

Space Weather Highlights
05 – 11 March 2001

SWO PRF 1332
13 March 2001

Solar activity increased to high levels during the period. The week began with activity at low levels as a few small, growing sunspot groups produced low-level C-class subflares. One of these groups, Region 9368 (S25, L = 088, class/area Eai/610 on 08 March), continued to increase in size and magnetic complexity through 10 March. As it grew, it produced two very impulsive major flares: an M5/1b at 08/1118 UTC and an M6/1b at 10/0405 UTC. Both flares had associated Type II radio sweeps and non-Earth-directed CMEs. Activity returned to low levels on 11 March with isolated C-class subflares as Region 9368 began to decay.

Data were available from the Advanced Composition Explorer (ACE) spacecraft for most of the period. Recurrent coronal hole effects occurred on 05 March as velocities increased to as high as 600 km/sec and densities decreased. Coronal hole effects gradually subsided on 06 March. No significant disturbances occurred in the solar wind during the rest of the period.

No proton events occurred. However, the greater than 10 MeV flux became slightly enhanced following the M6/1b flare on 10 March.

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

The geomagnetic field was at unsettled to minor storm levels on 05 March due to recurrent coronal hole effects. Quiet to unsettled conditions prevailed the rest of the period.

Space Weather Outlook
14 March - 09 April 2001

Activity is expected to be mostly low during the period with a fair chance for isolated M-class flares. There will also be a slight chance for an isolated major flare.

There will be a slight chance for a proton event during the period.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at normal to moderate levels during most of the period.

The geomagnetic field is expected to be at quiet to unsettled levels during most of the period, barring an Earth-directed CME. However, active conditions will be possible around 01 April.



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
05 March	156	143	580	B3.2	8	0	0	4	0	0	0	0
06 March	158	131	960	B5.5	15	0	0	7	0	0	0	0
07 March	177	102	1230	C1.4	10	0	0	9	1	0	0	0
08 March	167	98	1070	B9.8	6	1	0	1	1	0	0	0
09 March	161	113	730	C1.2	8	2	0	7	2	0	0	0
10 March	160	131	820	C1.0	13	1	0	15	1	0	0	0
11 March	158	139	740	B6.0	6	0	0	5	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	>4Me
05 March	1.2E+5	1.1E+4	2.5E+3		6.3E+5	
06 March	8.2E+4	1.1E+4	2.6E+3		1.0E+6	
07 March	1.3E+5	1.1E+4	2.6E+3		5.8E+6	
08 March	9.6E+4	1.1E+4	2.8E+3		9.3E+6	
09 March	1.4E+5	1.2E+4	2.9E+3		1.1E+7	
10 March	2.1E+5	1.3E+4	2.7E+3		1.2E+7	
11 March	1.6E+5	1.3E+4	2.7E+3		9.1E+6	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	05 March	14	5-3-3-2-3-1-1-2	22	4-4-4-5-3-3-1-3	18
06 March	4	1-1-2-1-1-2-2-0	*	*-*-*-*-*-*-*	6	1-1-2-2-2-2-3-2
07 March	9	2-2-3-2-2-3-2-1	10	1-1-2-4-3-3-2-1	7	1-2-3-2-2-3-2-1
08 March	7	0-0-2-3-2-3-2-2	8	1-0-3-4-1-2-2-1	6	1-0-2-3-1-2-2-2
09 March	7	3-2-2-1-2-2-1-1	*	1-1-*-*-*4-2-0	6	2-1-2-1-2-3-2-1
10 March	3	0-2-1-1-1-1-2-0	3	0-0-1-1-3-0-1-0	5	1-2-1-1-2-2-3-1
11 March	2	1-2-0-0-1-0-0-0	1	0-0-0-1-1-0-0-0	4	0-1-0-1-2-1-2-1

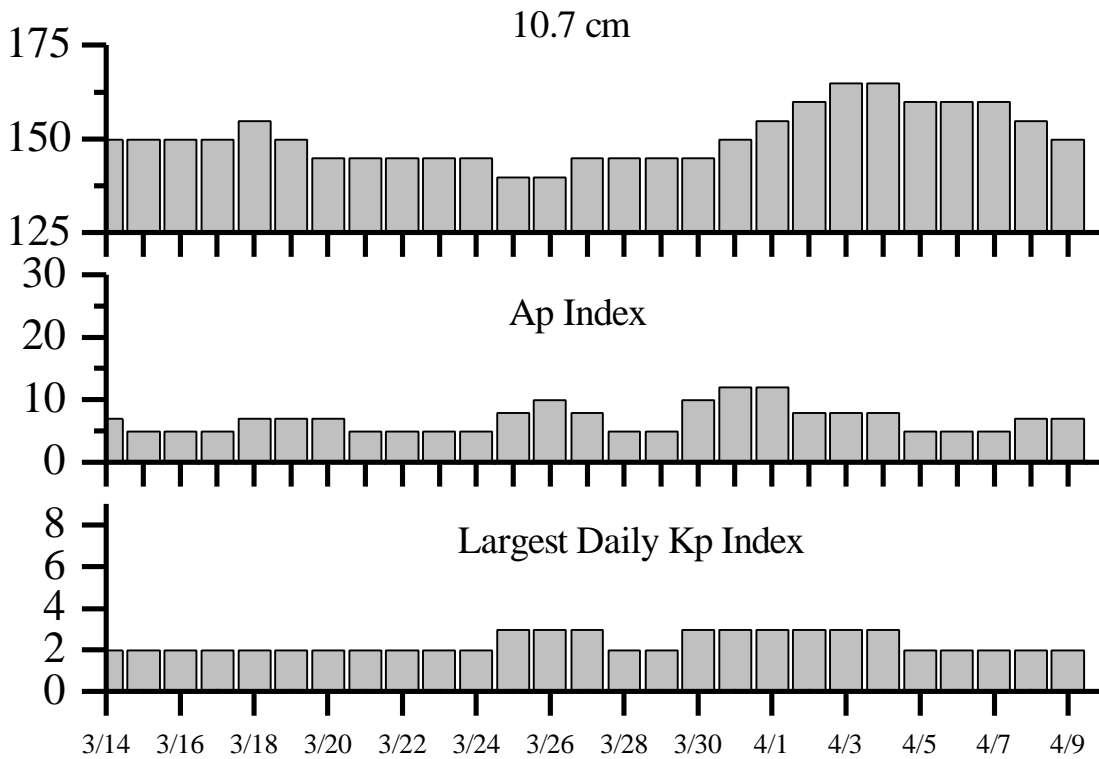


Alerts and Warnings Issued

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UT
05 Mar 300	K= 5 Observed	05 Mar 0000 - 0300
05 Mar 302	A >= 20 Observed	05 Mar 0300
05 Mar 658	K= 4 Warning	05 Mar 0700 - 1500
05 Mar 1201	K= 4 Observed	05 Mar 0900 - 1200
05 Mar 1236	Stratwarm Alert Exists Monday	
06 Mar 0000	ENDED A >=20 Observed	05 Mar 0300
06 Mar 1223	Stratwarm Alert Exists Tuesday	
07 Mar 1153	Stratwarm Alert Exists Wednesday	
07 Mar 1800	K= 4 Observed	07 Mar 1500 - 1800
08 Mar 0048	2 - 245 MHz Bursts	07 Mar
08 Mar 0048	245 MHz Noise Storm	07 Mar
08 Mar 1133	X-Ray event M5.7/1F/N30W18	08 Mar 1118
08 Mar 1149	Type II Radio Emission	08 Mar 1126
08 Mar 1215	Stratwarm Alert Exists Thursday	
09 Mar 0053	3 - 245 MHz Bursts	08 Mar
09 Mar 0053	245 MHz Noise Storm	08 Mar
09 Mar 1235	Stratwarm Alert Exists Friday	
10 Mar 0013	1 - 245 MHz Burst	09 Mar
10 Mar 0013	245 MHz Noise Storm	09 Mar
10 Mar 0411	X-Ray event M6.7/1B/N27W42	10 Mar 0405
10 Mar 0441	Type II Radio Emission	10 Mar 0409
10 Mar 1135	Stratwarm Alert Exists Saturday	
11 Mar 1405	Stratwarm Alert Exists Sunday	



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
14 Mar	150	7	2	28 Mar	145	5	2
15	150	5	2	29	145	5	2
16	150	5	2	30	145	10	3
17	150	5	2	31	145	12	3
18	150	7	2	01 Apr	150	12	3
19	155	7	2	02	155	8	3
20	150	7	2	03	160	8	3
21	145	7	2	04	165	8	3
22	145	5	2	05	165	5	2
23	145	5	2	06	160	5	2
24	145	5	2	07	160	5	2
25	145	8	3	08	155	7	2
26	140	10	3	09	150	7	2
27	140	8	3				



Energetic Events

Date	Time		X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½ Max	Class	Integ Flux	Imp/ Brtns	Location		Radio Flux		Intensity	
							Lat	CMD	245	2695	II	IV
08 Mar	1113	1118	1121	M5.7	.013	1b	N30W18		9368	1800	82	2
09 Mar	0151	0157	0200	M1.5	.004	1n	N24W38		9368		92	
09 Mar	1006	1028	1110	M1.0	.031							
10 Mar	0400	0405	0407	M6.7	.013	1b	N27W42		9368	9000	76	1

Flare List

Date	Time			X-ray Class.	Optical Imp / Brtns	Location Lat CMD	Rgn
	Begin	Max	End				
05 March	0015	0018	0020	B8.6			
	B0549	U0605	0626	B7.2	Sf	N17W66	9369
	0840	0843	0848	C1.1	Sf	S11W77	9364
	0911	0958	1014	C1.6			
	1408	1433	1445	C1.1			
	1443	1444	1449		Sf	S08W91	9362
	1534	1535	1542		Sf	N16W75	9369
	1625	1640	1651	C1.4			
	1803	1809	1814	C2.7			
	1831	1848	1904	C1.8			
	1940	2005	2011	C1.4			
	2113	2117	2122	C1.3			
	2245	2248	2251	B8.8			
	06 March	0213	0236	0252	C1.3		
0541		0545	0547	C1.2			
0726		0734	0738		Sf	N20W56	9371
0853		0854	0859		Sf	N20W56	9371
0912		0913	0916	C1.7	Sf	N26E02	9368
1004		1013	1023	C6.7			
1051		1059	1104	C2.2			
1222		1231	1238	C2.6	Sf	N25E03	9368
1254		U1256	1306	C2.1	Sf	N25E02	9368
1421		1427	1441	C1.5			
1549		1552	1559	C1.5			
1712		1712	1717	C2.1	Sf	N25W01	9368
1737		1739	1742	C1.4			
1813		1816	1819	C1.3			
1931	1935	1938	C1.4				
2142	2142	2146	C3.2	Sf	N25W03	9368	
2240	2251	2258	C1.6				



Flare List – continued.

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
07 March	0000	0003	0005		Sf	N21W64	9371
	0011	0017	0041	C4.6	1f	S08W49	9365
	0059	0107	0116	C3.9			
	0507	0509	0511	C2.9	Sf	N10E10	9370
	0840	0841	0856	C2.7	Sf	N19W73	9371
	0914	0921	0925		Sf	N20W68	9371
	0948	0950	0956	C2.0	Sf	N20W68	9371
	1455	1500	1554	C5.8	Sf	N23W75	9371
	1608	1609	1611		Sf	N22W79	9371
	1810	1815	1820	C2.9			
	1923	1929	1944	C7.3	Sf	N27W16	9368
	2007	2009	B2050		Sf	N30W16	9368
	2100	2105	2109	C3.9			
	2357	0001	0003	C1.6			
08 March	0332	0339	0352	C3.0			
	0855	0858	0900	C2.9			
	1016	U1019	1052	C5.5	Sf	N11W02	9370
	1119	U1119	A1145	M5.7	1b	N30W18	9368
	1237	1240	1243	C3.7			
	1547	1557	1603	C8.6			
	1609	1614	1618	C7.3			
09 March	0155	0157	0208	M1.5	1n	N24W38	9368
	0424	0456	0507	C2.4	Sf	S12W90	9365
	0729	0735	0741	C3.0			
	0839	0842	A0903	C6.0	Sf	N09W18	9370
	B0925	U0925	0946		Sf	S12W89	9365
	1006	1028	1110	M1.0			
	1546	1547	1600	C2.9	Sf	S35W48	9372
	1654	1655	1704	C2.6	Sf	S34W48	9372
	2021	2026	2038	C7.8	Sf	S36W49	9372
	2114	2119	2124	C2.4	Sf	S36W50	9372
2318	2324	0012	C9.0	1n	N24W49	9368	
10 March	0008	0010	0020	C3.7	Sf	S36W51	9372
	0058	0105	0115	C1.4			
	0152	0153	0159		Sf	S36W54	9372
	0208	0211	0216		Sf	S36W54	9372
	0323	0324	0330		Sf	N27W42	9368
	0401	0405	0419	M6.7	1b	N27W42	9368
	0407	0409	0413		Sf	S36W55	9372
	0447	0451	0500	C1.9			



Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical	Rgn
	Begin	Max	End			Location Lat CMD	
10 March	0609	0613	0615		Sf	S36W56	9372
	0636	0637	0640		Sf	S36W56	9372
	0650	0650	0658	C1.6	Sf	S37W55	9372
	0706	0709	0726	C2.7	Sf	S37W56	9372
	0735	0736	0740	C1.6	Sf	S37W55	9372
	0816	0825	0834	C1.6			
	0944	0945	0952	C3.1	Sf	S35W54	9372
	1508	1509	1511		Sf	S36W62	9372
	1600	1602	1609	C1.5	Sf	S08E67	9373
	1615	1622	1630	C6.3			
	1708	1723	1740	C5.9			
	1934	1939	1943	C2.5			
	2032	2033	2039		Sf	N25W60	9368
	2253	2259	2309	C1.0	Sf	S10E65	9373
11 March	0018	0023	0029	C2.0			
	0540	0540	0548	C1.8	Sf	S15E85	9376
	0653	0657	0702	C1.1			
	0757	0813	0829	C1.4			
	0834	0837	0852	C5.0	Sf	S14E87	9376
	0908	U0909	0933		Sf	N14E56	
	1541	1542	1544		Sf	N29W62	9368
	1650	1650	1653		Sf	N28W67	9368
2334	2338	2347	C1.1				

Region Summary

Date	Location		Sunspot Characteristics					Flares									
	Helio		Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical						
	(° Lat ° CMD)	Lon						C	M	X	S	1	2	3	4		
<i>Region 9364</i>																	
28 Feb	S10W16	176	0010	03	Bxo	009	B										
01 Mar	S10W30	177	0010	03	Bxo	004	B	1			1						
02 Mar	S10W43	177	0000	00		000											
03 Mar	S10W51	171	0020	04	Bxo	004	B										
04 Mar	S11W68	175	0050	10	Dso	005	B										
05 Mar	S10W82	176	0070	07	Dso	003	B	1			1						
								2	0	0	2	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 176



Region Summary- continued.

Date	Location		Sunspot Characteristics				Flares											
	(° Lat ° CMD)	Helio	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
		Lon						C	M	X	S	1	2	3	4			
<i>Region 9365</i>																		
28 Feb	S08E37	123	0020	03	Cro	007	B											
01 Mar	S07E24	123	0010	06	Cso	005	B											
02 Mar	S08E09	124	0020	04	Cso	003	B											
03 Mar	S08W04	124	0040	06	Cao	009	B											
04 Mar	S09W18	125	0010	05	Cso	005	B											
05 Mar	S10W34	128	0020	02	Hsx	002	A											
06 Mar	S10W49	130	0020	01	Hsx	002	A											
07 Mar	S10W62	129	0010	03	Cro	003	B	1						1				
08 Mar	S10W75	129	0020	01	Hsx	002	A											
09 Mar	S12W90	132	0030	02	Hsx	001	A	1					2					
								2	0	0	2	1	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 124

<i>Region 9366</i>																		
02 Mar	S23E38	095	0040	06	Dro	007	B											
03 Mar	S25E25	095	0090	08	Dao	016	B						1					
04 Mar	S24E12	095	0090	10	Dai	023	B	1					1					
05 Mar	S25E00	094	0070	12	Eao	016	B											
06 Mar	S25W14	095	0060	10	Dao	009	B											
07 Mar	S24W28	095	0030	10	Cro	004	B											
08 Mar	S25W41	095	0010	11	Bxo	004	B											
09 Mar	S24W48	090	0010	03	Cso	002	B											
10 Mar	S24W61	090																
11 Mar	S24W74	090																
								1	0	0	2	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 094



Region Summary- continued.

Date	Location		Sunspot Characteristics				Flares										
	(° Lat ° CMD)	Helio	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical						
		Lon						C	M	X	S	1	2	3	4		
<i>Region 9374</i>																	
10 Mar	S19E50	339	0010	00	Hrx	001	A										
11 Mar	S18E38	338	0000	01	Axx	001	A										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 338																	
<i>Region 9375</i>																	
10 Mar	S16W46	075	0030	03	Dso	004	B										
11 Mar	S16W58	074	0010	03	Bxo	003	B										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 075																	
<i>Region 9376</i>																	
11 Mar	S13E72	304	0030	01	Hrx	001	A										2
								0	0	0	2	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 304																	
<i>Region 9377</i>																	
11 Mar	S18E01	015	0000	00	Axx	001	A										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 015																	

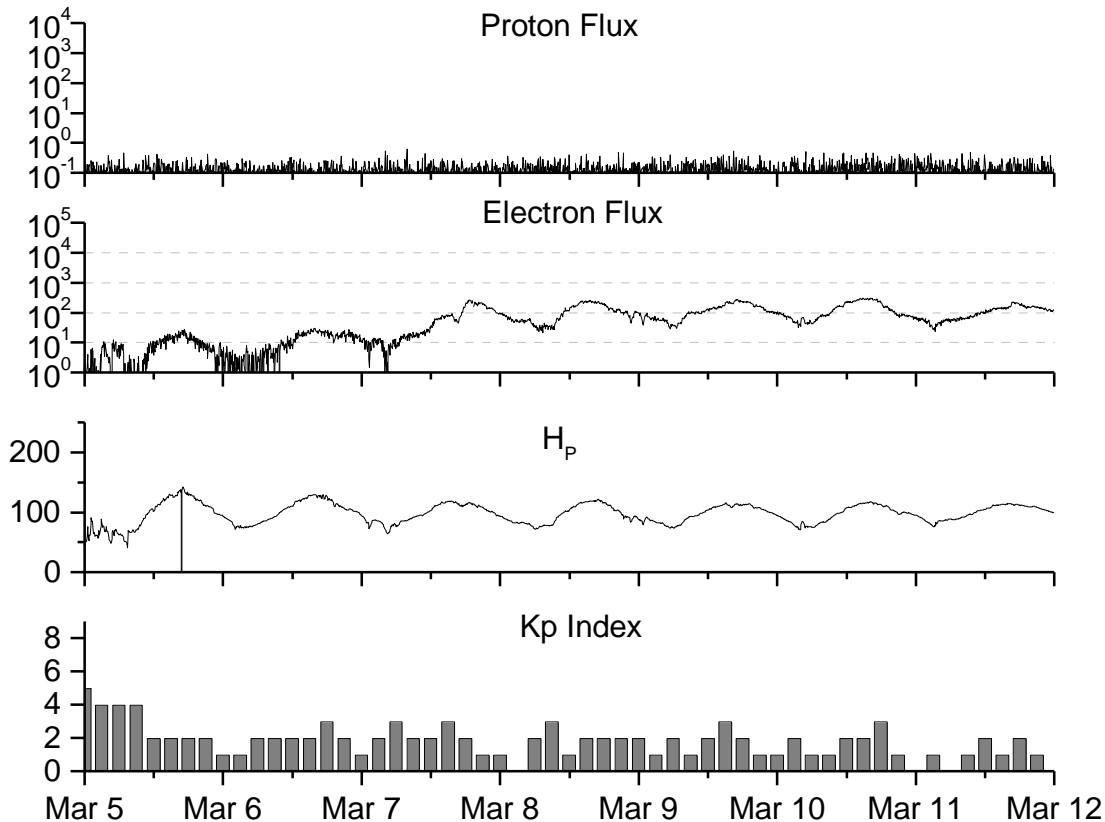


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	Observed values SWO	Ratio RI	Ratio RI/SWO	Smooth values SWO	Smooth values RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
1999									
March	100.5	68.8	0.68	120.5	83.8	126.3	144.0	14	11.7
April	92.9	63.7	0.69	123.8	85.5	117.2	145.8	12	12.2
May	140.5	106.4	0.76	131.7	90.5	148.6	149.9	08	12.4
June	208.3	137.7	0.66	136.0	93.1	169.8	152.9	07	12.4
July	169.2	113.5	0.67	138.0	94.3	165.6	154.4	10	12.6
August	136.1	93.7	0.69	142.8	97.5	170.8	156.3	15	12.9
September	107.4	71.5	0.67	150.0	102.3	135.7	161.0	19	12.8
October	167.7	116.7	0.70	158.5	107.8	164.8	167.2	19	12.7
November	199.3	133.2	0.67	164.7	110.0	191.5	171.5	14	13.1
December	123.5	86.4	0.69	165.9	111.1	169.8	173.4	10	13.8
2000									
January	140.8	90.1	0.64	168.0	112.9	158.1	175.5	13	14.5
February	161.9	112.9	0.70	172.1	116.7	173.2	176.8	15	15.0
March	203.6	138.5	0.68	175.4	119.9	208.2	178.4	09	15.0
April	193.4	125.5	0.65	176.3	120.8	184.2	180.5	15	15.0
May	188.8	121.6	0.64	173.1	119.0	184.5	180.0	15	15.0
June	190.3	124.9	0.66	172.0	118.7	179.8	179.7	15	15.1
July	236.7	169.1	0.71	173.0	119.7	204.7	180.2	21	14.8
August	166.6	130.5	0.78	171.8	118.6	163.1	179.5	16	14.2
September	157.9	109.9	0.70			182.1		18	
October	138.9	100.1	0.72			167.7		18	
November	149.9	106.5	0.71			178.8		17	
December	146.4	104.5	0.71			173.6		08	
2001									
January	142.7	95.1	0.67			166.7		08	
February	131.0	80.1	0.61			147.3		06	

NOTE: All smoothed values after December 1999 and monthly values after June 2000 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 22, RI= 158.5, occurred July 1989. *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 05 March 2001*

Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

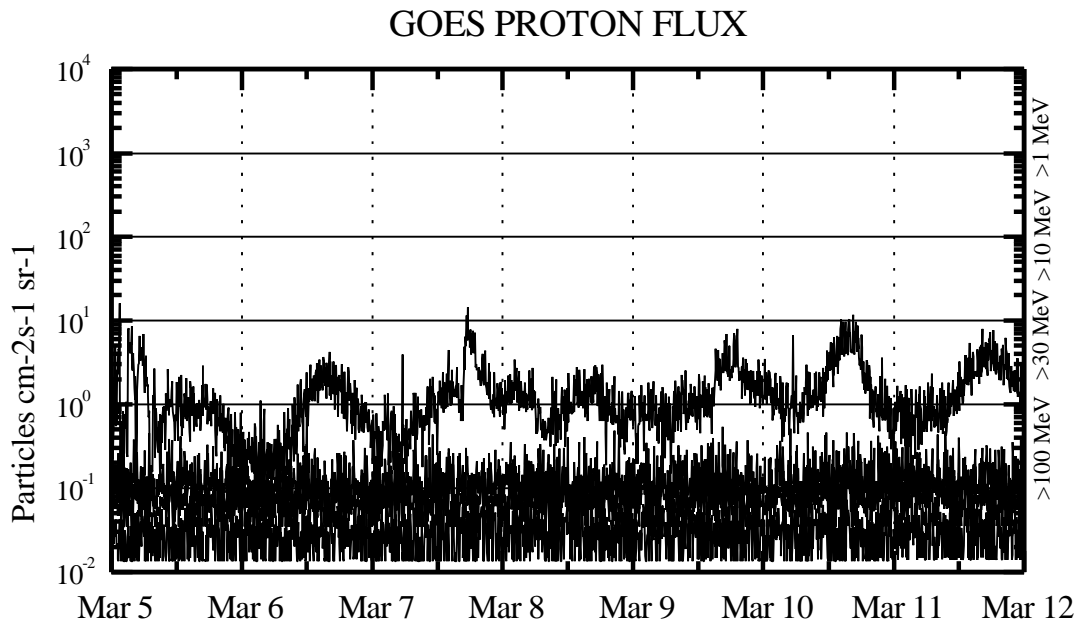
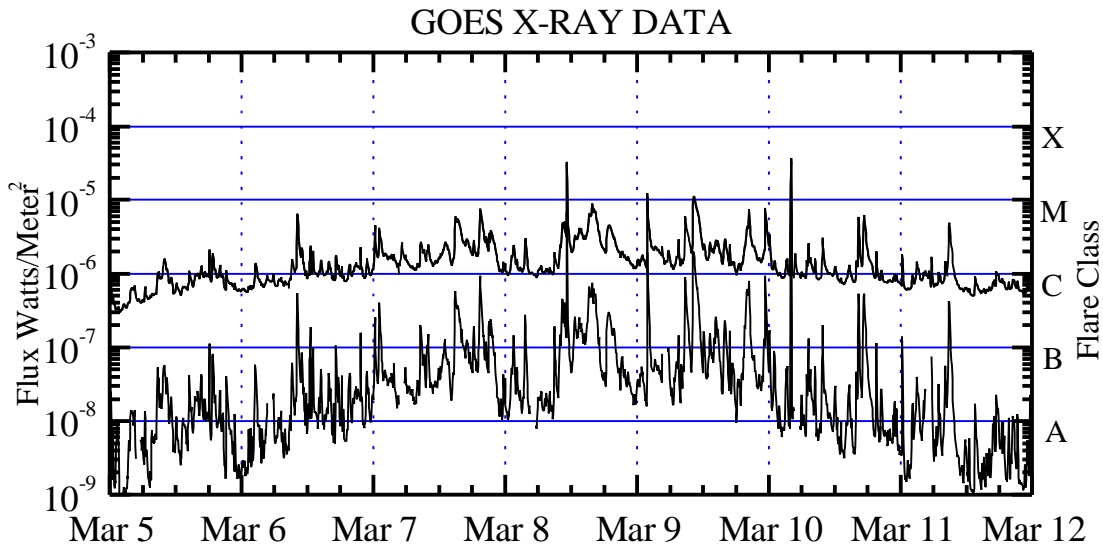
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm² -sec -sr) with energies greater than 2 MeV at GOES-8.

Hp plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-8. The H 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 USAF 55th Space Weather Squadron) 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 Kp 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 Kp are “ global ” parameters that are applicable to a first order approximation over large areas. Hparallel 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/m^2) as measured by GOES 8 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 ($\text{protons/cm}^2 \text{-sec-sr}$) as measured by GOES-8 (W75) for each of the energy thresholds: >1 , >10 , >30 and $>100 \text{ MeV}$. P10 event threshold is 10 pfu ($\text{protons/cm}^2 \text{-sec-sr}$) at greater than 10 MeV.

