

**Space Weather Highlights
29 December 1997-05 January 1998**

Solar activity ranged from very low to moderate. Moderate activity occurred during 01 - 03 January as Region 8124 (S22, L = 348, class/area EKc/590 on 23 December) produced one M-class flare each day. The first was an M1/SN at 01/0307UT, the second an M1/SF at 02/1303UT, and the third was an optically uncorrelated M2 at 03/1719UT (though optically uncorrelated, the most likely source was Region 8124, a day behind the west limb at the time). None of these flares produced significant radio emissions. Two coronal mass ejections (CME) were observed by a space-based coronagraph on 03 January. The first CME was nearly a full halo and was associated with a six hour B6 X-ray flare that peaked at 03/0225UT. The second occurred around 03/0900UT and was associated with the disappearance of a portion of the northern polar crown filament system from the northwest quadrant. The ejection appeared to be mostly westward directed and highly inclined to the ecliptic.

Solar wind data were received from the WIND spacecraft a few hours per day. Velocities ranged from 280 - 410 km/sec. Densities briefly increased to 40 p/cc on 30 December, but were in the 03 - 10 p/cc range for the rest of the period. Bz hovered within a few nanotesla of zero during most of the period, but varied from plus 14 to minus 13 nT (GSM) during 30 December. Solar sector orientation was toward (phi angle near 315 degrees) on 29 December, then shifted to away (phi angle near 135 degrees) for 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 was at normal levels.

The geomagnetic field was quiet on 29 December, but became disturbed on 30 December, probably in response to a partial-halo CME observed on 26 December (see PRF no. 1165). The disturbance caused unsettled to active levels at middle latitudes and unsettled to major storm levels at high latitudes. The field subsided to mostly quiet levels for the remainder of the period.

**Space Weather Forecast
07 January 1998 - 02 February 1998**

Solar activity is expected to range from very low to low. Isolated C-class flare activity is expected.

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 levels during most of the period.

The geomagnetic field is expected to be quiet to unsettled.



Daily Solar Data

Date	Radio Flux	Sun spot	Sunspot Area	X-ray Background	X-ray Flux			Flares				
	10.7 cm	No. (10 ⁶ hemi.)	(10 ⁶ hemi.)		C	M	X	S	Optical 1	Optical 2	Optical 3	Optical 4
29 December	104	79	470	B1.4	0	0	0	1	0	0	0	0
30 December	101	56	430	B1.6	0	0	0	0	0	0	0	0
31 December	105	64	430	B1.5	4	0	0	5	0	0	0	0
01 January	102	55	390	B1.9	3	1	0	3	0	0	0	0
02 January	101	50	290	B2.6	2	1	0	5	0	0	0	0
03 January	101	31	160	B4.7	1	1	0	1	0	0	0	0
04 January	91	30	120	B1.4	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
29 December	2.3E+5	1.8E+4	4.3E+3		3.8E+5	
30 December	2.7E+5	1.7E+4	3.9E+3		1.4E+5	
31 December	1.8E+5	1.6E+4	3.7E+3		1.5E+5	
01 January	1.0E+5	1.7E+4	4.1E+3		2.0E+5	
02 January	1.0E+5	1.6E+4	3.9E+3		2.8E+5	
03 January	1.2E+5	1.7E+4	4.1E+3		2.9E+5	
04 January	1.6E+5	1.8E+4	4.3E+3		3.0E+5	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
29 December	2	1-2-0-0-0-0-1-1	0	0-0-0-0-0-0-0-0	3	0-1-0-0-0-1-1-2
30 December	18	3-4-3-4-3-4-3-1	19	0-3-2-4-5-5-2-0	25	0-6-3-4-4-4-4-1
31 December	3	1-1-1-1-1-1-0-1	2	2-0-1-2-0-0-1-0	4	1-1-1-1-2-1-1-0
01 January	5	1-1-3-1-1-1-1-1	1	0-0-3-0-0-0-0-0	5	1-1-3-2-1-1-1-1
02 January	6	1-2-2-1-2-2-1-2	2	0-0-1-0-3-0-0-0	4	1-1-2-0-2-2-1-1
03 January	4	0-1-2-2-2-1-1-1	5	0-0-2-4-1-0-0-0	4	0-0-2-2-2-2-1-0
04 January	3	0-0-0-1-2-1-2-0	3	0-0-0-1-4-0-0-0	4	0-0-0-0-3-2-1-1

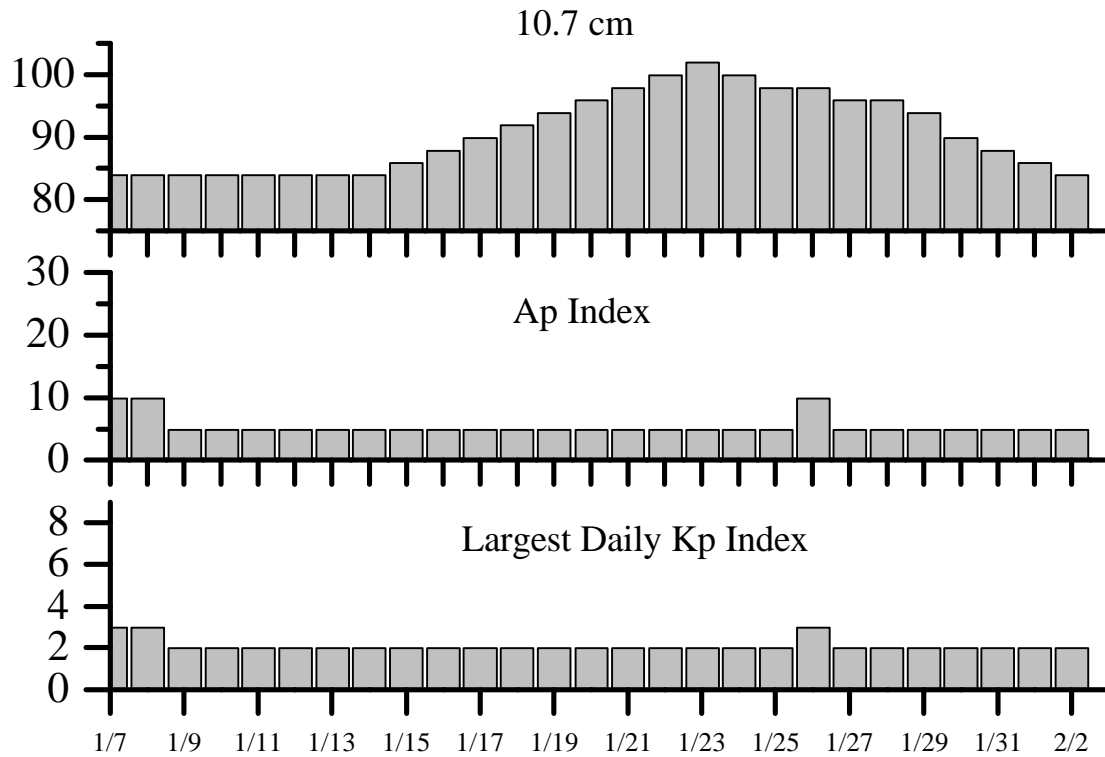


Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
29 Dec 0008	1-245 MHz Radio Burst	28 Dec
29 Dec 1407	Stratwarm Alert Exists Monday	
30 Dec 0228	Sudden Impulse observed at Boulder	30 Dec 0215
30 Dec 601	K= 4 Observed	30 Dec 03- 06
30 Dec 1423	Stratwarm Alert Exists Tuesday	
30 Dec 2107	K = 4 Observed	30 Dec 18- 21
31 Dec 1352	Stratwarm Alert exists Wednesday	
01 Jan 2006	Stratwarm Alert Exists Thursday	
02 Jan 0017	1-245 MHz Radio Burst	01 Jan
02 Jan 1358	Stratwarm Alert Exists Friday	
03 Jan 0009	1-245 MHz Radio Burst	02 Jan
03 Jan 1316	Stratwarm Alert Exists Saturday	
04 Jan 1427	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
07 Jan	84	10	3	21 Jan	98	5	2
08	84	10	3	22	100	5	2
09	84	5	2	23	102	5	2
10	84	5	2	24	100	5	2
11	84	5	2	25	98	5	2
12	84	5	2	26	98	10	3
13	84	5	2	27	96	5	2
14	84	5	2	28	96	5	2
15	86	5	2	29	94	5	2
16	88	5	2	30	90	5	2
17	90	5	2	31	88	5	2
18	92	5	2	01 Feb	86	5	2
19	94	5	2	02	84	5	2
20	96	5	2				



Energetic Events

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½	Class	Integ	Imp Brtns	Location		Rgn #	Radio Flux		Intensity	
			Max		Flux		Lat	CMD		245	2695	II	IV
01 Jan 98	0301	0307	0311	M1.1	.003	SN	S22W70	8124					
02 Jan 98	1257	1303	1307	M1.2	.003	SF	S19W86	8124					
03 Jan 98	1649	1719	1743	M2.7	.038						26		

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical Location Lat CMD	Rgn #
	Begin	Max	End				
29 December	0707	0713	0728	B2.4			
	0736	0740	0743	B4.4			
	1216	1218	1223		SF	N18E10	8126
30 December	0127	0131	0138	B3.4			
	0530	0548	0604	B7.5			
	0729	0743	0754	B4.9			
	1037	1045	1054	B5.3			
	1424	1432	1439	B6.1			
31 December	2129	2134	2137	B2.6			
	0659	0703	0714	C1.5	SF	N18W12	8126
	1445	1500	1507	C1.0			
	1519	1519	1532	B7.0	SF	N18W19	8126
	1827	1828	1831	C1.3	SF	S21W63	8124
	1843	1844	1850		SF	S23W63	8124
01 January	2022	2023	2056	C4.5	SF	S22W64	8124
	2352	2358	0007	B7.2			
	0132	0132	0139	C1.8	SF	S22W69	8124
	0247	0250	0255	B3.9			
	0304	0308	0317	M1.1	SN	S22W70	8124
	0613	0619	0625	B6.5			
	0636	0643	0650	B5.4			
	0655	0701	0718	C2.4	SF	S19W70	8124
	0823	0828	0833	B3.1			
	0915	0930	0939	B5.2			
	1559	1613	1621	B5.4			
	1945	1952	1959	C1.0			
	02 January	2115	2119	2123	B3.4		
0015		0025	0028	B7.2			
0233		0239	0247	B7.9			
0603		0607	0620	B4.0			
0641		0650	0703	B7.5			
0913		0928	0935	C6.4			
B1151		U1151	A1159		SF	N17W38	8126
1221		1232	1250	C1.2	SF	N19W42	8126
1302		1303	1306	M1.2	SF	S19W86	8124



Flare List – continued.

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
02 January	1337	1340	1344	B5.5			
	1347	1351	1354	B8.5			
	1356	1356	1403		SF	N19W61	
	1409	1413	1415	B6.7			
	1603	1608	1610	B3.4			
	1624	1625	1629	B4.3	SF	S29W16	8130
	1725	1728	1731	B3.3			
	1749	1753	1759	B5.2			
	1833	1840	1843	B6.1			
	1944	1947	1950	B3.1			
	2010	2014	2024	B2.5			
	2335	0225	0630	B6.4			
	03 January	B1112	U1113	A1121		SF	N21W57
1212		1220	1226	C3.3			
1649		1719	1743	M2.7			
04 January	0310	0316	0324	B6.7			
	0840	0843	0848	B1.9			
	0913	0924	0932	B2.1			
	1006	1016	1023	B1.8			
	1338	1345	1356	B1.6			
	1439	1512	1526	B3.3			
	1720	1725	1730	B2.3			
2126	2132	2138	B2.2				



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 8124</i>																			
20 Dec	S22E78	350	0040	02	HSX	001	A												
21 Dec	S22E66	349	0150	12	EAO	007	B						1						
22 Dec	S22E54	347	0240	14	EAC	020	BG	2					2						
23 Dec	S22E40	348	0590	13	EKC	027	BGD												
24 Dec	S22E27	348	0360	13	EKC	023	BGD						1						
25 Dec	S22E14	348	0310	13	EAI	024	BG						2						
26 Dec	S22E01	348	0260	12	ESI	017	BG	1					2						
27 Dec	S21W12	347	0230	11	ESC	020	BG	1							1				
28 Dec	S20W24	345	0190	12	EAI	015	BG						1						
29 Dec	S20W37	345	0200	11	ESO	012	BGD												
30 Dec	S22W55	350	0160	10	DAO	008	BGD												
31 Dec	S21W64	347	0120	09	DSO	006	BGD	2					3						
01 Jan	S21W79	349	0110	10	CAO	006	BG	2	1				3						
02 Jan	S22W90	346	0060	02	HSX	001	A			1			1						
								8	2	0	16	1	0	0	0	0			

Crossed West Limb.

Absolute heliographic longitude: 348

<i>Region 8125</i>																			
23 Dec	N19E41	347	0010	03	BXO	003	B												
24 Dec	N19E28	347	0000	03	BXO	002	B												
25 Dec	N19E16	346	0000	00	AXX	001	A												
26 Dec	N19E03	346																	
27 Dec	N19W10	346																	
29 Dec	N19W36	346																	
								0	0	0	0	0	0	0	0	0	0	0	

Died on Disk.

Absolute heliographic longitude: 346



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 8126</i>																			
23 Dec	N20E79	309	0100	03	HHX	001	A												
24 Dec	N21E66	309	0160	03	HHX	001	A						1						
25 Dec	N21E54	308	0160	03	HKX	001	A												
26 Dec	N20E41	308	0200	03	CHO	002	B												
27 Dec	N21E28	307	0180	03	HSX	003	A												
28 Dec	N22E16	305	0210	05	CHO	008	B												
29 Dec	N19E05	303	0230	03	DKO	007	B						1						
30 Dec	N21W10	305	0220	04	HKX	007	BG												
31 Dec	N21W24	307	0240	06	CHO	007	B	1						2					
01 Jan	N22W38	308	0210	04	CKO	006	B												
02 Jan	N20W51	307	0180	05	DAO	009	B	1						2					
03 Jan	N21W62	305	0150	05	DAO	007	B							1					
04 Jan	N22W74	304	0110	08	DAO	007	B												
																			2 0 0 7 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 303

Region 8127

26 Dec	S17W54	043	0000	00	AXX	001	A												
27 Dec	S17W67	043																	
																			0 0 0 0 0 0 0 0

Died on Disk.

Absolute heliographic longitude: 043

Region 8128

27 Dec	N28W54	029	0010	03	BXO	003	B												
28 Dec	N28W68	029	0010	02	BXO	002	B												
29 Dec	N27W87	035	0010	02	BXO	002	B												
																			0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 029



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 8129

29 Dec	N28E36	272	0010	02	BXO	003	B											
30 Dec	N28E23	272																
31 Dec	N29E12	271	0000	00	AXX	001	A											
01 Jan	N29W01	271																
02 Jan	N29W14	271																
03 Jan	N29W27	271																
04 Jan	N29W40	271																
																		0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 271

Region 8130

29 Dec	S29E30	278	0020	04	BXO	005	B											
30 Dec	S29E16	279	0050	06	DAO	011	B											
31 Dec	S29E03	280	0070	07	DAO	010	B											
01 Jan	S29W11	281	0070	07	DSO	013	B											
02 Jan	S28W23	279	0050	07	DSO	010	B											1
03 Jan	S28W35	278	0010	06	BXO	004	B											
04 Jan	S28W47	277	0010	08	BXO	003	B											
																		0 0 0 1 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 280



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

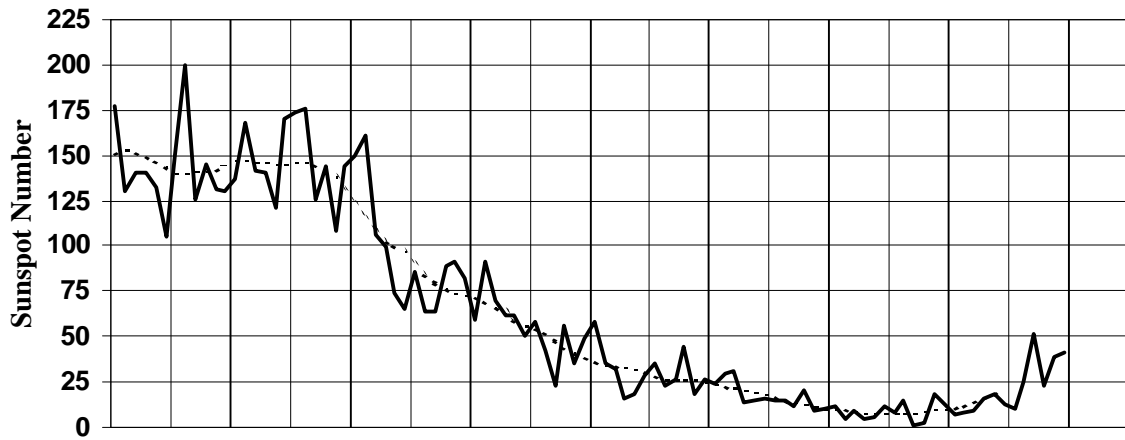
Month	Sunspot Numbers				Radio Flux		Geomagnetic		
	Observed values SWO	values RI	Ratio RI/SWO	Smooth values SWO	values RI	Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
1996									
January	17.6	11.5	0.65	16.8	10.4	74.5	72.4	09	09.8
February	09.1	04.4	0.48	16.2	10.1	71.5	72.2	10	09.8
March	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*			71.1		06*	
August	36.7	24.7*	0.67*			79.0		08*	
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*	

*Preliminary estimates.

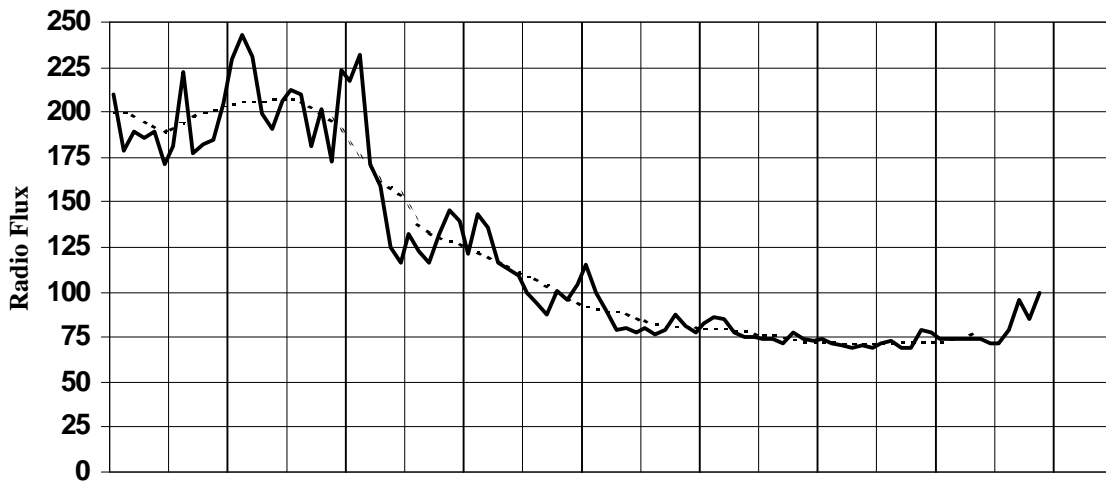
The lowest smoothed sunspot number for Cycle 22, RI = 8.0, occurred May 1996. The highest smoothed sunspot number for Cycle 22, RI=158.5, occurred July 1989. October 1996 has been selected as the start of Solar Cycle 23. From June 1991 onward, the 10.7 cm radio flux data source is Penticton, B.C. Canada. Prior to that, it was Ottawa.



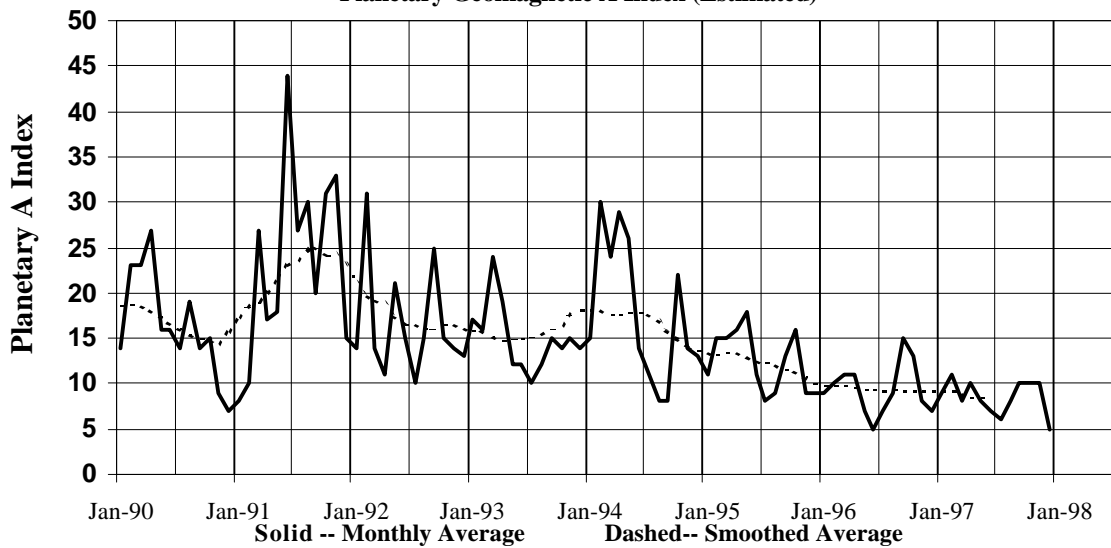
International Sunspot Number

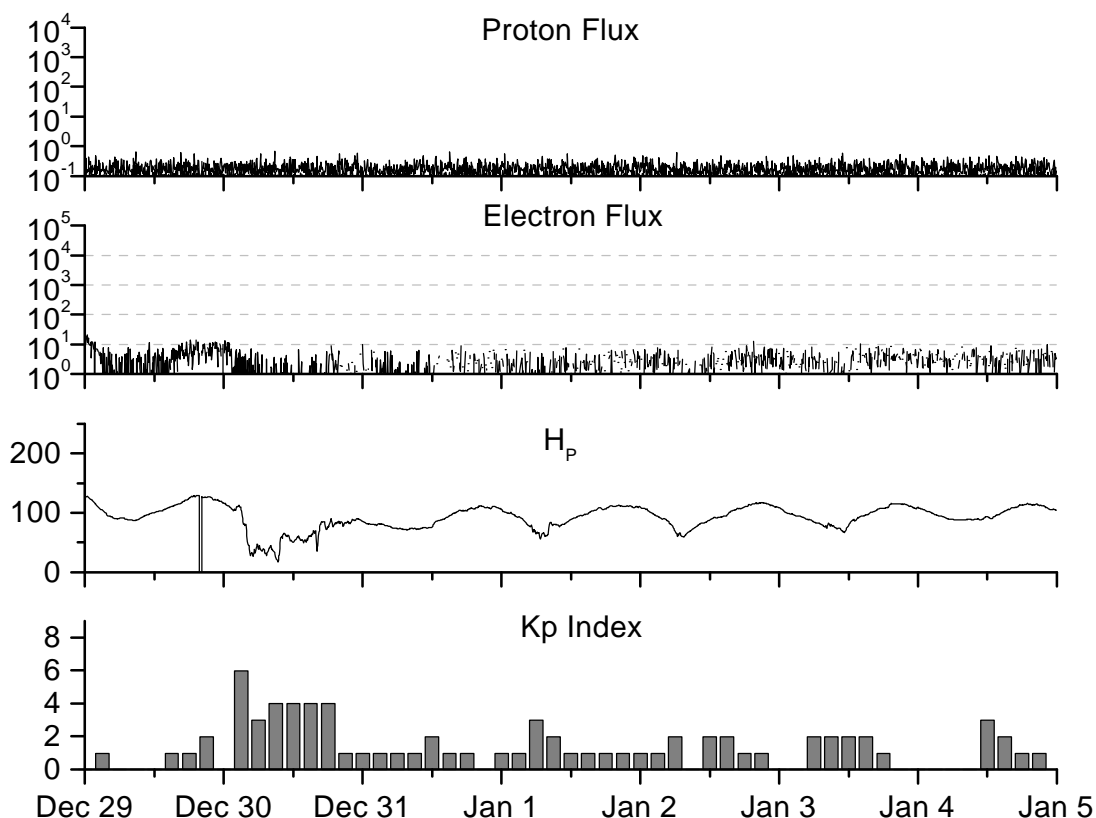


Penticton (DRAO) Radio Flux 2800MHz (10.7cm)



Planetary Geomagnetic A Index (Estimated)





Weekly Geosynchronous Satellite Environment Summary

Week Beginning 29 December 1997

Protons 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 three energy thresholds: greater than 10, 50, and 100 MeV.

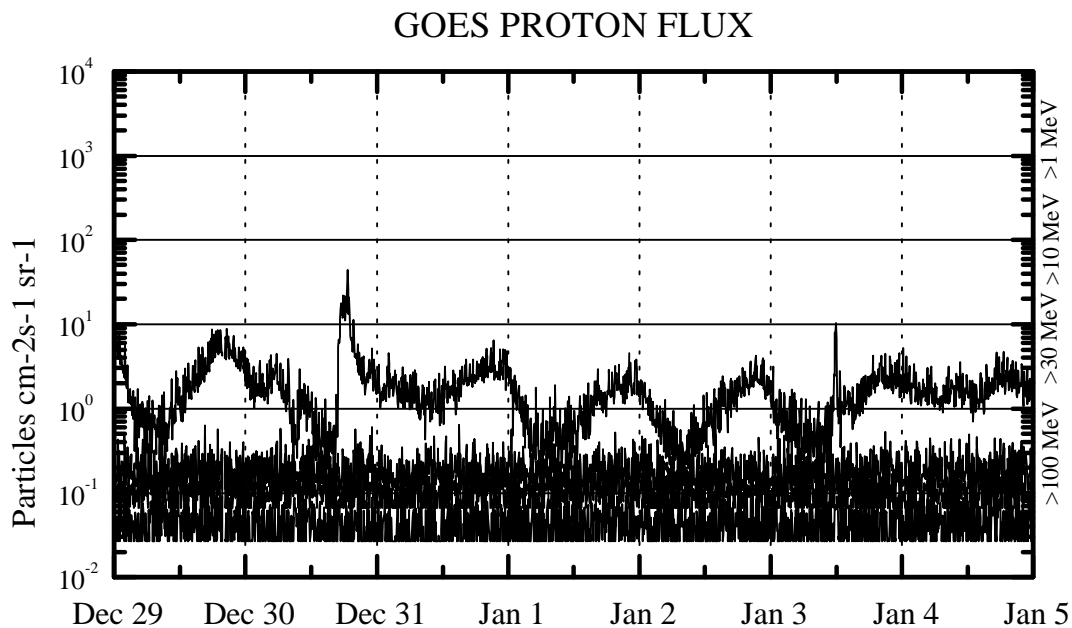
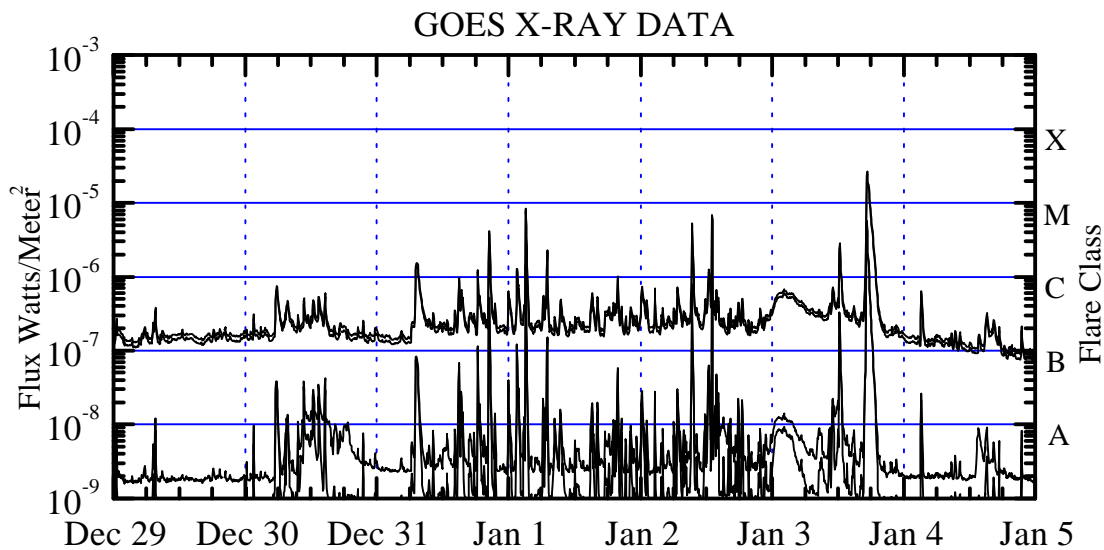
Electrons plot contains the five-minute averaged integral electron flux (electrons/ $\text{cm}^2\text{-sec-sr}$) with energies greater than 2 MeV at GOES-9.

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.



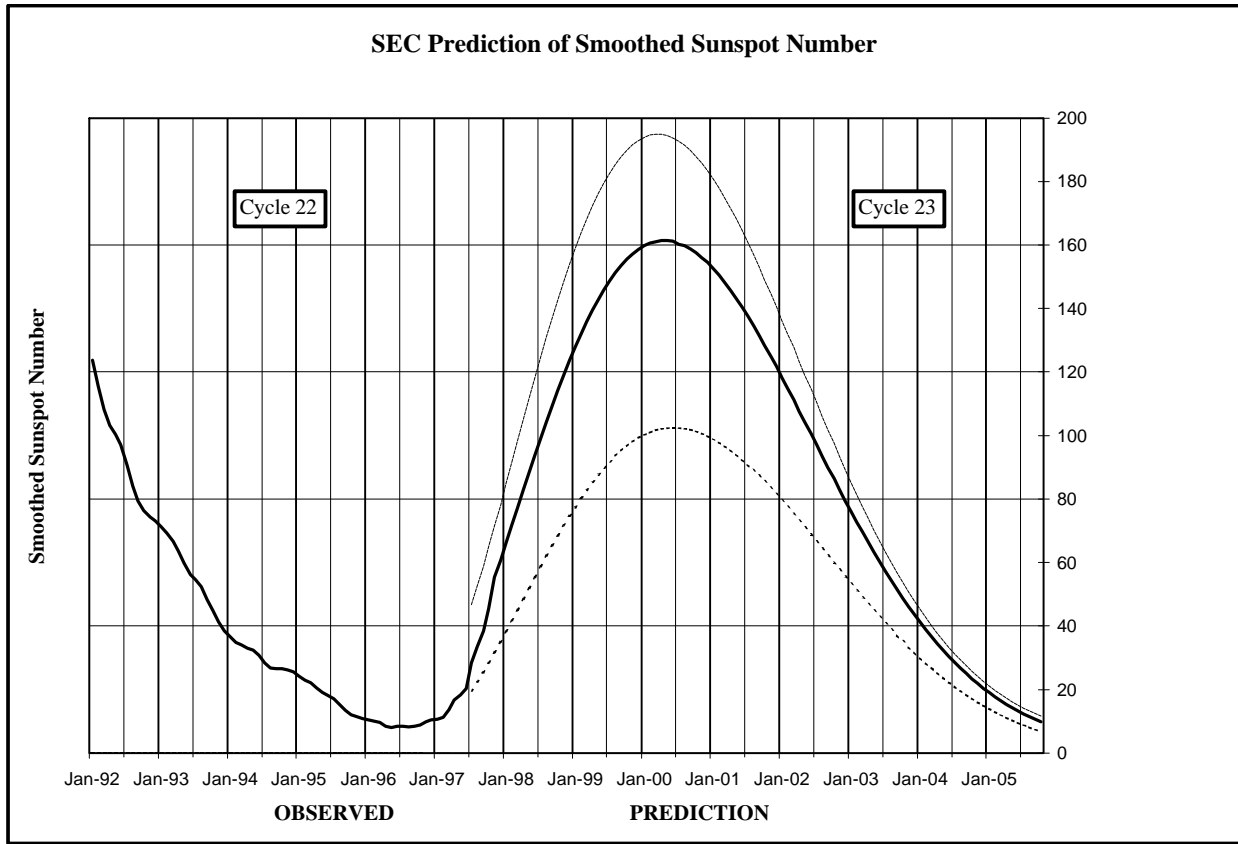


Weekly GOES Satellite X-ray and Proton Plots

Proton plot contains the five minute averaged integral proton flux (protons/cm²-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/cm²-sec-sr) at greater than 10 MeV.

X-ray plot contains five minute averaged x-ray flux (watts/m²) 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.

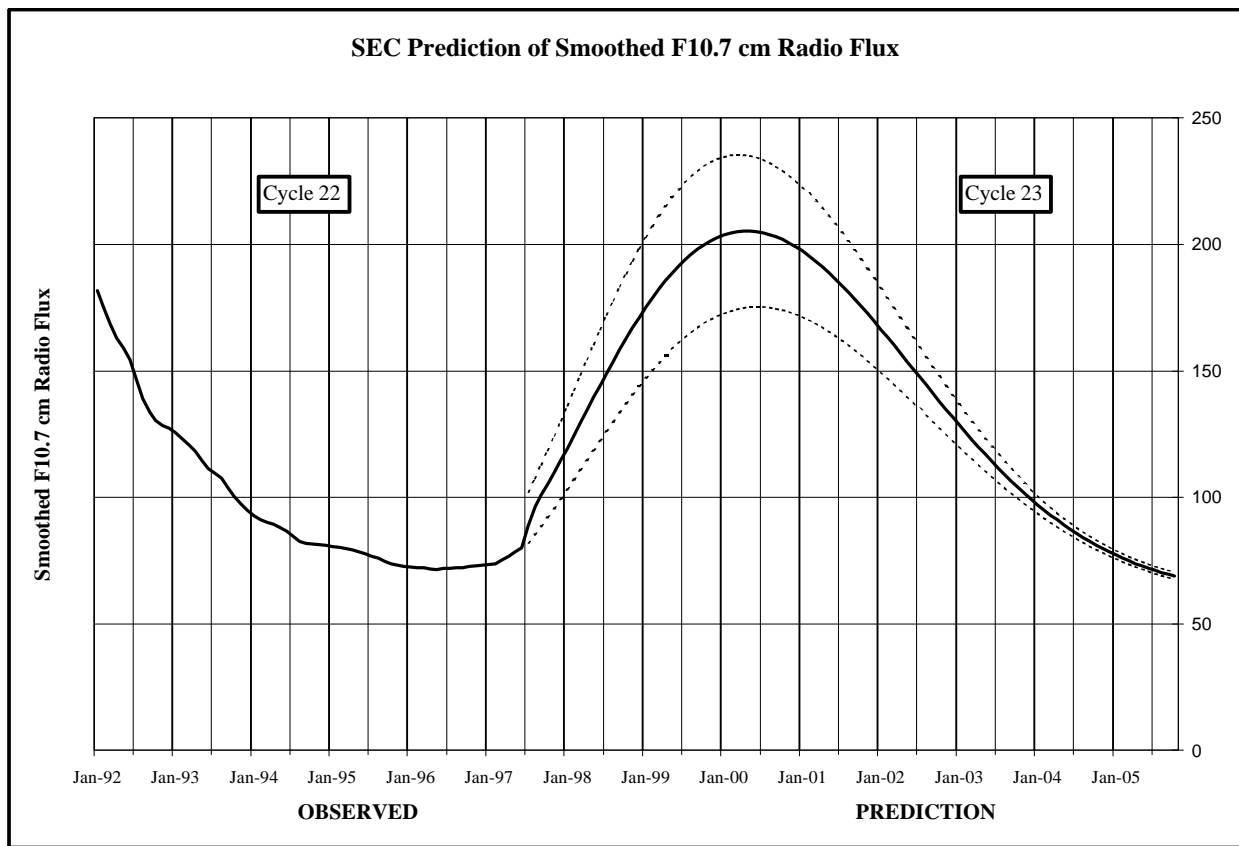




SEC Prediction of Smoothed Sunspot Number

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	10 (***)	10 (***)	10 (***)	9 (***)	8 (***)	9 (***)	9 (***)	8 (***)	9 (***)	9 (***)	10 (***)	11 (***)
1997	11 (***)	11 (***)	14 (***)	17 (***)	18 (***)	20 (***)	26 (16)	34 (17)	40 (18)	45 (19)	52 (20)	59 (20)
1998	66 (21)	72 (22)	77 (22)	83 (23)	88 (24)	94 (24)	99 (25)	104 (25)	109 (26)	114 (26)	119 (27)	124 (27)
1999	128 (27)	132 (28)	136 (28)	139 (29)	143 (29)	146 (29)	149 (29)	151 (29)	154 (29)	156 (29)	157 (29)	159 (29)
2000	160 (30)	161 (30)	161 (30)	161 (30)	161 (29)	161 (29)	160 (29)	160 (29)	159 (29)	158 (29)	156 (29)	155 (28)
2001	153 (28)	151 (28)	148 (28)	146 (27)	143 (27)	141 (27)	138 (27)	135 (26)	132 (26)	128 (26)	125 (25)	122 (25)
2002	119 (24)	115 (24)	111 (24)	108 (23)	104 (23)	101 (22)	97 (22)	94 (21)	90 (21)	86 (21)	83 (20)	80 (20)
2003	76 (19)	73 (19)	70 (18)	66 (18)	63 (17)	60 (17)	57 (17)	54 (16)	52 (16)	49 (15)	46 (15)	44 (14)
2004	41 (14)	39 (14)	37 (13)	35 (13)	32 (12)	31 (12)	29 (11)	27 (11)	25 (11)	23 (10)	22 (10)	20 (9)
2005	19 (9)	18 (9)	17 (8)	15 (8)	14 (8)	13 (8)	12 (7)	11 (7)	11 (7)	10 (6)	9 (5)	8 (4)





SEC Prediction of Smoothed F10.7cm Radio Flux

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	72 (***)	72 (***)	72 (***)	72 (***)	71 (***)	72 (***)	72 (***)	72 (***)	72 (***)	73 (***)	73 (***)	73 (***)
1997	73 (***)	74 (***)	75 (***)	77 (***)	78 (***)	80 (***)	86 (15)	94 (15)	100 (15)	105 (16)	110 (17)	115 (18)
1998	120 (18)	125 (19)	130 (20)	134 (20)	139 (21)	144 (21)	149 (22)	154 (22)	158 (23)	163 (23)	167 (23)	171 (24)
1999	175 (24)	179 (25)	182 (25)	186 (25)	189 (25)	191 (26)	194 (26)	196 (26)	198 (27)	200 (27)	202 (28)	203 (28)
2000	204 (30)	205 (30)	205 (30)	205 (30)	205 (30)	205 (28)	205 (27)	204 (27)	203 (26)	202 (26)	201 (26)	199 (26)
2001	197 (25)	195 (25)	193 (25)	191 (25)	189 (24)	186 (24)	184 (24)	181 (24)	178 (23)	175 (23)	173 (23)	170 (22)
2002	166 (22)	163 (22)	160 (21)	157 (21)	154 (21)	151 (21)	147 (20)	144 (20)	141 (19)	138 (19)	135 (18)	132 (18)
2003	129 (17)	126 (17)	123 (17)	120 (16)	117 (16)	114 (15)	112 (15)	109 (15)	106 (14)	104 (14)	102 (14)	99 (13)
2004	97 (13)	95 (13)	93 (12)	91 (12)	89 (11)	87 (10)	86 (9)	84 (9)	83 (8)	81 (7)	80 (9)	78 (9)
2005	77 (8)	76 (8)	75 (8)	74 (7)	73 (7)	72 (7)	71 (7)	70 (6)	70 (6)	69 (2)	68 (2)	68 (2)

