

Space Weather Highlights
21 November - 27 November 2016

SWPC PRF 2152
28 November 2016

Solar activity was at very low levels. The largest flare of the period was at B6 at 22/0010 UTC from Region 2612 (N09, L=194, class/area Hax/230 on 25 November). No Earth-directed CMEs were observed.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was moderate levels on 22-24 November while high levels were reached on 21 and 25-27 November. The largest flux of the period was 25,245 pfu at 27/1625 UTC.

Geomagnetic field activity ranged from quiet to G2 (Moderate) geomagnetic storm conditions. Enhanced geomagnetic activity was due to recurrent, positive-polarity, coronal hole high speed streams (CH HSS). The period began with solar wind speeds near 330 km/s on 21 November with an increasing total field from approximately 1 nT early in the period to near 12 nT by 22 November and a fluctuating Bz component between +10 nT and -8 nT. Solar wind speed increased, thereafter, to near 510 km/s by 23 November while total field decreased to near 3 nT. Another enhancement in total field was observed late on 23 November to a maximum near 11 nT on 24 November before decreasing to 5 nT by 25 November. Stepped increases in solar wind speed occurred at 24/0514 UTC from 400 km/s to 500 km/s and at 25/0144 UTC from 500 km/s to near 700 km/s. The geomagnetic field responded with quiet to unsettled levels on 21 November, quiet to active levels on 22-23 November, unsettled to G1 (Minor) storm levels on 24 November, unsettled to G2 (Moderate) storm levels on 25 November and quiet to unsettled levels on 26-27 November.

Space Weather Outlook
28 November - 24 December 2016

Solar activity is expected to be at very low levels with a slight chance for C-class flares for the forecast period.

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 on 28 November-07 December, 10-18 December and again on 22-24 December due to recurrent CH HSS influence.

Geomagnetic field activity is expected to be at quiet to unsettled levels on 28-30 November as the geomagnetic field recovers from positive polarity CH HSS activity. Unsettled to active levels are expected from 07-11 December and 19-24 December with G1 (Minor) geomagnetic storm levels likely on 10 and 21-22 December due to recurrent CH HSS effects.



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
21 November	75	0	0	A7.1	0	0	0	0	0	0	0	0
22 November	77	0	0	A9.2	0	0	0	0	0	0	0	0
23 November	78	11	120	A8.7	0	0	0	1	0	0	0	0
24 November	79	12	180	A9.0	0	0	0	0	0	0	0	0
25 November	81	12	230	A9.1	0	0	0	0	0	0	0	0
26 November	81	13	160	A9.3	0	0	0	0	0	0	0	0
27 November	83	31	200	A9.4	0	0	0	0	0	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
	21 November		1.3e+06	1.4e+04	3.6e+03	
22 November		1.2e+06	1.4e+04	3.2e+03		4.4e+06
23 November		7.5e+05	1.4e+04	3.2e+03		8.6e+06
24 November		2.2e+06	1.4e+04	3.2e+03		9.5e+06
25 November		2.3e+06	1.4e+04	3.3e+03		2.7e+08
26 November		1.7e+06	1.4e+04	3.2e+03		1.0e+09
27 November		9.3e+05	1.4e+04	3.3e+03		9.7e+08

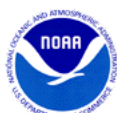
Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	21 November	4	1-2-0-1-1-2-1-1	6	0-1-0-2-4-1-2-1	6
22 November	9	1-1-1-2-3-2-2-4	10	0-0-1-3-4-3-3-2	12	1-1-1-2-3-3-3-4
23 November	11	4-3-3-2-2-1-2-2	14	3-2-3-4-4-2-2-1	13	4-3-3-2-2-2-3-2
24 November	17	3-2-3-4-4-3-3-3	35	2-2-4-6-6-5-3-3	24	4-3-3-4-5-3-4-4
25 November	24	3-5-5-2-4-3-4-2	49	4-4-4-6-7-5-4-3	33	4-6-5-3-4-4-4-3
26 November	9	3-3-2-2-2-2-2-1	22	2-2-5-5-3-4-3-2	12	3-3-2-2-2-3-3-2
27 November	9	2-3-3-3-2-1-1-2	12	2-2-3-4-4-2-1-1	12	3-3-3-3-2-1-2-2

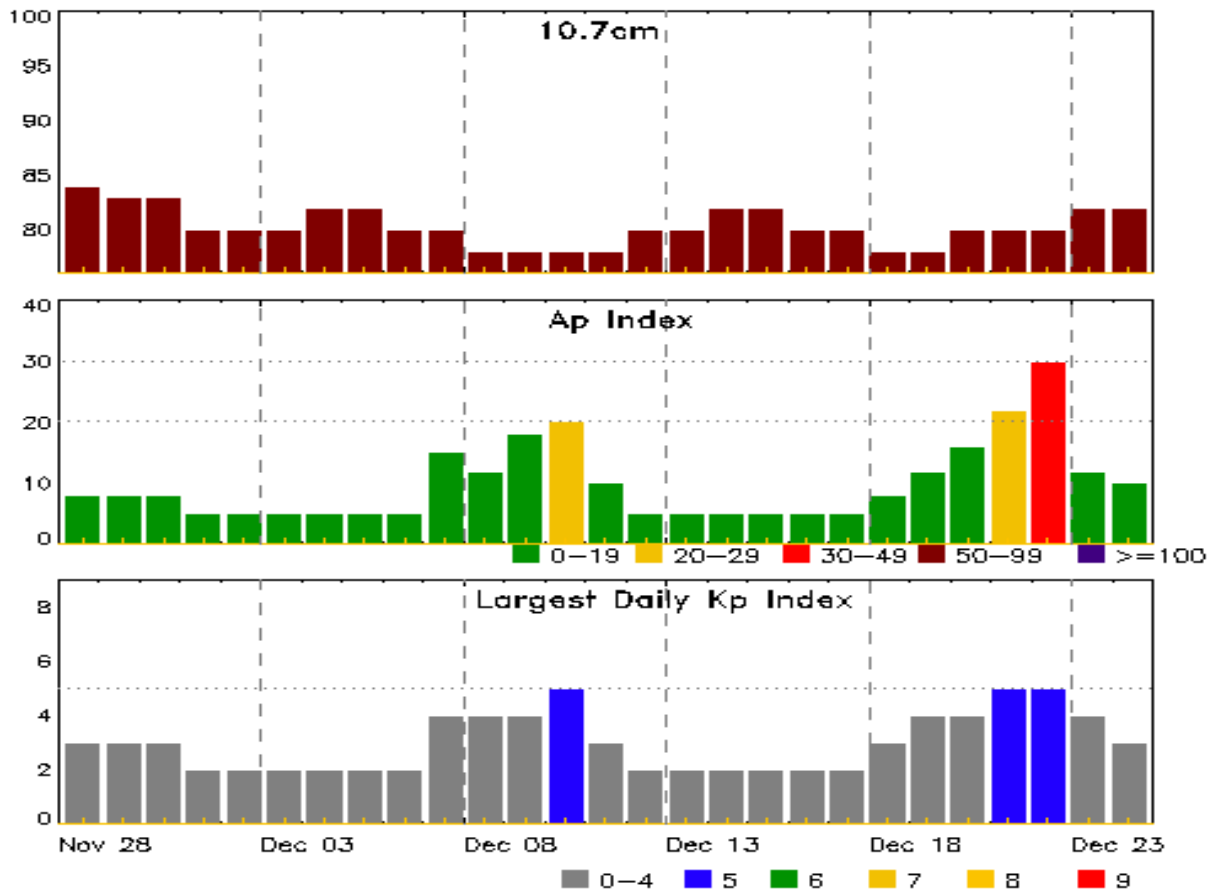


Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
21 Nov 1656	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	13/0950
21 Nov 2329	WATCH: Geomagnetic Storm Category G1 predicted	
22 Nov 1729	WARNING: Geomagnetic K = 4	22/1728 - 23/0600
22 Nov 2142	ALERT: Geomagnetic K = 4	22/2142
22 Nov 2154	WARNING: Geomagnetic K = 5	22/2153 - 23/0600
23 Nov 0539	EXTENDED WARNING: Geomagnetic K = 4	22/1728 - 23/1500
24 Nov 0040	WARNING: Geomagnetic K = 4	24/0045 - 0600
24 Nov 0058	ALERT: Geomagnetic K = 4	24/0058
24 Nov 0548	EXTENDED WARNING: Geomagnetic K = 4	24/0045 - 1500
24 Nov 1352	WARNING: Geomagnetic K = 5	24/1352 - 2100
24 Nov 1414	ALERT: Geomagnetic K = 5	24/1414
24 Nov 1456	EXTENDED WARNING: Geomagnetic K = 4	24/0045 - 25/0200
25 Nov 0024	EXTENDED WARNING: Geomagnetic K = 4	24/0045 - 25/1200
25 Nov 0052	WARNING: Geomagnetic K = 5	25/0050 - 0400
25 Nov 0530	WARNING: Geomagnetic K = 5	25/0530 - 1200
25 Nov 0540	ALERT: Geomagnetic K = 5	25/0540
25 Nov 0545	WARNING: Geomagnetic K = 6	25/0545 - 0900
25 Nov 0550	ALERT: Geomagnetic K = 6	25/0550
25 Nov 0702	ALERT: Geomagnetic K = 5	25/0701
25 Nov 1016	ALERT: Electron 2MeV Integral Flux \geq 1000pfu	25/0955
25 Nov 1139	EXTENDED WARNING: Geomagnetic K = 4	24/0045 - 25/2100
25 Nov 1159	EXTENDED WARNING: Geomagnetic K = 5	25/0530 - 1500
25 Nov 1440	EXTENDED WARNING: Geomagnetic K = 5	25/0530 - 2359
25 Nov 1440	EXTENDED WARNING: Geomagnetic K = 4	24/0045 - 26/0600
26 Nov 0501	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	25/0955
26 Nov 0545	EXTENDED WARNING: Geomagnetic K = 4	24/0045 - 26/1300
27 Nov 0501	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	25/0955



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
28 Nov	84	8	3	12 Dec	80	5	2
29	83	8	3	13	80	5	2
30	83	8	3	14	82	5	2
01 Dec	80	5	2	15	82	5	2
02	80	5	2	16	80	5	2
03	80	5	2	17	80	5	2
04	82	5	2	18	78	8	3
05	82	5	2	19	78	12	4
06	80	5	2	20	80	16	4
07	80	15	4	21	80	22	5
08	78	12	4	22	80	30	5
09	78	18	4	23	82	12	4
10	78	20	5	24	82	10	3
11	78	10	3				



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	Optical			Rgn #
	Begin	Max	End		Imp/ Brtns	Location Lat CMD	Rgn #	
21 Nov	0024	0027	0030	B1.2			2610	
22 Nov	0005	0010	0016	B1.6				
22 Nov	0727	0732	0741	B2.3				
22 Nov	2345	0010	0023	B6.0			2612	
23 Nov	0618	0622	0631	B1.4			2612	
23 Nov	0653	0654	0656		SF	S15W02		
23 Nov	1454	1501	1509	B2.2			2612	
23 Nov	2228	2234	2240	B2.7			2612	
25 Nov	1217	1238	1251	B2.5			2612	
26 Nov	0405	0409	0414	B1.8			2612	
27 Nov	0618	0624	0627	B1.4			2611	
27 Nov	0833	0837	0842	B2.4			2611	
27 Nov	1355	1402	1405	B3.1			2613	
27 Nov	1913	1918	1924	B2.0			2613	
27 Nov	2200	2206	2213	B3.2			2611	
27 Nov	2246	2249	2252	B1.9			2611	
27 Nov	2300	2304	2307	B1.9			2611	



Region Summary

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

Region 2610

12 Nov	N15E27	22	30	3	Cro	3	B										
13 Nov	N14E15	21	20	3	Cro	3	B					1					
14 Nov	N14W00	23	20	4	Bxo	4	B					1					
15 Nov	N14W13	23	20	4	Cro	7	B					1					
16 Nov	N15W22	19	40	6	Dai	8	B										
17 Nov	N16W35	18	50	6	Dao	6	B										
18 Nov	N15W48	17	10	5	Bxo	5	B										
19 Nov	N15W59	16	10	1	Axx	1	A										
20 Nov	N15W73	17	plage														
21 Nov	N15W87	18	plage														
										0	0	0	3	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 23

Region 2611

17 Nov	N03E54	289	10	1	Hrx	1	A										
18 Nov	N03E39	291	20	3	Cao	3	B										
19 Nov	N03E29	288	10	1	Axx	1	A					1					
20 Nov	N04E17	287	10	1	Axx	1	A										
21 Nov	N04E02	289	plage														
22 Nov	N04W13	290	plage														
23 Nov	N04W28	292	plage														
24 Nov	N04W43	294	plage														
25 Nov	N04W58	296	plage														
26 Nov	N04W73	298	plage														
27 Nov	N04W88	300	plage														
										0	0	0	1	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 289

Region 2612

23 Nov	N07E68	196	120	3	Hsx	1	A										
24 Nov	N09E56	194	180	3	Hax	2	A										
25 Nov	N09E43	194	230	3	Hax	2	A										
26 Nov	N08E29	195	160	4	Hax	3	A										
27 Nov	N08E17	195	170	4	Cao	6	B										
										0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 195



Region Summary - continued

Date	Location		Sunspot Characteristics				Flares									
	Lat CMD	Lon	Heli 10 ⁻⁶	Area hemi.	Extent (heli)	Spot Class	Spot Count	Mag Class	X-ray			Optical				
									C	M	X	S	1	2	3	4
Region 2613																
27 Nov	N12W51	263	30	4	Cao	5	B	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 263

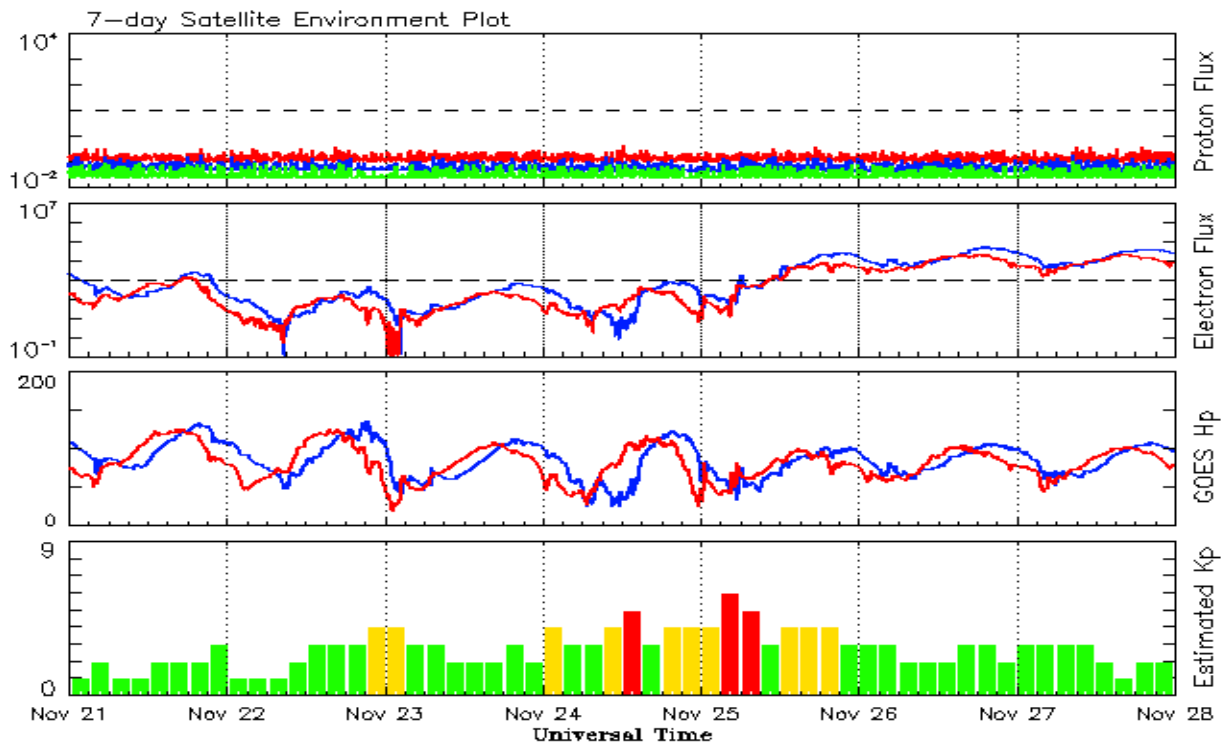


Recent Solar Indices (preliminary)
Observed monthly mean values

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	
2014										
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	45.7	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	
2016										
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	30.3	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			93.1		12		
June	19.3	12.3	0.65			81.9		9		
July	36.8	19.5	0.53			85.9		10		
August	50.4	30.4	0.60			85.0		10		
September	37.4	26.8	0.72			87.8		16		
October	30.0	20.2	0.67			86.1		16		

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 21 November 2016*

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.

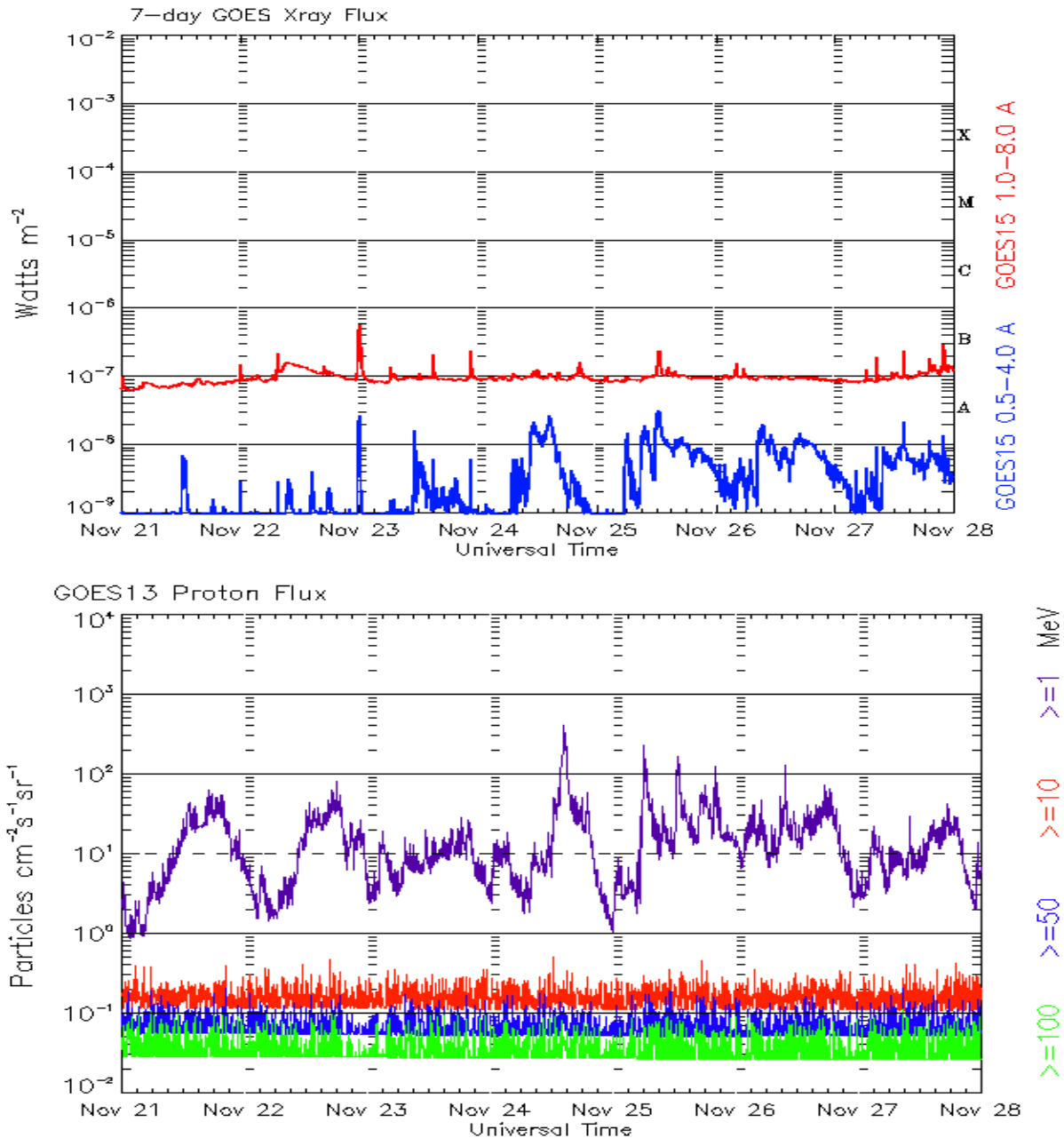
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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 21 November 2016*

The x-ray plots contains five-minute averages x-ray flux (Watt/m²) 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/cm² -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)

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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

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