

Solar activity ranged from very low to moderate levels. Region 1176 (S16, L=199, class/area Fki/420 on 26 March) rotated onto the visible disk on 21 March, and produced a long duration C4 flare. Low levels of activity continued through the 22nd. Activity increased to moderate levels from 23-25 March as Region 1176 produced one M1 flare each day (23/0217Z, 24/1207Z, 25/2322Z). Partial halo CMEs associated with the M1 flares on the 24th and 25th were observed. The first had an estimated plane-of-sky speed of 421 km/s; the second was accompanied by Type II (673 km/s), Type IV, and 10.7 cm (170 sfu) radio emissions. A fast (approx. 850 km/s), asymmetric, partial halo CME was observed on 26 March was attributed to Region 1180 (N25, L=162, class/area Hsx/070 on 26 March), but was not expected to be potentially geoeffective. Only the CME from the 24th was expected to have geoeffective potential. Of the four remaining active regions, Region 1178 (S15, L=172, class/area Dai/130) was the largest.

The greater than 10 MeV proton flux at geosynchronous orbit rose above 10 pfu on 21 March at 1950Z and reached a maximum of 14 pfu on 22 March at 0130Z and ended that day at 0335Z. The most likely source of the event was a flare and back-sided CME.

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

The geomagnetic field was quiet for the majority of the period, except for a few instances of unsettled conditions on 24 March due to Coronal Hole (CH) high speed stream (HSS) effects.

Space Weather Outlook **30 March - 25 April 2011**

Solar activity is forecast to be low for the period with C-class flares expected and a chance for M-class flares exists based on the size and magnetic complexity of Regions 1176 and 1183 (N15, L= 136, class/area Eai/250 on 28 March). Region 1176 is expected to remain on the disk through 05 April and Region 1183 will rotate off the west limb on 09 April, if it does not decay prior. Old Region 1169 which is anticipated to return on 31 March produced an M4.2/1N flare during the last rotation. Imagery from STEREO-B spacecraft as well as brightening on the east limb on GOES 15 SXI and NASA SDO AIA 193 suggest that the region may remain prominent this rotation as well.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach high levels on 01-02 April.

Geomagnetic activity is expected to range from quiet to unsettled levels. Unsettled levels are expected 30 - 31 March, 07 - 09 April, and 18 - 19 April, with a slight chance for an isolated active to minor storm period at high latitudes due to anticipated recurrent coronal holes. Predominantly quiet levels are expected for the remainder of the period.



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 March	101	34	320	B3.8	3	0	0	0	0	0	0	0
22 March	100	31	470	B4.5	4	0	0	2	0	0	0	0
23 March	105	46	580	B3.3	1	1	0	1	0	0	0	0
24 March	108	73	400	B3.2	4	1	0	3	2	0	0	0
25 March	113	104	590	B4.0	3	1	0	2	0	0	0	0
26 March	115	104	670	B4.3	1	0	0	1	0	0	0	0
27 March	117	132	710	B3.4	3	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
	21 March	1.6e+06	4.4e+05	8.4e+03		8.6e+06
22 March	5.0e+06	3.5e+05	4.4e+03		4.1e+06	
23 March	4.9e+05	3.1e+04	3.3e+03		4.5e+06	
24 March	3.4e+05	1.7e+04	3.2e+03		6.0e+06	
25 March	3.0e+05	1.4e+04	3.2e+03		6.9e+06	
26 March	1.7e+05	1.3e+04	3.0e+03		6.7e+06	
27 March	2.2e+05	1.4e+04	3.3e+03		7.8e+06	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	21 March	4	2-0-1-1-1-1-1-2	2	1-0-1-1-0-0-1-2	4
22 March	5	2-3-1-1-2-0-1-0	2	3-2-0-2-0-0-0-1	6	3-3-1-1-2-1-0-1
23 March	9	3-2-3-2-2-2-2-2	12	2-1-3-3-3-4-2-1	10	3-2-3-2-2-3-2-2
24 March	3	0-0-1-1-2-1-1-1	2	1-0-1-1-1-0-1-0	4	1-0-1-1-2-1-1-1
25 March	2	0-0-0-1-2-1-0-1	3	0-0-0-1-3-1-1-0	3	0-0-0-1-2-1-1-1
26 March	1	0-1-0-0-1-0-0-0	0	0-0-0-0-0-0-0-0	1	-1--1-0-0-0-0-0-1
27 March	2	0-0-0-0-1-1-1-1	1	0-0-0-0-0-0-1-1	2	0-0-0-0-1-1-1-1

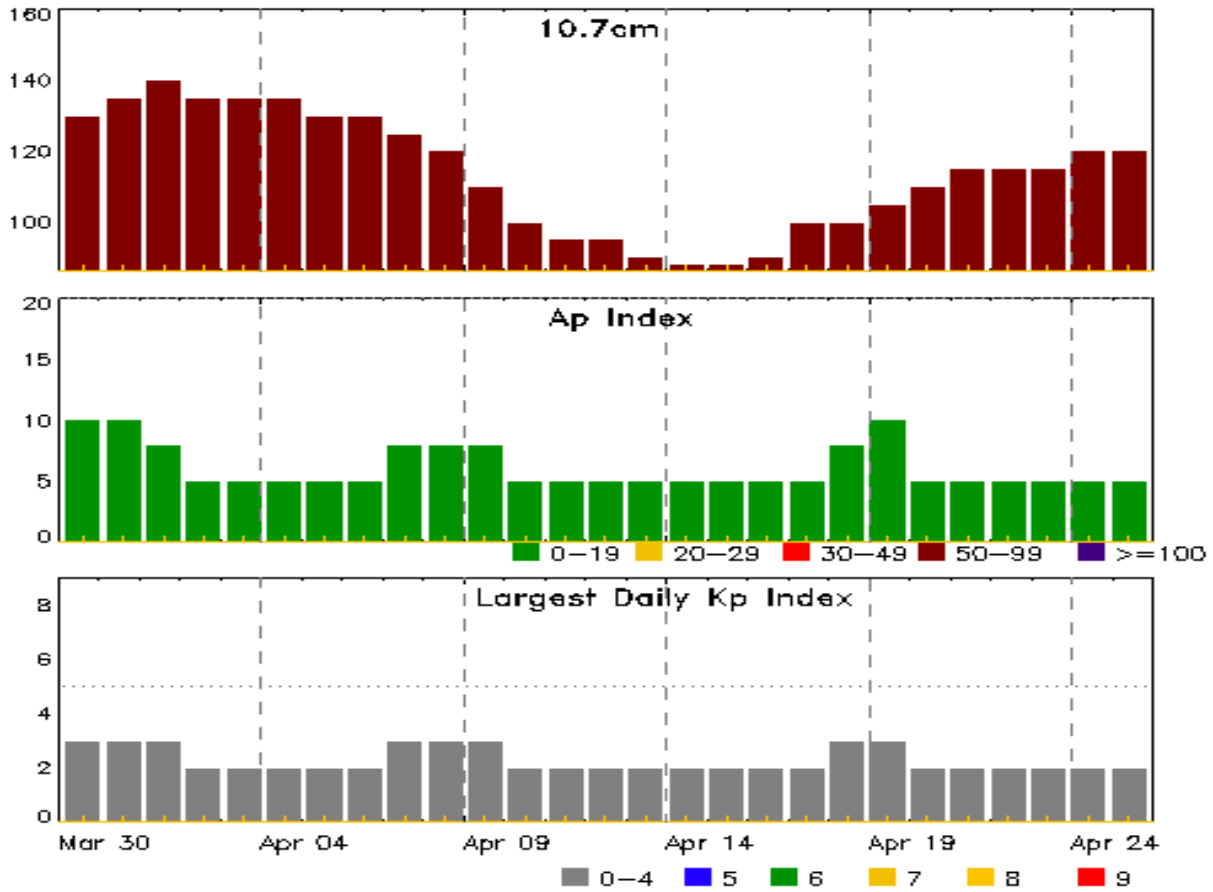


Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
21 Mar 0801	WARNING: Proton 10MeV Integral Flux > 10pfu	21/0830 - 22/0830
21 Mar 2006	ALERT: Proton Event 10MeV Integral Flux >= 10pfu	21/1950
22 Mar 1157	SUMMARY: Proton Event 10MeV Integral Flux >= 10pfu	21/1950 - 22/0335
22 Mar 1245	CANCELLATION: Proton Event 10MeV Integral Flux >= 10pfu	
22 Mar 1254	SUMMARY: Proton Event 10MeV Integral Flux >= 10pfu	21/1950 - 22/0335
23 Mar 0722	WARNING: Geomagnetic K = 4	23/0720 - 1200
23 Mar 0724	ALERT: Geomagnetic K = 4	23/0723
25 Mar 2343	ALERT: Type IV Radio Emission	25/2326
25 Mar 2343	ALERT: Type II Radio Emission	25/2314
25 Mar 2345	SUMMARY: 10cm Radio Burst	25/2314 - 2316
26 Mar 0137	ALERT: Type IV Radio Emission	26/0000
27 Mar 0206	ALERT: Type II Radio Emission	27/0026
27 Mar 0548	ALERT: Type II Radio Emission	27/0511
27 Mar 2013	SUMMARY: 10cm Radio Burst	27/1701 - 1701



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
30 Mar	130	10	3	13 Apr	90	5	2
31	135	10	3	14	88	5	2
01 Apr	140	8	3	15	88	5	2
02	135	5	2	16	90	5	2
03	135	5	2	17	100	5	2
04	135	5	2	18	100	8	3
05	130	5	2	19	105	10	3
06	130	5	2	20	110	5	2
07	125	8	3	21	115	5	2
08	120	8	3	22	115	5	2
09	110	8	3	23	115	5	2
10	100	5	2	24	120	5	2
11	95	5	2	25	120	5	2
12	95	5	2				



Energetic Events

Date	Time			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	Half	Class	Integ Flux	Imp/ Brtns	Location	Rgn #	Radio Flux		Intensity	
			Max						245	2695	II	IV
23 Mar	0203	0217	0224	M1.4	0.009			1176	970			
24 Mar	1201	1207	1211	M1.0	0.003	1F	S16E43	1176	910			
25 Mar	2308	2322	2330	M1.0	0.008	SF	N17W72	1153	870	170	1	1

Flare List

Date	Time			X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
	Begin	Max	End				
21 Mar	1145	1147	1150	C2.6			
21 Mar	1152	1157	1203	C1.0			
21 Mar	1531	1719	1830	C4.2			
22 Mar	0320	0325	0329	C1.9			
22 Mar	0331	0337	0340	C3.9			1176
22 Mar	1542	1550	1602	C2.5			
22 Mar	2119	2212	2234	C1.6	SF	S18E70	1176
22 Mar	2305	2306	2310		SF	S18E70	1176
23 Mar	0203	0217	0224	M1.4			1176
23 Mar	1547	1550	1553	B5.7			1176
23 Mar	1706	1710	1713	C1.1	SF	S20E69	1176
24 Mar	0052	0056	0058	B5.7			1176
24 Mar	0252	0255	0258	B6.2			1176
24 Mar	1108	1120	1125	B5.8			1176
24 Mar	1201	1207	1211	M1.0	1F	S16E43	1176
24 Mar	1531	1537	1542	C1.6	SF	S15E41	1176
24 Mar	1655	1658	1700	B6.6	1F	S20E51	1176
24 Mar	1701	1706	1710	C9.1			1176
24 Mar	1715	1719	1721	B9.6			1176
24 Mar	1801	1812	1820		SF	S13E41	1176
24 Mar	1823	1827	1829	B8.4			1176
24 Mar	1851	1857	1914	C1.3	SF	S19E49	1176
24 Mar	2020	2024	2027	B6.8			1176
24 Mar	2053	2057	2100	C1.4			1176
25 Mar	0038	0042	0045	C1.0			1176
25 Mar	0057	0101	0104	C1.0			1176
25 Mar	0254	0259	0301	B9.5			1176
25 Mar	0608	0609	0624		SF	S14E34	1176
25 Mar	1446	1447	1451		SF	S16E35	1176



Flare List

Date	Time			Optical			Rgn #
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	
25 Mar	1647	1713	1722	C1.0			1176
25 Mar	2308	2322	2330	M1.0			1176
26 Mar	0055	0058	0102	C1.0			1176
26 Mar	1442	1445	1447	B6.6	SF	S17E23	1176
27 Mar	0006	0014	0020	C3.1	SF	S12E12	1176
27 Mar	1253	1257	1259	B7.6			1176
27 Mar	1357	1400	1403	B5.9			1176
27 Mar	1554	1557	1559	B7.4			
27 Mar	1658	1703	1705	C1.1			
27 Mar	1809	1813	1818	B7.1			
27 Mar	2318	2326	2334	C1.0	SF	S30E48	1181



Region Summary

Date	Location		Sunspot Characteristics					Flares															
	Lat CMD	Lon	Helio 10 ⁶ hemi.	Area	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical											
									C	M	X	S	1	2	3	4							
Region 1172																							
11 Mar	N11E72	340	10	3	Bxo	2	B																
12 Mar	N12E58	345	20	4	Bxo	2	B	1				1											
13 Mar	N12E44	342	20	7	Bxo	3	B																
14 Mar	N14E30	343	10	8	Bxo	4	B	1				2											
15 Mar	N10E17	345	10	9	Bxo	2	B																
16 Mar	N11E02	345	0	1	Axx	1	A																
17 Mar	N11W12	346	plage																				
18 Mar	N13W25	346	plage																				
19 Mar	N13W38	346	plage									1											
20 Mar	N13W52	347	plage																				
21 Mar	N13W66	348	plage																				
22 Mar	N13W80	348	plage																				
								2	0	0	4	0	0	0	0	0							

Crossed West Limb.
Absolute heliographic longitude: 345

Region 1173																							
16 Mar	S28E39	308	40	6	Cao	10	B																
17 Mar	S29E26	308	60	8	Cao	11	B																
18 Mar	S29E14	307	30	7	Cro	9	B																
19 Mar	S30E01	307	20	6	Bxo	6	B																
20 Mar	S29W13	307	20	4	Bxo	5	B																
21 Mar	S29W27	308	plage																				
22 Mar	S29W40	308	plage																				
23 Mar	S29W53	308	plage																				
24 Mar	S29W66	308	plage																				
25 Mar	S29W80	308	plage																				
								0	0	0	0	0	0	0	0	0	0						

Crossed West Limb.
Absolute heliographic longitude: 307

Region 1174																							
17 Mar	N22W36	10	10	3	Bxo	2	B																
18 Mar	N22W50	11	plage																				
19 Mar	N23W63	11	0	1	Axx	1	A																
20 Mar	N23W76	11	0	1	Axx	1	A																
21 Mar	N23W89	11	plage																				
								0	0	0	0	0	0	0	0	0	0						

Crossed West Limb.
Absolute heliographic longitude: 10



Region Summary - continued

Date	Location		Sunspot Characteristics				Flares																
	Lat CMD	Lon	Helio 10 ⁻⁶ hemi.	Area	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical											
									C	M	X	S	1	2	3	4							
Region 1175																							
18 Mar	N13W09	330	20	5	Cro	6	B																
19 Mar	N14W22	330	60	6	Cso	11	B																
20 Mar	N14W36	330	130	8	Csi	11	B																
21 Mar	N12W50	331	140	7	Dso	13	B																
22 Mar	N11W65	333	130	9	Dso	8	B																
23 Mar	N11W76	331	80	8	Cso	3	B																
24 Mar	N11W89	331	plage																				
									0	0	0	0	0	0	0	0	0	0	0	0	0		

Crossed West Limb.
Absolute heliographic longitude: 330

Region 1176																							
21 Mar	S13E81	200	180	2	Hsx	1	A																
22 Mar	S14E69	198	340	10	Dho	3	B	2				2											
23 Mar	S15E58	196	490	11	Eko	12	BG	1	1			1											
24 Mar	S16E44	198	380	15	Eki	25	BG	4	1			3	2										
25 Mar	S16E30	198	440	13	Ehi	28	BG	3	1			2											
26 Mar	S16E16	199	420	16	Fki	28	BG	1				1											
27 Mar	S15E02	200	400	15	Eki	27	BG	1				1											
								12	3	0	10	2	0	0	0	0	0	0	0	0	0		

Still on Disk.
Absolute heliographic longitude: 200

Region 1177																							
23 Mar	N21E51	204	10	1	Axx	1	A																
24 Mar	N21E37	205	10	1	Bxo	3	B																
25 Mar	N21E24	204	40	4	Cao	6	B																
26 Mar	N20E11	204	30	4	Cro	5	B																
27 Mar	N19W02	204	30	4	Cro	5	B																
								0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Still on Disk.
Absolute heliographic longitude: 204



Region Summary - continued

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 1178

24 Mar	S13E68	174	0	1	Axx	1	A										
25 Mar	S15E55	173	50	4	Cao	4	B										
26 Mar	S15E43	172	130	6	Dai	7	B										
27 Mar	S15E32	170	60	5	Dao	8	B										
								0	0	0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 170

Region 1179

24 Mar	N09W32	274	10	2	Bxo	4	B										
25 Mar	N09W46	274	20	4	Bxo	4	B										
26 Mar	N08W61	276	10	2	Bxo	2	B										
27 Mar	N09W74	276	0	1	Axx	1	A										
								0	0	0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 274

Region 1180

25 Mar	N26E66	162	30	2	Hsx	1	A										
26 Mar	N25E53	162	70	2	Hsx	1	A										
27 Mar	N24E40	162	50	2	Hsx	1	A										
								0	0	0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 162

Region 1181

25 Mar	S25E69	159	10	2	Hsx	1	A										
26 Mar	S25E55	159	10	1	Axx	1	A										
27 Mar	S26E45	157	20	2	Hsx	1	A	1			1						
								1	0	0	1	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 157

Region 1182

27 Mar	N13E01	201	0	1	Axx	1	A										
								0	0	0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 201



Region Summary - continued

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	
<i>Region 1183</i>																	
27 Mar	N15E62		140	150	13	Eai	8	BG	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 140

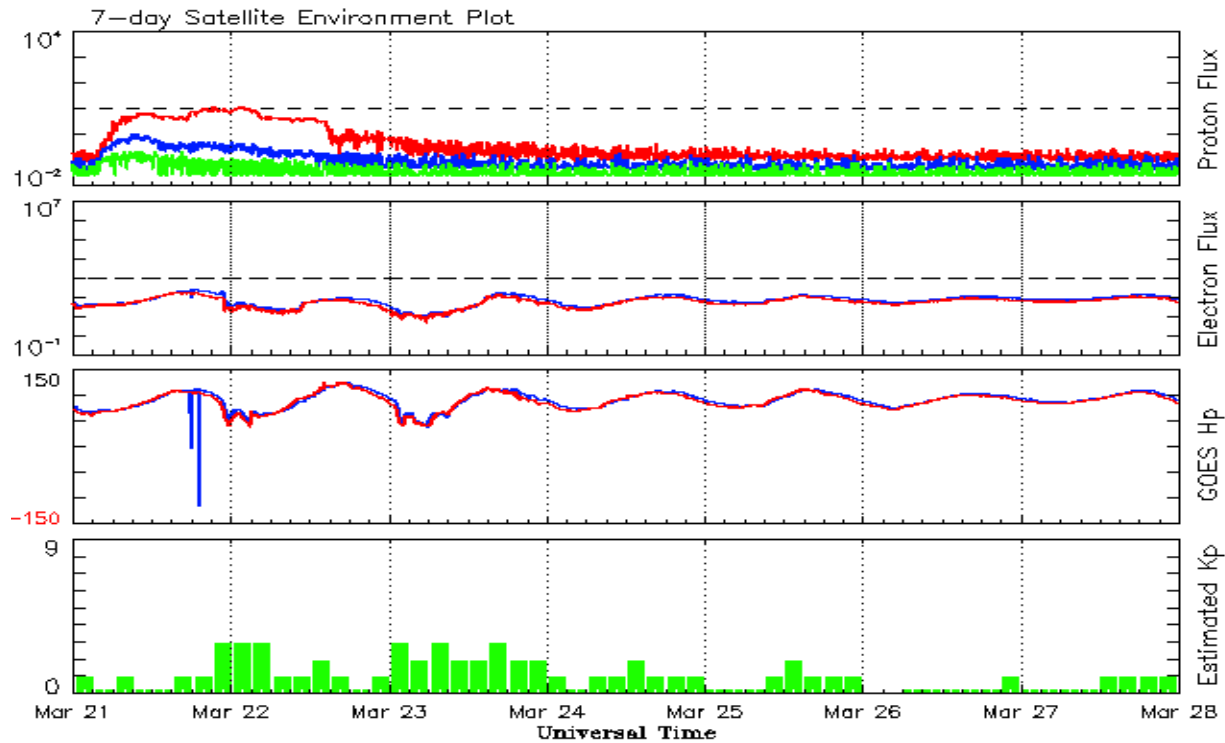


Recent Solar Indices (preliminary)
Observed monthly mean values

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
2009									
March	0.7	0.7	1.00	3.4	2.0	69.2	69.0	5	4.6
April	1.2	0.8	1.00	3.7	2.2	69.7	69.3	4	4.3
May	3.9	2.9	0.74	3.8	2.3	70.5	69.7	4	4.1
June	6.6	2.9	0.39	4.4	2.7	68.6	70.2	4	4.0
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
2010									
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	16.8	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			81.1		5	
October	35.0	23.5	0.67			81.6		6	
November	36.1	21.6	0.60			82.5		5	
December	22.0	14.5	0.66			84.3		4	
2011									
January	32.1	19.0	0.59			83.7		6	
February	53.2	29.4	0.55			94.5		6	

Note: Values are final except for the most recent 6 months which are considered preliminary. Cycle 23 started in May 1996 with an RI=8.0. Cycle 23 maximum was April 2000 with an RI=120.8. Solar minimum for Cycle 23 was December 2008.





*Weekly Geosynchronous Satellite Environment Summary
Week Beginning 21 March 2011*

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.

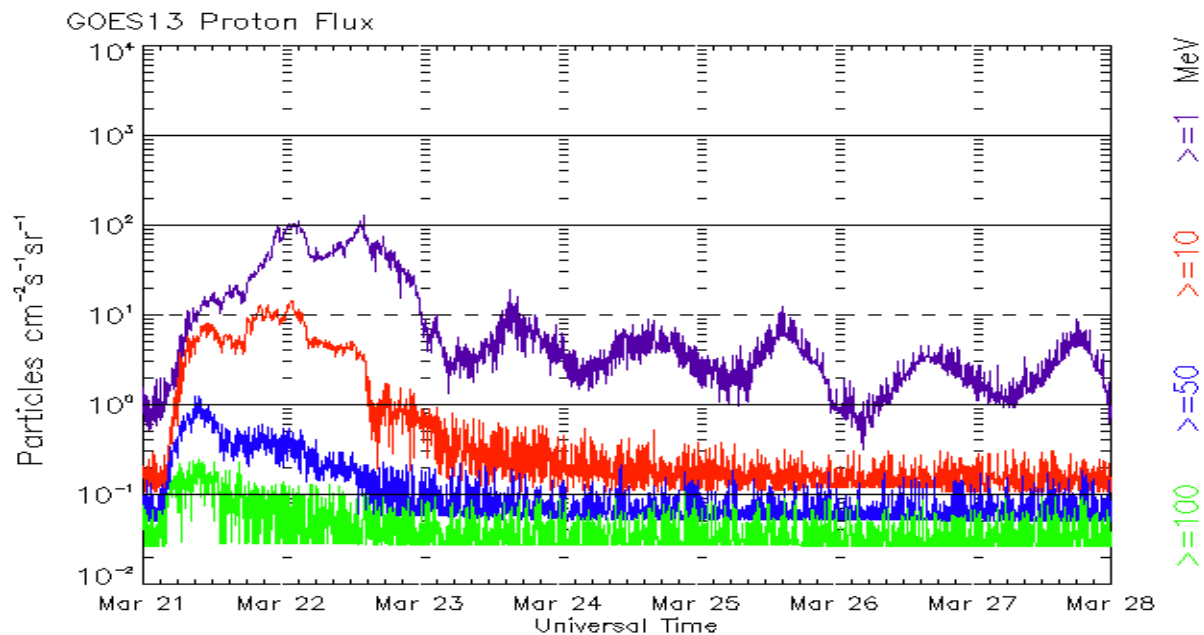
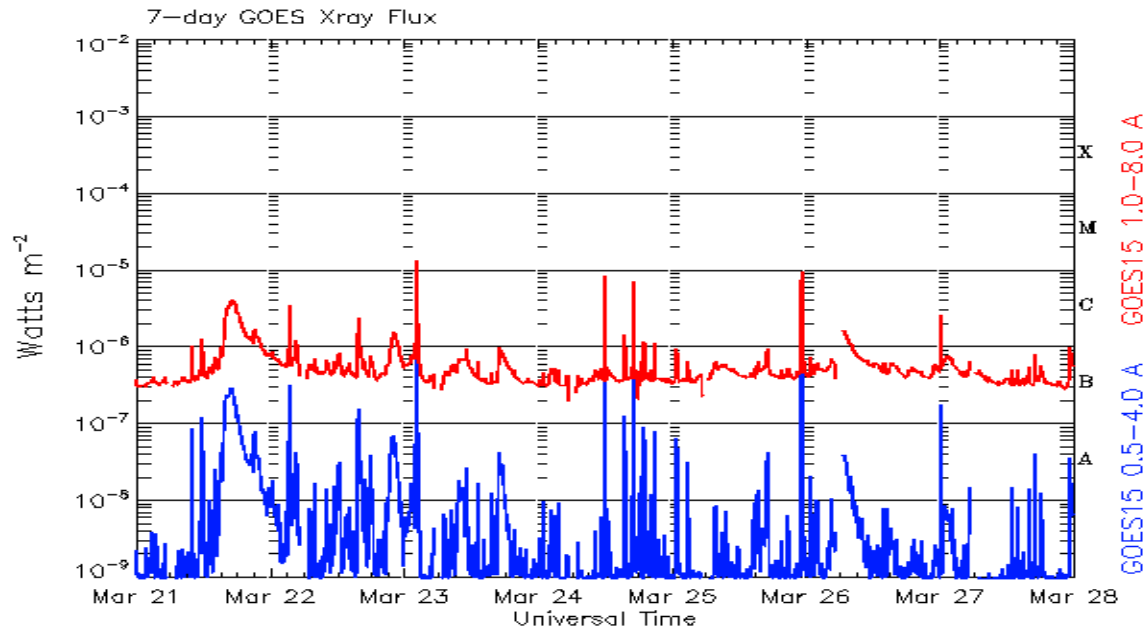
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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.

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 21 March 2011*

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-minue 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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