

Space Weather Highlights
11 April - 17 April 2016

SWPC PRF 2120
18 April 2016

Solar activity was at low levels throughout the period. Region 2529 (N09, L=342, class/area Eki/850 on 11 Apr) produced all of the C-class activity, the largest event a C5/Sf at 16/1958 UTC. An associated CME was observed off the west limb but was determined not to be Earth-directed.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal levels on 11 and 12 April. High levels were reached from 13-18 April following coronal hole high speed stream (CH HSS) effects.

Geomagnetic field activity was at quiet levels on 11 April. Unsettled to minor storm conditions were observed on 12-14 April due to effects from a negative polarity CH HSS. Active conditions continued into early 15 April but decreased to mostly quiet levels through midday on 16 April. A weak CME moved through late on 16 April increasing activity to unsettled to active levels. Quiet to active conditions continued into 17 April as CME effects subsided and a co-rotating interaction region (CIR) ahead of an approaching positive polarity CH HSS.

Space Weather Outlook
18 April - 14 May 2016

Solar activity is expected to be low with a slight chance for M-class flares on 18-20 April. As Region 2529 exits the west limb, activity is expected to decrease to very low levels with a chance for C-class activity from 21 April to 02 May. Low levels are expected to return from 03-14 May due to the return of old Region 2529.

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 the exception of 26-28 April, 01-03 May and 10-13 April following recurrent CH HSS events.

Geomagnetic field activity is expected to be unsettled to active on 18-19 April followed with quiet to unsettled levels on 20 April due to effects from a positive polarity CH HSS. Mostly quiet conditions are expected on 21-22 April. Unsettled conditions are expected on 23-26 April with isolated active periods likely due to a second recurrent, positive polarity CH HSS. Mostly quiet conditions are expected from 27-28 April. Unsettled to active conditions are anticipated on 29-30 April with minor storm periods likely on 29 April as a negative polarity HSS becomes geoeffective. Mostly quiet conditions are expected from 01-08 May with the exception of possible unsettled to active periods on 04 May due to an SSBC that has affected us the last few rotations. Unsettled to active conditions are expected on 09-11 May with minor storm periods



likely as a recurrent negative polarity CH HSS moves into geoeffective position. Mostly quiet conditions are expected on 12-13 May followed by possible unsettled to active conditions on 14 May as a CIR impacts the Earth.



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
11 April	117	41	880	B4.2	4	0	0	5	0	0	0	0
12 April	111	34	820	B3.0	1	0	0	2	0	0	0	0
13 April	108	41	810	B2.5	1	0	0	2	0	0	0	0
14 April	111	45	810	B2.6	2	0	0	4	0	0	0	0
15 April	112	69	760	B2.9	1	0	0	7	1	0	0	0
16 April	113	51	750	B3.0	3	0	0	5	0	0	0	0
17 April	102	35	830	B2.8	1	0	0	2	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
	11 April	9.1e+04	1.2e+04	2.9e+03	5.6e+05	
12 April	1.6e+05	1.2e+04	3.1e+03	4.2e+05		
13 April	1.1e+06	1.3e+04	3.1e+03	8.4e+07		
14 April	1.0e+06	1.2e+04	2.7e+03	1.1e+08		
15 April	1.5e+06	1.3e+04	3.1e+03	6.7e+07		
16 April	5.8e+05	1.3e+04	3.3e+03	9.3e+07		
17 April	1.4e+06	1.3e+04	3.3e+03	1.6e+07		

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	11 April	5	0-0-1-1-3-3-1-1	4	0-0-0-1-2-3-1-1	6
12 April	12	2-2-2-2-3-3-4	21	2-2-3-3-5-5-3-3	19	3-3-2-2-3-3-4-5
13 April	16	3-3-3-3-4-2-3-3	45	4-4-6-6-6-5-2-2	26	5-4-4-4-4-3-4-3
14 April	14	3-3-2-4-3-3-2-2	47	3-3-4-7-6-6-3-2	23	4-3-2-5-4-4-3-3
15 April	9	4-2-0-1-3-2-2-1	4	3-1-0-1-1-1-1-1	9	4-2-1-1-2-2-2-2
16 April	8	0-0-2-2-3-2-3-3	14	0-0-2-5-3-3-3-3	12	1-1-3-2-2-3-4-4
17 April	17	4-4-3-2-3-3-3-3	33	4-5-5-5-4-5-3-1	27	4-4-3-2-2-3-4-3



Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
11 Apr 0259	WATCH: Geomagnetic Storm Category G1 predicted	
11 Apr 2039	SUMMARY: 10cm Radio Burst	11/2021 - 2021
12 Apr 0228	ALERT: Type II Radio Emission	12/0153
12 Apr 1551	WARNING: Geomagnetic K = 4	12/1600 - 13/1500
12 Apr 1930	ALERT: Geomagnetic K = 4	12/1929
12 Apr 1954	WARNING: Geomagnetic K = 5	12/2000 - 13/1200
12 Apr 2220	ALERT: Geomagnetic K = 5	12/2215
13 Apr 0041	WARNING: Geomagnetic K = 6	13/0040 - 0900
13 Apr 0052	ALERT: Geomagnetic K = 5	13/0047
13 Apr 1403	EXTENDED WARNING: Geomagnetic K = 4	12/1600 - 14/0600
13 Apr 1501	ALERT: Electron 2MeV Integral Flux \geq 1000pfu	13/1445
14 Apr 0500	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	13/1445
14 Apr 0555	EXTENDED WARNING: Geomagnetic K = 4	12/1600 - 14/1500
14 Apr 1042	WARNING: Geomagnetic K = 5	14/1045 - 1600
14 Apr 1042	EXTENDED WARNING: Geomagnetic K = 4	12/1600 - 14/1900
14 Apr 1058	ALERT: Geomagnetic K = 5	14/1058
14 Apr 1541	EXTENDED WARNING: Geomagnetic K = 4	12/1600 - 15/0600
14 Apr 1541	EXTENDED WARNING: Geomagnetic K = 5	14/1045 - 2100
15 Apr 1251	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	13/1445
16 Apr 0501	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	13/1445
16 Apr 1747	WARNING: Geomagnetic K = 4	16/1750 - 17/0600
16 Apr 2103	ALERT: Geomagnetic K = 4	16/2059
16 Apr 2113	ALERT: Type II Radio Emission	16/2049
17 Apr 0538	EXTENDED WARNING: Geomagnetic K = 4	16/1750 - 17/1300
17 Apr 0538	WARNING: Geomagnetic K = 5	17/0535 - 1300
17 Apr 1641	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	13/1445
17 Apr 1720	WARNING: Geomagnetic K = 4	17/1720 - 2359

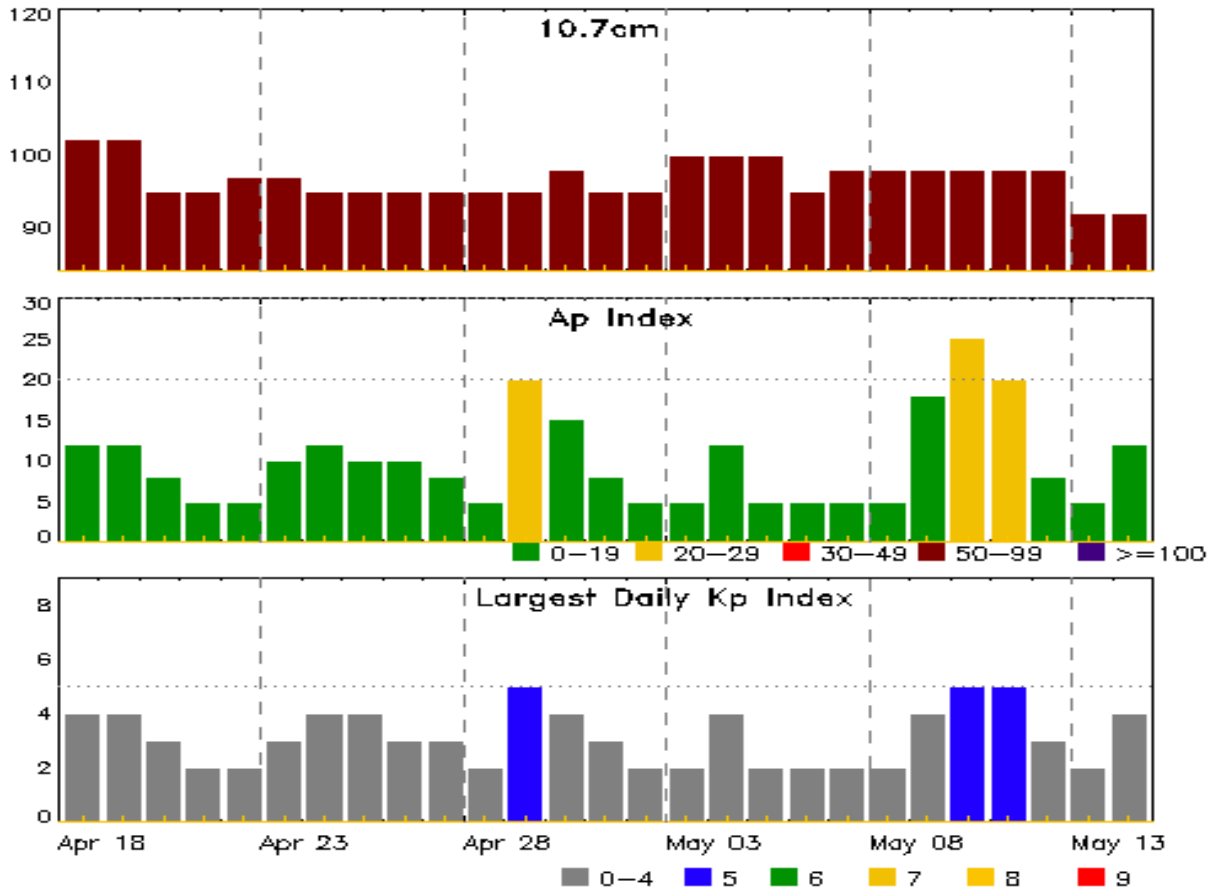


Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
17 Apr 2041	ALERT: Geomagnetic K = 4	17/2040



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
18 Apr	102	12	4	02 May	95	5	2
19	102	12	4	03	100	5	2
20	95	8	3	04	100	12	4
21	95	5	2	05	100	5	2
22	97	5	2	06	95	5	2
23	97	10	3	07	98	5	2
24	95	12	4	08	98	5	2
25	95	10	4	09	98	18	4
26	95	10	3	10	98	25	5
27	95	8	3	11	98	20	5
28	95	5	2	12	98	8	3
29	95	20	5	13	92	5	2
30	98	15	4	14	92	12	4
01 May	95	8	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	Imp/ Brtns	Location Lat CMD	Rgn #
	Begin	Max	End				
11 Apr	0134	0202	0307	C1.1			2529
11 Apr	1118	1121	1135		SF	N11E33	2529
11 Apr	1316	1320	1326	B8.1	SF	N08E34	2529
11 Apr	1828	1834	1841	C1.0	SF	N07E55	2529
11 Apr	2019	2027	2035	C1.4	SF	N11E24	2529
11 Apr	2159	2212	2219	B9.3	SF	N05E30	2529
11 Apr	2356	0006	0013	C1.3	SF	N05E29	2529
12 Apr	0740	0751	0810	C1.8			2529
12 Apr	1418	1418	1426		SF	N16E18	2529
12 Apr	1556	1559	1603	B4.1			
13 Apr	0735	0757	0816	B8.6			2529
13 Apr	1146	1146	1148		SF	N13E00	2529
13 Apr	1153	1158	1206	B6.0			2529
13 Apr	1236	U1244	A1253		SF	N11E12	2529
13 Apr	1703	1714	1722	B4.3			2529
13 Apr	1726	1734	1740	B4.2			2529
13 Apr	2246	2253	2307	B6.0			
13 Apr	2328	2343	0001	C2.9			2529
14 Apr	0150	0154	0157	B7.2			2531
14 Apr	1321	1332	1344	C1.8	SF	N11W14	2529
14 Apr	1437	1459	1510	B4.8	SF	N11W04	2529
14 Apr	1625	1626	1628		SF	N11W06	2529
14 Apr	1759	1807	1816	C1.3	SF	N12W07	2529
14 Apr	2016	2029	2044	B5.1			2529
14 Apr	2145	2152	2155	B7.0			2529
14 Apr	2300	2302	2304	B4.9			2529
15 Apr	0246	0250	0303	B7.6			
15 Apr	0521	0524	0538		SF	N11W12	2529
15 Apr	0614	0626	0634	B7.7	SF	N09W12	2529
15 Apr	0811	0815	0818	B6.8			2529
15 Apr	0925	0928	1001	B8.3	SF	N12W18	2529



Flare List

Date	Time			X-ray Class	Imp/ Brtns	Optical		Rgn #
	Begin	Max	End			Location Lat CMD		
15 Apr	1237	1242	1244	B7.7	SF	N13W20		2529
15 Apr	1357	1400	1402		SF	N11W20		2529
15 Apr	1404	1430	1443	C4.1	1F	N11W20		2529
15 Apr	1505	1511	1518		SF	N11W15		2529
15 Apr	1550	1557	1629		SF	N09W17		2529
15 Apr	2357	0005	0016	B7.9				2529
16 Apr	0506	0513	0538	B7.0	SF	N09W35		2529
16 Apr	0540	0509	0545		SF	N12W15		2529
16 Apr	1230	1233	1235	B4.8				
16 Apr	1430	1439	1453	C1.0				
16 Apr	1505	1524	1554		SF	N08W29		2529
16 Apr	1914	1920	1923	C1.4	SF	N10W16		2529
16 Apr	1942	1958	2012	C5.8	SF	N13W43		2529
16 Apr	2306	2312	2316	B5.8				2529
17 Apr	0053	0057	0100	B9.6				2529
17 Apr	0357	0401	0405	B7.9				2529
17 Apr	1648	1702	1715	B8.4	SF	N13W43		2529
17 Apr	1717	1730	1747	C2.4	SF	N13W43		2529
17 Apr	2156	2200	2207	B4.8				



Region Summary

Date	Location		Sunspot Characteristics					Flares															
	Lat	CMD	Helio Lon	Area 10 ⁶ hemi.	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical											
									C	M	X	S	1	2	3	4							
Region 2529																							
06 Apr	N10E91		346	plage									1										
07 Apr	N10E77		346	330	5	Hkx	1	A					3										
08 Apr	N10E66		344	350	10	Dhi	5	B					1										
09 Apr	N10E54		343	820	12	Ehi	8	B	8				14										
10 Apr	N09E42		341	820	11	Eki	16	B	2				3										
11 Apr	N09E28		342	850	12	Eki	19	B	4				5										
12 Apr	N09E14		343	800	12	Eho	12	B	1				2										
13 Apr	N09W00		344	780	12	Eko	8	B	1				2										
14 Apr	N10W13		344	790	12	Eki	12	B	2				4										
15 Apr	N10W24		341	740	13	Eki	36	BG	1				7	1									
16 Apr	N10W37		340	720	14	Eki	18	BG	2				5										
17 Apr	N10W52		342	780	14	Eki	10	BG	1				2										
									27	0	0	0	44	1	0	0	0	0					

Still on Disk.

Absolute heliographic longitude: 344

Region 2530

11 Apr	N15W11		21	30	4	Cso	2	B															
12 Apr	N15W25		22	20	4	Cro	2	B															
13 Apr	N15W39		23	20	3	Hrx	2	A															
14 Apr	N14W53		24	10	1	Axx	2	A															
15 Apr	N13W67		24	10	2	Axx	2	A															
16 Apr	N08W80		24	10	1	Axx	1	A															
									0	0	0	0	0	0	0	0	0	0	0				

Crossed West Limb.

Absolute heliographic longitude: 21

Region 2531

13 Apr	N14E59		285	10	1	Axx	1	A															
14 Apr	N14E45		286	10	1	Axx	1	A															
15 Apr	N13E34		283	10	1	Axx	1	A															
16 Apr	N13E20		284	plage																			
17 Apr	N13E06		285	plage																			
									0	0	0	0	0	0	0	0	0	0					

Still on Disk.

Absolute heliographic longitude: 285



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 2532																				
16 Apr	N07E62	240	20	5	Cao	2	B													
17 Apr	N07E53	238	50	2	Cao	5	B													

Still on Disk.

Absolute heliographic longitude: 238

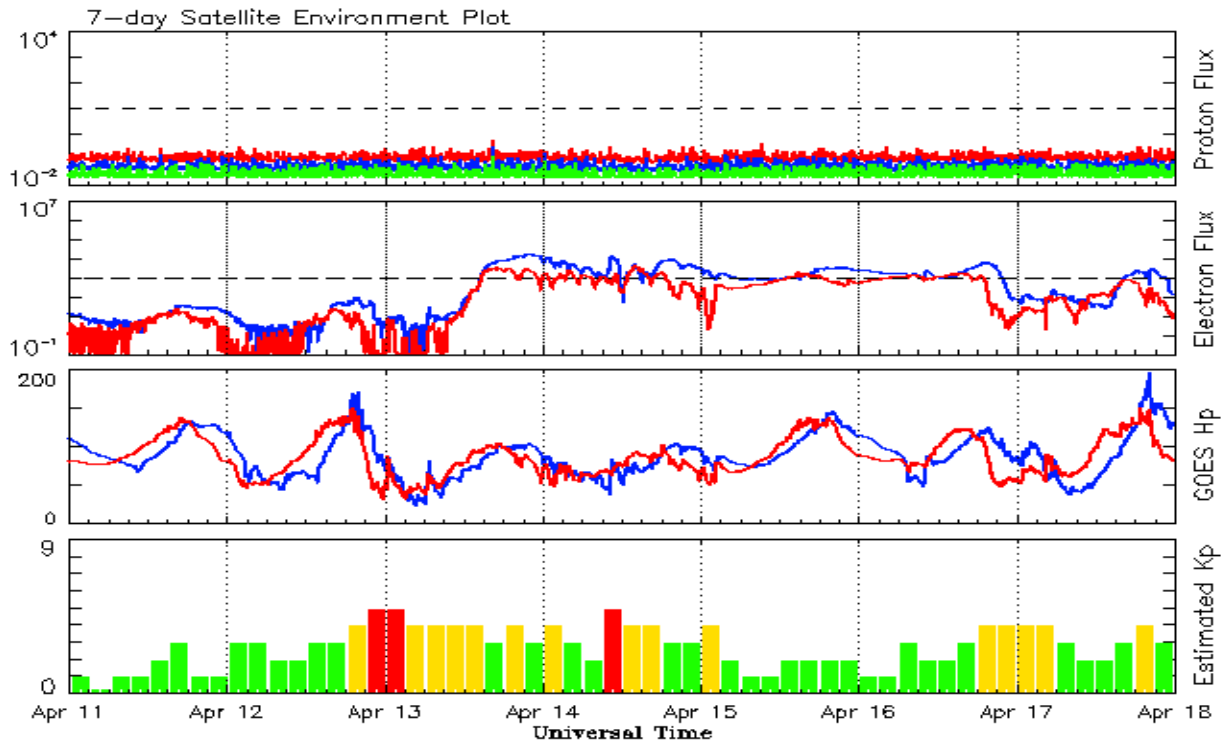


Recent Solar Indices (preliminary)
Observed monthly mean values

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									
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	45.7	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			104.1		15	
November	61.8	37.3	0.61			109.6		13	
December	54.1	34.8	0.64			112.8		15	
2016									
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	

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 11 April 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.

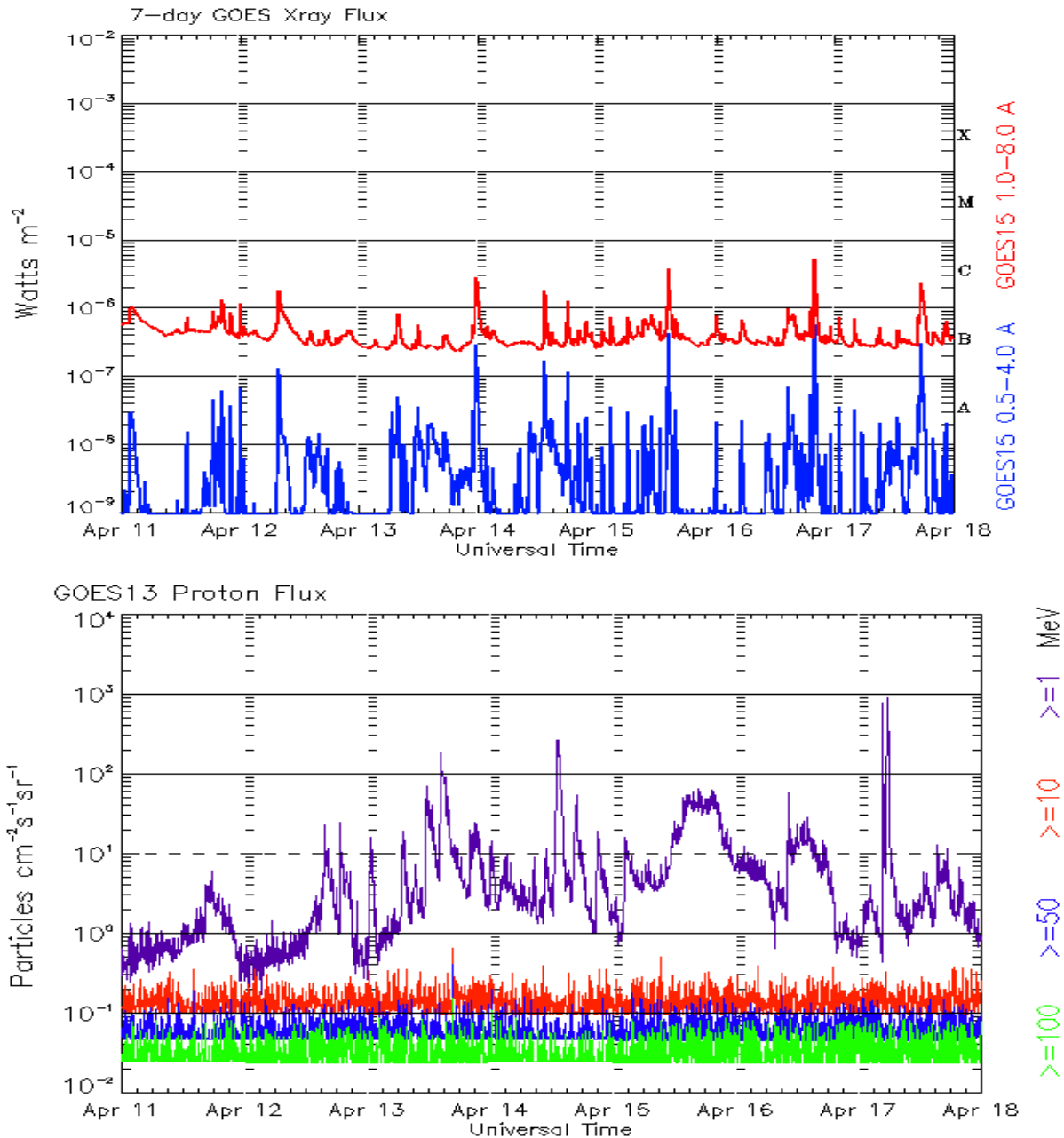
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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 11 April 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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