

**Space Weather Highlights**  
**20 March - 26 March 2017**

**SWPC PRF 2169**  
**27 March 2017**

Solar activity was very low during through 24 March. However, by 25 March, a region began to develop in the NE quadrant and was numbered as Region 2644 (N12, L=054, class/area, Dao/050 on 26 March). As this region grew, it produced multiple B-class flares as well as a C1/Sf at 27/0000 UTC. No Earth-directed coronal mass ejections were observed during the period.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal to moderate levels on 20-21 March and reached high levels from 22-26 March. The largest flux of the period was 19,100 pfu observed at 23/1735 UTC.

Geomagnetic field activity ranged from quiet to G1 (Minor) storm conditions. The period began under nominal solar wind conditions with solar wind speed near 310 km/s and total field near 4 nT. This continued until a co-rotating interactive region (CIR) preceding a positive polarity coronal hole high speed stream (CH HSS) became geoeffective starting around 21/0027 UTC. Total field increased to a maximum of 18 nT by 21/0722 UTC while the Bz component deflected southward to -17 nT at 21/0607 UTC. Solar wind speed began to increase beginning at 20/2349 UTC and reached a maximum of 755 km/s 22/1513 UTC. The geomagnetic field responded with quiet conditions on 20 March, quiet to G1 (Minor) storming on 21 March, and unsettled to G1 (Minor) storming on 22 March. By 23 March, a secondary increase in total field and solar wind speed was observed. Total field increased from 2 nT to 10 nT while the solar wind speed increased from 550 km/s to near 730 km/s. From 24 March through the end of the period, solar wind conditions gradually returned to nominal levels. However, late on 26 March, an increase in density and total field was observed around 2000 UTC followed by a solar sector boundary crossing into the negative sector suggesting the onset of a subsequent CIR preceding a negative polarity CH HSS. The geomagnetic field was at quiet to active conditions on 23 March, quiet to unsettled levels on 24 March, and quiet levels on 25-26 March.

**Space Weather Outlook**  
**27 March - 22 April 2017**

Solar activity is expected to be at very low levels with a chance for isolated C-class flares from Region 2644 during its transit across the visible disk from 27 March - 04 April.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at normal to moderate levels with high levels likely from 29 March - 11 April and again from 18-22 April due to CH HSS influence.

Geomagnetic field activity is expected to be at unsettled to active levels from 27 March - 06



April and 17-19 April with G1 (Minor) storm levels likely on 27-31 March and 17-18 April. G2 (Moderate) storm levels are likely on 28-29 March. Heightened activity during these periods is due to recurrent CH HSS effects. Quiet conditions are expected for the remainder of the forecast period.



### *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
20 March	73	0	0	A1.9	0	0	0	1	0	0	0	0
21 March	71	12	40	A2.8	0	0	0	0	0	0	0	0
22 March	73	12	30	A1.8	0	0	0	0	0	0	0	0
23 March	72	12	20	A1.6	0	0	0	0	0	0	0	0
24 March	72	12	10	A1.2	0	0	0	0	0	0	0	0
25 March	74	11	10	A0.0	0	0	0	1	0	0	0	0
26 March	77	20	50	A3.0	1	0	0	5	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
	20 March	9.5e+05	1.5e+04	3.7e+03	1.4e+07	
21 March	1.7e+06	1.4e+04	3.2e+03	2.3e+06		
22 March	2.3e+06	1.5e+04	3.3e+03	4.6e+07		
23 March	2.6e+06	1.5e+04	3.7e+03	5.5e+08		
24 March	1.6e+06	1.4e+04	3.4e+03	4.8e+08		
25 March	1.7e+06	1.4e+04	3.6e+03	5.0e+08		
26 March	2.5e+06	1.5e+04	3.8e+03	4.9e+08		

### *Daily Geomagnetic Data*

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	20 March	2	0-0-1-0-1-2-1-1	1	0-0-1-1-0-0-0-0	3
21 March	18	2-3-3-2-3-4-4-4	24	1-2-4-3-3-6-4-3	26	2-3-4-2-3-5-5-4
22 March	19	4-4-2-3-3-3-3-4	49	3-5-3-7-5-6-4-3	27	4-4-3-4-4-4-4-5
23 March	9	4-3-2-2-1-2-1-1	16	4-3-5-4-1-1-1-0	11	4-4-2-2-1-2-1-1
24 March	7	2-3-2-0-2-2-2-1	6	3-2-1-1-3-2-0-0	6	2-3-2-0-2-2-1-0
25 March	3	0-2-0-0-2-2-1-1	4	0-0-1-3-2-1-0-0	4	0-2-1-1-1-1-0-1
26 March	3	1-0-0-1-1-1-1-2	1	1-0-0-2-0-0-0-0	7	2-0-1-1-1-0-1-1



## *Alerts and Warnings Issued*

<b>Date &amp; Time of Issue UTC</b>	<b>Type of Alert or Warning</b>	<b>Date &amp; Time of Event UTC</b>
20 Mar 1950	WATCH: Geomagnetic Storm Category G1 predicted	
21 Mar 0605	WARNING: Geomagnetic K = 4	21/0605 - 1500
21 Mar 0621	WARNING: Geomagnetic K = 5	21/0621 - 1200
21 Mar 0802	ALERT: Geomagnetic K = 4	21/0801
21 Mar 1418	EXTENDED WARNING: Geomagnetic K = 4	21/0605 - 22/0600
21 Mar 1429	WATCH: Geomagnetic Storm Category G1 predicted	
21 Mar 1607	WARNING: Geomagnetic K = 5	21/1608 - 2100
21 Mar 1614	ALERT: Geomagnetic K = 5	21/1612
21 Mar 1928	ALERT: Geomagnetic K = 5	21/1927
21 Mar 2016	EXTENDED WARNING: Geomagnetic K = 5	21/1608 - 22/0300
21 Mar 2016	WARNING: Geomagnetic K = 6	21/2015 - 2359
22 Mar 0252	EXTENDED WARNING: Geomagnetic K = 5	21/1608 - 22/1200
22 Mar 0252	EXTENDED WARNING: Geomagnetic K = 4	21/0605 - 22/1500
22 Mar 1055	EXTENDED WARNING: Geomagnetic K = 5	21/1608 - 22/1500
22 Mar 1055	EXTENDED WARNING: Geomagnetic K = 4	21/0605 - 22/1800
22 Mar 1447	EXTENDED WARNING: Geomagnetic K = 5	21/1608 - 22/2100
22 Mar 1447	EXTENDED WARNING: Geomagnetic K = 4	21/0605 - 23/0600
22 Mar 1759	ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	22/1740
22 Mar 2039	EXTENDED WARNING: Geomagnetic K = 5	21/1608 - 23/0300
23 Mar 0004	ALERT: Geomagnetic K = 5	22/2359
23 Mar 0500	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	22/1740
23 Mar 0555	EXTENDED WARNING: Geomagnetic K = 4	21/0605 - 23/1200
23 Mar 2000	WATCH: Geomagnetic Storm Category G1 predicted	
24 Mar 0536	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	22/1740
24 Mar 1425	CANCELLATION: Geomagnetic Storm Category G1 predicted	
25 Mar 0500	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	22/1740
25 Mar 1515	WATCH: Geomagnetic Storm Category G2 predicted	



### *Alerts and Warnings Issued*

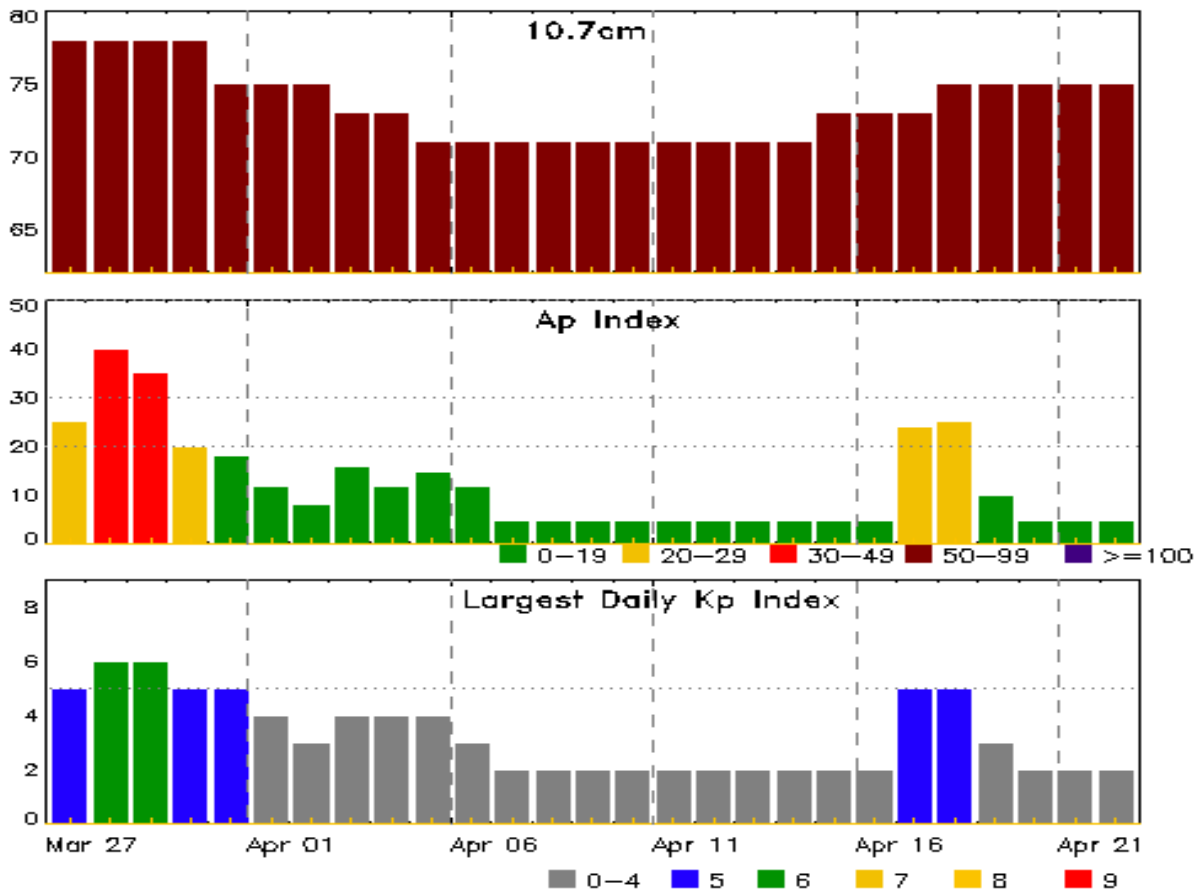
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<b>Date &amp; Time of Issue UTC</b>	<b>Type of Alert or Warning</b>	<b>Date &amp; Time of Event UTC</b>
26 Mar 0502	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	22/1740
26 Mar 1902	WATCH: Geomagnetic Storm Category G2 predicted	

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## 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
27 Mar	78	25	5	10 Apr	71	5	2
28	78	40	6	11	71	5	2
29	78	35	6	12	71	5	2
30	78	20	5	13	71	5	2
31	75	18	5	14	71	5	2
01 Apr	75	12	4	15	73	5	2
02	75	8	3	16	73	5	2
03	73	16	4	17	73	24	5
04	73	12	4	18	75	25	5
05	71	15	4	19	75	10	3
06	71	12	3	20	75	5	2
07	71	5	2	21	75	5	2
08	71	5	2	22	75	5	2
09	71	5	2				



### *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 245	Radio Flux 2695	Intensity II

**No Events Observed**

### *Flare List*

Date	Time			X-ray Class	Imp/ Brtns	Optical Location Lat CMD	Optical Rgn #
	Begin	Max	End				
20 Mar	1552	1559	1606	B1.5			
20 Mar	2352	2353	0000		SF	S09E13	
22 Mar	1821	1858	1915	B3.3			2643
25 Mar	2204	2213	2219	B2.8			2644
25 Mar	2331	2339	2346	B2.3	SF	N12E47	2644
26 Mar	0229	0234	0241	B4.0	SF	N15E50	2644
26 Mar	0320	0328	0335	B1.3			2644
26 Mar	1029	1032	1037	B1.0			2644
26 Mar	1307	1312	1325	B1.6			2644
26 Mar	1336	1343	1348		SF	N12E39	2644
26 Mar	1517	1535	1547	B1.3	SF	N21E43	2644
26 Mar	1554	1558	1605	B1.8			2644
26 Mar	1817	1830	1838		SF	N14E40	2644
26 Mar	1902	1905	1911	B1.7			2644
26 Mar	2121	2128	2141	B4.0			2644
26 Mar	2300	2317	2326	B2.0			2644
26 Mar	2349	0000	0008	C1.3	SF	N12E33	2644



## *Region Summary*

Date	Location		Sunspot Characteristics				Flares								
	Lat CMD	Lon	Heli 10 <sup>-6</sup> hemi.	Area	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical			
									C	M	X	S	1	2	3

### *Region 2643*

21 Mar	N09E72	78	40	1	Hrx	2	A										
22 Mar	N08E56	81	30	1	Hsx	2	A										
23 Mar	N08E42	81	20	2	Hrx	2	A										
24 Mar	N08E29	81	10	1	Hrx	2	A										
25 Mar	N08E16	81	10	1	Axx	1	A										
26 Mar	N08E02	82	plage														
									0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 82

### *Region 2644*

26 Mar	N12E30	54	50	6	Dao	10	B	1				4					
								1	0	0	4	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 54



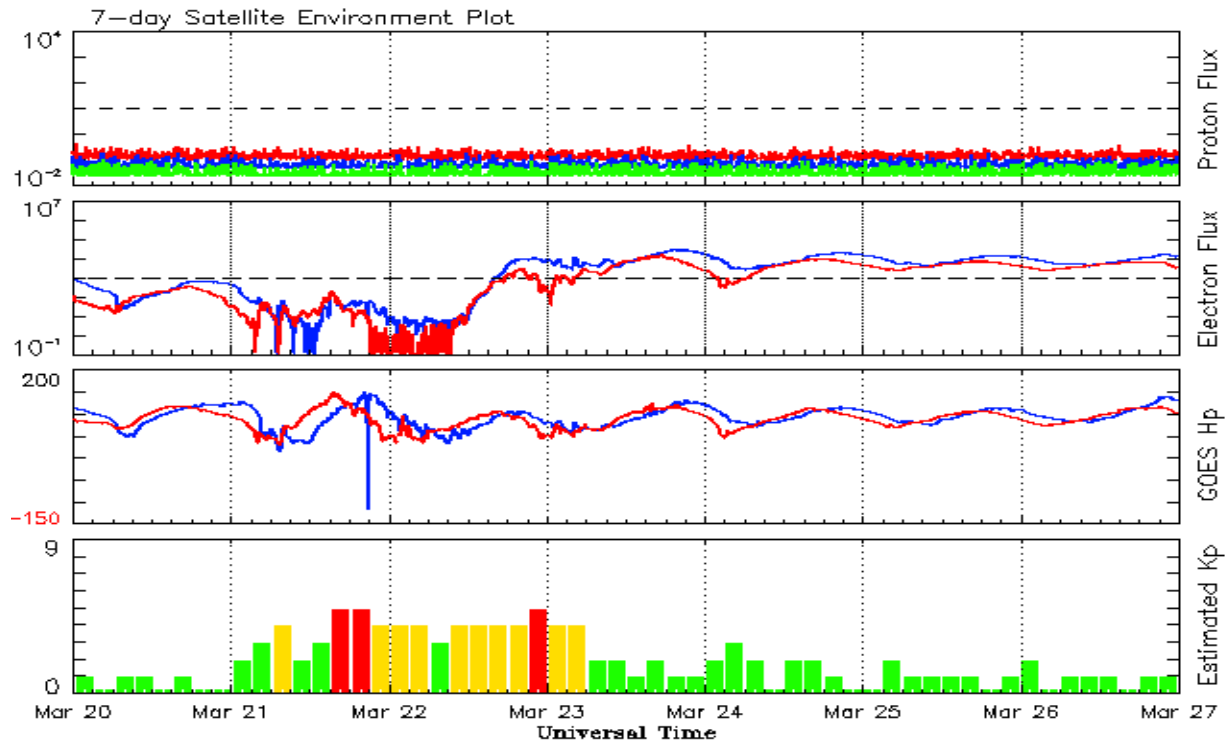


**Recent Solar Indices (preliminary)**  
**Observed monthly mean values**

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>2015</b>									
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	39.5	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	59.0	36.7	109.6	105.3	13	12.5
December	54.1	34.8	0.64	55.1	34.7	112.8	102.5	15	12.5
<b>2016</b>									
January	50.4	34.2	0.67	51.4	32.6	103.5	99.9	10	12.3
February	56.0	33.8	0.61	49.6	31.5	103.5	98.1	10	12.0
March	40.9	32.5	0.80	47.7	30.2	91.6	96.6	11	11.8
April	39.2	22.7	0.58	45.0	28.7	93.4	95.3	10	11.8
May	48.9	30.9	0.64	42.1	26.9	93.1	93.2	12	11.7
June	19.3	12.3	0.65	39.0	24.9	81.9	90.4	9	11.4
July	36.8	19.4	0.53	36.5	23.2	85.9	87.7	10	11.2
August	50.4	30.1	0.60	34.2	21.6	85.0	85.5	10	11.2
September	37.4	26.8	0.72			87.8		16	
October	30.0	20.2	0.67			86.1		16	
November	22.4	12.8	0.57			78.7		10	
December	17.6	11.3	0.64			75.1		10	
<b>2017</b>									
January	28.1	15.5	0.55			77.4		10	
February	22.0	15.7	0.71			76.9		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 20 March 2017*

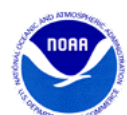
The proton flux plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-sec -sr) as measured by the SWPC Primary GOES satellite, near West 75, for each of three energy thresholds: greater than 10, 50, and 100 MeV.

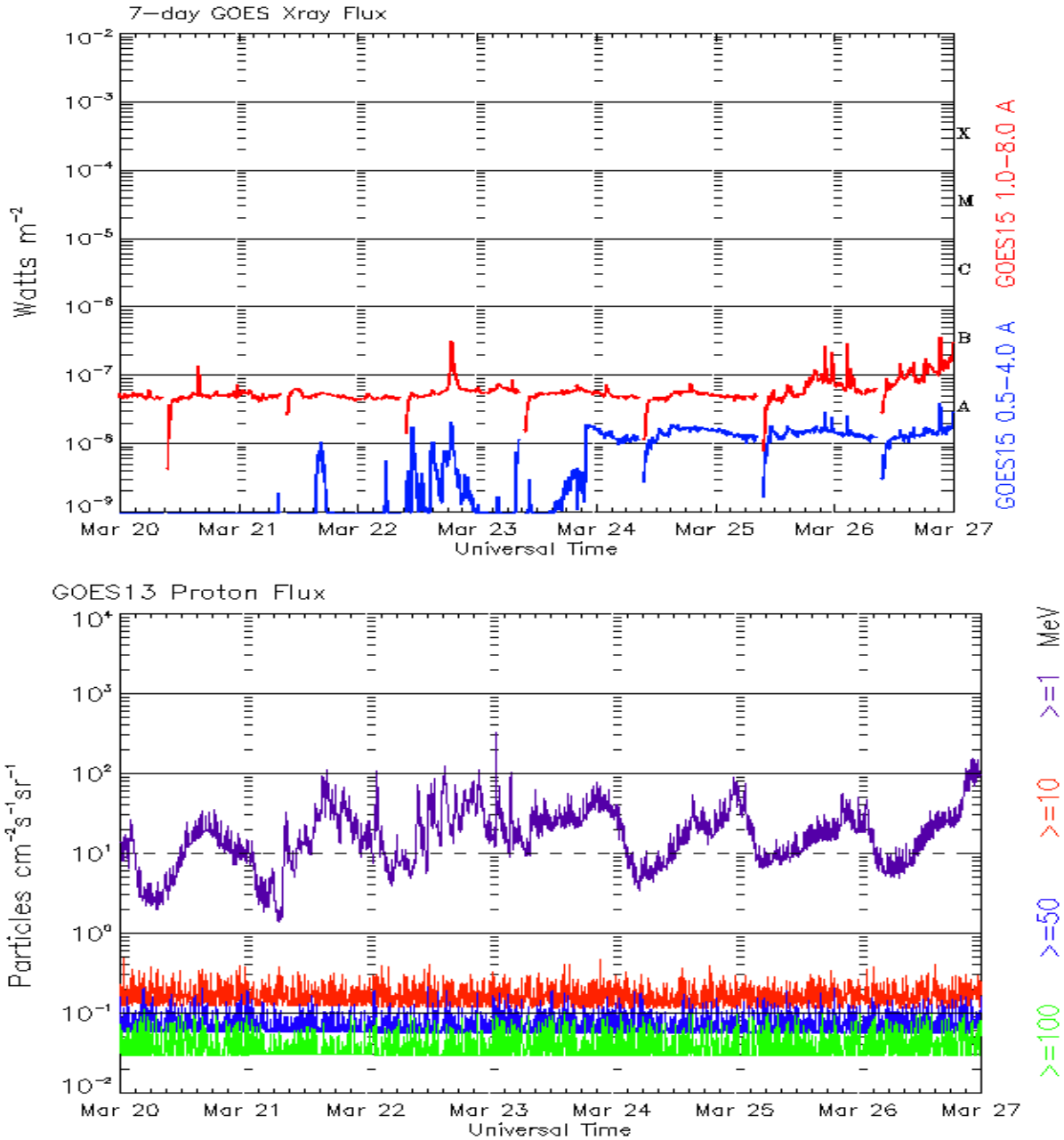
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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.

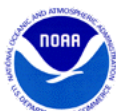




*Weekly GOES Satellite X-ray and Proton Plots  
Week Beginning 20 March 2017*

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  
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**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.

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