

**Space Weather Highlights
01-07 March 1999**

Solar activity was low throughout the period. Isolated C-class flares occurred each day from a few small- to medium-sized regions, typically during periods of minor growth within these regions. A 38-degree, high latitude filament disappeared from the southeast quadrant on 05 March.

Real-time solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft during most of the period. It appeared that Earth was under the influence of a high-speed coronal hole windstream during most of the period. Velocities were elevated during the period with peaks near 600 km/sec noted on 02 and 05 March. Particle densities were enhanced on 01 March preceding the onset of coronal hole effects reaching a peak of 50 p/cc, then declined to a range of 02 - 05 p/cc for most of the rest of the period. The Earth was in a toward (negative polarity) solar sector during most of the week. IMF Bz varied from plus 16 to minus 10 nT (GSM) on 01 March, then hovered around zero in the plus to minus 07 nT range for the rest of the period.

There were no significant proton enhancements detected at geo-synchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude was at normal to moderate levels during 01 - 03 March, then increased to moderate to high levels for the rest of the period.

Geomagnetic field activity varied from quiet to minor storm levels during most days with brief periods of major to severe storm levels at some high latitude stations. It appeared an isolated, southern hemispheric coronal hole was the likely source for this activity.

**Space Weather Outlook
10 March - 05 April 1999**

Solar activity is expected to be low to moderate. Isolated M-class flares are possible during the first half of the period.

No significant proton enhancements are expected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be at normal to moderate levels during most of the period. However, fluxes may reach high levels during 11 - 12 March and again during 29 March - 05 April.

The geomagnetic field is expected to be at quiet to unsettled levels during most of the period.

However, active to minor storm levels are possible around 18 March and again during 28 March - 03 April due to recurrent coronal hole effects.



Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No. (10 ⁶ hemi.)	Sunspot Area	X-ray Background	Flares							
					X-ray Flux			Optical				
					C	M	X	S	1	2	3	4
01 March	120	127	370	B3.5	4	0	0	7	0	0	0	0
02 March	130	143	540	B2.8	4	0	0	20	1	0	0	0
03 March	137	148	630	B4.1	5	0	0	22	1	0	0	0
04 March	144	144	660	B4.3	4	0	0	3	0	0	0	0
05 March	128	135	650	B4.6	2	0	0	2	1	0	0	0
06 March	114	136	530	B3.3	2	0	0	5	0	0	0	0
07 March	110	93	420	B8.0	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
01 March	1.5E+5	1.8E+4	5.1E+3		1.4E+6	
02 March	1.6E+5	1.6E+4	4.2E+3		2.2E+6	
03 March	1.1E+5	1.6E+4	4.4E+3		7.2E+6	
04 March	3.2E+5	1.5E+4	4.2E+3		2.9E+7	
05 March	6.6E+5	1.5E+4	4.1E+3		1.1E+8	
06 March	1.7E+5	1.5E+4	4.1E+3		1.4E+8	
07 March	3.5E+5	1.6E+4	4.0E+3		3.0E+7	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	01 March	23	5-4-2-3-4-3-3-4	31	3-5-3-2-5-5-5-3	33
02 March	12	4-4-2-2-2-2-2-2	27	5-4-3-2-5-5-3-2	18	5-4-3-2-3-3-2-3
03 March	11	1-3-2-3-1-2-4-2	23	3-1-2-4-5-5-4-2	15	2-3-3-3-3-4-4-3
04 March	19	2-4-4-3-4-3-3-3	43	2-3-5-5-6-6-5-3	23	3-4-5-4-4-4-4-3
05 March	17	5-2-4-3-3-3-1-1	29	3-2-5-5-3-4-4-5	18	4-3-5-3-3-4-2-2
06 March	7	1-3-0-2-1-3-2-2	20	1-1-1-5-3-4-3-5	11	2-2-1-3-2-3-3-4
07 March	14	3-4-4-3-2-2-2-2	44	3-4-7-6-2-4-5-2	25	3-4-6-4-2-4-3-3

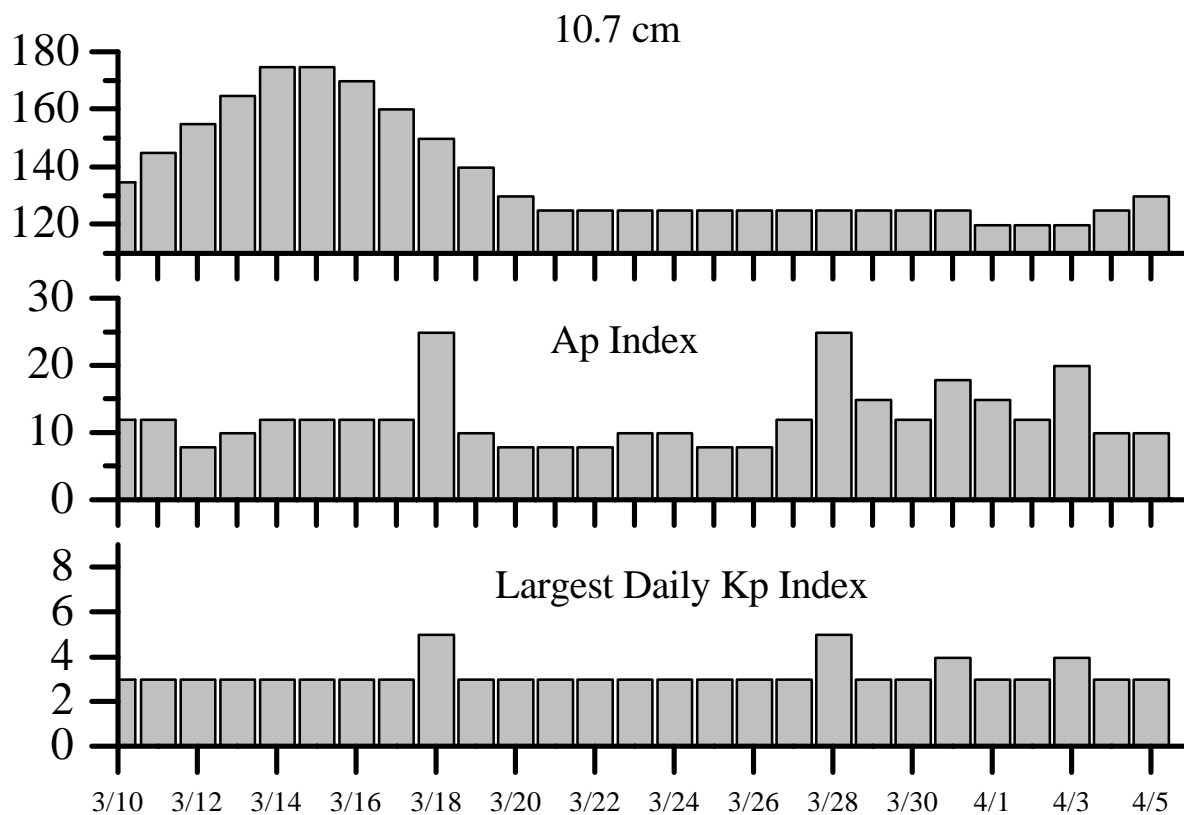


Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
01 Mar 0001	K= 4 Observed	28 Feb 21 - 24
01 Mar 0001	K= 4 Warning	01 Mar 00 - 12
01 Mar 0300	K= 5 Observed	01 Mar 00 - 03
01 Mar 0600	A \geq 20 Observed	01 Mar 0600
01 Mar 0600	K= 5 Observed	01 Mar 03 - 06
01 Mar 1342	Stratwarm Alert EXISTS Monday	01 Mar
01 Mar 1447	K= 4 Observed	01 Mar 12 - 15
01 Mar 1902	K= 4 Observed	01 Mar 15 - 18
01 Mar 1911	K= 4 Warning	01 Mar 1800 - 02 Mar 0000
02 Mar 0300	K= 5 Observed	02 Mar 00 - 03
02 Mar 0600	K= 4 Observed	02 Mar 03 -06
02 Mar 1200	A \geq 20 Observed CONTINUED	01 Mar 0600
02 Mar 1257	Stratwarm Alert EXISTS Tuesday	02 Mar
03 Mar 0037	1-245 MHz Burst	02 Mar
03 Mar 1342	Stratwarm Alert EXISTS Wednesday	03 Mar
04 Mar 0102	1 - 245 MHz Noise Storm	03 Mar
04 Mar 0600	K= 4 Observed	04 Mar 03 - 06
04 Mar 0900	K= 4 Observed	04 Mar 06 - 09
04 Mar 0900	K= 4 Warning	04 Mar 09 - 15
04 Mar 1358	Stratwarm Alert EXISTS Thursday	04 Mar
04 Mar 1610	K= 4 Warning	04 Mar 1600 - 05 Mar 1200
04 Mar 1922	>2MeV Electron Event \geq 1000pfu BEG	04 Mar 1920
05 Mar 0101	1-245 MHz Burst	04 Mar
05 Mar 0101	1 - 245 MHz Noise Storm	04 Mar
05 Mar 0300	A \geq 20 Observed	05 Mar 0300
05 Mar 0300	K= 5 Observed	05 Mar 00 - 03
05 Mar 0300	K= 5 Warning	05 Mar 03 - 15
05 Mar 1234	Stratwarm Alert EXISTS Friday	05 Mar
05 Mar 1434	K= 4 Warning	05 Mar 1500 - 06 Mar 1500
06 Mar 0104	1-245 MHz Burst	05 Mar
06 Mar 0104	1 - 245 MHz Noise Storm	05 Mar
06 Mar 1201	>2MeV Electron Event \geq 1000pfu CONTINUED	04 Mar 1920
07 Mar 0023	1-245 MHz Burst	06 Mar
07 Mar 0610	K= 5 Observed	07 Mar 03 - 06
07 Mar 0901	A \geq 20 Observed	07 Mar 0900
07 Mar 1159	>2MeV Electron Event \geq 1000pfu CONTINUED	04 Mar 1920



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
10 Mar	135	12	3	24 Mar	125	10	3
11	145	12	3	25	125	8	3
12	155	8	3	26	125	8	3
13	175	10	3	27	125	12	3
14	175	12	3	28	125	25	5
15	170	12	3	29	125	15	3
16	160	12	3	30	125	12	3
17	150	12	3	31	125	18	3
18	140	25	5	01 Apr	120	15	3
19	130	10	3	02	120	12	3
20	125	8	3	03	120	20	4
21	125	8	3	04	125	10	3
22	125	8	3	05	130	10	3
23	125	10	3				



Energetic Events

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

No Events Observed

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical	Rgn #
	Begin	Max	End			Location Lat CMD	
01 March	0035	0052	0104	C1.0			
	0341	0345	0352	C1.7	SF	N29W13	8471
	0532	0535	0541	C2.0	SF	N28W17	8471
	0541	0542	0550		SF	N28W17	8471
	1332	1335	1354	C3.1	SF	N28W19	8471
	1434	1437	1452		SF	N30E21	8475
	1722	1724	1731		SF	N31E19	8475
	1744	1749	1757		SF	N31E19	8475
	1821	1827	1837	B7.7			
	2348	2353	2358	B5.5			
02 March	0331	0335	0339	B7.7			
	0431	0435	0439	C1.3			
	0529	0532	0535	B6.5			
	0635	0635	0639		SF	N29W27	8471
	0909	0916	0953		SF	N17W02	8476
	0926	0928	0933		SF	N29W06	8472
	1056	1100	1102	B6.9			
	1209	1210	1234	C6.3	SN	N31E11	8475
	1242	1242	1255		SF	N17W03	8476
	1324	1331	1343	C1.6	SF	N17W03	8476
	1332	1333	1337		SF	N30W04	8472
	1345	1345	1354		SF	N29W32	8471
	1415	1417	1426		SF	N29E08	8475
	1419	1530	1545		SF	N17W04	8476
	1434	1446	1503		SF	N31E08	8475
	1450	1517	1552	C6.2	1F	N28W37	8471
	1504	1512	1525		SF	N31E09	8475
	1526	1534	1543		SF	N30E07	8475
	1549	1550	1557		SF	N30E07	8475
	1638	1641	1647		SF	N27W38	8471
1712	1712	1717		SF	N31E08	8475	
1754	1754	1805		SF	N18W06	8476	
1756	1757	1758		SF	N29E05	8475	
1819	1820	1826		SF	N29W36	8471	
2035	2036	2044		SF	N30E06	8475	
2237	2240	2245	B6.1				



Flare List-continued

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
03 March	0125	0126	0139	C2.0	SF	N27W40	8471
	0332	0343	0359	C4.5	SF	N27W41	8471
	0334	0334	0340		SF	N27W41	8471
	0458	0459	0506		SF	N16W13	8476
	0601	0602	0611	C1.5	SF	N16W16	8476
	0750	0751	0753	B7.6	SF	N18W13	8476
	0753	0757	0800	B7.1			
	1322	1324	1331	B8.1	SF	N28W50	8471
	1348	1348	1354		SF	N28W50	8471
	1413	1414	1420		SF	N17W17	8476
	1526	1527	1546		SF	N17W17	8476
	1536	1537	1547		SF	N28W51	8471
	1601	1608	A1625		SF	N29W51	8471
	1608	1609	1618		SF	N17W18	8476
	1632	1632	1637		SF	N28W43	8471
	1652	1652	1703	C1.1	SF	N18W18	8476
	1713	1716	1719	B9.6			
	1731	1731	1734		SF	N17W19	8476
	1819	1820	1826		SF	N29W36	8471
	1834	1835	1842		SF	N17W21	8476
	1847	1855	1904		SF	N18W19	8476
	1848	1850	1855		SF	N28W52	8471
	1944	1947	1949	B6.9			
	2018	2020	2040		SF	N17W21	8476
	2041	2045	2053		SF	N17W21	8476
	2336	2343	0004	C3.0	1F	N33W04	8475
	04 March	0258	0303	0312	B7.3		
0510		0514	0529	C3.3	SF	N32W09	8475
1602		1609	1623	C1.0	SF	S25E30	8477
1808		1808	1814		SF	N31W16	8475
1926		1931	1937	C1.4			
05 March	2013	2018	2025	C1.2			
	0506	0510	0516	B8.0			
	0819	0836	0846	C1.0			
	0949	0956	1005	B9.8			
	1727	1728	1736		SF	S25E18	8477
	1834	1837	1844		SF	S15W66	8478
	1910	1916	A2023	C3.7	1N	S25E16	8477



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 8472</i>																			
24 Feb	N28E63	077	0000	00	AXX	001	A												
25 Feb	N30E50	077	0010	06	BXO	004	B												1
26 Feb	N29E40	074	0050	07	CSO	008	B												
27 Feb	N30E27	074	0010	07	BXO	009	B												
28 Feb	N30E11	077	0030	08	CSO	011	B												
01 Mar	N30E01	073	0010	05	BXO	004	B												
02 Mar	N31W09	070	0010	03	BXO	003	B	1											2
03 Mar	N31W22	070																	
04 Mar	N31W35	070																	
05 Mar	N31W48	070																	
06 Mar	N31W61	070																	
07 Mar	N31W74	070																	
																			1 0 0 3 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 073

Region 8473

26 Feb	N18E10	104	0010	03	BXO	003	B												
27 Feb	N18W04	105	0000	02	BXO	002	B												
28 Feb	N16W21	109	0000	02	BXO	002	B												
																			0 0 0 0 0 0 0 0

Died on Disk.

Absolute heliographic longitude: 105

Region 8474

27 Feb	S24W38	139	0010	03	BXO	002	B												
28 Feb	S24W52	140	0010	02	BXO	002	B												
01 Mar	S24W65	140																	
02 Mar	S24W78	140																	
																			0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 139



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 8475</i>																		
27 Feb	N32E43	058	0010	03	BXO	005	B											
28 Feb	N32E29	059	0030	07	CAO	010	B											1
01 Mar	N32E15	059	0120	08	DAO	017	B											3
02 Mar	N31E02	059	0150	09	DAO	015	B	1										9
03 Mar	N31W11	059	0140	11	EAO	017	B	1										1
04 Mar	N32W23	058	0100	12	EAO	014	B	1										2
05 Mar	N31W37	059	0050	13	CRO	009	B											
06 Mar	N30W51	059	0020	10	BXO	003	B	1										2
07 Mar	N30W64	059																
								4	0	0	16	2	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 059

Region 8476

28 Feb	N20E19	069	0010	05	BXO	009	B											1
01 Mar	N19E07	067	0020	06	CRO	006	B											
02 Mar	N18W10	071	0070	07	DSO	015	B	1										5
03 Mar	N18W23	071	0150	09	DSI	021	B	2										12
04 Mar	N18W35	070	0200	12	EKO	018	B											
05 Mar	N18W49	071	0340	12	EAI	024	B											
06 Mar	N17W62	070	0330	13	EAO	019	B											
07 Mar	N17W74	069	0250	14	EAO	009	B											
								3	0	0	18	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 067

Region 8477

28 Feb	S25E77	011	0030	10	CSO	004	B											
01 Mar	S26E64	010	0100	09	DAO	005	B											
02 Mar	S26E53	008	0110	07	DSO	004	B											
03 Mar	S26E40	008	0110	09	DSO	005	B											
04 Mar	S32E28	007	0130	11	EAO	013	B	1										1
05 Mar	S26E15	007	0150	11	EAO	021	B	1										1
06 Mar	S29E01	007	0150	13	ESO	021	B											2
07 Mar	S25W10	005	0090	13	CSO	017	B	1										1
								3	0	0	5	1	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 007



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

Region 8478

01 Mar	S15W08	082	0020	10	BXO	004	B													
02 Mar	S14W26	087	0020	04	CSO	003	B													
03 Mar	S15W40	088	0020	04	CRO	005	B													
04 Mar	S16W52	087	0020	04	BXO	004	B													
05 Mar	S15W66	088	0020	06	BXO	004	B						1							
06 Mar	S15W80	088	0000	00	AXX	001	A						1							
													0	0	0	2	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 082

Region 8479

02 Mar	S14W18	079	0020	03	CSO	003	B													
03 Mar	S14W32	080	0020	04	CSO	005	B													
04 Mar	S14W45	080	0020	05	CRO	005	B													
05 Mar	S13W60	082	0020	06	BXO	003	B													
06 Mar	S13W75	083	0000	00	AXX	001	A													

Died on Disk.

Absolute heliographic longitude: 079

Region 8480

02 Mar	N25E66	355	0000	00	AXX	001	A													
03 Mar	N25E51	357	0010	04	BXO	002	B													
04 Mar	N25E39	356	0000	01	AXX	002	A													
05 Mar	N26E26	356	0010	06	BXO	003	B													
06 Mar	N25E10	358	0010	01	AXX	001	A													
07 Mar	N26E00	355	0000	00	AXX	001	A													

Still on Disk.

Absolute heliographic longitude: 355

Region 8481

03 Mar	S18W15	063	0010	02	BXO	002	B													
04 Mar	S18W28	063	0010	02	BXO	002	B													
05 Mar	S18W41	063																		
06 Mar	S18W54	063																		
07 Mar	S18W67	063																		

Still on Disk.

Absolute heliographic longitude: 063



Region Summary-continued

Location		Sunspot Characteristics					Flares							
Date	(° 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 8482</i>														
06 Mar	S26E64	304	0000	00	AXX	001	A							
07 Mar	S27E54	301	0010	05	BXO	004	B							
								0	0	0	0	0	0	0
Still on Disk.														
Absolute heliographic longitude: 301														
<i>Region 8483</i>														
06 Mar	S18W05	013	0020	03	CRO	009	B							
07 Mar	S17W20	015	0070	05	DAO	012	B							
								0	0	0	0	0	0	0
Still on Disk.														
Absolute heliographic longitude: 013														



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

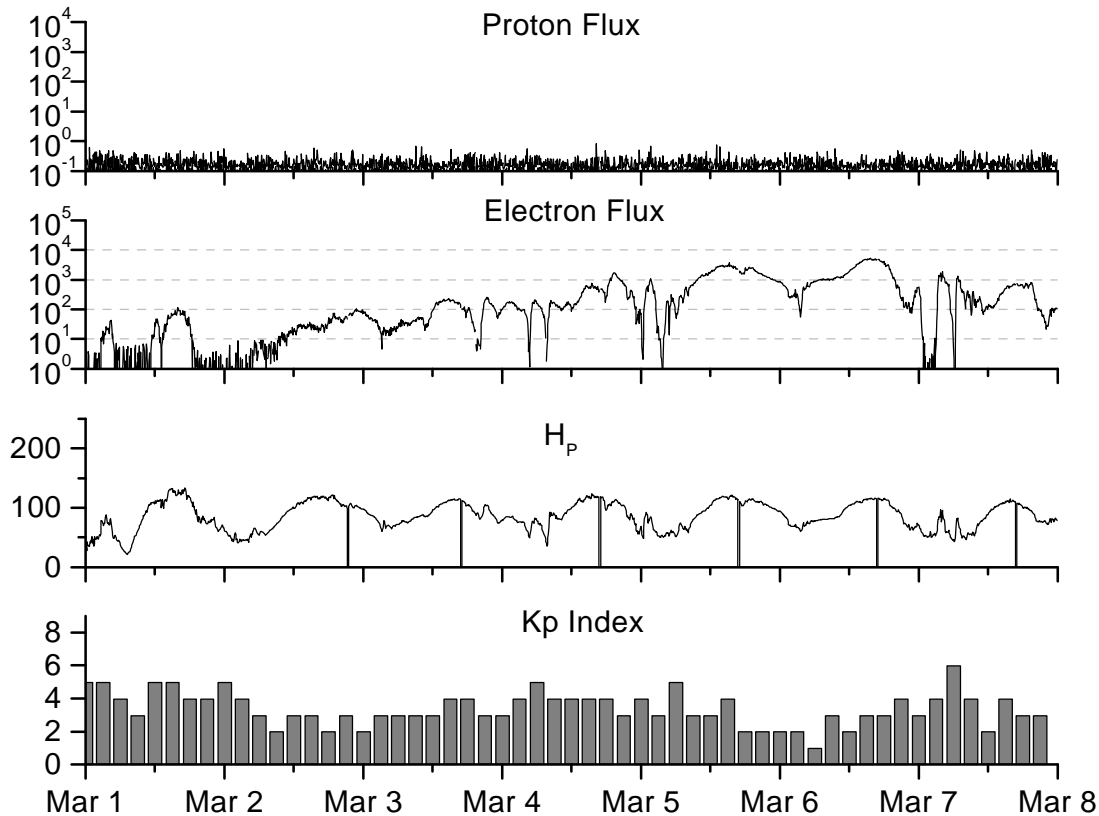
Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	Observed values SWO	Ratio RI	Ratio RI/SWO	Smooth values SWO	Ratio RI	**Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
1997									
March	14.4	08.7	0.60	20.4	13.5	73.5	75.1	08	08.9
April	24.5	15.5	0.63	24.0	16.5	74.5	76.8	10	08.6
May	28.6	18.5	0.65	26.4	18.3	74.6	78.4	08	08.6
June	22.1	12.7	0.57	29.0	20.3	71.7	80.1	07	08.6
July	17.0	10.4	0.61	32.4	22.6	71.1	81.8	06	08.5
August	36.7	24.4	0.66	35.9	25.0	79.0	83.4	07	08.3
September	52.8	51.3	0.88	40.5	28.3	96.2	85.7	10	08.4
October	33.6	22.8	0.68	45.4	31.8	84.9	88.6	11	08.6
November	53.5	39.0	0.73	49.3	35.0	99.5	91.3	11	09.0
December	57.9	41.2	0.71	54.2	39.0*	98.8	94.2*	05	09.5
1998									
January	51.8	31.9	0.62	60.6	43.7*	93.4	97.5*	08	09.9*
February	54.4	40.3	0.74	67.4	48.8*	93.4	101.7*	08	10.5*
March	81.8	54.8	0.67	73.3	53.4*	109.1	105.8*	13	11.2*
April	73.6	53.4	0.73	77.7	56.5*	108.3	109.1*	10	11.4*
May	74.3	56.3	0.76	81.4	59.3*	106.7	112.4*	18	11.7*
June	93.6	70.7*	0.76*	85.9	62.4*	108.4*	116.2*	10	12.0*
July	98.3	66.2*	0.67*	90.3	65.4*	114.0*	120.3*	11*	12.2*
August	118.6	91.7*	0.77*			136.0*		18*	
September	119.0	92.9*	0.78*			138.4*		14*	
October	77.0	55.6*	0.72*			121.9*		13*	
November	99.5	73.6*	0.74*			140.2*		16*	
December	120.8	81.6*	0.68*			150.1*		08*	
1999									
January	94.3	62.4*	0.66*			140.6*		08*	
February	93.4	66.1	0.70*			142.0*		11*	

*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 01 March 1999*

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.

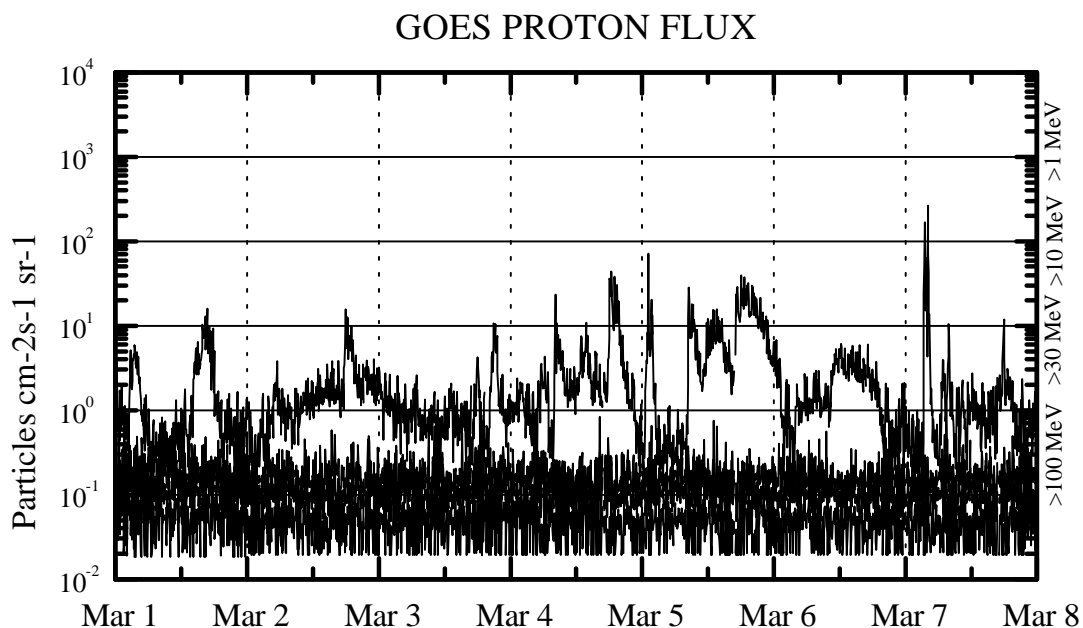
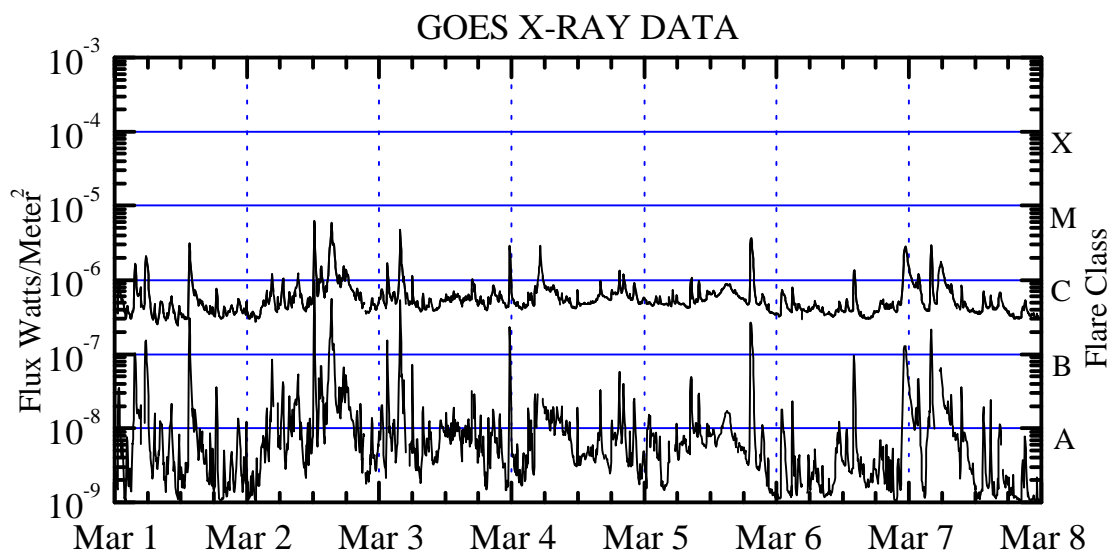
Electrons plot contains the five-minute averaged integral electron flux (electrons/ cm²-sec-sr) with energies greater than 2 MeV at GOES-8.

H_p 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.

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_p 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

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

