

Solar activity was at very low to low levels during the period. The summary period began at low levels, when Region 1254 (S24, L=136, class/area Cso/110 on 20 July) produced the largest event of the period, a C1/Sf flare at 1028 UTC. On 19 July, solar activity decreased to very low levels and remained at these levels for the rest of the summary period. Even though numerous regions were numbered and tracked during the summary period, all regions either remained stable and quiet, producing low level B-class events, or diminished to spotless plage.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal to moderate levels from 18-19 July. High levels were observed for the remainder of the period, 20-24 July, in response to a coronal hole high speed stream (CH HSS).

Geomagnetic activity ranged during the period between quiet to minor storm levels, with a few isolated major storms occurring at high latitudes due to coronal hole high-speed stream effects. Early on 18 July, quiet to unsettled levels were observed due to a solar sector boundary crossing (SSBC), as the Earth moved from a positive to a negative polarity region of the IMF. On 19 July, measurements from the ACE spacecraft indicated the onset of another CH HSS while geomagnetic levels also increased to mostly active conditions at mid latitudes. On 20 July, quiet to active levels were again observed with an isolated major storm period occurring at high latitudes between 0900-1200Z. Conditions on 21 and 22 July were also observed at quiet to unsettled levels on both days. On 22 July, conditions included a major storm period observed at high latitudes. A return to quiet to unsettled levels was observed on 23-24 July, as effects of the CH HSS finally deminished.

### **Space Weather Outlook** **27 July - 22 August 2011**

Solar activity is expected to be at very low to low levels during the forecast period. However, there is a chance that new, rapidly emerging flux regions could increase activity to moderate levels at any time during the outlook period.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to start the period at moderate to normal levels on 27 - 30 July, before increasing to high flux levels on 31 July - 02 August, as the result of elevated solar winds from a CH HSS. Moderate to normal levels are expected from 03-06 August after solar winds subside. A return to moderate to high levels is expected 07-13 August and once again from 16- 22 August as the result of two solar wind speed increases from two more coronal holes.

Geomagnetic activity is expected to be at quiet levels on 25 July. Quiet to unsettled levels are expected from 26 - 27 July as another CH HSS becomes geoeffective. A return to mostly quiet conditions is expected on 28 July. Quiet to unsettled levels are forecast on 29-31 July as a



northern polar CH HSS extension moves into a geoeffective position. Afterwards, quiet levels are expected to prevail between 01 and 04 August. Conditions are expected to increase again, ranging from quiet to active levels 04-11 August as another recurrent CH HSS is expected. Mostly quiet conditions should return 12-14 August before the next CH HSS is expected 15-19 August, when unsettled to active conditions return. A brief retreat to mostly quiet levels is expected on 20 August before the period finally ending with mostly unsettled to active conditions as yet another recurrent CH HSS becoming geoeffective 21-22 August.



### *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
18 July	102	127	400	B2.4	1	0	0	3	0	0	0	0
19 July	100	96	660	B2.2	0	0	0	1	0	0	0	0
20 July	100	79	310	B2.1	0	0	0	2	0	0	0	0
21 July	96	56	290	B1.8	0	0	0	1	0	0	0	0
22 July	92	54	180	B1.6	0	0	0	0	0	0	0	0
23 July	88	41	160	B1.5	0	0	0	0	0	0	0	0
24 July	86	46	40	B1.4	0	0	0	0	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
	18 July	3.0e+05	1.3e+04	3.2e+03		1.7e+07
19 July	3.9e+05	1.2e+04	3.0e+03		8.2e+06	
20 July	5.6e+05	1.2e+04	2.9e+03		4.9e+07	
21 July	6.7e+05	1.2e+04	2.8e+03		1.7e+08	
22 July	7.8e+05	1.2e+04	3.0e+03		2.2e+08	
23 July	3.7e+05	1.2e+04	3.1e+03		4.0e+08	
24 July	3.4e+05	1.3e+04	3.3e+03		4.7e+08	

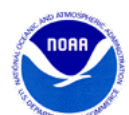
### *Daily Geomagnetic Data*

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	18 July	6	1-2-2-2-2-1-1-2	9	2-3-2-3-3-1-1-1	8
19 July	10	1-1-2-3-3-3-3-2	14	1-1-2-4-3-4-3-3	18	1-1-2-3-3-5-4-4
20 July	12	3-3-2-3-3-2-2-3	27	3-4-2-6-5-3-2-3	19	3-4-3-4-4-3-4-3
21 July	10	3-3-3-1-2-2-2-3	14	3-3-4-2-4-2-2-2	12	3-3-3-1-3-2-3-3
22 July	10	3-3-3-2-2-2-2-2	20	3-4-6-3-2-2-1-2	10	2-3-3-1-2-3-2-2
23 July	6	2-2-2-2-2-1-1-2	7	2-3-2-3-1-1-1-0	8	3-3-2-2-1-1-2-2
24 July	3	0-1-0-1-1-1-1-2	3	0-1-1-2-0-1-1-1	4	2-0-0-1-1-1-2-2

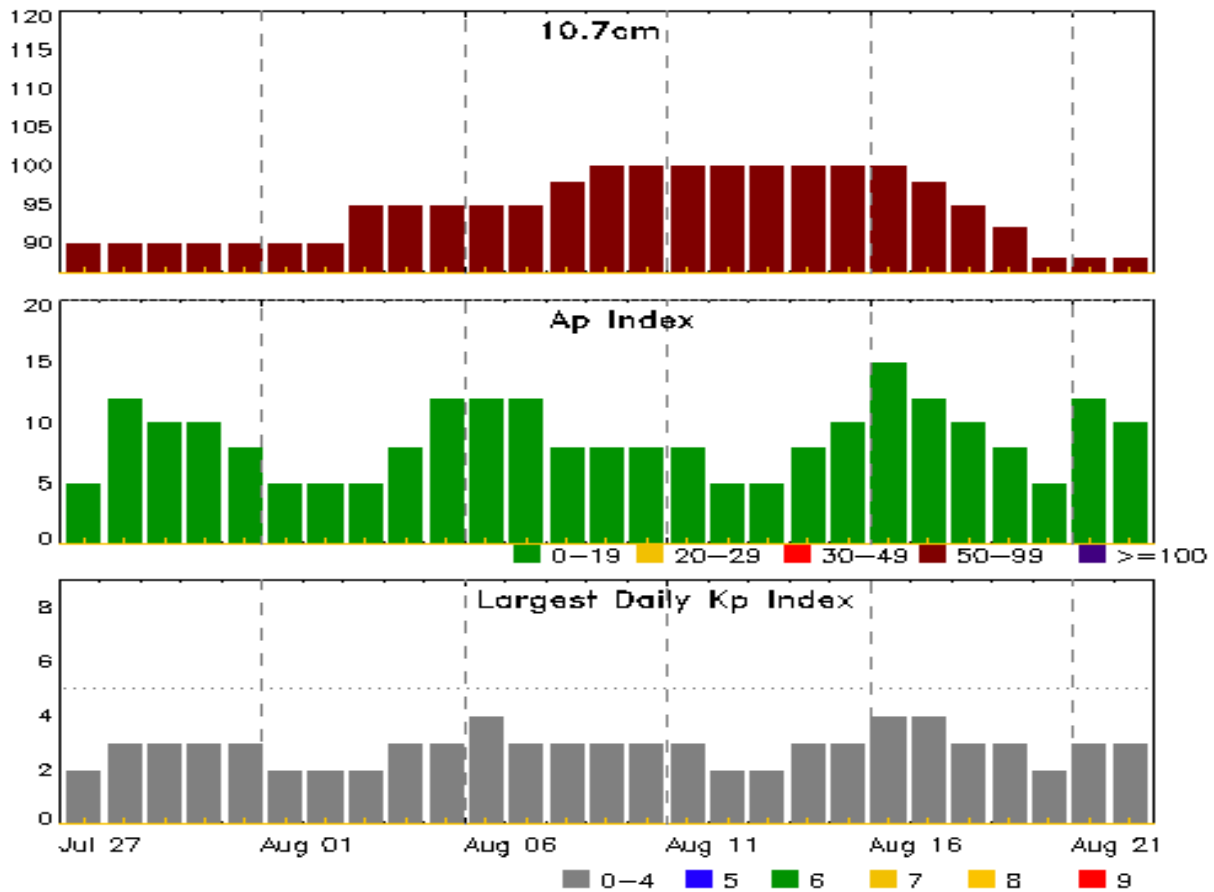


### *Alerts and Warnings Issued*

<b>Date &amp; Time of Issue UTC</b>	<b>Type of Alert or Warning</b>	<b>Date &amp; Time of Event UTC</b>
19 Jul 1636	WARNING: Geomagnetic K = 4	19/1636 - 2236
19 Jul 1650	ALERT: Geomagnetic K = 4	19/1649
19 Jul 1709	WARNING: Geomagnetic K = 5	19/1720 - 2320
19 Jul 2219	EXTENDED WARNING: Geomagnetic K = 4	19/1636 - 20/0900
20 Jul 0815	EXTENDED WARNING: Geomagnetic K = 4	19/1636 - 20/1500
20 Jul 1307	ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	20/1250
20 Jul 1449	EXTENDED WARNING: Geomagnetic K = 4	19/1636 - 20/2000
20 Jul 1937	EXTENDED WARNING: Geomagnetic K = 4	19/1636 - 21/0300
21 Jul 0319	WARNING: Geomagnetic K = 4	21/0320 - 1500
21 Jul 0803	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	20/1250
22 Jul 0531	WARNING: Geomagnetic K = 4	22/0545 - 1200
22 Jul 0702	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	20/1250
22 Jul 0802	ALERT: Geomagnetic K = 4	22/0801
23 Jul 0348	WARNING: Geomagnetic K = 4	23/0350 - 0900
23 Jul 0557	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	20/1250
24 Jul 0509	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	20/1250



## 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 Jul	90	5	2	10 Aug	100	8	3
28	90	12	3	11	100	8	3
29	90	10	3	12	100	5	2
30	90	10	3	13	100	5	2
31	90	8	3	14	100	8	3
01 Aug	90	5	2	15	100	10	3
02	90	5	2	16	100	15	4
03	95	5	2	17	98	12	4
04	95	8	3	18	95	10	3
05	95	12	3	19	92	8	3
06	95	12	4	20	88	5	2
07	95	12	3	21	88	12	3
08	98	8	3	22	88	10	3
09	100	8	3				



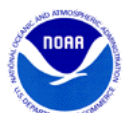
## *Energetic Events*

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

**No Events Observed**

## *Flare List*

Date	Time			X-ray Class	Imp/ Brtns	Optical Location Lat CMD	Rgn #
	Begin	Max	End				
18 Jul	0915	0916	0922		SF	N20W60	1257
18 Jul	1019	1028	1038	C1.0	SF	S23E19	1254
18 Jul	B1359	U1400	1406		SF	N26E09	1255
18 Jul	1512	1517	1524	B4.3			1254
18 Jul	2044	2114	2129	B4.4			
18 Jul	2331	2340	2358	B4.5			1255
19 Jul	0121	0121	0131		SF	S25E09	1254
19 Jul	1054	1101	1109	B5.8			1254
19 Jul	1124	1127	1130	B7.1			1254
19 Jul	2234	2330	0009	B5.2			1254
20 Jul	0315	0318	0323	B3.2			
20 Jul	0653	0653	0656		SF	N12W55	1258
20 Jul	0957	1005	1011	B7.2			1254
20 Jul	1545	1551	1558	B8.3	SF	S25W11	1254
20 Jul	1751	1756	1801	B5.1			1259
20 Jul	1959	2004	2006	B4.0			
20 Jul	2113	2117	2121	B4.0			
21 Jul	1500	1503	1509	B3.0	SF	S25W23	1254
22 Jul	0338	0343	0346	B3.1			1254
22 Jul	0415	0420	0426	B5.7			1254
22 Jul	0951	0955	0958	B5.0			
23 Jul	1303	1309	1317	B4.1			1260
23 Jul	1445	1449	1453	B5.4			1260
24 Jul	2149	2155	2203	B4.1			1260
24 Jul	2241	2250	2258	B7.4			1260



## 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

### Region 1248

08 Jul	N20E53	226	10	1	Axx	1	A										
09 Jul	N20E39	228	plage														
10 Jul	N20E25	229	plage														
11 Jul	N20E11	230	plage														
12 Jul	N20W03	231	plage														
13 Jul	N20W16	231	plage														
14 Jul	N20W30	231	plage														
15 Jul	N20W44	232	plage														
16 Jul	N20W58	233	plage														
17 Jul	N20W72	234	plage														
18 Jul	N20W86	234	plage														
									0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 231

### Region 1250

10 Jul	S25E48	206	30	4	Dai	8	B										
11 Jul	S27E32	208	100	6	Dso	4	B										
12 Jul	S27E18	210	140	6	Dso	4	BG										
13 Jul	S27E04	209	170	7	Dso	9	B										
14 Jul	S27W07	208	100	7	Dso	10	B										
15 Jul	S27W21	208	80	2	Cso	4	B										
16 Jul	S26W34	208	80	2	Hsx	1	A										
17 Jul	S26W48	209	70	2	Cso	4	B										
18 Jul	S27W61	209	50	2	Cso	2	B										
19 Jul	S26W74	209	100	3	Hsx	1	A										
20 Jul	S26W90	212	30	2	Hsx	1	A										
									0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 209



### *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><i>Region 1251</i></b>																	
11 Jul	N15E68	172	80	3	Hsx	1	A										
12 Jul	N16E57	170	100	1	Hsx	1	A										
13 Jul	N17E42	171	160	3	Hsx	1	A										
14 Jul	N17E30	170	100	2	Hsx	2	A										
15 Jul	N17E17	170	100	2	Hsx	1	A										
16 Jul	N16E04	170	70	2	Hsx	2	A										
17 Jul	N16W08	169	80	2	Hsx	3	A										
18 Jul	N16W21	169	80	2	Hsx	3	A										
19 Jul	N17W35	170	90	2	Hsx	1	A										
20 Jul	N17W49	170	70	2	Hsx	1	A										
21 Jul	N17W62	170	60	3	Hax	3	A										
22 Jul	N17W76	171	40	2	Hsx	1	A										
23 Jul	N17W88	168	60	1	Hax	1	A										
24 Jul	N14W98	166	10	1	Axx	1	A										
									0	0	0	0	0	0	0	0	0

Still on Disk.  
Absolute heliographic longitude: 170

<b><i>Region 1252</i></b>																	
13 Jul	N25E62	151	30	11	Cso	3	B										
14 Jul	N25E56	144	20	1	Hrx	2	A										
15 Jul	N25E45	142	10		Bxo	3	B										
16 Jul	N25E32	142	0	1	Axx	1	A										
17 Jul	N25E19	142	plage										1				
18 Jul	N25E06	142	plage														
19 Jul	N25W08	143	plage														
20 Jul	N25W22	144	plage														
21 Jul	N25W36	145	plage														
22 Jul	N25W50	145	plage														
23 Jul	N25W64	146	plage														
24 Jul	N25W78	147	plage														
									0	0	0	1	0	0	0	0	0

Still on Disk.  
Absolute heliographic longitude: 142





### *Region Summary - continued*

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><i>Region 1253</i></b>																		
13 Jul	N14W12	226	10	3	Bxo	3	B											
14 Jul	N14W26	227	plage															
15 Jul	N14W40	228	plage															
16 Jul	N14W54	229	plage															
17 Jul	N14W68	230	plage															
18 Jul	N14W82	230	plage															
								0	0	0	0	0	0	0	0	0	0	0

Crossed West Limb.  
 Absolute heliographic longitude: 226

<b><i>Region 1254</i></b>																		
14 Jul	S22E59	141	30	2	Cro	1	B											6
15 Jul	S22E49	138	50	8	Cao	5	B											
16 Jul	S22E36	138	50	8	Dso	7	B											1
17 Jul	S23E23	137	50	8	Cai	15	B											6
18 Jul	S22E11	136	60	7	Cai	15	B	1										1
19 Jul	S22W04	139	80	8	Dso	12	B											1
20 Jul	S22W17	138	110	9	Cso	14	B											1
21 Jul	S24W28	136	100	7	Cai	10	B											1
22 Jul	S24W42	137	80	7	Dso	10	B											
23 Jul	S23W54	134	60	7	Cao	7	B											
24 Jul	S23W67	134	10	4	Axx	2	A											
								1	0	0	17	0	0	0	0	0	0	0

Still on Disk.  
 Absolute heliographic longitude: 139



### *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

#### *Region 1255*

14 Jul	N17E45	156	10	2	Axx	3	A										
15 Jul	N18E33	154	0		Bxo	3	B										
16 Jul	N18E19	156	plage														
17 Jul	N18E07	153	10	3	Bxo	3	B										
18 Jul	N18W06	154	20	2	Cro	5	B				1						
19 Jul	N18W20	155	plage														
20 Jul	N18W34	156	plage														
21 Jul	N18W48	157	plage														
22 Jul	N18W62	157	plage														
23 Jul	N18W76	158	plage														
24 Jul	N18W90	159	plage														
										0	0	0	1	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 154

#### *Region 1256*

15 Jul	N09E34	153	20	3	Dro	3	B										
16 Jul	N08E21	153	20	4	Cro	2	B										
17 Jul	N09E07	154	20	4	Dro	4	B										
18 Jul	N09W06	154	20	4	Dro	4	B										
19 Jul	N10W21	155	10	4	Bxo	2	B										
20 Jul	N10W35	157	plage														
21 Jul	N10W49	158	plage														
22 Jul	N10W63	158	plage														
23 Jul	N10W77	159	plage														
										0	0	0	0	0	0	0	0

Died on Disk.

Absolute heliographic longitude: 154

#### *Region 1257*

17 Jul	N19W56	217	50	4	Dai	12	B				19						
18 Jul	N20W69	217	120	4	Dsi	12	B				1						
19 Jul	N20W83	218	240	10	Dso	3	B										
										0	0	0	20	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 217



### *Region Summary - continued*

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

#### *Region 1258*

18 Jul	N11W37	185	20	3	Cro	5	B										
19 Jul	N12W51	186	40	5	Cso	4	B										
20 Jul	N12W65	187	20	1	Hrx	1	A				1						
21 Jul	N12W79	188	plage														
								0	0	0	1	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 185

#### *Region 1259*

18 Jul	N26E69	78	30	3	Dao	1	B										
19 Jul	N25E56	79	100	8	Cso	3	B										
20 Jul	N25E42	79	80	6	Cso	12	B										
21 Jul	N25E32	76	130	5	Dsi	13	B										
22 Jul	N25E18	77	60	5	Dso	13	B										
23 Jul	N25E02	80	40	3	Cao	3	B										
24 Jul	N25W10	79	10	2	Bxo	3	B										
								0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 80

#### *Region 1260*

24 Jul	N20E71	358	10	1	Axx		A										
								0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 358

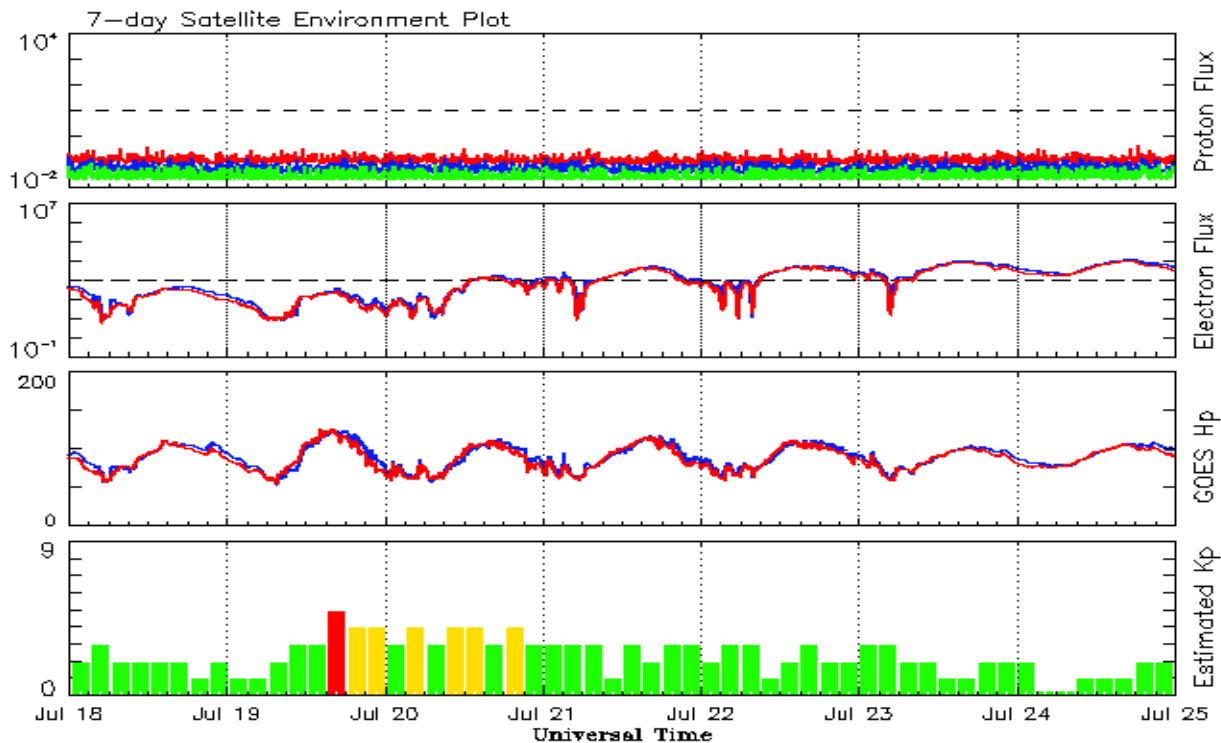


**Recent Solar Indices (preliminary)**  
**Observed monthly mean values**

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>2009</b>									
July	5.0	3.2	0.70	5.8	3.6	68.2	71.0	4	3.9
August	0.3	0.0	0.00	7.7	4.8	67.4	72.1	5	3.8
September	6.6	4.3	0.64	9.9	6.2	70.5	73.3	4	3.8
October	7.0	4.8	0.66	11.3	7.1	72.3	74.1	3	4.1
November	7.7	4.1	0.55	12.4	7.6	73.6	74.5	3	4.5
December	15.7	10.8	0.68	13.6	8.3	76.8	74.9	2	4.8
<b>2010</b>									
January	21.3	13.2	0.62	14.8	9.3	81.1	75.5	3	5.0
February	31.0	18.8	0.60	16.7	10.6	84.7	76.5	5	5.1
March	24.7	15.4	0.62	19.1	12.3	83.3	77.5	5	5.3
April	11.2	8.0	0.71	21.4	14.0	75.9	78.3	10	5.5
May	19.9	8.7	0.44	23.8	15.5	73.8	79.0	8	5.7
June	17.9	13.6	0.75	25.2	16.4	72.6	79.7	7	5.8
July	23.1	16.1	0.70	25.9	16.7	79.9	80.1	5	6.0
August	28.2	19.6	0.70	27.3	17.4	79.7	80.7	8	6.2
September	35.6	25.2	0.71	30.6	19.6	81.1	82.4	5	6.3
October	35.0	23.5	0.67	35.9	23.2	81.6	85.3	6	6.4
November	36.1	21.5	0.60	40.5	26.5	82.5	87.7	5	6.4
December	22.0	14.4	0.66	43.8	28.8	84.3	89.6	4	6.5
<b>2011</b>									
January	32.1	18.8	0.59			83.7		6	
February	53.2	29.6	0.55			94.5		6	
March	81.0	55.8	0.69			115.3		7	
April	81.7	54.4	0.67			112.6		9	
May	61.4	41.6	0.68			95.9		9	
June	55.5	37.0	0.67			95.8		8	

**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 18 July 2011*

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.

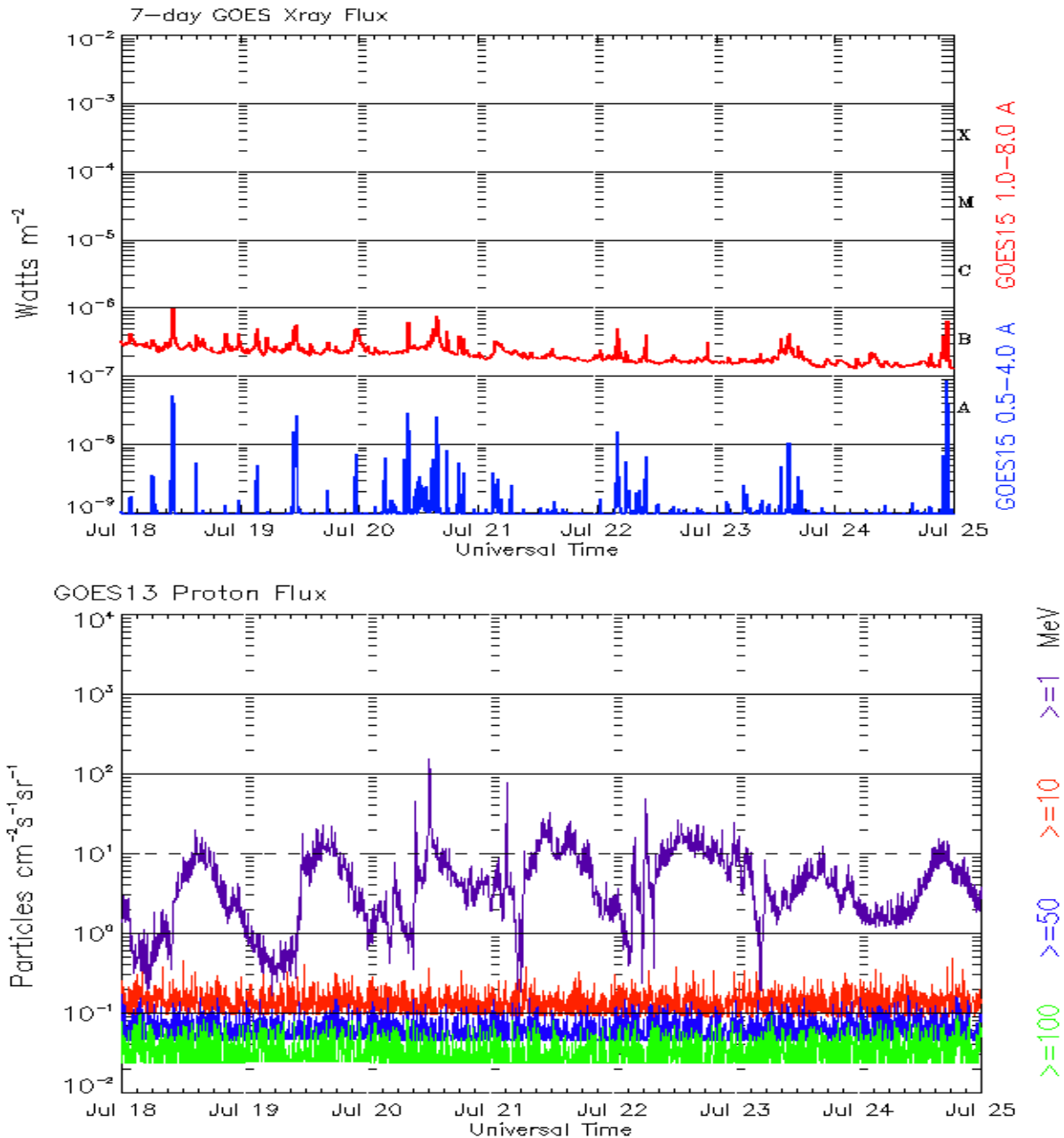
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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.

Kp plot contains the estimated planetary 3-hour K-index (derived by the Air Force Weather Agency) in real time from magnetometers at Meanook, Canada; Sitka, AK; Glenlea, Canada; St. Johns, Canada; Ottawa, Canada; Newport, WA; Fredericksburg, VA; Boulder, CO; Fresno, CA and Hartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC), British Geological Survey (BGS) and the US Geological Survey. These may differ from the final Kp values derived from a more extensive network of magnetometers.

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 18 July 2011*

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 Tuesday 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

