Space Weather Highlights
28 Dec 1998 - Jan 03 1999

Solar activity ranged from low to moderate. Region 8419 (N27, L = 224, class/area Eai/540 on 28 December) was in a rapid growth phase at the beginning of the period and produced an M3/1B flare at 28/0548UT and an M2/1F flare at 28/2338UT. Region 8419 began a slow decay on 29 December which continued until it crossed the west limb on 01 January. Region 8421 (N27, L = 171, class/area Ekc/710 on 30 December) showed slow to moderate growth through 30 December, then stabilized as a large, magnetically complex sunspot group. It produced three M-class flares as it grew, including an M1/SF at 28/0531UT, an M1/1F at 28/2322UT and an M1/SF at 30/0536UT. None of these flares had significant radio emission. Region 8421 produced isolated B- and C-class subflares during the remainder of the period. Perhaps the most interesting event of the week was a long-duration C6/1N flare at 03/1501UT from Region 8422 (S23, L = 159, class/area Dao/190 on 27 December). This flare was associated with an 18-degree filament eruption and a Type II radio sweep. This eruption had characteristics indicative of a CME (see the geomagnetic field forecast below).

Real-time solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft during most of the period. Significant wind flow changes were evident during 28 - 29 December with IMF Bz southerly excursions to minus 10 nT (GSM) and enhanced particle densities. However, velocities remained relatively steady throughout the week.

No significant proton flux enhancements were detected at geosynchronous altitude.

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

The geomagnetic field was disturbed during 28 - 29 December with active to minor storm periods at all latitudes and isolated major storm intervals at high latitudes. Field activity declined to quiet to unsettled levels during the rest of the period.

Space Weather Forecast
06 January 1999 - 01 February 1999

Solar activity is expected to be low during most of the period. However, given our place in the increasing phase of Cycle 23 (January is month 28 of the cycle), isolated M-class flares may occur sometime during 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, high levels are likely during 08 - 10 January.

The geomagnetic field is expected to be disturbed during 07 - 08 January in response to the long-duration C6/1N flare/filament eruption of 03 January (at issue time, ACE real-time solar wind data showed the presence of interplanetary shock-accelerated particles related to the C6 event, indicating a possible Earth-directed CME). Active to minor storm levels are expected during the disturbance. The field is expected to be quiet to unsettled during the remainder of the period, barring any other Earth-directed CMEs.

Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10^{-6} hemi.)	X-ray Background	Flares: X-ray Flux C	X-ray Flux M	X-ray Flux X	Optical S	Optical 1	Optical 2	Optical 3	Optical 4
28 December	184	177	1170	C2.5	7	4	0	21	4	0	0	0
29 December	183	136	1170	C1.2	9	0	0	26	0	0	0	0
30 December	179	186	1270	B9.9	11	1	0	14	0	0	0	0
31 December	175	135	1070	C1.0	14	0	0	10	1	0	0	0
01 January	167	121	860	B6.3	4	1	0	5	2	0	0	0
02 January	160	107	690	B8.7	4	0	0	2	0	0	0	0
03 January	155	113	670	B6.7	7	0	0	6	1	0	0	0

Daily Particle Data

Date	Proton Fluence (protons/cm^2-day-sr) >1MeV	>10MeV	>100MeV	Electron Fluence (electrons/cm^2-day-sr) >.6MeV	>2MeV	>4MeV
28 December	3.3E+5	1.6E+4	3.7E+3		3.8E+5	
29 December	2.4E+5	1.6E+4	3.6E+3		5.0E+5	
30 December	1.5E+5	1.6E+4	3.7E+3		5.4E+6	
31 December	1.2E+5	1.6E+4	3.7E+3		7.1E+6	
01 January	2.0E+5	1.5E+4	3.7E+3		8.3E+6	
02 January	1.3E+5	1.5E+4	3.6E+3		5.9E+6	
03 January	1.4E+5	1.6E+4	3.7E+3		6.5E+6	

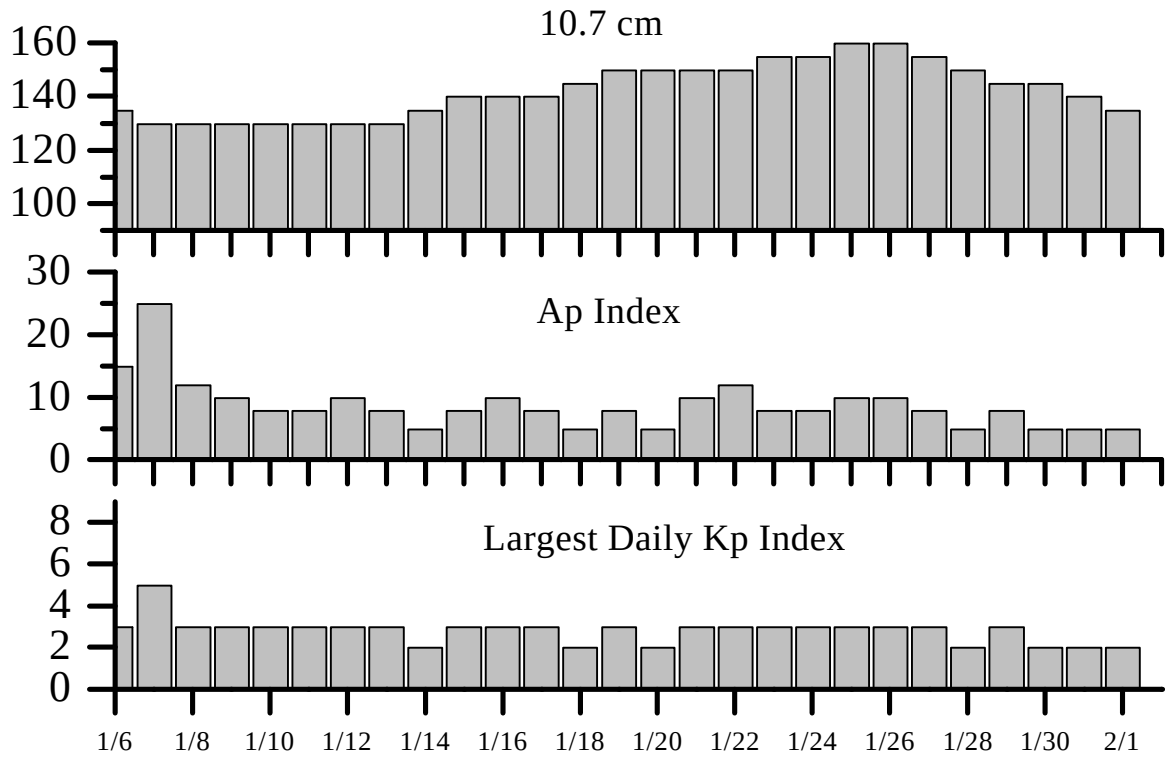
Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg A	Middle Latitude Fredericksburg K-indices	High Latitude College A	High Latitude College K-indices	Estimated Planetary A	Estimated Planetary K-indices
28 December	3	0-1-0-1-2-1-2-1	6	1-0-0-1-1-2-4-2	5	0-0-0-1-2-2-3-2
29 December	10	1-2-3-2-2-2-3-3	30	0-1-4-5-5-5-5-3	16	1-1-3-4-4-3-4-3
30 December	5	3-2-2-0-1-0-1-1	5	2-2-2-2-1-1-1-1	6	2-2-2-1-1-2-2-3
31 December	3	2-1-0-1-1-1-1-0	3	2-0-0-0-1-0-1-0	3	1-1-0-1-1-1-2-0
01 January	4	0-2-1-1-2-1-2-1	8	0-1-0-4-4-2-1-0	5	0-2-1-2-2-1-1-1
02 January	6	1-2-2-2-2-2-2-1	*	*-*-*-*-*-*-*-*	7	1-2-2-3-3-2-2-1
03 January	3	2-2-0-0-0-1-0-1	*	1-*-*-*-*-*-*-*	4	2-2-0-0-1-1-1-1

Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
28 Dec 0610	10cm Radio Burst 330 s.f.u.	28 Dec 0515
29 Dec 0024	3-245 MHz Radio Bursts	28 Dec
31 Dec 0010	2-245 MHz Radio Bursts	30 Dec
01 Jan 0028	2-245 MHz Radio Bursts	31 Dec
03 Jan 1638	Type II Radio Emission	03 Jan 1521

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
06 Jan	135	15	3	20	150	5	2
07	130	25	5	21	150	10	3
08	130	12	3	22	150	12	3
09	130	10	3	23	155	8	3
10	130	8	3	24	155	8	3
11	130	8	3	25	160	10	3
12	130	10	3	26	160	10	3
13	130	8	3	27	155	8	3
14	135	5	2	28	150	5	2
15	140	8	3	29	145	8	3
16	140	10	3	30	145	5	2
17	140	12	3	31	140	5	2
18	145	8	3	01 Feb	135	5	2
19	150	8	3				

Energetic Events

Date	Time (UT)			X-ray		Optical Information			Peak Radio Flux		Sweep Freq Intensity	
	Begin	Max	½ Max	Class	Integ Flux	Imp Brtns	Location Lat CMD	Rgn #	245	2695	II	IV
28 Dec 98	0515	0531	0544	M1.4	.019	SF	N28E26	8421		330		
28 Dec 98	0545	0548	0559	M3.1	.019	1B	N25W27	8419	390	110		
28 Dec 98	2315	2322	2333	M1.7	.012	1F	N27E14	8421		26		
28 Dec 98	2333	2338	2351	M2.1	.019	1F	N24W36	8419				
30 Dec 98	0526	0546	0600	M1.0	.012	SF	N28E03	8421				
01 Jan 99	0021	0031	0047	M1.1	.013							

Flare List

Date	Time			X-ray	Optical		
	Begin	Max	End	Class.	Imp / Brtns	Location Lat CMD	Rgn #
28 December	0000	0000	0013		SF	S22E34	8422
	0047	0054	0103		SF	N25W24	8419
	0056	0059	0101		SF	N27E25	8421
	0233	0317	0328		SF	N25W26	8419
	0357	0403	0438		SF	N25W26	8419
	0446	0506	0520		SF	N25W27	8419
	0516	0521	0633	M1.4	SF	N28E26	8421
	0536	0548	0623	M3.1	1B	N25W27	8419
	0547	0547	0620		SF	N22W27	8416
	0618	0626	0659		SF	S22E31	8422
	0635	0637	0640		SF	N27E24	8421
	0843	0845	0850	C2.5	SF	N24W30	8419
	0935	0937	0949		SF	N25W32	8419
	1021	1030	1040		SF	N25W30	8419
	1102	1106	1108	C2.8			
	B1149	1157	1221	C5.7	SF	N26W35	8419
	1312	1313	1315	C2.3	SF	N24W33	8419
	1359	U1402	A1406		SF	N26E21	8421
	1515	1517	1539	C3.1	SF	S20E27	8422
	1525	1527	1544		SF	N27E17	8421
	1716	1718	1743	C5.0	1F	N24W34	8419
	1811	1813	1833	C4.9	SF	N25W33	8419
	2149	2150	2155		SF	N26E13	8421
	2211	2214	2224		SF	N26W41	8419
	2301	2323	0035	M1.7	1F	N27E14	8421
	2324	2335	A2356	M2.1	1F	N24W36	8419
29 December	0044	0044	0048		SF	N27E14	8421
	0059	0102	0105		SF	N27E14	8421
	0120	0124	0133		SF	N24E11	8421
	0218	0221	0223		SF	N25W38	8419
	0231	0233	0236		SF	N25E09	8421
	0552	0552	0607		SF	N27W42	8419

Flare List-continued

	Time			X-ray	Optical Imp /	Location	Rgn
Date	Begin	Max	End	Class.	Brtns	Lat CMD	#
29 December	0552	0605	0627	C2.2	SF	N24E07	8421
	0741	0743	0751	C2.6	SF	N26E10	8421
	0834	0838	0852		SF	N26W43	8419
	0855	0904	0911		SF	N27W45	8419
	0828	0939	1018	C5.1	SF	N27E13	8421
	1010	1014	1018		SF	N26W41	8419
	1056	1109	A1119		SF	N24E04	8421
	1107	U1113	A1142		SF	S20E17	8422
	1210	1216	1219		SF	N24E07	8421
	1222	1231	1300		SF	N24E06	8421
	B1303	1305	A1331	C2.0	SF	N24E06	8421
	1509	1509	1515	C1.6	SF	N27E08	8421
	1518	1552	1641	C2.4	SF	N27E06	8421
	1647	1719	1736		SF	N25E01	8421
	1824	1824	1836		SF	N27E05	8421
	1952	2028	2042	C2.0	SF	N25E01	8421
	2059	2118	2129		SF	N27E02	8421
	2231	2232	2237	C1.6	SF	N29E04	8421
	2255	2257	2304		SF	N28E06	8421
	2329	2331	2333	C2.0	SF	N26E00	8421
30 December	0003	0007	0012	C2.1			
	0138	0138	0145	C1.5	SF	N27E01	8421
	0149	0150	0155		SF	N24W06	8421
	0238	0240	0245		SF	N27W01	8421
	0528	0530	0532	C2.9	SF	N27W01	8421
	0532	0539	0630	M1.0	SF	N28E03	8421
	0741	0744	0748	C1.4			
	0750	0751	0756		SF	N27W02	8421
	0824	0829	0838	C1.6	SF	N27W02	8421
	0940	0940	0944		SF	N27W04	8421
	1016	1017	1020		SF	N27W04	8421
	1218	1225	1256	C3.0	SF	N27W05	8421
30 December	1507	1508	1512	C1.3	SF	N24W12	8421
	1515	1520	A1547	C1.9	SF	N24W10	8421
	1550	1554	1557	C1.3			
	1807	1807	1856	C1.7	SF	N28W06	8421
	2058	2100	2102		SF	N26W12	8421
	2344	0023	0032	C2.1			
31 December	0054	0055	A0104	C2.8	1F	N27W12	8421
	0132	0138	0148	C1.6	SF	N27W12	8421
	0303	0315	0320	C1.8			
			0349	0353 0358	C1.3		

Flare List-continued

Date	Time Begin	Time Max	Time End	X-ray Class.	Optical Imp / Brtns	Optical Location Lat CMD	Rgn #
31 December	B0412	U0414	A0416	C3.4	SF	N28W11	8421
	0445	0449	0502	C1.6			
	0516	0519	0521	C1.6			
	0626	0632	0642	C4.9			
	0719	0719	0725	C4.1	SF	N25W19	8421
	0834	0839	A0849	C2.3	SF	N27W21	8421
	0906	0911	0922	C2.2			
	0936	0939	0944		SF	N27W16	8421
	0949	0949	1006		SF	N28W22	8421
	1015	1015	1019		SF	N27W17	8421
	1036	1041	1051	C1.9			
	1153	1157	1201		SF	N27W24	8421
	1254	1308	1318	C2.0			
	1454	1459	1505	C1.4			
	1633	1633	1650		SF	N29W21	8421
	1756	1757	1802		SF	N27W32	8421
01 January	0021	0031	0047	M1.1			
	1007	1011	1015	B9.1			
	1220	1253	1347	C3.4	SF	N20W36	8421
	1347	1401	1417	C7.7	SF	N27W31	8421
	1412	1415	1420		SF	N26W86	8419
	1900	1902	1915	C1.3	1F	N26W84	8419
	1931	1931	1938		SF	N28W33	8421
	2052	2058	2101		1F	N26W75	8419
	2100	2102	2105		SF	N27W35	8421
	2240	2249	2253	C1.4			
02 January	0325	0329	0344	C2.8	SF	N27W40	8421
	0615	0619	0629	C1.0			
	1645	1650	1653	C1.3			
	2015	2021	2121		SF	N22W53	8421
	2124	2127	2139	C1.2			
03 January	0113	0126	0134	C1.0			
	0525	0526	0530	C1.0	SF	N16W68	8420
	0700	0715	0734	C1.4			
	0827	0900	0903	C8.2	SF	N16W70	8420
	1446	1501	1710	C6.2	1N	S23W49	8422
	1732	1733	1736		SF	S23W47	8422
	1854	1903	1911	C2.6	SF	N21W67	8421
	1909	1909	1914		SF	S23W51	8422
	1949	1950	1952	C2.8	SF	N15E19	8426

Region Summary

Date	Location (° Lat ° CMD)	Helio Lon	Sunspot Characteristics Area (10^{-6} hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	Flares X-ray C	M	X	Optical S	1	2	3	4
		Region	*8415*												
17 Dec	N19E72	257	0010	06	BXO	005	B	2			7	2			
18 Dec	N19E61	255	0190	11	EAI	011	B	6	1		15		1		
19 Dec	N20E49	254	0270	13	EAI	018	B	2			3				
20 Dec	N20E36	253	0170	13	EAI	016	BG	2	1		2	1			
21 Dec	N20E23	253	0130	13	EAO	017	BG	1			2				
22 Dec	N20E11	252	0070	14	CAO	016	B	1			2				
23 Dec	N22W02	252	0040	13	CRO	011	B								
24 Dec	N23W12	249	0010	06	BXO	005	B								
25 Dec	N23W25	249													
26 Dec	N20W40	250	0000	01	AXX	001	A				1				
27 Dec	N16W49	246	0000	00	AXX	001	A								
28 Dec	N16W59	243													
29 Dec	N16W72	243													
30 Dec	N16W85	243													
								14	2	0	32	3	1	0	0

Crossed West Limb.
Absolute heliographic longitude: 252

		Region 8416													
20 Dec	N19E68	221	0060	10	DSO	002	B				3				
21 Dec	N18E58	218	0120	12	EAO	010	B	1			4				
22 Dec	N19E45	218	0130	10	DAO	009	B	1			2				
23 Dec	N20E31	219	0090	09	DSO	010	B								
24 Dec	N20E20	217	0050	09	DSO	006	B	1			4				
25 Dec	N19E05	219	0030	07	CSO	006	B								
26 Dec	N21W10	220	0050	07	CSO	007	B				1				
27 Dec	N19W22	219	0020	05	CSO	005	B	2			2				
28 Dec	N19W33	217	0030	04	CSO	007	B		1		1				
29 Dec	N18W47	218	0020	03	CSO	003	B								
30 Dec	N18W60	218	0020	03	CRO	003	B								
31 Dec	N15W73	218													
01 Jan	N15W86	218													
								5	1	0	17	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 219

Region Summary-continued

Date	Location (° Lat ° CMD)	Helio Lon	Sunspot Characteristics Area (10^{-6} hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	Flares X-ray C	M	X	Optical S	1	2	3	4
			Region 8418												
20 Dec	S23E43	246	0000	03	BXO	002	B								
21 Dec	S23E30	246													
22 Dec	S23E17	246													
23 Dec	S23E04	246													
24 Dec	S23W09	246													
25 Dec	S23W22	246													
26 Dec	S23W35	246													
27 Dec	S23W48	246													
28 Dec	S23W61	246													
29 Dec	S23W74	246													
30 Dec	S23W87	246													
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 246

			Region 8419												
23 Dec	N28E25	225	0020	04	BXO	004	B				1				
24 Dec	N28E14	223	0030	06	BXO	009	B								
25 Dec	N27E00	224	0040	08	CSO	013	B				1				
26 Dec	N27W14	224	0060	08	DSO	010	B	3			4				
27 Dec	N27W27	224	0280	09	DAI	023	BGD	2			3				
28 Dec	N26W40	224	0540	11	EAI	027	BGD	5	2		11	3			
29 Dec	N26W52	223	0390	11	EAI	022	BG				5				
30 Dec	N26W65	223	0360	11	EAI	021	BG								
31 Dec	N28W79	223	0240	12	EAO	005	B								
01 Jan	N28W95	227	0060	05	DAO	004	B	1			1	2			
								11	2	0	26	5	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 224

Region Summary-continued

Date	Location (° Lat ° CMD)	Helio Lon	Sunspot Characteristics Area (10^{-6} hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	Flares X-ray C	X-ray M	X-ray X	Optical S	Optical 1	Optical 2	Optical 3	Optical 4
	Region 8420														
23 Dec	N18E64	186	0010	01	AXX	001	A								
24 Dec	N18E52	185	0010	01	AXX	002	A								
25 Dec	N17E40	184	0000	01	AXX	001	A								
26 Dec	N20E24	186	0010	03	BXO	003	B								
27 Dec	N20E12	185	0010	04	BXO	003	B								
28 Dec	N18W01	185	0010	04	BXO	003	B								
29 Dec	N18W14	185													
30 Dec	N19W17	175	0010	01	HRX	002	A								
31 Dec	N20W30	174	0000	01	AXX	002	B								
01 Jan	N20W42	174	0030	03	BXO	005	B								
02 Jan	N20W55	174	0000	00	AXX	001	A								
03 Jan	N20W68	174						2			2				
								2	0	0	2	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 185

	Region 8421														
23 Dec	N29E80	170	0090	03	HAX	002	A				1				
24 Dec	N27E64	173	0120	05	DAO	006	B	1	1		3	1			
25 Dec	N27E52	172	0170	08	DAO	010	B	4	1		5				
26 Dec	N26E40	170	0270	09	DAI	011	B	4			9	1			
27 Dec	N27E26	171	0290	11	EAI	032	BG	4			7				
28 Dec	N26E13	171	0360	13	EAC	047	BG		2		6	1			
29 Dec	N26E00	171	0610	13	EKC	046	BGD	9			20				
30 Dec	N26W14	172	0710	13	EKC	070	BGD	7	1		14				
31 Dec	N27W27	171	0670	15	EKC	055	BGD	5			10	1			
01 Jan	N27W37	169	0660	14	EKC	043	BGD	2			4				
02 Jan	N26W53	172	0580	15	EKC	035	BGD	1			2				
03 Jan	N26W67	173	0560	16	FKC	032	BGD	1			1				
								38	5	0	82	4	0	0	0

Still on Disk.
Absolute heliographic longitude: 171

Region Summary-continued

Date	Location (° Lat ° CMD)	Helio Lon	Sunspot Characteristics Area (10^{-6} hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	Flares X-ray C	M	X	Optical S	1	2	3	4
			Region 8422												
24 Dec	S23E75	162	0070	10	CAO	005	B								
25 Dec	S26E68	156	0130	09	DSO	004	B								
26 Dec	S23E51	159	0160	07	DSO	008	B	1			1				
27 Dec	S23E38	159	0190	07	DAO	016	B				2				
28 Dec	S23E26	158	0180	09	DAO	019	B	1			3				
29 Dec	S23E13	158	0120	08	CSO	014	B				1				
30 Dec	S23W01	159	0130	08	CSO	017	B								
31 Dec	S23W15	159	0120	07	CAO	008	B								
01 Jan	S24W26	158	0090	09	CAO	006	B								
02 Jan	S22W41	160	0090	02	HSX	002	A								
03 Jan	S23W52	158	0080	06	CSO	004	B	1			2	1			
								3	0	0	9	1	0	0	0
Still on Disk.															
Absolute heliographic longitude:		159													
			Region 8423												
27 Dec	N23W28	225	0010	04	BXO	006	B	1			1				
28 Dec	N22W44	229	0040	02	HSX	002	A								
29 Dec	N22W57	228	0030	01	HSX	001	A								
30 Dec	N21W72	230	0030	01	HSX	001	A								
31 Dec	N21W85	230	0000	00		000									
01 Jan	N21W98	230	0000	00		000									
								1	0	0	1	0	0	0	0
Crossed West Limb.															
Absolute heliographic longitude:		225													
			Region 8424												
28 Dec	S21E10	174	0010	02	BXO	002	B								
29 Dec	S21W03	174													
								0	0	0	0	0	0	0	0
Died on Disk.															
Absolute heliographic longitude:		174													
			Region 8425												
30 Dec	S26E51	107	0010	05	BXO	002	B								
31 Dec	S26E38	107													
01 Jan	S26E25	107													
02 Jan	S26E12	107													
03 Jan	S29W02	108	0000	00	AXX	001	A								
								0	0	0	0	0	0	0	0
Still on Disk.															
Absolute heliographic longitude:		108													

Region Summary-continued

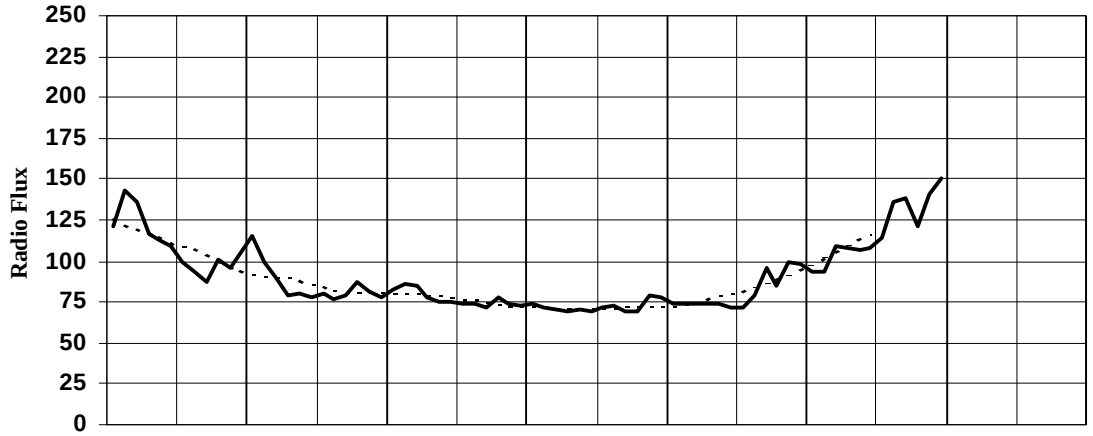
Date	Location (° Lat ° CMD)	Helio Lon	Sunspot Characteristics Area (10^{-6} hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	Flares X-ray C	X-ray M	X-ray X	Optical S	Optical 1	Optical 2	Optical 3	Optical 4
	Region 8426														
31 Dec	N14E55	089	0010	00	AXX	001	A								
01 Jan	N14E41	091	0010	00	AXX	001	A								
02 Jan	N15E27	092	0010	06	BXO	006	B								
03 Jan	N15E16	090	0020	08	CRO	012	B	1			1				
								1	0	0	1	0	0	0	0
Still on Disk.															
Absolute heliographic longitude:		90													
	Region 8427														
31 Dec	N16W62	206	0030	05	BXO	004	B								
01 Jan	N16W73	205	0010	03	BXO	002	B								
02 Jan	N16W86	205													
								0	0	0	0	0	0	0	0
Crossed West Limb.															
Absolute heliographic longitude:		206													
	Region 8428														
02 Jan	N23W15	134	0010	03	BXO	002	B								
03 Jan	N24W26	132	0010	05	BXO	002	B								
								0	0	0	0	0	0	0	0
Still on Disk.															
Absolute heliographic longitude:		134													
	Region 8429														
02 Jan	N34E38	081	0000	00	AXX	001	A								
03 Jan	N34E25	081													
								0	0	0	0	0	0	0	0
Still on Disk.															
Absolute heliographic longitude:		081													
	Region 8430														
03 Jan	S25E50	056	0000	01	AXX	002	A								
								0	0	0	0	0	0	0	0
Still on Disk.															
Absolute heliographic longitude:		056													

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

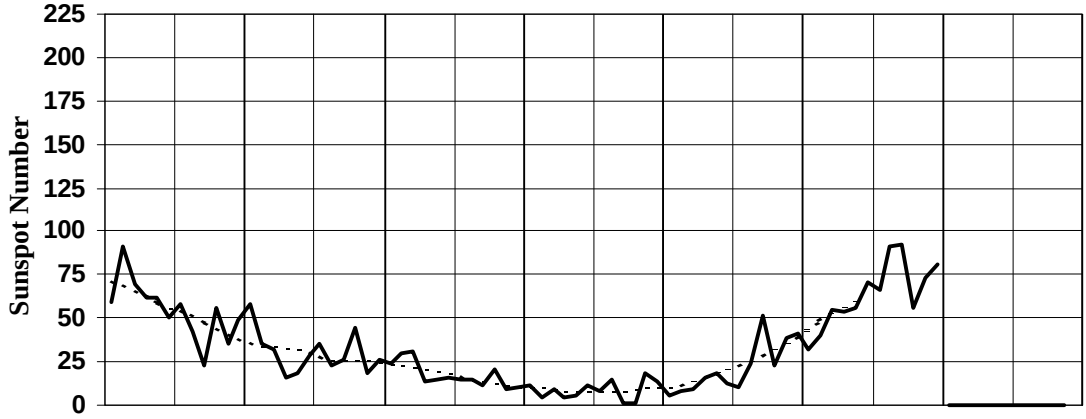
	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed values		Ratio	Smooth values		**Penticton	Smooth	Planetary	Smooth
Month	SWO	RI	RI/SWO	SWO	RI	10.7 cm	Value	Ap	Value
					1997				
January	09.0	05.7	0.63	16.5	10.5	74.0	73.4	09	09.3
February	11.3	07.6	0.67	17.4	11.0	73.8	73.7	11	09.2
March	14.4	08.7	0.60	20.4	13.5	73.5	75.1	08	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			106.7		18	
June	93.6	70.7*	0.76*			108.4*		10	
July	98.3	66.2*	0.67*			114.0*		11*	
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*	

*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.

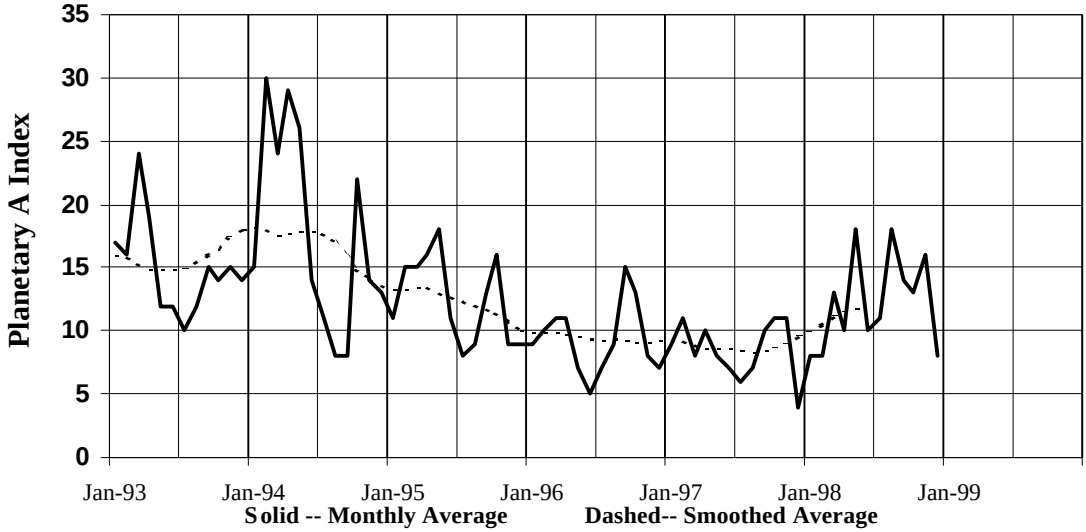
Penticton (DRAO) Radio Flux 2800MHz (10.7cm)
(With data through 1 Jan 99 for all graphs)



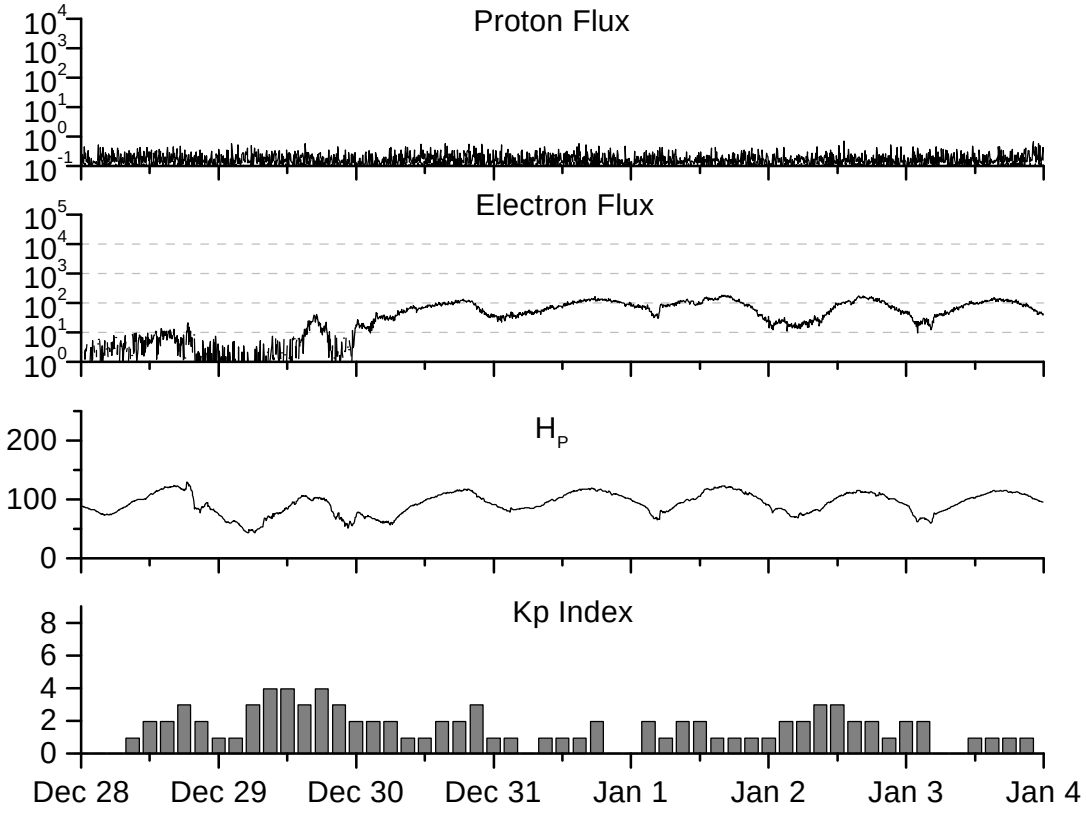
International Sunspot Number



Planetary Geomagnetic A Index (Estimated)



Solid -- Monthly Average **Dashed-- Smoothed Average**



Weekly Geosynchronous Satellite Environment Summary
Week Beginning 28 December 1998

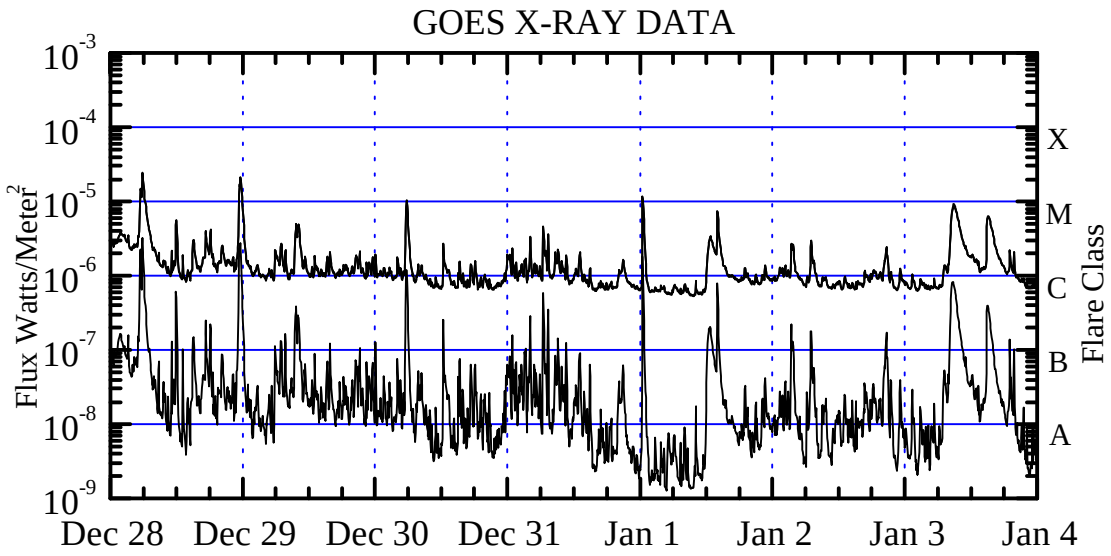
Protons plot contains the five-minute averaged integral proton flux (protons/ cm^2 -sec-sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

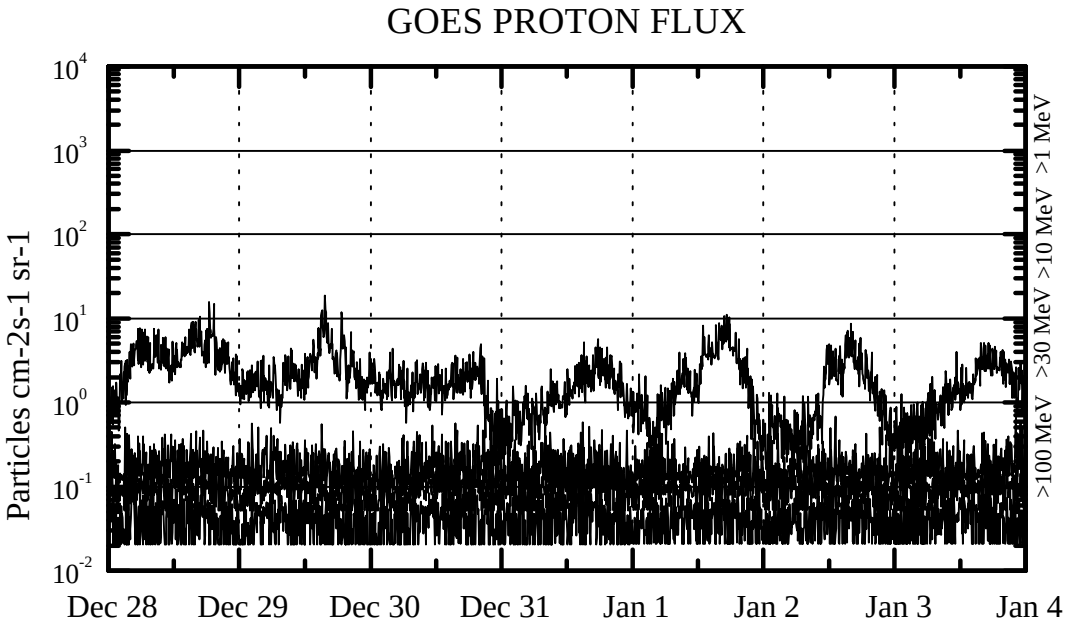
Electrons plot contains the five-minute averaged integral electron flux (electrons/ cm^2 -sec-sr) with energies greater than 2 MeV at GOES-8.

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 a more localized phenomena and the measurements generally are applicable to within a few degrees of longitude of the measuring satellite.

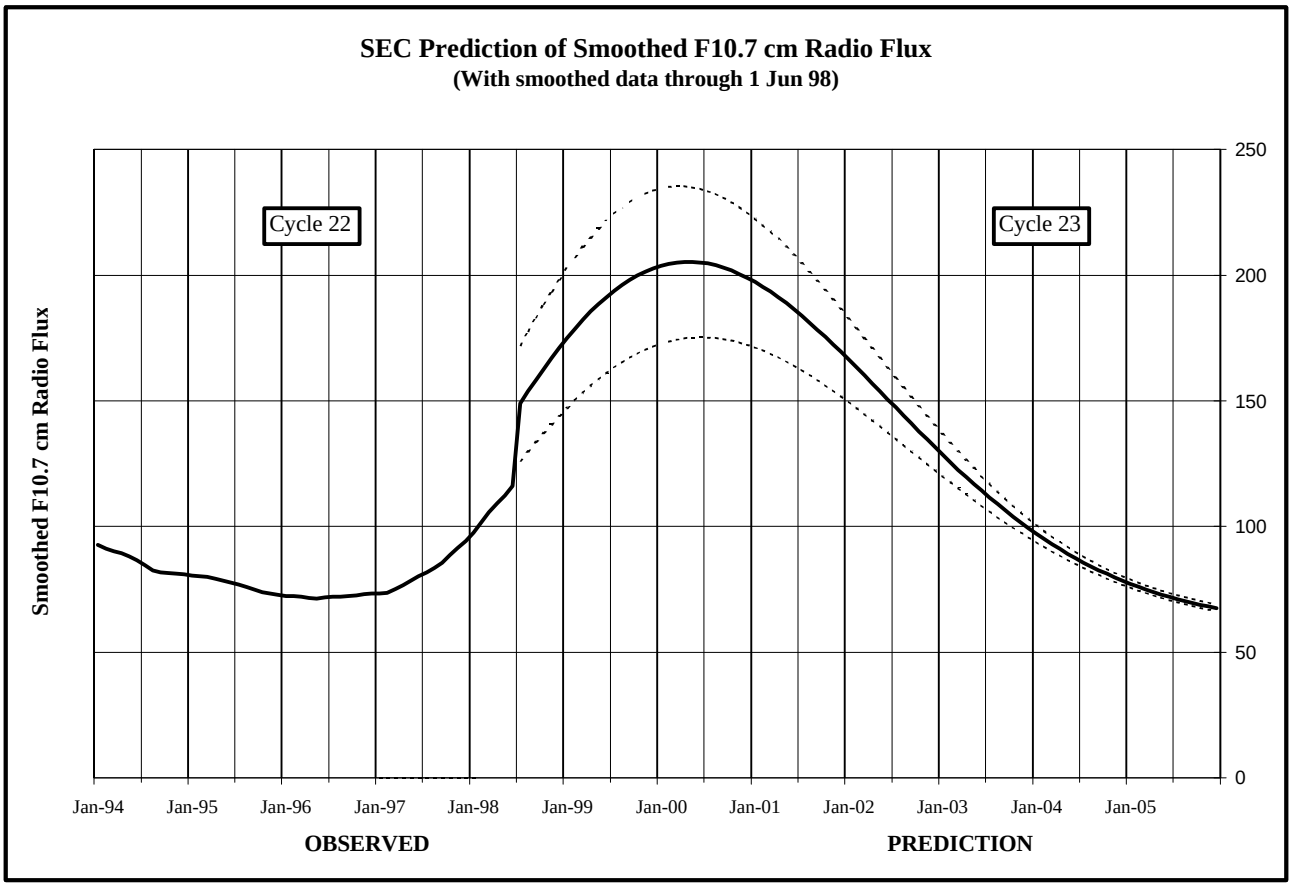




Weekly GOES Satellite X-ray and Proton Plots

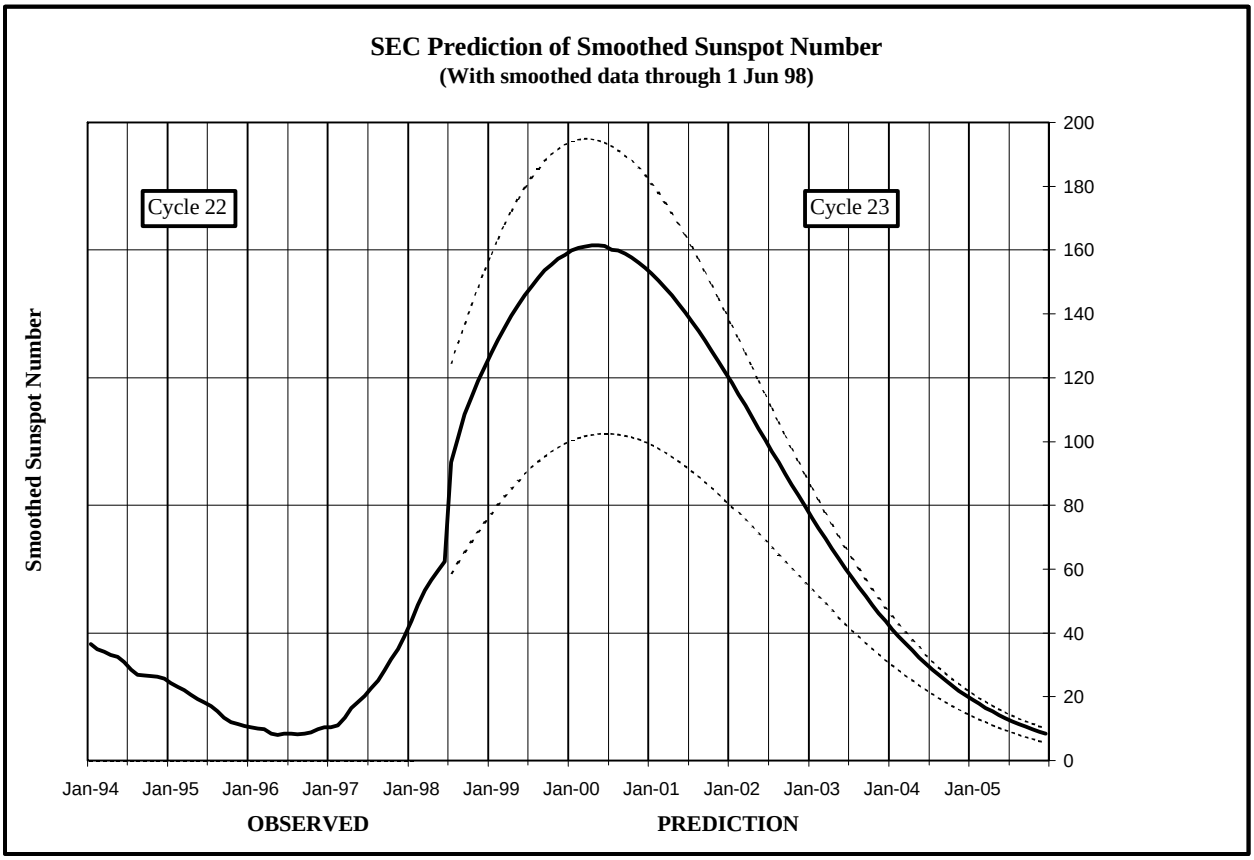
X-ray plot contains five minute averaged x-ray flux (watts/m^2) as measured by GOES 8 and 10 in two wavelength bands, .05 -.4 and .1 - .8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 - .8 nm band.

Proton plot contains the five minute averaged integral proton flux (protons/cm^2-sec-sr) as measured by GOES-8 (W75) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu (protons/cm^2-sec-sr) at greater than 10 MeV.



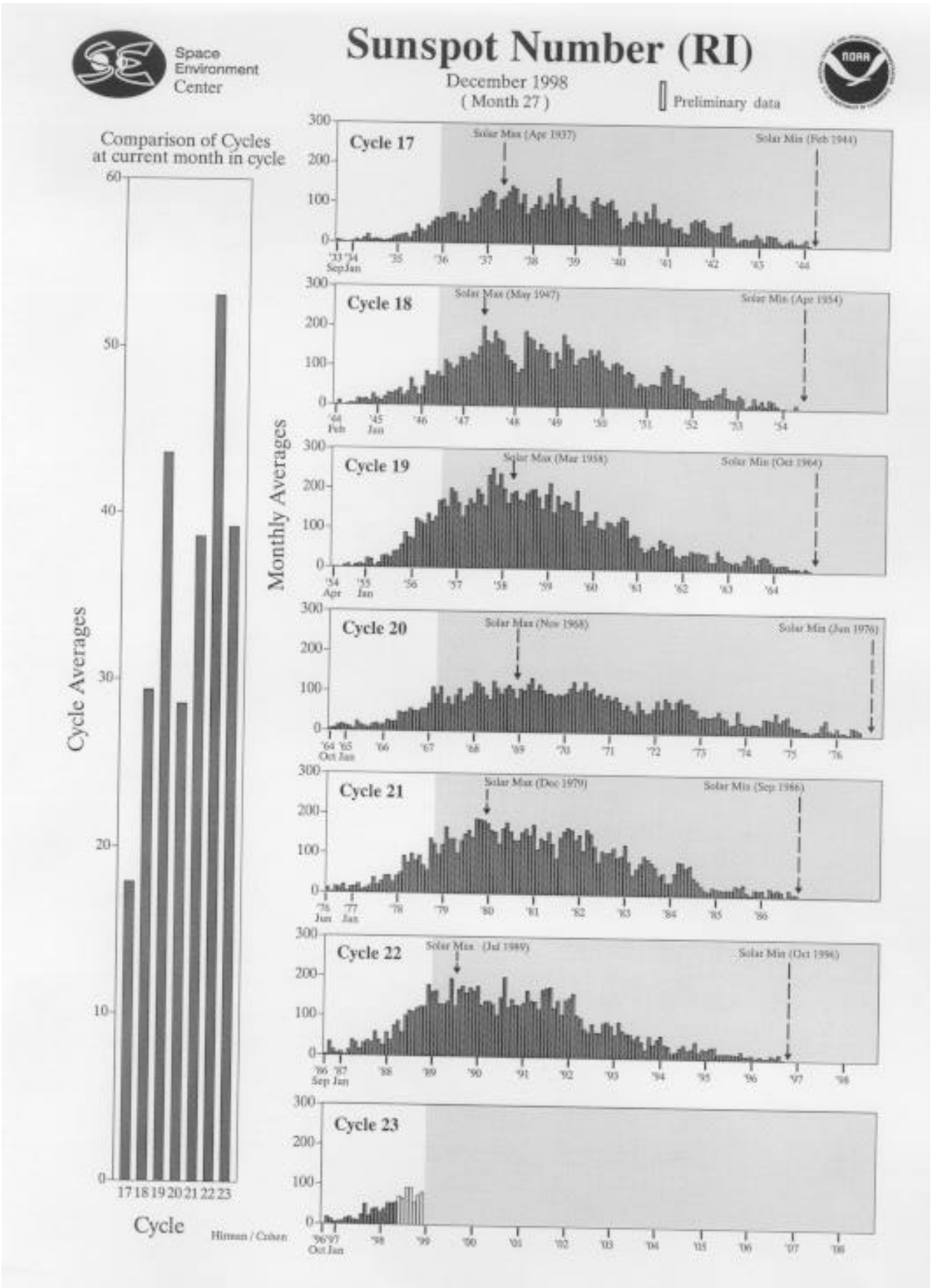
SEC Prediction of Smoothed F10.7cm Radio Flux

	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	82	83	86	89	91	94
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)
1998	98	102	106	109	112	116	**149**	**154**	**158**	**163**	**167**	**171**
	(***)	(***)	(***)	(***)	(***)	(***)	(22)	(22)	(23)	(23)	(23)	(24)
1999	**175**	**179**	**182**	**186**	**189**	**191**	**194**	**196**	**198**	**200**	**202**	**203**
	(24)	(25)	(25)	(25)	(25)	(26)	(26)	(26)	(27)	(27)	(28)	(28)
2000	**204**	**205**	**205**	**205**	**205**	**205**	**205**	**204**	**203**	**202**	**201**	**199**
	(30)	(30)	(30)	(30)	(30)	(28)	(27)	(27)	(26)	(26)	(26)	(26)
2001	**197**	**195**	**193**	**191**	**189**	**186**	**184**	**181**	**178**	**175**	**173**	**170**
	(25)	(25)	(25)	(25)	(24)	(24)	(24)	(24)	(23)	(23)	(23)	(22)
2002	**166**	**163**	**160**	**157**	**154**	**151**	**147**	**144**	**141**	**138**	**135**	**132**
	(22)	(22)	(21)	(21)	(21)	(21)	(20)	(20)	(19)	(19)	(18)	(18)
2003	**129**	**126**	**123**	**120**	**117**	**114**	**112**	**109**	**106**	**104**	**102**	**99**
	(17)	(17)	(17)	(16)	(16)	(15)	(15)	(15)	(14)	(14)	(14)	(13)
2004	**97**	**95**	**93**	**91**	**89**	**87**	**86**	**84**	**83**	**81**	**80**	**78**
	(13)	(13)	(12)	(12)	(11)	(10)	(9)	(9)	(8)	(7)	(9)	(9)
2005	**77**	**76**	**75**	**74**	**73**	**72**	**71**	**70**	**70**	**69**	**68**	**68**
	(8)	(8)	(8)	(7)	(7)	(7)	(7)	(6)	(6)	(2)	(2)	(2)



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	23	25	29	32	35	34
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)
1998	44	49	53	57	59	62	**94**	**101**	**109**	**114**	**119**	**124**
	(***)	(***)	(***)	(***)	(***)	(***)	(25)	(25)	(26)	(26)	(27)	(27)
1999	**128**	**132**	**136**	**139**	**143**	**146**	**149**	**151**	**154**	**156**	**157**	**159**
	(27)	(28)	(28)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(29)
2000	**160**	**161**	**161**	**161**	**161**	**161**	**160**	**160**	**159**	**158**	**156**	**155**
	(30)	(30)	(30)	(30)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(28)
2001	**153**	**151**	**148**	**146**	**143**	**141**	**138**	**135**	**132**	**128**	**125**	**122**
	(28)	(28)	(28)	(27)	(27)	(27)	(27)	(26)	(26)	(26)	(25)	(25)
2002	**119**	**115**	**111**	**108**	**104**	**101**	**97**	**94**	**90**	**86**	**83**	**80**
	(24)	(24)	(24)	(23)	(23)	(22)	(22)	(21)	(21)	(21)	(20)	(20)
2003	**76**	**73**	**70**	**66**	**63**	**60**	**57**	**54**	**52**	**49**	**46**	**44**
	(19)	(19)	(18)	(18)	(17)	(17)	(17)	(16)	(16)	(15)	(15)	(14)
2004	**41**	**39**	**37**	**35**	**32**	**31**	**29**	**27**	**25**	**23**	**22**	**20**
	(14)	(14)	(13)	(13)	(12)	(12)	(11)	(11)	(11)	(10)	(10)	(9)
2005	**19**	**18**	**17**	**15**	**14**	**13**	**12**	**11**	**11**	**10**	**9**	**8**
	(9)	(9)	(8)	(8)	(8)	(8)	(7)	(7)	(7)	(6)	(5)	(4)


Space Environment Center
Sunspot Number (RI)
December 1998
(Month 27)
Preliminary data
Comparison of Cycles at current month in cycle
Cycle Averages
Cycle
17 18 19 20 21 22 23
Himan / Cohen
Monthly Averages
Cycle 17
Solar Max (Apr 1937)
Solar Min (Feb 1944)
Cycle 18
Solar Max (May 1947)
Solar Min (Apr 1954)
Cycle 19
Solar Max (Mar 1958)
Solar Min (Oct 1964)
Cycle 20
Solar Max (Nov 1968)
Solar Min (Jun 1976)
Cycle 21
Solar Max (Dec 1979)
Solar Min (Sep 1986)
Cycle 22
Solar Max (Jul 1989)
Solar Min (Oct 1996)
Cycle 23