

Space Weather Highlights
02-08 March 1998

Solar activity was low. Region 8171 (S24, L = 234, class/area Eki/660 on 05 March) produced isolated C-class subflares before crossing the west limb early on 07 March. Isolated, optically uncorrelated C-class X-ray flares occurred during the rest of the period.

Solar wind data were available from the WIND spacecraft during most of the period. Velocities gradually declined from 400 - 300 km/sec. However, velocities briefly increased to around 500 km/sec during 02 March. Solar wind particle densities were enhanced on 02 March with a peak of 22 p/cc, then declined to a range of 03 - 05 p/cc during 03 - 04 March. Densities increased during the remainder of the period with a peak of 45 p/cc detected early on 06 March. Bz was mostly south during 02 - 04 March (maximum deflection minus 06 nT (GSM) on 02 March), then shifted north on 05 March with a maximum deflection of plus 10 nT. Bz ranged plus to minus 05 nT for the remainder of the period. Solar sector orientation was toward (phi angle near 315 degrees) during 02 - 04 March, then shifted to away conditions (phi angle near 135 degrees) on 05 March. Sector orientation was not discernible during the rest of the period.

There were no significant proton enhancements observed at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude reached high levels late on 02 March, then declined to normal levels for the rest of the period.

The geomagnetic field was at unsettled to minor storm levels on 02 March with the active to minor storm levels confined to the high latitudes. Activity subsided to mostly quiet levels through midday on 04 March. Activity increased during the latter half of 04 March with active periods detected at middle latitudes and active to minor storm periods at high latitudes. Activity declined to unsettled to quiet levels for the rest of the period.

Space Weather Forecast
11 March 1998 - 06 April 1998

Solar activity is expected to be very low to low. Isolated C-class flare activity is forecast.

No significant proton enhancements are expected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be normal during most of the period. However, fluxes may reach high levels during 11 -12 March.

The geomagnetic field is expected to be at quiet to unsettled levels during most of the period. Active to minor storm conditions are possible during 11 March (a geomagnetic disturbance was in progress at issue time and is expected to continue through tomorrow; details will be available in next week's highlights).



Daily Solar Data

Date	Radio	Sun	Sunspot	X-ray	X-ray Flux			Flares	Optical			
	Flux 10.7 cm	spot No. (10 ⁶ hemi.)	Area	Background	C	M	X	S	1	2	3	4
02 March	98	105	300	B1.5	3	0	0	12	0	0	0	0
03 March	97	56	310	B2.2	7	0	0	17	0	0	0	0
04 March	102	55	560	B3.6	7	0	0	9	0	0	0	0
05 March	97	42	710	B6.3	9	0	0	12	1	0	0	0
06 March	92	54	400	B2.4	2	0	0	1	0	0	0	0
07 March	92	54	80	B2.6	1	0	0	0	0	0	0	0
08 March	91	57	130	B1.9	1	0	0	1	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
02 March	6.3E+5	1.7E+4	4.4E+3		2.3E+7	
03 March	2.4E+5	****	****		3.3E+7	
04 March	2.5E+5	1.8E+4	4.1E+3		1.3E+7	
05 March	9.6E+4	1.8E+4	4.2E+3		4.9E+5	
06 March	1.2E+5	1.7E+4	4.1E+3		5.2E+5	
07 March	1.7E+5	1.7E+4	4.1E+3		6.3E+5	
08 March	1.6E+5	1.8E+4	4.3E+3		4.5E+5	

Daily Geomagnetic Data

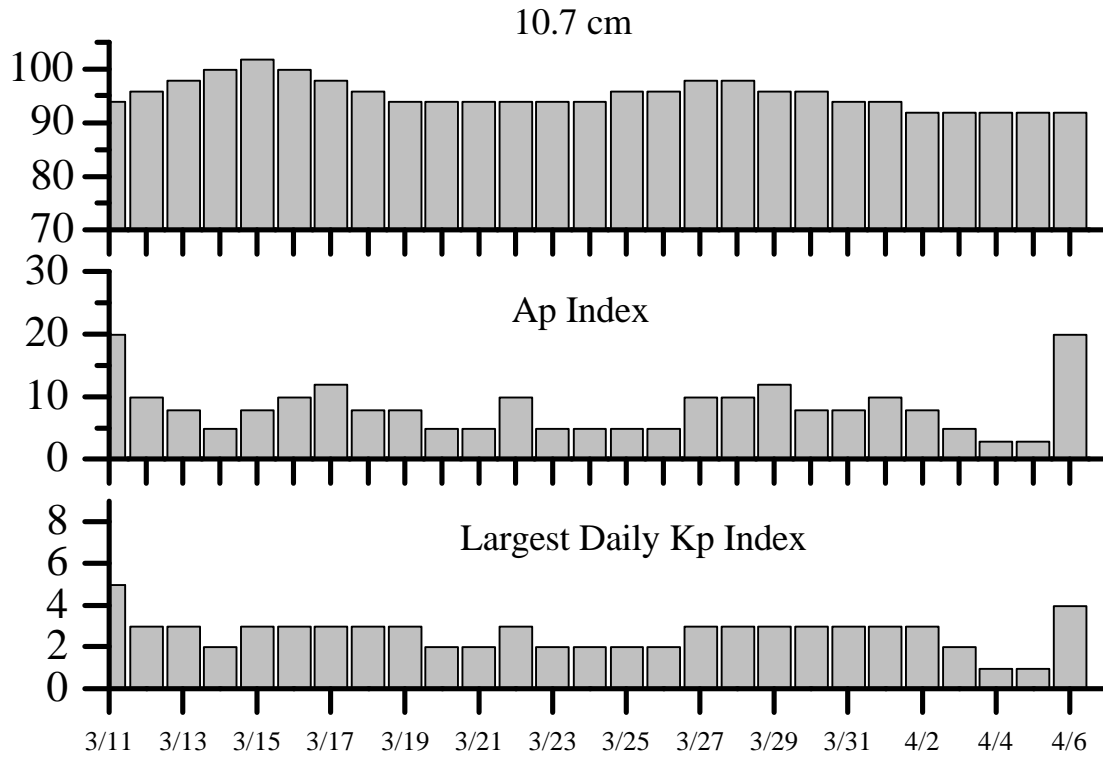
Date	Middle Latitude		High Latitude		Estimated	
	Fredericksburg		College		Planetary	
	A	K-indices	A	K-indices	A	K-indices
02 March	11	3-3-3-3-2-1-2-3	*	*-3-*-*3-*3-3-3	14	3-3-4-3-3-2-3-3
03 March	3	3-1-1-0-0-0-1-0	2	2-1-1-0-0-0-1-0	4	3-1-1-0-0-1-1-1
04 March	4	2-1-1-1-2-2-1-0	25	0-0-2-3-6-6-3-1	8	2-2-1-1-3-3-2-2
05 March	10	3-1-3-3-1-0-1-4	10	1-1-3-3-0-0-0-5	9	1-1-3-3-1-1-2-3
06 March	7	3-3-2-1-2-1-1-1	12	2-1-1-4-5-1-0-0	6	3-2-1-1-3-2-0-0
07 March	2	0-1-1-1-1-0-0-0	4	0-2-3-2-0-0-0-0	5	2-2-3-1-1-0-1-2
08 March	2	1-1-0-0-1-0-1-0	*	*-*-*-*-*-*-*	2	1-0-0-0-1-1-1-1

Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
02 Mar 0905	K=4 Observed	2 Mar 06-09
02 Mar 2159	>2MeV Electron Event ≥ 1000pfu	2 Mar 2151
04 Mar 0004	>2MeV Electron Event in Progress ≥ 1000pfu	3 Mar
06 Mar 0000	K=4 Observed	5 Mar 21-00



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
11 Mar	94	20	5	25	96	5	2
12	96	10	3	26	96	5	2
13	98	8	3	27	98	10	3
14	100	5	2	28	98	10	3
15	102	8	3	29	96	12	3
16	100	10	3	30	96	8	3
17	98	12	3	31	94	8	3
18	96	8	3	01 Apr	94	10	3
19	94	8	3	02	92	8	3
20	94	5	2	03	92	5	2
21	94	5	2	04	92	3	1
22	94	10	3	05	92	3	1
23	94	5	2	06	92	20	4
24	94	5	2				



Energetic Events

Date	Time (UT)		X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	½ Max	Class	Integ Flux	Imp Brtns	Location		Rgn #	Radio Flux	
							Lat	CMD		245	2695

No Events Observed

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn #
	Begin	Max	End			Lat	CMD	
02 March	0329	0330	0335	B4.2	SF	S24W26	8171	
	0424	0433	0437	C1.0	SF	S23W28	8171	
	0439	0441	0443		SF	S24W27	8171	
	0610	0613	0615	B4.1				
	0804	0810	0816	B5.7				
	1208	1209	1222	C1.2	SF	S24W33	8171	
	B1357	U1400	1418		SF	S22W46	8171	
	1420	1423	1425	B2.1				
	1841	1844	1846	B3.2				
	2019	2019	2021		SF	S22W37	8171	
	2025	2028	2036		SF	S23W35	8171	
	2059	2103	2111		SF	S22W36	8171	
	2148	2151	2153	B6.0	SF	S22W36	8171	
	2245	2248	2252	B4.3				
	2253	2256	2258		SF	S22W37	8171	
	2304	2308	2312	B6.7	SF	S22W37	8171	
	2326	2334	2337		SF	S21W38	8171	
	2354	0001	0004	C1.9				
03 March	0008	0013	0015	B8.6				
	0041	0044	0048	B5.2				
	0137	0154	0156	C1.6				
	0248	0250	0259	C1.0	SF	S24W38	8171	
	0303	0309	0316	C1.1	SF	S24W39	8171	
	0720	0720	0728	C1.2	SF	S23W43	8171	
	0908	0918	0921		SF	S22W43	8171	
	0930	0939	1021	B4.2	SF	S24W41	8171	
	1031	1034	1036	B3.1				
	1105	1105	1120	B5.0	SF	S22W43	8171	
	1128	1131	1137	B4.7	SF	S21W43	8171	
	1225	1229	1232	B5.5	SF	S23W44	8171	
	1317	1327	1417	B3.4	SF	S21W45	8171	
	1401	U1401	1413	B9.7	SF	S21W47	8171	
	1424	1424	1429		SF	S21W45	8171	
	1801	1804	1807	B4.6				
	2039	2040	2048	C1.8	SF	S23W47	8171	
	2135	2139	2149	C1.1	SF	S21W49	8171	
2151	2152	2157		SF	S21W52	8171		



Flare List – continued.

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
03 March	2158	2208	2230	C2.4	SF	S22W49	8171
	2328	2332	2338	B6.2	SF	S22W50	8171
	2342	2348	2350		SF	S21W52	8171
04 March	2355	0018	0038	B5.6			
	0040	0046	0051	B7.6			
	0129	0129	0135	B7.2	SF	S25W49	8171
	0338	0344	0347	B8.5	SF	S25W49	8171
	0555	0556	0606	C1.9	SF	S24W53	8171
	0714	0716	0726	C2.7	SF	S24W53	8171
	0933	0939	0943	B4.0			
	1134	1138	1141		SF	S24W55	8171
	1143	1222	1240	B8.3			
	1628	1631	1635	B4.9			
	1734	1735	1743	C1.5	SF	S22W63	8171
	1809	1849	1909	C1.3			
	B1912	U1914	A1927	C2.1	SF	S26W58	8171
	1941	1943	1945	C1.2	SF	S25W56	8171
	2134	2134	2144	C2.7	SF	S22W59	8171
2219	2222	2225	B5.0				
2337	2340	2352	B5.6				
05 March	0018	0020	0029	C2.8	SF	S24W63	8171
	0343	0355	0408		SF	S24W65	8171
	0441	0447	0455	B6.3			
	0446	0446	0451		SF	S24W65	8171
	0536	0540	0546	B8.2			
	0617	0620	0622	B6.3			
	0707	0714	0718	B7.8			
	0807	0814	0822	C1.4	SF	S24W67	8171
	0909	0911	0916	C4.4	SF	S26W72	8171
	0939	0940	0944		SF	S24W67	8171
	1107	1122	1127	B9.5			
	1205	1209	1234	B9.7	SF	S24W69	8171
	1231	1237	1242	C2.6			
	1300	1325	1343	C2.0	SF	S23W71	8171
1506	1506	1510	C2.5	SF	S25W74	8171	
1720	1721	1723		SF	S18W92	8171	
1729	1737	1741	C1.5				



Flare List – continued.

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn #
	Begin	Max	End			Location Lat CMD		
05 March	1825	1825	1829	SF		S20W93	8171	
	1841	1844	1858	B5.0				
	2009	2010	2026	C1.4	1F	N24W46	8172	
	2159	2203	2206	B4.1				
	2302	2309	2312	C5.6				
06 March	B2315	2318	2321		SF	S24W75	8171	
	0100	0104	0109	B3.6				
	0126	0128	0134	C2.7	SF	S24W77	8171	
	0223	0235	0248	B7.7				
	0633	0643	0652	B8.0				
	1123	1127	1132	B4.0				
	1231	1236	1240	C1.0				
	1721	1739	1750	B4.6				
	1906	1910	1913	B4.1				
	2059	2103	2105	B5.0				
07 March	0219	0231	0253	C1.3				
	0624	0631	0637	B3.4				
	1451	1458	1510	B8.6				
	1759	1803	1805	B4.5				
08 March	1859	1902	1907	B3.0				
	0314	0318	0325	B4.2				
	0525	0525	0530		SF	S41E66	8176	
	0832	0837	0842	B3.4				
	1902	1924	1939	C1.1				

Region Summary

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 8164</i>																		
23 Feb	N17E14	278	0020	04	BXO	004	B											
24 Feb	N16E01	278	0070	07	DAI	016	B	1				6						
25 Feb	N17W12	277	0130	08	DAO	019	B											
26 Feb	N16W25	277	0120	08	DAI	018	B											
27 Feb	N17W37	276	0090	08	DAO	013	B											
28 Feb	N16W51	277	0030	07	CRO	005	B					1						
01 Mar	N15W66	279	0060	06	CSO	004	B											
02 Mar	N15W82	281	0020	01	AXX	001	A											
								1	0	0	7	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 278



Region Summary- continued.

Date	Location		Sunspot Characteristics				Flares										
	(° Lat ° CMD)	Helio	Area hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical						
		Lon (10 ⁻⁶)						C	M	X	S	1	2	3	4		
<i>Region 8165</i>																	
23 Feb	N29E53	239	0010	03	BXO	003	B										
24 Feb	N28E39	240	0010	04	BXO	002	B										
25 Feb	N28E26	240															
26 Feb	N28E13	240															
27 Feb	N28E00	240															
28 Feb	N28W13	240															
01 Mar	N28W26	240															
02 Mar	N28W39	240															
03 Mar	N28W52	240															
04 Mar	N28W65	240															
05 Mar	N28W78	240															

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 240

<i>Region 8167</i>																	
24 Feb	S27E17	262	0010	04	BXO	005	B										
25 Feb	S26E04	261	0060	06	DAO	007	B										
26 Feb	S26W09	261	0070	07	DAO	008	B				1						
27 Feb	S26W22	261	0030	07	CRO	008	B										
28 Feb	S26W33	260	0020	04	BXO	003	B										
01 Mar	S26W45	258	0020	05	BXO	005	B										
02 Mar	S25W56	255	0010	04	BXO	003	B										
03 Mar	S25W69	255															
04 Mar	S25W82	255															

0 0 0 1 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 261

<i>Region 8169</i>																	
27 Feb	S20W44	283	0010	04	BXO	003	B										
28 Feb	S21W60	286	0020	06	BXO	004	B										
01 Mar	S20W72	285	0070	07	CSO	005	B	2			3						
02 Mar	S21W86	285	0060	11	CSO	005	B										

2 0 0 3 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 283



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 8170</i>																							
27 Feb	N00E02	237	0000	00	AXX	001	A																
28 Feb	N00W11	237																					
01 Mar	N00W24	237																					
																					0 0 0 0 0 0 0 0		
Died on Disk.																							
Absolute heliographic longitude: 237																							
<i>Region 8171</i>																							
27 Feb	S24E05	234	0010	02	BXO	003	B																
28 Feb	S24W10	236	0030	05	DRO	008	B															1	
01 Mar	S23W23	236	0110	08	DSO	014	B															1	
02 Mar	S23W36	235	0190	10	DSI	030	B	1														12	
03 Mar	S23W50	236	0300	12	EAI	024	B	5														17	
04 Mar	S24W62	235	0540	11	EKI	019	BG	6														9	
05 Mar	S24W75	235	0660	14	EKI	016	BG	5														12	
06 Mar	S24W86	233	0340	10	DHO	005	B	1														1	
																						18 0 0 53 0 0 0 0	
Crossed West Limb.																							
Absolute heliographic longitude: 234																							
<i>Region 8172</i>																							
01 Mar	N22E06	207	0020	04	BXO	004	B																
02 Mar	N23W07	206	0010	06	BXO	005	B																
03 Mar	N23W22	208	0010	00	AXX	001	A																
04 Mar	N22W35	208	0020	07	CRO	005	B																
05 Mar	N22W49	209	0050	06	CRO	006	B	1														1	
06 Mar	N23W63	210	0040	07	BXO	005	B																
07 Mar	N23W75	210	0030	08	BXO	005	B																
																						1 0 0 0 1 0 0 0	
Died on Disk.																							
Absolute heliographic longitude: 207																							



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 8173</i>																	
01 Mar	S17E71	142	0000	00	AXX	001	A										
02 Mar	S17E57	142	0010	00	AXX	001	A										
03 Mar	S15E43	143	0000	00	AXX	001	A										
04 Mar	S16E29	144	0000	00	AXX	001	A										
05 Mar	S16E16	144															
06 Mar	S18E10	137	0010	02	BXO	002	B										
07 Mar	S18W03	137															
08 Mar	S18W16	137															
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 137																	
<i>Region 8174</i>																	
06 Mar	S17E50	097	0010	02	BXO	002	B										
07 Mar	S17E37	098	0040	05	DRO	007	B										
08 Mar	S19E25	095	0050	07	CSO	008	B										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 95																	
<i>Region 8175</i>																	
07 Mar	N44E56	079	0020	01	AXX	002	A										
08 Mar	N45E46	074	0040	02	HAX	001	A										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 074																	
<i>Region 8176</i>																	
08 Mar	S43E66	069	0000	01	AXX	001	A										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 066																	
<i>Region 8177</i>																	
08 Mar	S33W21	141	0010	03	BXO	002	B										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 141																	



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

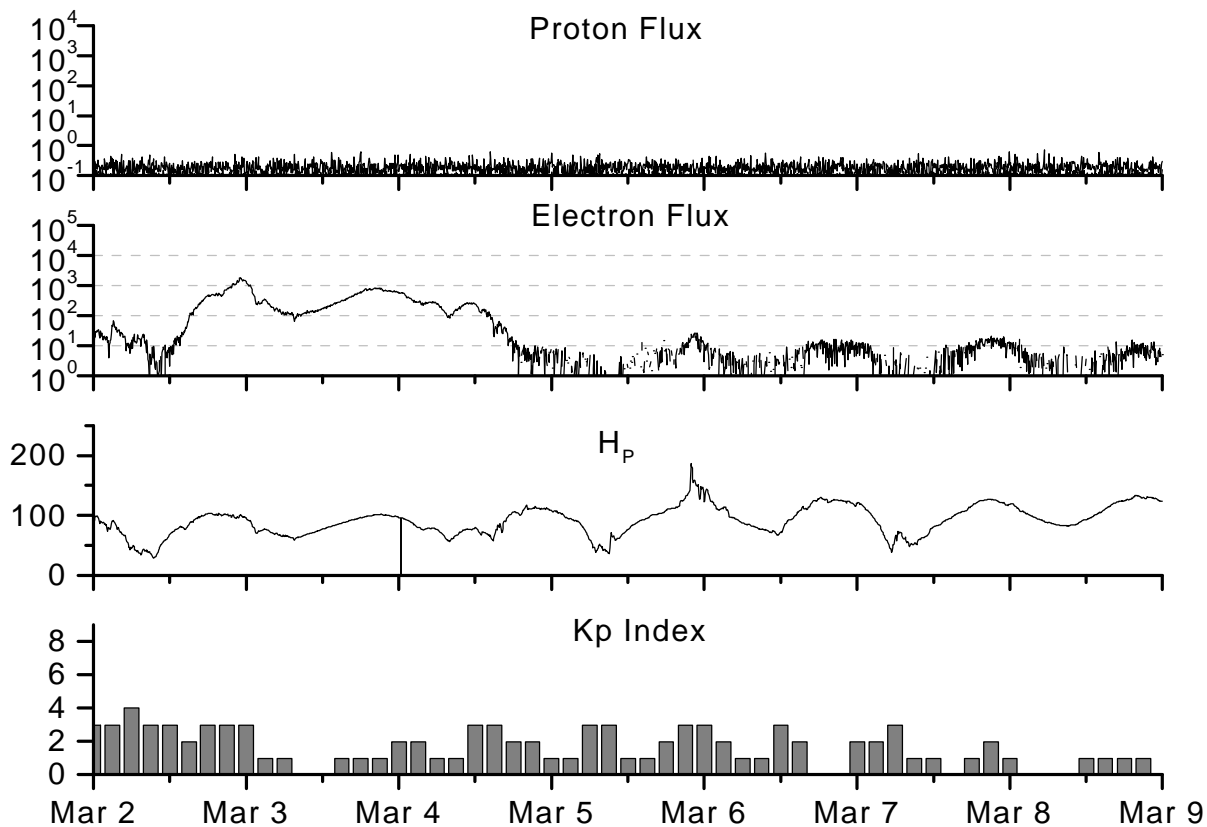
Month	Sunspot Numbers				Radio Flux		Geomagnetic		
	Observed SWO	values RI	Ratio RI/SWO	Smooth SWO	values RI	**Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
1996									
March	12.1	09.2	0.76	15.4	09.7	72.7	72.1	11	09.9
April	08.5	04.8	0.56	13.6	08.5	69.3	71.6	11	09.7
May	11.8	05.5	0.47	12.9	08.0	72.1	71.4	07	09.5
June	18.8	11.8	0.63	13.5	08.5	69.6	71.8	05	09.4
July	13.2	08.2	0.62	13.4	08.4	71.2	72.0	07	09.3
August	20.5	14.4	0.70	13.1	08.3	72.4	72.1	09	09.4
September	02.9	01.6	0.55	13.3	08.4	69.4	72.3	15	09.3
October	02.3	00.9	0.39	14.0	08.8	69.2	72.6	13	09.1
November	26.7	17.9	0.67	15.4	09.8	78.7	73.0	08	09.1
December	21.1	13.3	0.63	16.2	10.4	77.8	73.3	07	09.3
1997									
January	09.0	05.7	0.63	16.5	10.5*	74.0	73.4	09	09.3*
February	11.3	07.6	0.67	17.4	11.0*	73.8	73.7	11	09.2*
March	14.4	08.7	0.60	20.4	13.5*	73.5	75.1*	08	09.0*
April	24.5	15.5	0.63	24.0	16.5*	74.5	76.8*	10	08.6*
May	28.6	18.5	0.65	26.4	18.4*	74.6	78.4*	08	08.6*
June	22.1	12.7	0.57	29.0	20.4*	71.7	80.1*	07	08.6*
July	17.0	10.5*	0.62*	32.4	22.7*	71.1	81.8*	06*	08.4*
August	36.7	24.7*	0.67*	35.9	25.2*	79.0	83.4*	08*	08.2*
September	52.8	51.3*	0.88*			96.2*		10*	
October	33.6	23.3*	0.69*			85.0*		10*	
November	53.5	39.3*	0.73*			99.5*		10*	
December	57.9	41.5*	0.72*			98.8*		05*	
1998									
January	51.8	32.3*	0.62*			93.5*		07*	
February	54.4	40.7*	0.75*			93.6*		07*	

*Preliminary estimates.

The lowest smoothed sunspot indices 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.

** From June 1991 onward, 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 02 March 1998*

Protons plot contains the five-minute averaged integral proton flux (protons/ cm²-sec-sr) as measured by GOES-9 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

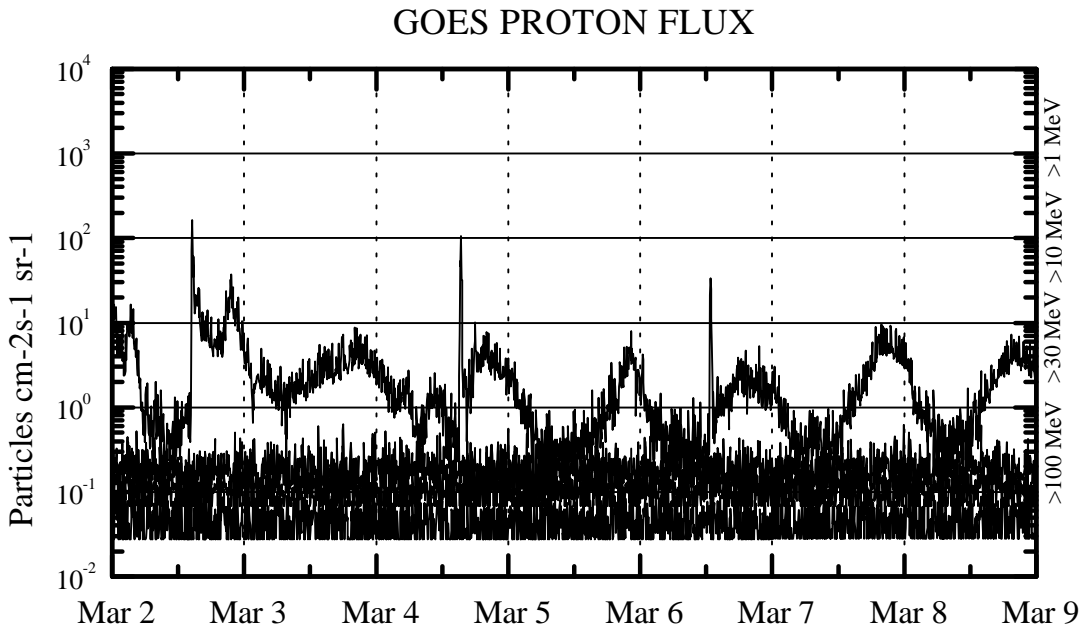
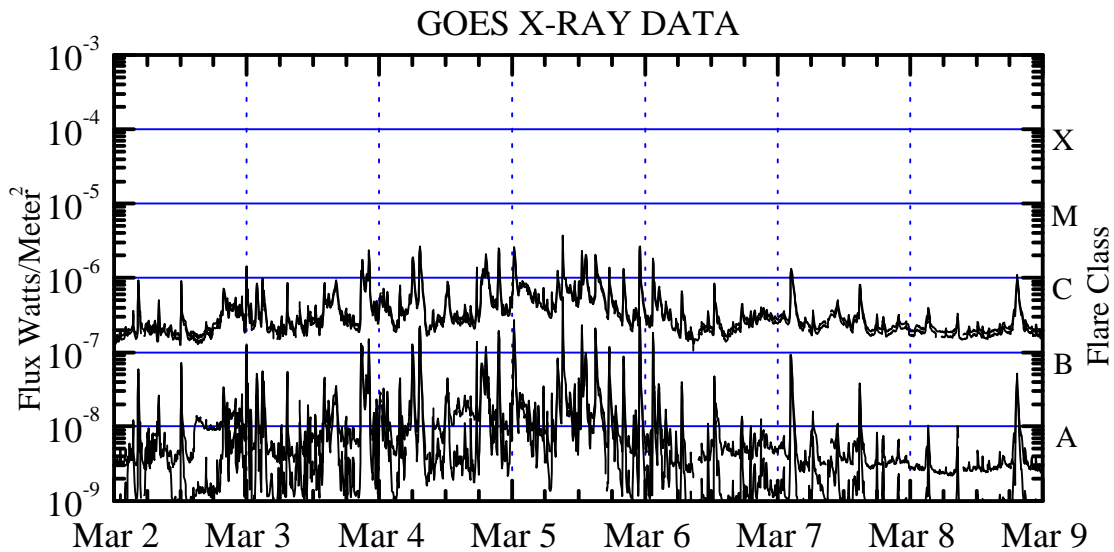
Electrons plot contains the five-minute averaged integral electron flux (electrons/ cm² -sec-sr) with energies greater than 2 MeV at GOES-9.

H_p plot contains the five minute averaged magnetic field H component in nanoteslas (nT) as measured by GOES-9. 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 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 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_{parallel} is subject to a 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

Proton plot contains the five minute averaged integral proton flux (protons/ $\text{cm}^2\text{-sec-sr}$) as measured by GOES-9 (W135) for each of the energy thresholds: >1 , >10 , >30 and >100 MeV. P10 event threshold is 10 pfu (protons/ $\text{cm}^2\text{-sec-sr}$) at greater than 10 MeV.

X-ray plot contains five minute averaged x-ray flux (watts/ m^2) as measured by GOES 8 and 9 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.

