

Space Weather Highlights
08 – 14 March 2004

SWO PRF 1489
16 March 2004

Solar activity ranged from very low to low. Region 570 (S13, L=303, class/area, Fko/580 on 11 March) produced the period's only activity that consisted of seven weak C-class flares. A C2.3 long duration event (LDE) was observed from Region 570 on 08/2011 UTC; LASCO imagery indicated no subsequent CME. The largest event of the period was a C3.1/Sf on 12/0237 UTC with associated weak radio emission. Since 11 March, this region displayed a slow, steady decrease both in spot count and areal coverage while maintaining good magnetic complexity.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft during most of the summary period. The period began with solar wind velocities at speeds between 350 – 400 km/s. By 09 March, wind speeds began to gradually increase and strengthened to just over 800 km/s by midday on 10 March. The elevated solar wind speeds were driven by a favorably positioned, recurrent coronal hole. By 12 March, solar wind velocities began a slow decrease, declining to 500 km/s by the end of the summary period on 15 March. The Bz component of the interplanetary magnetic field fluctuated between +/- 10 nT from 08 March through midday on 10 March and did not vary beyond +/- 5 nT for the remainder of the period.

There were no greater than 10 MeV proton events at geosynchronous orbit during the summary period.

The greater than 2 MeV electron flux at geosynchronous orbit was at high levels on 08 March and then again on 10 – 14 March.

The geomagnetic field ranged from quiet to major storm levels. Quiet to unsettled levels were observed from 08 March through midday on 09 March. Active to major storm conditions became prevalent from midday on 09 March through early on 12 March. Quiet to active levels were recorded for the remainder of the period. The geomagnetic storming was due to a coronal hole driven high-speed solar wind stream.

Space Weather Outlook
17 March - 12 April 2004

Solar activity is expected to be at very low to low levels throughout the forecast period. Isolated moderate activity is possible from Region 570 and also from old Region 564 that is due to return on 16 March.

No greater than 10 MeV proton events are expected during the period.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach high -levels on 17 March, 22 – 23 March, 29 – 31 March and again on 06 – 11 April due to recurrent coronal holes.

Geomagnetic activity is expected to range from quiet to minor storm levels. A weak coronal hole high-speed stream is due to return on 19 – 20 March and is expected to produce quiet to active conditions. From 26 – 27 March, activity levels are expected to increase to active to minor storm levels as a small coronal hole high-speed stream rotates into geoeffective position. A large, recurrent coronal hole high-speed stream is due to return on 05 – 09 April and is expected to produce active to minor storm conditions.



Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10 ⁻⁶ hemi.)	X-ray Background	Flares							
					X-ray Flux			Optical				
					C	M	X	S	1	2	3	4
08 March	108	55	800	B1.8	1	0	0	0	0	0	0	0
09 March	109	40	650	B1.9	2	0	0	2	0	0	0	0
10 March	113	56	770	B2.2	0	0	0	1	0	0	0	0
11 March	113	67	600	B2.4	1	0	0	1	0	0	0	0
12 March	108	71	660	B1.9	2	0	0	2	0	0	0	0
13 March	104	61	570	B1.4	1	0	0	0	0	0	0	0
14 March	103	61	490	B1.3	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)		
	>1MeV	>10MeV	>100MeV	>.6MeV	>2MeV	>4MeV
	08 March	1.1E+6	1.3E+4	2.8E+3		1.1E+8
09 March	8.6E+5	1.3E+4	3.0E+3		3.1E+7	
10 March	2.0E+6	1.3E+4	2.6E+3		1.6E+7	
11 March	3.3E+6	1.2E+4	2.5E+3		2.5E+8	
12 March	3.2E+6	1.2E+4	2.7E+3		4.7E+8	
13 March	1.1E+6	1.2E+4	2.6E+3		7.4E+8	
14 March	6.9E+5	1.2E+4	2.7E+3		3.8E+8	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	08 March	2	1-1-2-1-0-1-0-0	3	1-0-3-2-0-0-0-0	6
09 March	11	0-1-2-2-3-3-3-4	42	0-0-1-3-6-6-6-6	21	1-2-3-3-4-4-4-5
10 March	36	5-6-5-3-4-2-3-5	47	4-5-7-4-6-4-3-3	40	5-6-6-4-5-3-3-4
11 March	17	4-3-3-2-3-3-4-3	61	5-3-6-6-6-6-6-4	26	4-4-4-3-4-4-5-3
12 March	19	5-4-4-2-2-3-2-3	36	3-4-6-5-5-5-3-2	23	5-5-4-3-3-4-2-3
13 March	10	2-2-4-2-3-2-2-1	40	3-2-5-4-6-5-3-2	15	3-1-4-3-4-4-2-2
14 March	12	3-2-3-3-3-2-3-2	40	3-2-5-7-5-4-4-2	16	3-3-4-4-4-3-3-2

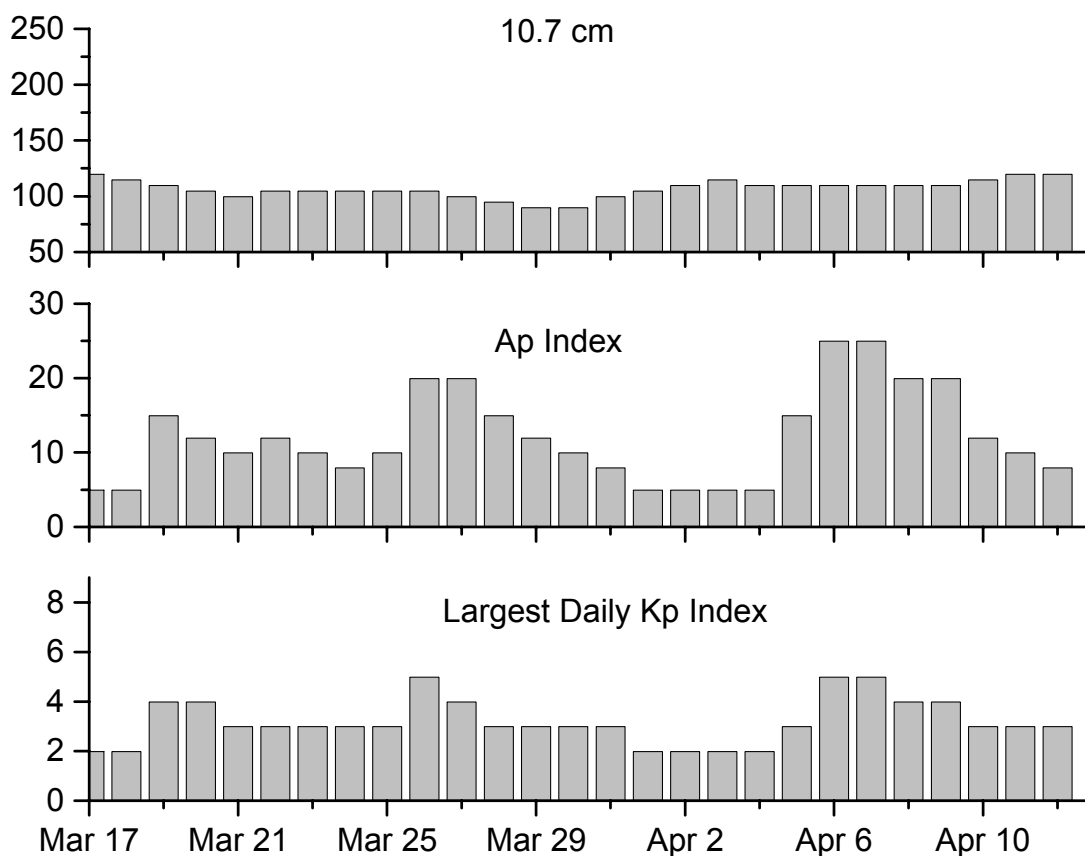


Alerts and Warnings Issued

<u>Date & Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date & Time of Event UT</u>
08 Mar 0011	1 – 245 MHz Radio Burst	07 Mar
08 Mar 0532	ALERT: Electron 2MeV Integral Flux > 1000pfu	08 Mar 0515
09 Mar 0005	1 – 245 MHz Radio Burst	08 Mar
09 Mar 1304	ALERT: Electron 2MeV Integral Flux > 1000pfu	09 Mar 1245
09 Mar 1601	WARNING: Geomagnetic K = 4	09 Mar 1605 - 2359
09 Mar 1635	ALERT: Geomagnetic K = 4	09 Mar 1631
09 Mar 1638	WARNING: Geomagnetic K = 5	09 Mar 1645 - 2359
09 Mar 1803	ALERT: Geomagnetic K = 5	09 Mar 1745
10 Mar 0010	2 – 245 MHz Radio Bursts	09 Mar
10 Mar 0010	1 – 245 MHz Radio Noise Storm	09 Mar
10 Mar 0013	WARNING: Geomagnetic K = 4	10 Mar 0015 - 1500
10 Mar 0019	ALERT: Geomagnetic K = 4	10 Mar 0016
10 Mar 0024	WARNING: Geomagnetic K = 5	10 Mar 0030 - 1500
10 Mar 0059	ALERT: Geomagnetic K = 5	10 Mar 0056
10 Mar 0419	WARNING: Geomagnetic K = 6	10 Mar 0419 - 0600
10 Mar 1457	EXTENDED WARNING: Geomagnetic K = 4	10 Mar 0015 - 2359
10 Mar 2237	WATCH: Geomagnetic A \geq 20	11 Mar
10 Mar 2350	EXTENDED WARNING: Geomagnetic K= 4	10 Mar 0015 - 11 Mar 1500
11 Mar 0010	5 – 245 MHz Radio Bursts	10 Mar
11 Mar 0010	1 – 245 MHz Radio Noise Storm	10 Mar
11 Mar 0031	ALERT: Geomagnetic K = 5	11 Mar 0028
11 Mar 0317	ALERT: Electron 2MeV Integral Flux > 1000pfu	11 Mar 0255
11 Mar 0756	ALERT: Electron 2MeV Integral Flux > 1000pfu	11 Mar 0645
11 Mar 1453	EXTENDED WARNING: Geomagnetic K= 4	10 Mar 0015 - 11 Mar 2359
11 Mar 1801	ALERT: Geomagnetic K = 5	11 Mar 1757
11 Mar 1846	WARNING: Geomagnetic K = 5	11 Mar 1845 - 2100
12 Mar 0018	ALERT: Geomagnetic K = 4	12 Mar 0016
12 Mar 0023	WARNING: Geomagnetic K = 4	12 Mar 0025 - 1500
12 Mar 0344	ALERT: Geomagnetic K= 4	12 Mar 0344
12 Mar 0519	ALERT: Electron 2MeV Integral Flux > 1000pfu	12 Mar 0500
12 Mar 0551	ALERT: Geomagnetic K= 5	12 Mar 0548
12 Mar 1455	EXTENDED WARNING: Geomagnetic K= 4	12 Mar 0025 - 2359
12 Mar 2356	EXTENDED WARNING: Geomagnetic K= 4	12 Mar 0025 - 13 Mar 1630
13 Mar 0031	3 - 245 MHz Radio Bursts	12 Mar
13 Mar 0031	1 - 245 MHz Radio Noise Storm	12 Mar
13 Mar 0524	ALERT: Electron 2MeV Integral Flux > 1000pfu	13 Mar 0500
14 Mar 0636	ALERT: Electron 2MeV Integral Flux > 1000pfu	14 Mar 0500
14 Mar 0813	ALERT: Geomagnetic K= 4	14 Mar 0813
14 Mar 2117	SUMMARY: 10cm Radio Burst	14 Mar 2035



Twenty-seven Day Outlook



Date	Radio Flux 10.7 cm	Planetary A Index	Largest Kp Index	Date	Radio Flux 10.7 cm	Planetary A Index	Largest Kp Index
17 Mar	120	5	2	31 Mar	100	8	3
18	115	5	2	01 Apr	105	5	2
19	110	15	4	02	110	5	2
20	105	12	4	03	115	5	2
21	100	10	3	04	110	5	2
22	105	12	3	05	110	15	3
23	105	10	3	06	110	25	5
24	105	8	3	07	110	25	5
25	105	10	3	08	110	20	4
26	105	20	5	09	110	20	4
27	100	20	5	10	115	12	3
28	95	15	4	11	120	10	3
29	90	12	3	12	120	8	3
30	90	10	3				



Energetic Events

Date	Time		X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	1/2 Max	Integ	Imp/ Brtns	Location Lat CMD	Rgn #	Radio Flux		Intensity	
								245	2695	II	IV

No Events Observed

Flare List

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
08 March	0726	0730	0745	B3.3			570
	0813	0820	0832	B6.6			570
	1345	1349	1354	B3.0			567
	1959	2011	2046	C2.3			570
09 March	0331	0336	0350	B6.4			
	0434	0436	0441	C1.1	Sf	S13E41	570
	0644	0648	0658	C1.3	Sf	S16E43	570
	1424	1429	1434	B5.4			570
10 March	1631	1635	1637	B4.8			
	0015	0018	0020	B4.0			570
	1526	1529	1531	B4.7			
	1533	1536	1539	B5.6			
	1856	1859	1903	B6.4			570
	2259	2302	2305	B8.4			
11 March	2301	2302	2306		Sf	S11E15	570
	0214	0217	0225	C1.3	Sf	S17E15	570
	1842	1852	1901	B6.8			
	2309	2313	2317	B4.3			570
12 March	B0237	U0238	0243	C3.1	Sf	S16W04	570
	0702	0707	0712	B6.8			570
	1546	1549	1552	B3.1			
	2237	2240	2244	B2.5			570
13 March	2333	2335	2357	C1.8	Sf	S14W08	570
	0743	0747	0749	B3.4			570
	1350	1354	1356	C1.0			570
	1459	1502	1504	B2.5			
	2121	2132	2147	B4.1			570
14 March	0411	0414	0418	B2.1			570
	0436	0440	0445	B2.0			570
	2032	2035	2037	B3.8			570



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 567

27 Feb	S13E50	070	0040	06	Cso	005	B								
28 Feb	S13E37	070	0070	08	Dao	009	B	2							
29 Feb	S13E24	070	0120	09	Dao	016	B								
01 Mar	S13E11	069	0120	09	Dai	017	Bg								
02 Mar	S12W04	071	0140	11	Esi	028	B	2			2				
03 Mar	S12W16	070	0160	12	Eai	021	Bg								
04 Mar	S12W29	070	0160	12	Eac	029	Bgd	2							
05 Mar	S12W42	070	0160	14	Eao	016	Bgd								
06 Mar	S12W55	070	0210	13	Eao	017	Bg	2			1				
07 Mar	S14W66	067	0080	11	Eao	008	B								
08 Mar	S14W79	067	0030	10	Bxo	004	B								
09 Mar	S14W92	067													
								8	0	0	3	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude:071

Region 569

04 Mar	S11E34	011	0020	04	Bxo	004	B								
05 Mar	S11E16	012	0040	04	Cso	008	B								
06 Mar	S11E03	012	0070	06	Dao	007	B								
07 Mar	S11W11	012	0030	06	Dao	006	B								
08 Mar	S12W26	014	0020	01	Hsx	002	A								
09 Mar	S12W40	015	0010	01	Hsx	001	A								
10 Mar	S12W54	016	0030	03	Bxo	003	B								
11 Mar	S11W68	018	0010	01	Axx	001	A								
12 Mar	S13W80	016	0010	01	Axx	001	A								
								0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude:012



Region Summary - continued.

Date	Location		Sunspot Characteristics				Flares			X-ray				Optical			
	(° Lat ° CMD)	Helio Lon	Area (10 ⁻⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	C	M	X	S	1	2	3	4		

Region 570

05 Mar	S13E84	304	0100	03	Hkx	001	A	3									
06 Mar	S13E70	305	0340	17	Cko	007	B	4	1								
07 Mar	S14E59	302	0570	14	Ekc	009	B										
08 Mar	S14E46	302	0750	20	Fko	019	Bg	1									
09 Mar	S14E34	301	0640	18	Fho	019	Bg	2			2						
10 Mar	S14E20	302	0730	10	Fko	021	Bg				1						
11 Mar	S13E07	303	0580	20	Fko	033	Bgd	1			1						
12 Mar	S14W05	301	0550	18	Fao	023	Bgd	2			2						
13 Mar	S13W20	303	0390	18	Fho	019	Bgd	1									
14 Mar	S13W32	302	0340	19	Fho	018	Bg										
								14	1	0	6	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude:301

Region 571

10 Mar	S14W13	335	0010	01	Bxo	002	B										
11 Mar	S14W27	337	0010	03	Bxo	003	B										
12 Mar	S14W40	337															
13 Mar	S14W53	337															
14 Mar	S14W66	337															
								0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude:335

Region 572

12 Mar	N19W05	301	0020	04	Cso	006	B										
13 Mar	N19W19	302	0110	05	Dao	010	B										
14 Mar	N19W32	302	0100	05	Dso	011	B										
								0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude:301

Region 573

12 Mar	S14E71	225	0080	04	Hsx	001	A										
13 Mar	S12E57	226	0070	02	Hax	002	A										
14 Mar	S13E44	226	0050	02	Hax	002	A										
								0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude:226

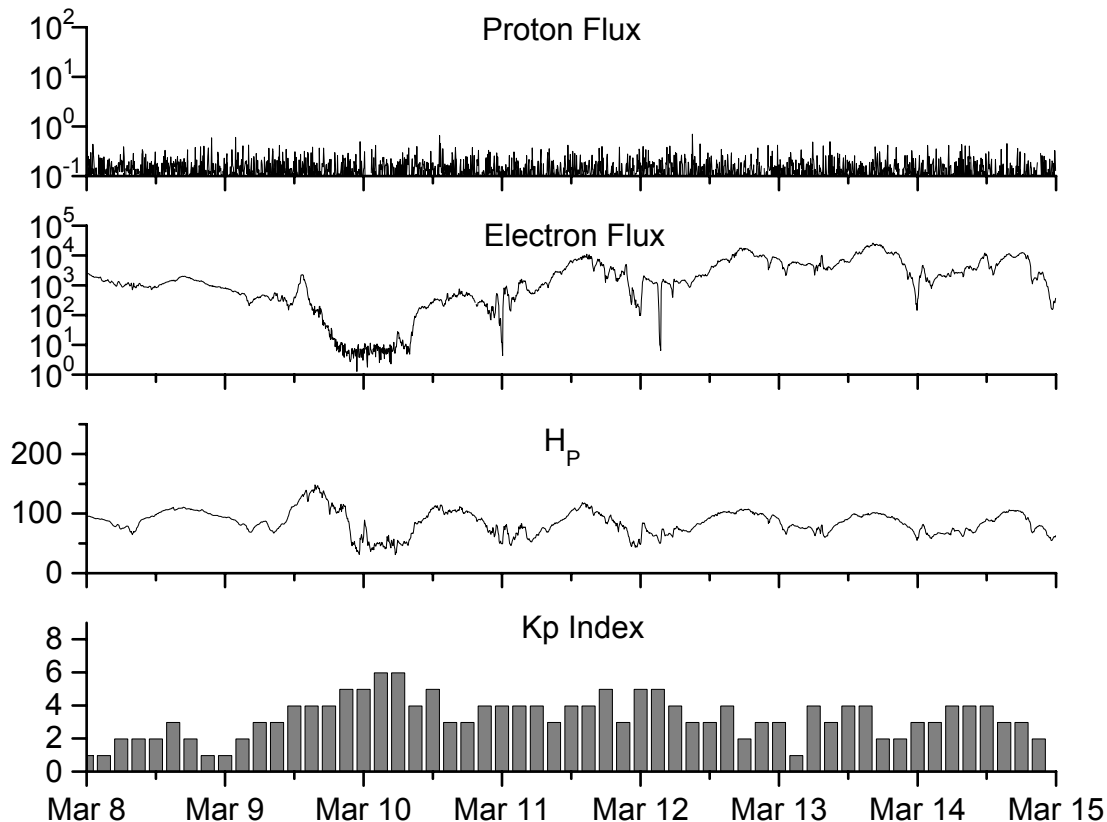


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

Month	Sunspot Numbers			Smooth values		Radio Flux		Geomagnetic	
	Observed SWO	values RI	Ratio RI/SWO	SWO	RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
2002									
March	153.1	98.4	0.64	188.9	113.3	180.3	195.7	10	12.9
April	194.9	120.7	0.62	186.2	110.5	189.8	191.5	15	13.2
May	204.1	120.8	0.59	183.6	108.9	178.4	188.0	15	13.3
June	146.0	88.3	0.60	179.9	106.3	148.7	183.0	11	13.5
July	183.5	99.6	0.54	175.4	102.7	173.5	176.3	11	13.7
August	191.0	116.4	0.61	169.2	98.7	183.9	169.5	16	14.2
September	206.4	109.6	0.53	163.4	94.6	175.8	164.1	14	15.0
October	153.9	97.5	0.63	158.8	90.5	167.0	159.4	23	15.6
November	159.8	95.5	0.60	150.9	85.2	168.7	154.8	16	16.3
December	147.9	80.8	0.55	144.6	82.1	158.6	150.9	13	17.0
2003									
January	149.3	79.7	0.53	141.7	81.0	144.0	149.2	13	18.2
February	87.0	46.0	0.53	136.4	78.5	124.5	144.7	17	18.9
March	119.7	61.1	0.51	128.1	74.2	132.2	139.5	21	19.4
April	119.7	60.0	0.50	121.5	70.3	126.3	136.3	20	20.0
May	89.6	55.2	0.62	118.3	67.8	129.3	135.0	26	21.0
June	118.4	77.4	0.65	113.6	65.2	129.4	132.6	24	21.8
July	132.8	85.0	0.64	106.9	62.0	127.8	129.5	20	22.3
August	114.3	72.7	0.64	102.8	60.3	122.1	127.5	23	22.4
September	82.6	48.8	0.59			112.3		19	
October	118.9	65.6	0.55			153.1		32	
November	118.9	67.2	0.57			153.1		31	
December	75.4	47.0	0.62			115.1		18	
2004									
January	62.3	37.2	0.60			114.1		20	
February	75.6	46.0	0.61			107.0		13	

NOTE: All smoothed values after September 2002 and monthly values after March 2003 are preliminary estimates. The lowest smoothed sunspot index number for Cycle 22, RI = 8.0, occurred in May 1996. The highest smoothed sunspot number for Cycle 23, RI= 120.8, occurred April 2000. *After June 1991, the 10.7 cm radio flux data source is Penticton, B.C. Canada. Prior to that, it was Ottawa.





Weekly Geosynchronous Satellite Environment Summary

Week Beginning 08 March 2004

Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by

GOES-11 (W113) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

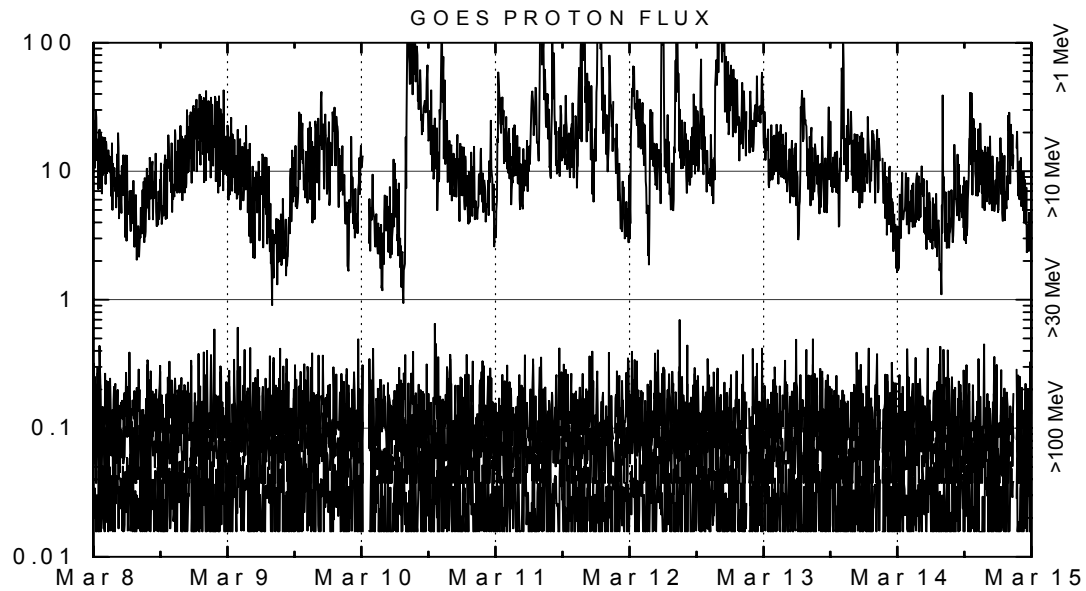
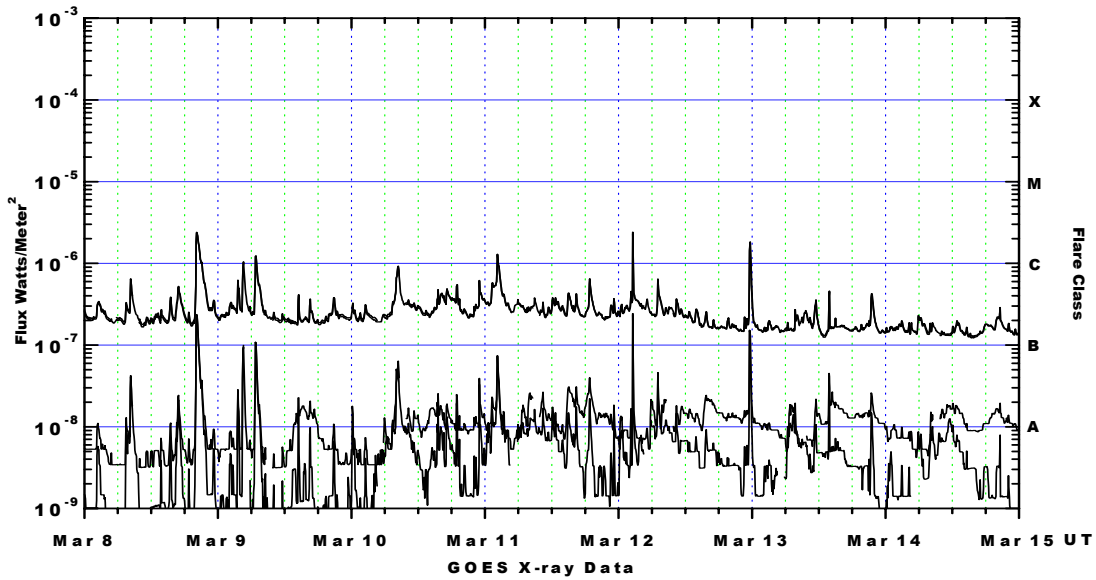
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-12.

H_p plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-12. The H component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

K_p 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 Heartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC) and the US Geological Survey. These may differ from the final K_p values derived from a more extensive network of magnetometers.

The data included here are those now available in real time at the SWO 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 K_p are "global" parameters that are applicable to a first order approximation over large areas. H_p 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

X-ray plot contains five-minute averaged x-ray flux (watts/m²) as measured by GOES 12 and 10 in two wavelength bands, .05 - .4 and .1 - .8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 - .8 nm band.

Proton plot contains the five-minute averaged integral proton flux (protons/cm²-sec-sr) as measured by GOES-11 (W113) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu (protons/cm²-sec-sr) at greater than 10 MeV.

