

**Space Weather Highlights**  
**08 February - 14 February 2016**

**SWPC PRF 2111**  
**15 February 2016**

Solar activity was low from 08-11 Feb. The largest C-class event during that period was a C8/1f observed at 11/2103 UTC from Region 2497 (N13, L=087, class/area Eac/250 on 12 Feb) with associated Type II (est. speed 483 km/s) and Type IV radio sweeps. A CME was visible following this event and is anticipated to arrive at Earth early on 15 Feb. Solar activity was moderate from 12-14 Feb with Region 2497 producing an M1 flare each day. No other Earth-directed CMEs were observed.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal to moderate levels during the period.

Geomagnetic field activity began the week at minor storm levels due to effects from a co-rotating interaction region (CIR) ahead of a CH HSS. Predominately quiet to unsettled levels were observed for the remainder of the period with isolated active periods on 09, 11 and 12 Feb associated with extended periods of negative Bz.

**Space Weather Outlook**  
**15 February - 12 March 2016**

Solar activity is expected to be at very low to low levels with a chance for M-class flares from 15-17 Feb. Activity is expected to decrease to very low levels with only a chance for C-class flares from 18-29 Feb as Region 2497 moves beyond the west limb. Low levels are anticipated once again on 01-12 Mar as well as a chance for M-class flares with the return of Region 2497.

A slight chance for a proton event exists at geosynchronous orbit from 15-17 Feb due to the flare potential and position of Region 2497.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at normal to moderate levels for the majority of the period. High levels are likely on 18-20 Feb following effects from a CME and a subsequent CH HSS.

Geomagnetic field activity is expected to reach minor storm levels on 15 Feb due to effects from the 11 Feb CME. Quiet to active conditions are expected on 16 Feb as CME effects subside. Minor storm conditions are likely again on 17 Feb as a recurrent negative polarity CH HSS becomes geoeffective. Quiet to unsettled conditions are expected with isolated active periods possible on 18-20 Feb as CH HSS effects continue. Mostly quiet conditions are expected on 21-29 Feb. Quiet to unsettled conditions are expected from 01-03 Mar due to effects from a positive polarity CH HSS. Mostly quiet conditions are expected for the remainder of the period with unsettled to active periods possible on 06-07 Mar and 11 Mar as two sequential small recurrent coronal holes affect the field.



### *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
08 February	115	82	650	B3.3	1	0	0	3	0	0	0	0
09 February	117	79	350	B3.7	1	0	0	5	0	0	0	0
10 February	112	82	350	B2.8	1	0	0	3	0	0	0	0
11 February	113	68	250	B2.8	3	0	0	3	1	0	0	0
12 February	112	74	290	B4.4	4	1	0	6	0	0	0	0
13 February	110	46	230	B3.7	6	1	0	9	1	0	0	0
14 February	108	52	280	B4.1	7	1	0	6	1	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
	08 February	2.2e+05	1.3e+04	3.1e+03	5.9e+05	
09 February	3.2e+05	1.3e+04	3.0e+03	3.4e+06		
10 February	8.5e+04	1.3e+04	3.1e+03	5.9e+06		
11 February	8.6e+04	1.3e+04	3.2e+03	1.5e+06		
12 February	1.2e+05	1.3e+04	3.1e+03	3.6e+05		
13 February	9.8e+04	1.3e+04	2.8e+03	2.1e+05		
14 February	1.6e+05	1.3e+04	3.1e+03	1.2e+06		

### *Daily Geomagnetic Data*

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	08 February	11	4-3-4-2-2-1-1-0	21	5-4-5-4-2-2-1-0	17
09 February	8	2-1-1-3-3-2-1-2	19	1-0-2-6-5-2-1-1	10	2-1-2-4-3-1-1-3
10 February	4	2-1-2-1-1-1-1-1	6	1-1-2-4-2-0-0-0	5	3-2-2-1-1-0-1-1
11 February	8	2-1-2-2-2-2-2-3	16	1-2-3-4-5-3-1-2	11	3-2-2-2-2-2-2-4
12 February	11	4-2-2-3-2-2-2-2	19	3-2-2-5-5-3-2-1	13	4-3-2-4-3-2-2-2
13 February	7	2-3-2-2-2-2-1-1	10	1-2-3-5-1-0-0-1	7	2-3-3-2-1-1-1-1
14 February	6	2-2-2-2-2-2-1-1	16	1-1-4-4-4-4-3-0	12	3-3-3-2-2-3-2-1

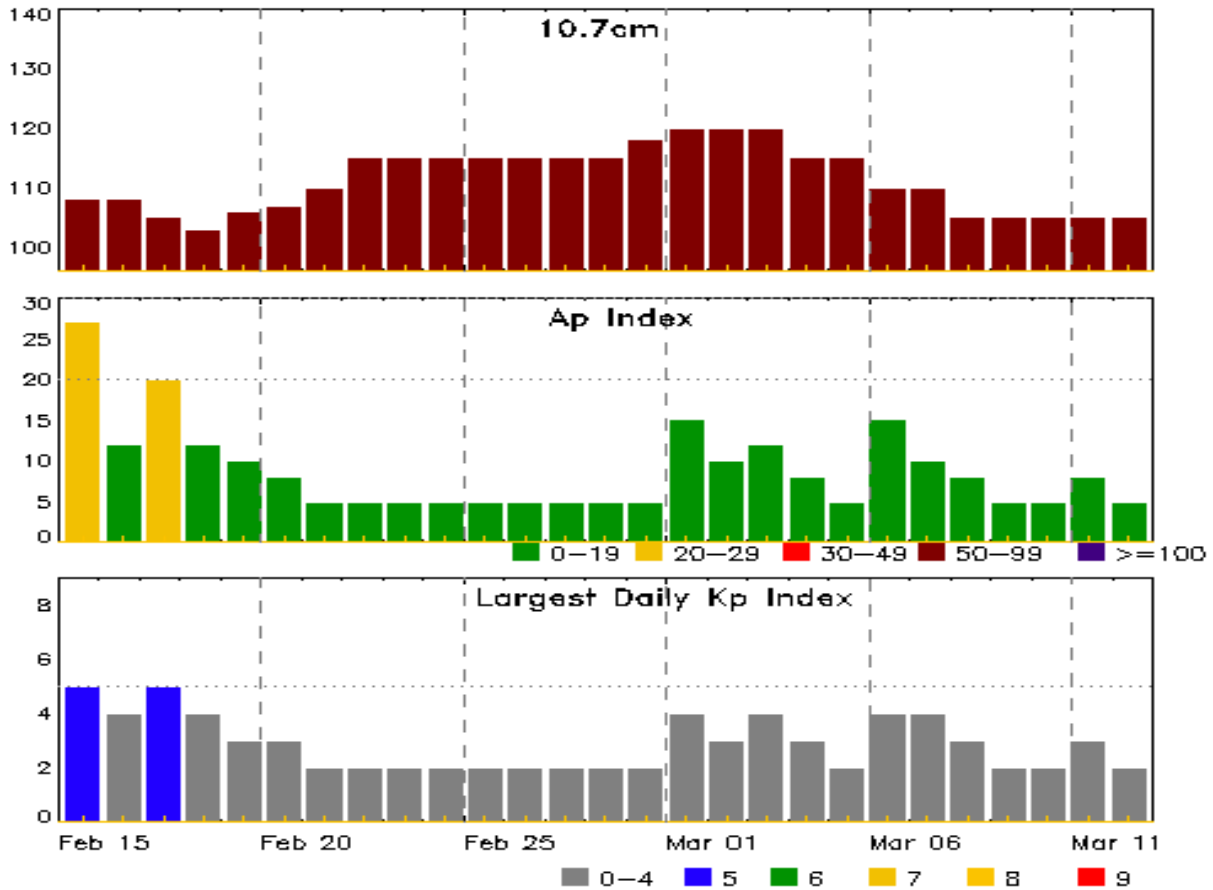


### *Alerts and Warnings Issued*

<b>Date &amp; Time of Issue UTC</b>	<b>Type of Alert or Warning</b>	<b>Date &amp; Time of Event UTC</b>
08 Feb 0115	WARNING: Geomagnetic K = 5	08/0114 - 0900
08 Feb 0158	ALERT: Geomagnetic K = 5	08/0157
08 Feb 0829	EXTENDED WARNING: Geomagnetic K = 4	07/1640 - 08/1800
08 Feb 0849	EXTENDED WARNING: Geomagnetic K = 5	08/0114 - 1500
09 Feb 1031	WARNING: Geomagnetic K = 4	09/1030 - 1500
09 Feb 1200	ALERT: Geomagnetic K = 4	09/1159
11 Feb 2114	ALERT: Type II Radio Emission	11/2035
11 Feb 2256	WARNING: Geomagnetic K = 4	11/2256 - 12/0400
11 Feb 2301	ALERT: Type IV Radio Emission	11/2228
12 Feb 0002	ALERT: Geomagnetic K = 4	12/0000
12 Feb 0357	EXTENDED WARNING: Geomagnetic K = 4	11/2256 - 12/1100
12 Feb 1056	EXTENDED WARNING: Geomagnetic K = 4	11/2256 - 12/1800
12 Feb 2105	WATCH: Geomagnetic Storm Category G1 predicted	
13 Feb 0637	WARNING: Geomagnetic K = 4	13/0636 - 1400



## 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
15 Feb	108	27	5	29 Feb	118	5	2
16	108	12	4	01 Mar	120	15	4
17	105	20	5	02	120	10	3
18	103	12	4	03	120	12	4
19	106	10	3	04	115	8	3
20	107	8	3	05	115	5	2
21	110	5	2	06	110	15	4
22	115	5	2	07	110	10	4
23	115	5	2	08	105	8	3
24	115	5	2	09	105	5	2
25	115	5	2	10	105	5	2
26	115	5	2	11	105	8	3
27	115	5	2	12	105	5	2
28	115	5	2				



### *Energetic Events*

Date	Time		Half Max	X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max		Class	Integ Flux	Imp/ Brtns	Location Lat CMD	Rgn #	Radio Flux 245 2695	Intensity II IV		
12 Feb	1036	1047	1053	M1.0	0.006				2497			
13 Feb	1516	1524	1526	M1.8	0.004	1B	N13W25		2497			
14 Feb	1918	1926	1929	M1.0	0.004	SF	N15W47		2497			

### *Flare List*

Date	Time			X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
	Begin	Max	End				
08 Feb	0344	0347	0350	B6.4			
08 Feb	0508	0513	0519		SF	S16W26	2494
08 Feb	0522	0529	0543	C1.6	SF	N14W08	2492
08 Feb	0849	0852	0854	B5.7			2497
08 Feb	1613	1618	1631	B7.8	SF	N15W14	2492
09 Feb	0026	0031	0039	B7.4			2492
09 Feb	0130	0131	0133		SF	S12W44	2494
09 Feb	0138	0139	0140		SF	S12W44	2494
09 Feb	0558	0601	0606	C1.0			
09 Feb	1158	1206	1221	B5.6			2492
09 Feb	1224	1228	1233	B6.7			2492
09 Feb	1744	1747	1749	B5.6			2492
09 Feb	1926	1939	1947	B9.1	SF	S11W55	2494
09 Feb	1955	1955	2002		SF	S10W56	2494
09 Feb	2151	2205	2208	B6.2			2498
09 Feb	2319	2328	2333		SF	N16E61	2498
10 Feb	0243	0250	0255	B9.1			2497
10 Feb	0750	0801	0808	B6.3			2497
10 Feb	1439	1442	1444	B4.0			
10 Feb	1512	1522	1534	C1.3	SF	N11E16	2497
10 Feb	2041	2048	2103	B5.9	SF	N08W04	2496
10 Feb	2229	2235	2243	B5.8	SF	N10W03	2496
11 Feb	0408	0413	0419	B4.7	SF	N11E01	2497
11 Feb	1622	1649	1704	C2.6	SF	N11E02	2497
11 Feb	2018	2103	2128	C8.9	1F	N11W07	2497
11 Feb	2228	2229	2238		SF	N12W08	2497
11 Feb	2354	2359	0002	C1.2			2492
12 Feb	0004	0005	0024		SF	N12W09	2497



## *Flare List*

Date	Time			X-ray Class	Imp/ Brtns	Optical		Rgn #
	Begin	Max	End			Location Lat CMD		
12 Feb	0048	0053	0100	C1.2	SF	N11W10		2497
12 Feb	0627	0636	0655	C2.1	SF	N12W65		2492
12 Feb	1036	1047	1053	M1.0				2497
12 Feb	1508	1509	1513		SF	N12W16		2497
12 Feb	1710	1721	1727	C6.8	SF	N12W17		2497
12 Feb	1715	1717	1808		SF	N08W11		2496
12 Feb	2105	2110	2120	B7.5				2497
12 Feb	2204	2215	2225	B7.7				2497
12 Feb	2234	2239	2243	C3.0				2497
13 Feb	0020	0026	0032	B8.9	SF	N11W21		2497
13 Feb	0059	0103	0106	B8.0				2497
13 Feb	0646	0650	0654	B6.6				2497
13 Feb	0825	0831	0834	C1.3	SF	N13W26		2497
13 Feb	1004	1009	1013	C2.8	SF	N13W27		2497
13 Feb	1058	1101	1106	B8.5				2497
13 Feb	1226	1227	1241		SF	N11W28		2497
13 Feb	1332	1343	1358	B6.9	SF	N11W29		2497
13 Feb	1516	1524	1526	M1.8	1B	N13W25		2497
13 Feb	1600	1600	1621		SF	N13W25		2497
13 Feb	1850	1855	1902	C1.6				2497
13 Feb	2045	2105	2112	C2.5	SF	N14W33		2497
13 Feb	2119	2121	2124		SF	N08W46		2496
13 Feb	2129	2134	2140	C1.1	SF	N14W33		2497
13 Feb	2157	2201	2206	B9.5				2497
13 Feb	2207	2213	2216	C2.1				
13 Feb	2341	2354	0002	B8.6				2497
14 Feb	0051	0058	0102	B9.6				2497
14 Feb	0118	0121	0126	C1.3				2500
14 Feb	0306	0317	0331	C1.1				
14 Feb	0324	0326	0332		SF	N11W36		2497
14 Feb	0416	0417	0419		SF	N12W37		2497
14 Feb	0427	0439	0452	C3.4	1F	N12W37		2497
14 Feb	0823	0823	0826		SF	N12W42		2497
14 Feb	0830	0833	0836	C1.0				2497
14 Feb	0952	1025	1030	C6.9				2497
14 Feb	1153	1157	1201	C1.4	SF	N11W41		2497
14 Feb	1918	1926	1929	M1.0	SF	N15W47		2497
14 Feb	2110	2118	2127	C2.4	SF	N15W47		2497



## Region Summary

Date	Location		Sunspot Characteristics				Flares											
	Lat CMD	Lon	Helio 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 2491</b>																		
31 Jan	N02E70	156	10	6	Bxo	2	B											
01 Feb	N01E57	156	60	9	Dao	4	B											
02 Feb	N02E44	156	50	8	Dao	3	B					1						
03 Feb	N03E30	157	30	8	Dro	6	B											
04 Feb	N02E16	157	20	8	Cro	6	B											
05 Feb	N02E03	156	10	2	Axx	2	A											
06 Feb	N01W10	157	plage															
07 Feb	N01W25	159	plage															
08 Feb	N01W40	161	plage															
09 Feb	N01W54	162	plage															
10 Feb	N01W68	162	plage															
11 Feb	N01W82	163	plage															
								0	0	0	1	0	0	0	0	0		

Crossed West Limb.  
Absolute heliographic longitude: 156

<b>Region 2492</b>																		
02 Feb	N15E60	140	10	7	Dao	3	B					2						
03 Feb	N15E49	138	60	8	Dsi	5	B	1				1						
04 Feb	N14E36	137	50	9	Dai	7	B											
05 Feb	N14E23	136	50	7	Dso	8	B											
06 Feb	N13E10	136	40	6	Dri	8	B					2						
07 Feb	N15W04	137	30	6	Dro	7	B											
08 Feb	N14W19	140	20	12	Cro	7	B	1				2						
09 Feb	N14W35	143	30	7	Dao	4	B											
10 Feb	N14W49	143	20	6	Cro	2	B											
11 Feb	N14W63	144	20	6	Hrx	2	A	1										
12 Feb	N14W78	146	10		Axx	1	A	1				1						
								4	0	0	8	0	0	0	0	0		

Crossed West Limb.  
Absolute heliographic longitude: 137



**Region Summary - continued**

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 2493</b>																							
03 Feb	S06W31	218	30	6	Dao	5	B	2				3											
04 Feb	S07W46	219	50	6	Dao	5	B																
05 Feb	S05W58	217	10	7	Dro	5	B																
06 Feb	S06W73	220	plage																				
07 Feb	S06W88	222	plage																				
								2	0	0		3	0	0	0	0	0	0					

Crossed West Limb.  
Absolute heliographic longitude: 218

<b>Region 2494</b>																							
04 Feb	S12E09	164	150	7	Dai	7	BGD	5				4											
05 Feb	S12W04	163	230	7	Dai	16	BG	2				1											
06 Feb	S11W17	163	270	8	Dai	9	B	3				4											
07 Feb	S12W29	162	270	8	Dki	9	BD																
08 Feb	S12W43	164	240	8	Dai	8	BG					1											
09 Feb	S12W57	165	120	8	Dao	6	B					4											
10 Feb	S12W70	164	70	8	Dso	5	B																
11 Feb	S12W84	165	40	7	Dso	3	B																
12 Feb	S14W96	164	10	1	Axx	1	A																
								10	0	0		14	0	0	0	0	0						

Crossed West Limb.  
Absolute heliographic longitude: 163

<b>Region 2495</b>																							
05 Feb	S07W46	205	10	4	Bxo	6	B																
06 Feb	S08W61	208	30	3	Cro	4	B																
07 Feb	S08W74	207	70	4	Dao	5	B					5	1										
08 Feb	S08W88	209	180	8	Dao	2	B																
								0	0	0		5	1	0	0	0	0						

Crossed West Limb.  
Absolute heliographic longitude: 205





### *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 2496</b>																		
05 Feb	N09E56	103	10		Axx	1	A	1										
06 Feb	N09E43	104	plage															
07 Feb	N08E34	98	20	5	Bxi	4	B	3				2						
08 Feb	N08E19	102	10	6	Bxo	5	B											
09 Feb	N08E05	103	10	4	Bxo	2	B											
10 Feb	N08W09	103	10	5	Bxo	2	B					2						
11 Feb	N08W23	104	plage															
12 Feb	N08W37	105	plage									1						
13 Feb	N08W51	106	plage									1						
14 Feb	N08W65	107	plage															
								4	0	0	6	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 103

<b>Region 2497</b>																		
06 Feb	N13E58	88	50	3	Dai	10	B					6						
07 Feb	N13E49	84	70	7	Dai	9	B											
08 Feb	N13E36	85	200	9	Dao	10	B											
09 Feb	N13E22	86	180	10	Dai	14	BG											
10 Feb	N13E08	86	240	12	Eac	22	BG	1				1						
11 Feb	N13W06	87	180	13	Eac	22	BGD	2				3	1					
12 Feb	N13W19	87	250	13	Eac	20	BGD	3	1			4						
13 Feb	N12W35	89	220	13	Eac	23	BGD	5	1			8	1					
14 Feb	N12W48	89	200	11	Eac	18	BGD	5	1			6	1					
								16	3	0	28	3	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 87

<b>Region 2498</b>																		
09 Feb	N19E58	50	10	2	Bxo	3	B					1						
10 Feb	N19E44	50	10	1	Axx	1	A											
11 Feb	N18E28	52	10	1	Axx	1	A											
12 Feb	N18E15	53	10	1	Axx	1	A											
13 Feb	N18E02	53	plage															
14 Feb	N18W12	54	plage															
								0	0	0	1	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 53



**Region Summary - continued**

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

**Region 2499**

12 Feb	N11E38	30	10	1	Axx	1	A										
13 Feb	N11E24	31	plage														
14 Feb	N11E11	31	plage														
									0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 31

**Region 2500**

13 Feb	S18W29	83	10	3	Bxo	3	B										
14 Feb	S18W42	83	20	3	Cro	3	B	1									
								1	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 83

**Region 2501**

14 Feb	N04E76	325	60	2	Hsx	1	A										
								0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 325

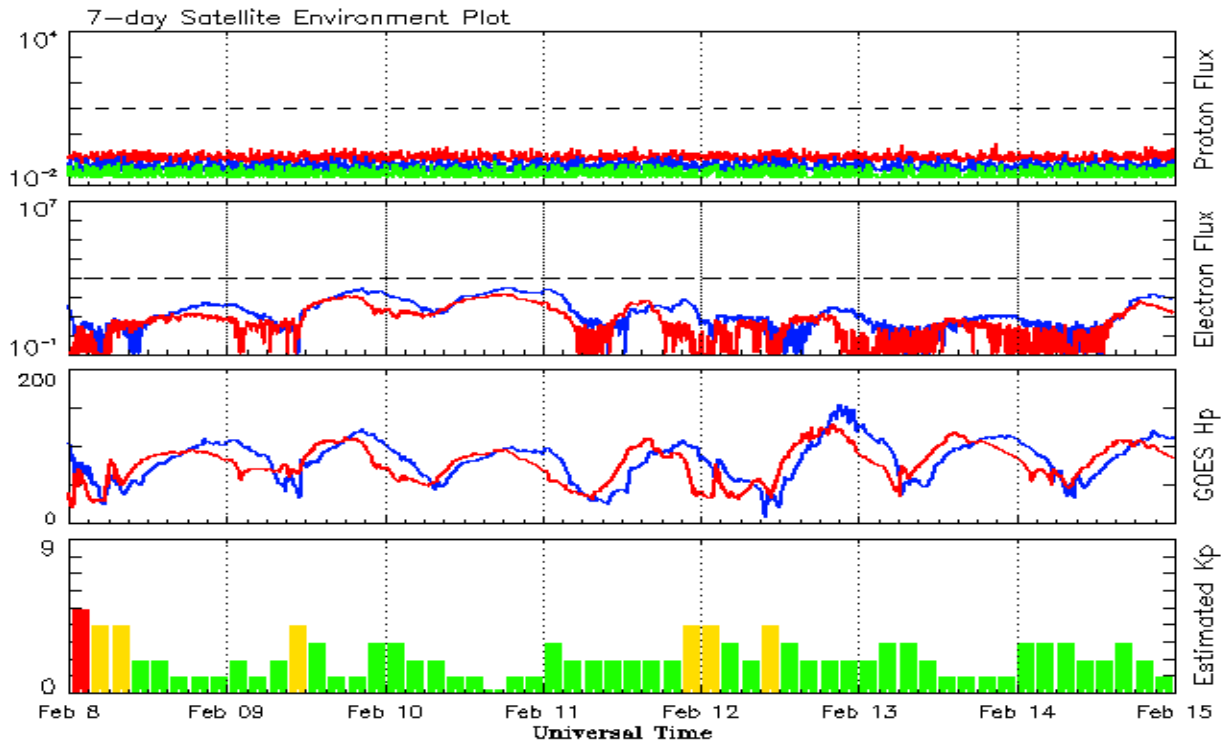


**Recent Solar Indices (preliminary)**  
**Observed monthly mean values**

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>										
February	174.6	102.3	0.59	119.5	119.5	78.3	170.3	138.6	12	6.9
March	141.1	91.9	0.65	123.2	123.2	80.8	149.9	140.8	6	7.2
April	130.5	67.5	0.65	124.8	124.8	69.8	144.3	143.5	9	7.5
May	116.8	67.5	0.64	122.3	122.3	69.0	130.0	144.7	7	7.9
June	107.7	61.7	0.66	121.4	121.4	68.5	122.2	145.5	7	8.4
July	113.6	60.1	0.64	120.4	120.4	67.6	137.3	145.2	5	8.8
August	106.2	64.1	0.70	115.1	115.1	65.0	124.7	142.8	9	8.9
September	127.4	78.0	0.69	107.4	107.4	61.1	146.1	140.1	11	9.3
October	92.0	54.0	0.66	101.7	101.7	58.4	153.7	138.4	10	9.9
November	101.8	62.2	0.69	97.9	97.9	56.8	155.3	137.4	10	10.1
December	120.0	67.7	0.65	95.2	95.2	55.3	158.7	137.0	12	10.5
<b>2015</b>										
January	101.2	55.8	0.66	92.1	92.1	53.6	141.7	135.8	10	11.0
February	70.6	40.0	0.63	88.3	88.3	51.7	128.8	133.8	10	11.5
March	61.7	32.7	0.62	84.2	84.2	49.3	126.0	131.2	17	12.0
April	72.5	45.2	0.75	80.5	80.5	47.3	129.2	127.3	12	12.4
May	83.0	53.3	0.71	77.5	77.5	45.6	120.1	123.3	9	12.7
June	77.3	39.9	0.53	73.1	73.1	43.2	123.2	119.5	14	13.0
July	68.4	39.5	0.58	68.2	68.2	40.9	107.0	116.0	10	13.1
August	61.6	38.6	0.63				106.2		16	
September	72.5	47.2	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	
December	54.1	34.6	0.64				112.8		15	
<b>2016</b>										
January	50.4	34.0	0.67				103.5		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 08 February 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.

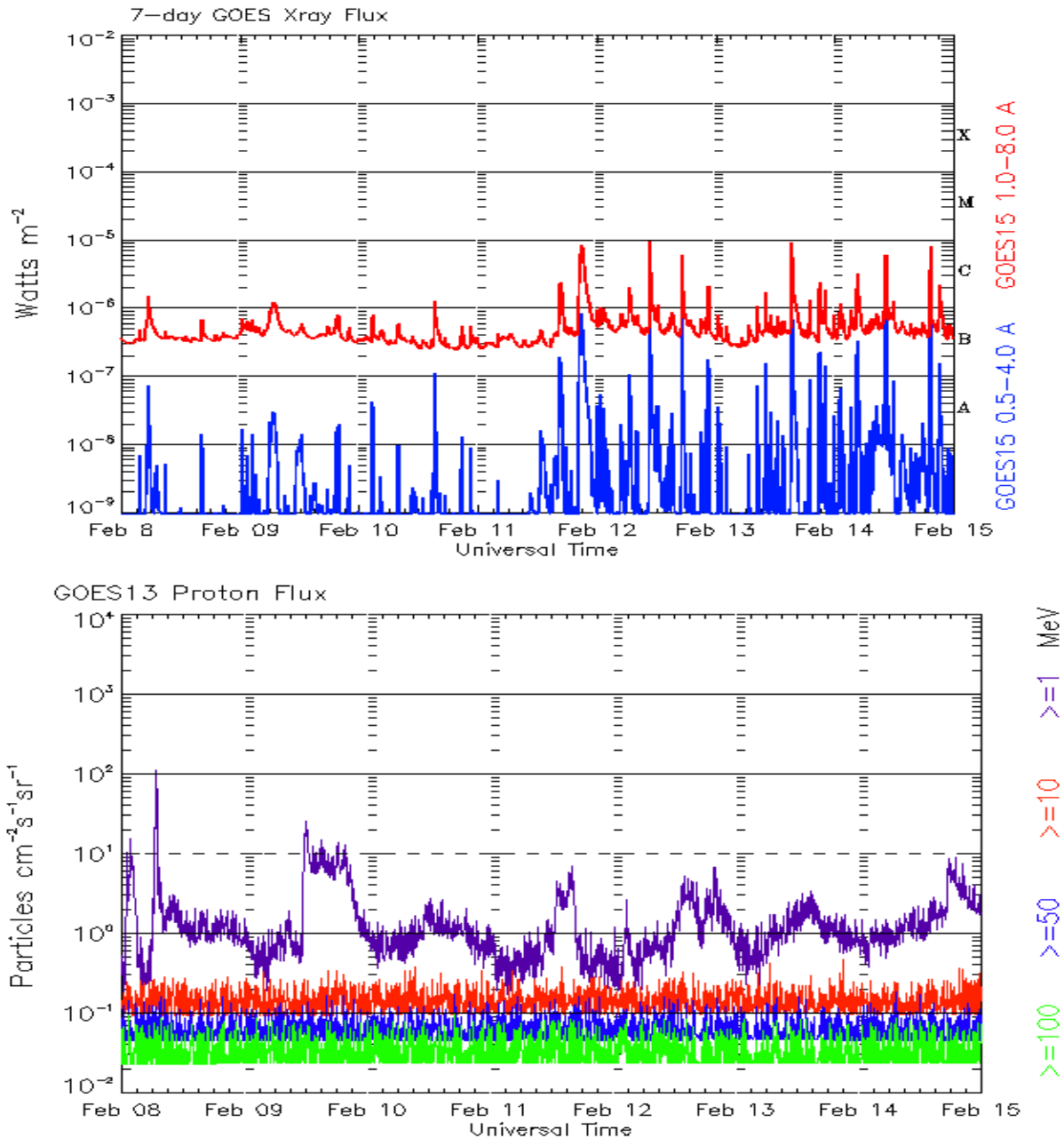
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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 08 February 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)***

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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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