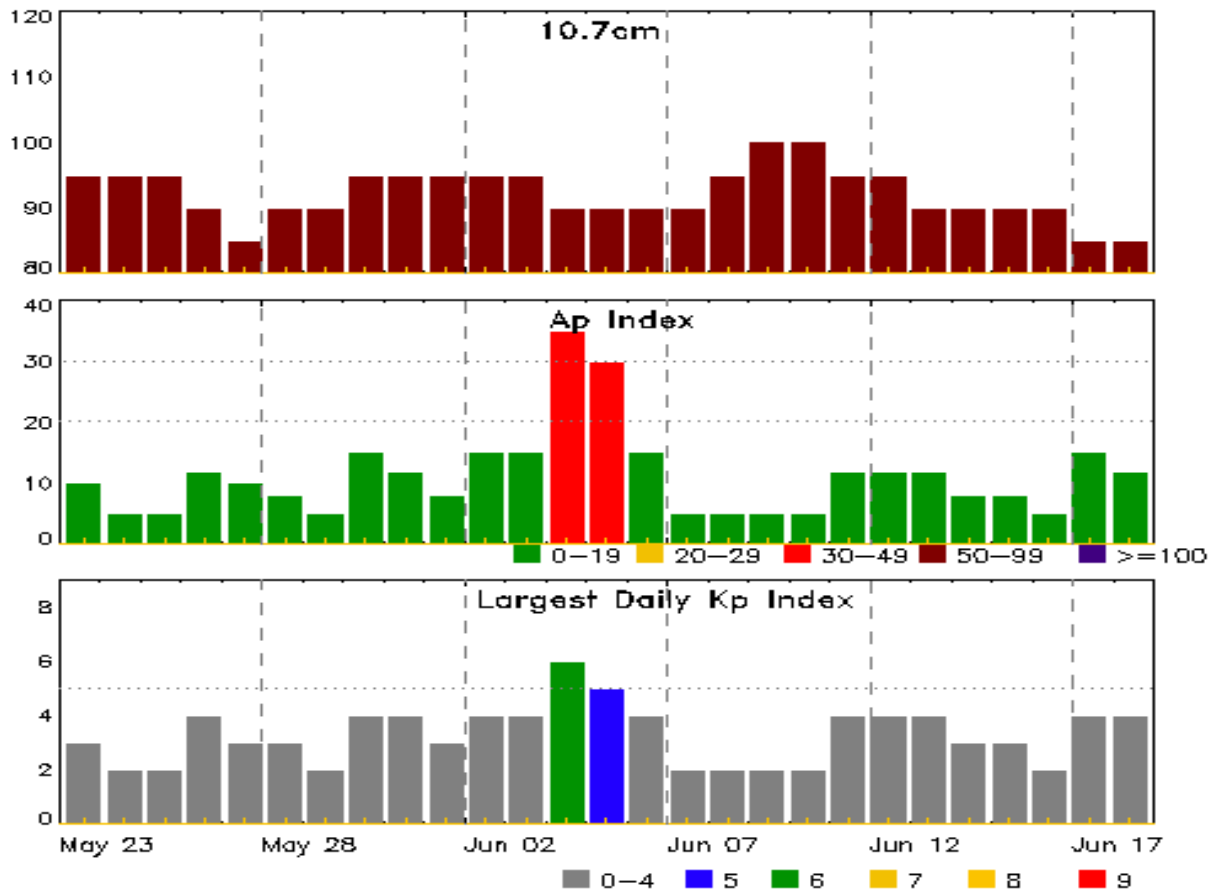


### *Alerts and Warnings Issued*

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
16 May 0118	ALERT: Type II Radio Emission	16/0058
16 May 1234	EXTENDED WARNING: Geomagnetic K = 4	15/0645 - 17/0300
16 May 1705	ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	16/1650
17 May 0739	WARNING: Geomagnetic K = 4	17/0739 - 1500
17 May 0858	ALERT: Geomagnetic K = 4	17/0857
17 May 1516	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	16/1650
17 May 1520	WATCH: Geomagnetic Storm Category G1 predicted	
19 May 1232	ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	19/1225
20 May 1556	CANCELLATION: Geomagnetic Storm Category G1 predicted	
21 May 0504	WARNING: Geomagnetic K = 4	21/0505 - 1300
21 May 0714	ALERT: Geomagnetic K = 4	21/0714
21 May 0744	WARNING: Geomagnetic K = 5	21/0745 - 1300
21 May 0847	ALERT: Geomagnetic K = 5	21/0845
21 May 1255	EXTENDED WARNING: Geomagnetic K = 4	21/0505 - 2359
21 May 1954	WATCH: Geomagnetic Storm Category G1 predicted	
22 May 0956	ALERT: Type IV Radio Emission	22/0922



## 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
23 May	95	10	3	06 Jun	90	15	4
24	95	5	2	07	90	5	2
25	95	5	2	08	95	5	2
26	90	12	4	09	100	5	2
27	85	10	3	10	100	5	2
28	90	8	3	11	95	12	4
29	90	5	2	12	95	12	4
30	95	15	4	13	90	12	4
31	95	12	4	14	90	8	3
01 Jun	95	8	3	15	90	8	3
02	95	15	4	16	90	5	2
03	95	15	4	17	85	15	4
04	90	35	6	18	85	12	4
05	90	30	5				



## *Energetic Events*

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

**No Events Observed**

## *Flare List*

Date	Time			X-ray Class	Imp/ Brtns	Optical Location Lat CMD	Rgn #
	Begin	Max	End				
16 May	0006	0057	0217	C1.0	SF	N18W18	2544
16 May	0412	0412	0420		SF	N20W17	2544
16 May	0438	0442	0448	B6.0	SF	S24W67	2545
16 May	0534	0538	0543	B4.7	SF	S23W67	2545
16 May	1521	1525	1530	C1.8	SF	N18W21	2544
16 May	1547	1550	1552	B5.1			2544
16 May	B1823	U1826	1834		SF	N22W29	2544
16 May	2217	2221	2223	B4.6			2544
16 May	B2314	U2317	2324		SF	S76W22	2545
17 May	0400	0408	0410	C1.2			2542
17 May	0738	0742	0744	B6.1			2544
17 May	0750	0754	0757	B7.0			2542
17 May	2007	2011	2013	B4.1			2544
18 May	1752	1758	1807	B5.1			2544
20 May	0055	0059	0102	B2.6			2546
20 May	0414	0418	0423	B3.9			2546
20 May	0435	0440	0443	B3.7	SF	S08E07	2546
20 May	0834	0842	0847	B3.9	SF	S10W03	2546
20 May	1136	1139	1141	B2.5			2546
20 May	1219	1223	1228	B4.4			2546
20 May	1941	1945	1948	B3.0			
21 May	0106	0107	0111		SF	S06W12	2546
21 May	0112	0113	0115		SF	S06W12	2546
21 May	0843	0846	0850	B5.9	SF	S09W09	2546
21 May	B0851	U0852	0901		SF	S09W09	2546
21 May	1056	1100	1103	B7.3			2546
21 May	1355	1400	1407	C1.0	SF	S08W17	2546
21 May	2230	2234	2240	B2.4			
22 May	0121	0125	0129	B2.5			2546
22 May	0443	0447	0451	B2.5			2546
22 May	0912	0921	0928	B5.9	SF	S10W30	2546



## Region Summary

Date	Location		Sunspot Characteristics					Flares															
	Lat CMD	Lon	Helio 10 <sup>6</sup> hemi.	Area	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical											
									C	M	X	S	1	2	3	4							
<b>Region 2542</b>																							
04 May	N09E70		356	250	3	Cko	2	B	1					1									
05 May	N10E56		357	120	3	Cso	3	B					1										
06 May	N10E42		357	150	4	Cso	3	B															
07 May	N11E28		359	170	5	Hax	4	A															
08 May	N12E16		358	100	5	Cao	8	B															
09 May	N12E03		357	150	5	Dai	16	BG					1										
10 May	N12W11		358	130	6	Cao	15	BG															
11 May	N11W23		357	130	6	Cai	12	B					1										
12 May	N10W36		357	160	6	Dai	11	BG					1										
13 May	N10W50		358	160	5	Dac	16	B					1										
14 May	N10W64		358	140	6	Dac	12	B					1										
15 May	N11W77		358	110	4	Cai	4	B	1														
16 May	N11W90		358	30	2	Hsx	1	A															
									2	0	0	6	1	0	0	0							

Crossed West Limb.

Absolute heliographic longitude: 357

<b>Region 2543</b>																							
08 May	S06E12		2	10	4	Bxo	3	B															
09 May	S05W03		3	30	4	Dso	7	B					1										
10 May	S05W15		2	90	6	Dao	10	BG					2										
11 May	S05W27		1	110	7	Dai	9	B															
12 May	S05W40		1	80	7	Dso	8	B															
13 May	S05W54		2	40	6	Dao	6	B					1										
14 May	S05W69		3	20	6	Cao	4	B	3				3	1									
15 May	S05W80		1	30	5	Cro	3	B	2				2										
16 May	S05W91		359	10	1	Hsx	1	A															
									5	0	0	9	1	0	0	0							

Crossed West Limb.

Absolute heliographic longitude: 3



### *Region Summary - continued*

Date	Location		Sunspot Characteristics				Flares											
	Lat CMD	Helio Lon	Area 10 <sup>6</sup> hemi.	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
								C	M	X	S	1	2	3	4			
<b>Region 2544</b>																		
09 May	N21E60	300	30	3	Cro	4	B											
10 May	N20E45	302	40	4	Dso	4	B											
11 May	N21E33	301	30	8	Cso	6	B											
12 May	N20E21	300	20	5	Cro	3	B						1					
13 May	N21E11	297	20	7	Cro	6	B						4					
14 May	N21W01	294	40	8	Dao	10	B						1					
15 May	N21W15	296	150	9	Dai	14	BG	5					10					
16 May	N20W27	295	160	9	Dai	20	BG	2					4					
17 May	N22W41	296	120	8	Cao	11	BG											
18 May	N21W55	296	110	6	Cso	6	B											
19 May	N22W70	298	80	2	Hsx	1	A											
20 May	N22W83	298	80	2	Hsx	1	A											
								7	0	0	20	0	0	0	0			

Crossed West Limb.  
Absolute heliographic longitude: 294

<b>Region 2545</b>																		
10 May	S21E05	342	10	1	Hrx	1	A											
11 May	S21W09	343	30	5	Cro	5	B											
12 May	S21W21	342	90	6	Dai	5	B											
13 May	S21W35	343	70	7	Cao	8	B											
14 May	S21W49	343	60	7	Cao	11	B											
15 May	S21W65	346	70	4	Cao	4	B						2					
16 May	S20W79	347	20	3	Cro	2	B						3					
								0	0	0	5	0	0	0	0			

Crossed West Limb.  
Absolute heliographic longitude: 342



### *Region Summary - continued*

Date	Location		Sunspot Characteristics				Flares										
	Lat CMD	Helio Lon	Area 10 <sup>6</sup> hemi.	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical						
								C	M	X	S	1	2	3	4		
<b>Region 2546</b>																	
14 May	S07E71	223	250	6	Hhx	1	A										
15 May	S07E57	224	410	5	Hhx	3	A										
16 May	S07E43	225	540	6	Hhx	2	A										
17 May	S07E33	222	540	5	Cho	5	B										
18 May	S07E19	222	480	6	Cho	2	B										
19 May	S07E07	221	440	7	Cho	4	B										
20 May	S07W07	222	520	7	Cho	9	B					2					
21 May	S07W21	223	550	7	Cho	7	B	1				5					
22 May	S07W35	224	480	6	Cho	5	B					1					
								1	0	0		8	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 221

### **Region 2547**

19 May	S18W28	256	10	3	Bxo	3	B										
20 May	S17W42	257	10	4	Bxo	3	B										
21 May	S17W56	258	plage														
22 May	S17W70	259	plage														
								0	0	0		0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 256



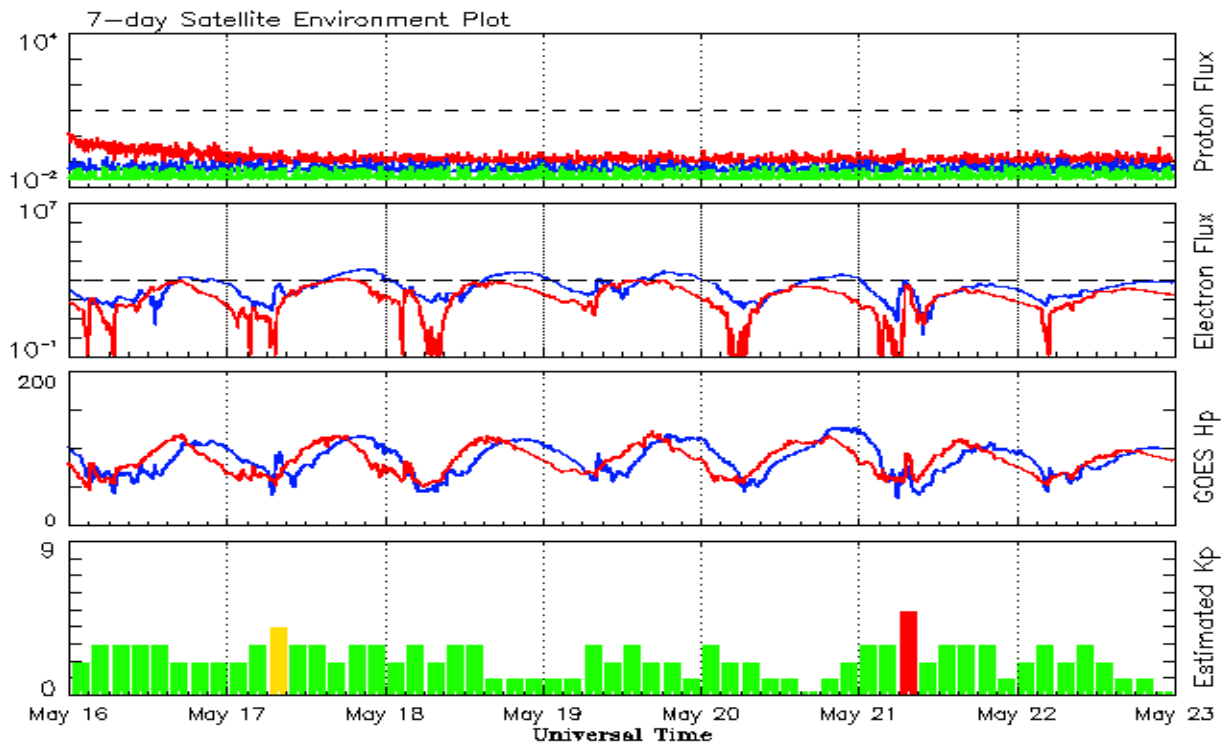


**Recent Solar Indices (preliminary)**  
**Observed monthly mean values**

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
<b>2014</b>									
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
<b>2015</b>									
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	45.7	120.1	123.3	9	12.7
June	77.3	39.9	0.53	73.1	43.3	123.2	119.5	14	13.0
July	68.4	39.5	0.58	68.2	41.0	107.0	116.0	10	13.1
August	61.6	38.6	0.63	65.5	39.8	106.2	113.3	16	13.1
September	72.5	47.2	0.65	64.0	39.6	102.1	110.8	16	12.8
October	59.5	38.2	0.62	61.8	38.6	104.1	107.9	15	12.5
November	61.8	37.3	0.61			109.6		13	
December	54.1	34.8	0.64			112.8		15	
<b>2016</b>									
January	50.4	34.0	0.67			103.5		10	
February	56.0	34.3	0.61			103.5		10	
March	40.9	32.9	0.80			91.6		11	
April	39.2	22.8	0.58			93.4		10	

**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 16 May 2016*

The proton flux plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-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.

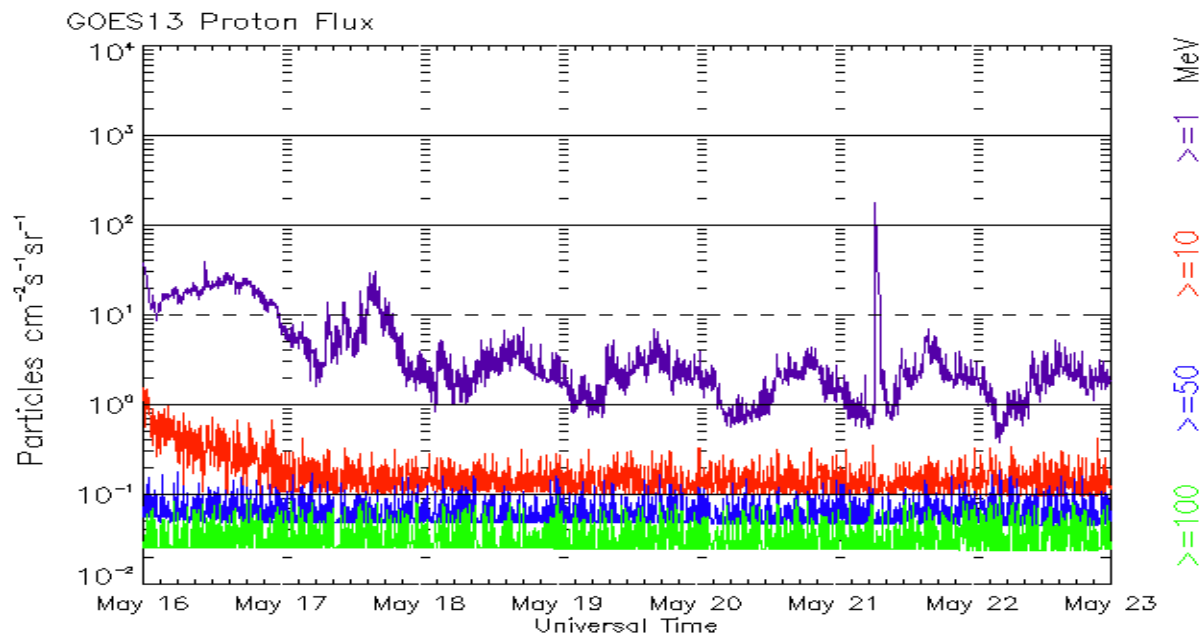
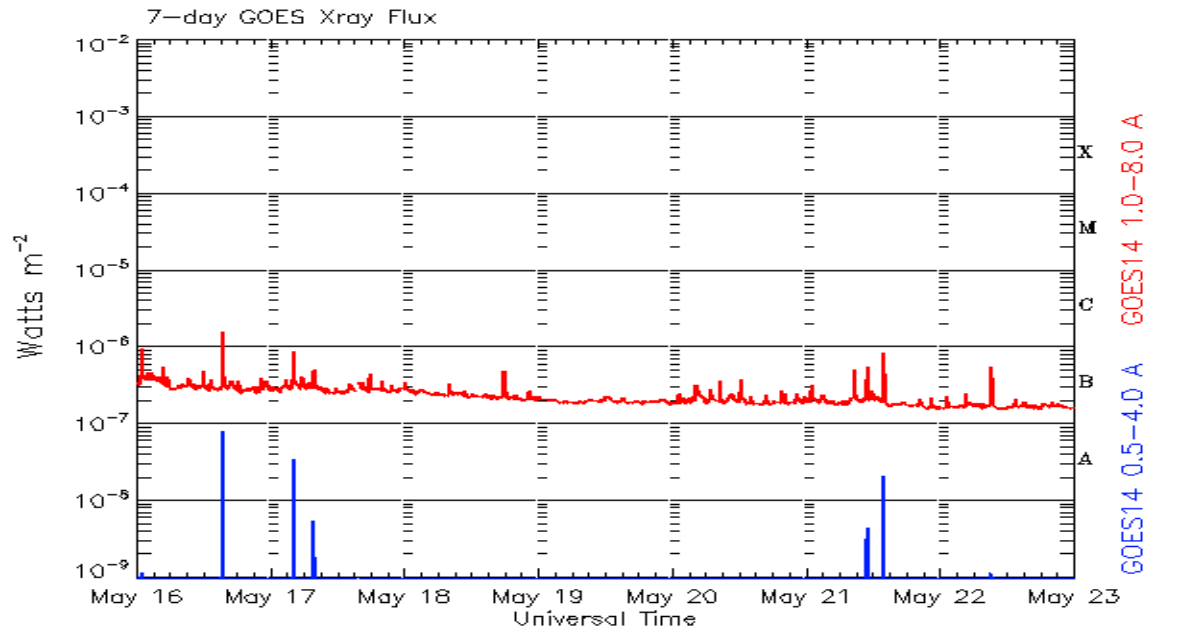
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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 16 May 2016*

The x-ray plots contains five-minute averages x-ray flux (Watt/m<sup>2</sup>) 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<sup>2</sup> -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](http://spaceweather.gov/weekly/Usr_guide.pdf) -- User Guide

