

Space Weather Highlights

03 February - 09 February 2003

SWO PRF 1432
11 February 2003

Solar activity was at very low to moderate levels. Very isolated low C-class flares were observed through the first half of the period, primarily from Regions 276 (S14, L=160, class/area Eai/280 on 04 February), 277 (S21, L=132, class/area Cro/020 on 08 February) and 278 (N18, L=122, class/area Dao/130 on 08 February). Region 278 rotated onto the visible disk on 04 February producing considerable surging and occasional subflares. This region eventually raised activity levels to moderate by producing an M1/1n on 06 February, but quickly transitioned to a decay phase following the event. Activity levels for the remainder of the period were low to very low with isolated minor C-class flares observed. By the end of the period, several small spot groups with simple magnetic configurations dominated the visible disk. For flare times and magnitudes, please refer to Energetic and Optical Flare Lists.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft for most of the summary period. The period began with slightly elevated, but declining solar wind speed following the CME impact, midday on 01 February. A slow return of speed and magnetic field intensity to nominal values occurred on 03 February. The quiescent period was short-lived as a gradual rise in wind speed and temperature indicated a transition into a high-speed stream by 04 February. This high-speed stream, associated with a favorably positioned coronal hole, persisted through 06 February and reached speeds in excess of 600 km/s. The speed declined by the 6th, but remained elevated, averaging 450 – 500 km/s through 08 February. The period ended with near nominal speeds of 450 km/s. Interplanetary magnetic field (IMF) data were consistent with a high-speed coronal flow for most of the period. Occasional, short-lived periods of southward turning Bz within the interplanetary magnetic field were noted throughout the period.

There were no greater than 10 MeV proton events at geo-synchronous orbit during the summary period.

The greater than 2 MeV electron flux at geo-synchronous orbit were elevated through the entire period. Fluxes reached high levels on 03 February, and again on 05 – 09 February. This extended elevated period began back on 20 January; we have now exceeded high threshold levels in fifteen of the last eighteen days.

The geomagnetic field was at quiet to minor storm levels. Active to minor storm periods were observed early in the period as we transitioned from transient effects to high speed coronal hole flow. Local nighttime hours on the 4th saw the most active levels. The remainder of the period was predominately unsettled to active with occasional quiet levels. Occasional periods of southward turning Bz within the interplanetary magnetic field were associated with times of the most enhanced geomagnetic activity.

Space Weather Outlook

12 February - 10 March 2003

Solar activity is expected to be mostly low with occasional moderate levels during the period.

No greater than 10 MeV proton events are expected during the forecast period.

The greater than 2 MeV electron flux is expected to reach high levels on 15 – 19 February due to recurring coronal holes.

The geomagnetic field is expected to be at quiet to isolated major storm levels during the period. Minor storming with isolated major storm conditions are possible on 15 -18 February due to a returning equatorial coronal hole.



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
03 February	133	69	450	B3.9	1	0	0	0	0	0	0	0
04 February	135	77	470	B3.9	2	0	0	1	0	0	0	0
05 February	140	89	430	B4.0	2	0	0	3	0	0	0	0
06 February	150	135	510	B5.9	4	1	0	16	1	0	0	0
07 February	147	153	490	B3.8	1	0	0	2	0	0	0	0
08 February	139	162	470	B3.1	1	0	0	0	0	0	0	0
09 February	141	194	430	B3.2	0	0	0	2	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
03 February	3.9E+5	1.3E+4	2.4E+3		2.4E+7	
04 February	4.8E+5	1.4E+4	3.0E+3		2.6E+7	
05 February	3.4E+5	1.5E+4	3.4E+3		1.2E+8	
06 February	4.0E+5	1.4E+4	3.2E+3		1.4E+8	
07 February	1.4E+5	1.5E+4	3.3E+3		4.7E+7	
08 February	1.8E+5	1.5E+4	3.5E+3		6.3E+7	
09 February	3.0E+5	1.3E+4	3.4E+3		1.0E+8	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	03 February	16	5-2-3-3-2-2-3-3	27	3-3-4-4-5-4-5-2	19
04 February	14	2-4-4-3-2-2-3-2	32	3-4-6-5-4-3-4-3	24	3-4-5-5-3-3-3-3
05 February	7	3-2-2-1-2-2-1-1	21	3-2-1-5-5-4-3-1	12	3-3-2-2-4-4-2-2
06 February	8	1-1-2-3-3-2-2-2	30	1-1-3-5-5-5-5-4	16	2-3-3-3-4-3-4-3
07 February	8	3-1-2-2-3-1-2-1	23	3-2-3-5-5-4-3-2	13	3-2-2-3-4-3-3-3
08 February	9	2-2-2-2-3-2-2-3	21	2-2-3-2-6-4-3-2	13	3-2-3-3-4-3-3-3
09 February	11	3-2-3-2-3-3-2-2	31	4-2-3-4-5-6-4-3	15	3-3-4-2-3-4-3-3

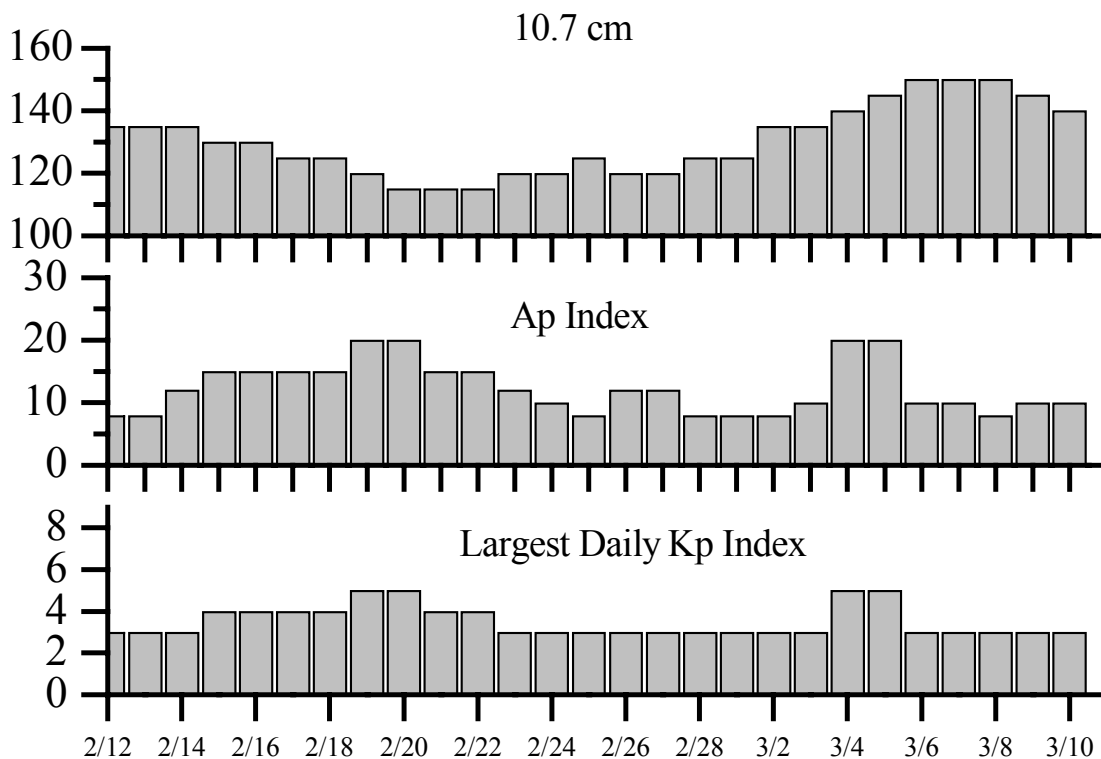


Alerts and Warnings Issued

<u>Date & Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date & Time of Event UT</u>
03 Feb 1148	ALERT: STRATWARM	03 Feb
03 Feb 1928	ALERT: Electron 2MeV Integral Flux > 1000pfu	03 Feb 1910
04 Feb 0356	WARNING: Geomagnetic K= 4	04 Feb 0357 – 04 Feb 1500
04 Feb 0423	ALERT: Geomagnetic K= 4	04 Feb 0423
04 Feb 1148	ALERT: STRATWARM	04 Feb
04 Feb 1456	EXTENDED WARNING: Geomagnetic K= 4	04 Feb 0357 – 04 Feb 2359
05 Feb 1219	ALERT: STRATWARM	05 Feb
05 Feb 1226	ALERT: Electron 2MeV Integral Flux > 1000pfu	05 Feb 1205
06 Feb 0747	ALERT: Electron 2MeV Integral Flux > 1000pfu	06 Feb 0730
06 Feb 1322	ALERT: Geomagnetic K= 4	06 Feb 1321
06 Feb 1346	ALERT: STRATWARM	06 Feb
07 Feb 0039	1 - 245 MHz Radio Burst	06 Feb
07 Feb 1333	ALERT: STRATWARM	07 Feb
07 Feb 1342	ALERT: Electron 2MeV Integral Flux > 1000pfu	07 Feb 1320
08 Feb 1249	ALERT: STRATWARM	08 Feb
08 Feb 1351	ALERT: Electron 2MeV Integral Flux > 1000pfu	08 Feb 1330
09 Feb 0745	WARNING: Geomagnetic K= 4	09 Feb 0745 – 09 Feb 1500
09 Feb 0754	ALERT: Geomagnetic K= 4	09 Feb 0754
09 Feb 1127	ALERT: Electron 2MeV Integral Flux > 1000pfu	09 Feb 1105
09 Feb 1310	ALERT: STRATWARM	09 Feb
09 Feb 1717	ALERT: Geomagnetic K= 4	09 Feb 1715



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
12 Feb	135	8	3	26 Feb	120	12	3
13	135	8	3	27	120	12	3
14	135	12	3	28	125	8	3
15	130	15	4	01 Mar	125	8	3
16	130	15	4	02	135	8	3
17	125	15	4	03	135	10	3
18	125	15	4	04	140	20	5
19	120	20	5	05	145	20	5
20	115	20	5	06	150	10	3
21	115	15	4	07	150	10	3
22	115	15	4	08	150	8	3
23	120	12	3	09	145	10	3
24	120	10	3	10	140	10	3
25	125	8	3				



Energetic Events

Date	Time		X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½ Max	Class	Integ Flux	Imp/ Brtns	Location Lat CMD	Rgn #	Radio Flux		Intensity	
									245	2695	II	IV
06 Feb	0330	0349	0401	M1.2	.017	1n	N18E64	278	55			

Flare List

Date	Time			X-ray Class.	Optical Imp / Brtns	Location Lat CMD	Rgn
	Begin	Max	End				
03 February	0451	0456	0501	C1.0			276
	1209	1213	1218	B7.0			276
	2211	2215	2220	B6.6			276
04 February	1212	1222	1232	B8.3			277
	1337	1340	1342	B6.6			277
	2004	2015	2031	C1.4			278
	2116	2122	2132	C1.6	Sf	S20E67	277
05 February	B1411	U1411	1416		Sf	S16E63	277
	B1547	U1547	1553		Sf	N20E73	278
	B1651	U1651	1701		Sf	N20E69	278
06 February	1729	1733	1739	B7.7			
	2026	2037	2049	C2.1			
	2135	2139	2144	C2.2			
	0207	0212	0214	C3.4			
	B0224	0224	0233		Sf	S17E55	277
	0234	0239	0242		Sf	S17E55	277
	0302	0302	0306		Sf	N18E62	278
	0333	0348	0447	M1.2	1n	N18E64	278
	0502	0505	0509		Sf	S17E54	277
	0523	0532	0541		Sf	N17E59	278
	0842	0847	0900		Sf	N19E59	278
	0914	0924	0942		Sf	N19E58	278
	1004	1005	1013	C1.5	Sf	N20E59	278
	B1131	U1131	1138	C1.1	Sf	N20E56	278
	1245	1250	1306	C1.3	Sf	S16E50	277
	1313	1313	1327		Sf	S15E22	276
	1652	1653	1657		Sf	N19E57	278
	1843	1845	1848		Sf	S20E43	277
	1907	1908	1917		Sf	N20E53	278
	2311	2312	2314		Sf	N00E65	
2318	2318	2324		Sf	N00E65		
07 February	0107	0110	0126	B9.8	Sf	S17E42	277
	0202	0205	0214	B7.1			
	0334	0341	0347	B9.8			
08 February	1605	1625	1709	C1.0	Sf	S03W61	274
	0532	0536	0540	B5.5			
	1239	1315	1339	C1.4			



Flare List - continued.

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
09 February	B1503	U1503	1510		Sf	S08W06	280
	B2043	U2043	2051	B9.4	Sf	S14W23	276

Region Summary

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

Region 272

26 Jan	S05E26	293	0030	04	Dso	003	B								
27 Jan	S08E11	295	0010	05	Bxo	007	B								
28 Jan	S06W02	295	0030	06	Dro	008	B								
29 Jan	S06W15	295	0070	07	Dao	025	B								
30 Jan	S06W32	298	0060	07	Dso	012	B								
31 Jan	S05W44	297	0050	05	Dso	008	B								
01 Feb	S05W57	297	0070	05	Dao	009	B								
02 Feb	S04W71	298	0060	05	Dao	007	B								
03 Feb	S04W87	301	0040	01	Hrx	001	A								
															0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 295

Region 274

28 Jan	S06E71	222	0050	02	Hax	001	A								
29 Jan	S07E57	223	0170	02	Hsx	001	A								
30 Jan	S07E45	221	0090	02	Hsx	001	A						1		
31 Jan	S07E32	221	0060	02	Hsx	001	A								
01 Feb	S07E18	222	0070	04	Hsx	004	A								
02 Feb	S06E05	222	0080	05	Dso	005	B								
03 Feb	S05W09	223	0130	07	Dso	013	B								
04 Feb	S05W22	224	0120	06	Dso	009	B								
05 Feb	S05W37	227	0110	07	Dso	006	B								
06 Feb	S05W50	225	0100	08	Dso	003	B								
07 Feb	S05W63	225	0100	07	Cso	003	B	1			1				
08 Feb	S05W76	225	0100	08	Dso	003	B								
09 Feb	S05W86	222	0050	02	Hsx	001	A								
															1 0 0 1 1 0 0 0

Still on Disk.

Absolute heliographic longitude: 222



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 275

29 Jan	S11W08	288	0010	02	Cao	002	B												
30 Jan	S11W23	289																	
31 Jan	S11W36	289																	
01 Feb	S11W49	289																	
02 Feb	S11W62	289																	
03 Feb	S11W75	289																	
04 Feb	S11W88	289																	
																			0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 288

Region 276

01 Feb	S15E78	162	0180	09	Dao	007	B	8	1	3									
02 Feb	S14E66	161	0240	11	Eai	008	B	7		5									
03 Feb	S14E54	160	0280	12	Eai	025	B	1											
04 Feb	S13E40	162	0260	13	Eai	020	Bg												
05 Feb	S13E27	161	0180	13	Eai	021	Bg												
06 Feb	S13E15	160	0130	14	Eai	026	B			1									
07 Feb	S13W01	162	0090	14	Esi	031	Bg												
08 Feb	S13W14	163	0060	12	Eso	014	B												
09 Feb	S12W26	162	0070	15	Eac	028	B			1									
																			16 1 0 10 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 162

Region 277

04 Feb	S20E66	136	0010	03	Bxo	002	B	1		1									
05 Feb	S20E54	134	0020	02	Bxo	002	B			1									
06 Feb	S18E41	134	0020	06	Bxo	007	B	1		5									
07 Feb	S19E25	134	0020	00	Hrx	001	B			1									
08 Feb	S21E17	132	0020	06	Cro	008	B												
09 Feb	S19E06	130	0030	05	Dso	008	B												
																			2 0 0 8 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 130



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 279

05 Feb	S10E02	186	0010	05	Bxo	004	B											
06 Feb	S13W12	187	0020	04	Bxo	007	B											
07 Feb	S13W25	187																
08 Feb	S12W35	184	0010	02	Bxo	003	B											
09 Feb	S12W48	184																
												0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 186

Region 280

06 Feb	S08E29	146	0040	04	Dso	005	B											
07 Feb	S07E16	146	0040	05	Dso	009	B											
08 Feb	S07E00	149	0040	04	Dso	009	B											
09 Feb	S07W13	149	0030	06	Dso	008	B											
												0	0	0	3	0	0	0

Still on Disk.

Absolute heliographic longitude: 149

Region 281

06 Feb	S14E73	102	0030	01	Hsx	001	A											
07 Feb	S14E60	102	0050	01	Hax	001	A											
08 Feb	S13E46	103	0040	01	Hsx	001	A											
09 Feb	S15E33	103	0030	01	Hsx	001	A											
												0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 103

Region 282

07 Feb	N12E35	127	0020	03	Bxo	004	B											
08 Feb	N12E22	127																
09 Feb	N11E08	128	0010	02	Axx	002	A											
												0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 128



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 283</i>																						
07 Feb	N01E52	110	0040	04	Cso	003	B															
08 Feb	N01E38	111	0050	06	Dao	005	B															
09 Feb	N00E25	111	0050	07	Dso	013	B															
Still on Disk.																						
Absolute heliographic longitude: 111																						
<i>Region 284</i>																						
08 Feb	N12W14	163	0020	04	Cro	004	B															
09 Feb	N13W26	162	0020	04	Cso	004	B															
Still on Disk.																						
Absolute heliographic longitude: 163																						
<i>Region 285</i>																						
08 Feb	S10E75	074	0060	04	Hsx	001	A															
09 Feb	S11E65	071	0070	02	Hax	001	A															
Still on Disk.																						
Absolute heliographic longitude: 071																						
<i>Region 286</i>																						
09 Feb	S11W17	153	0010	03	Cso	005	B															
Still on Disk.																						
Absolute heliographic longitude: 153																						

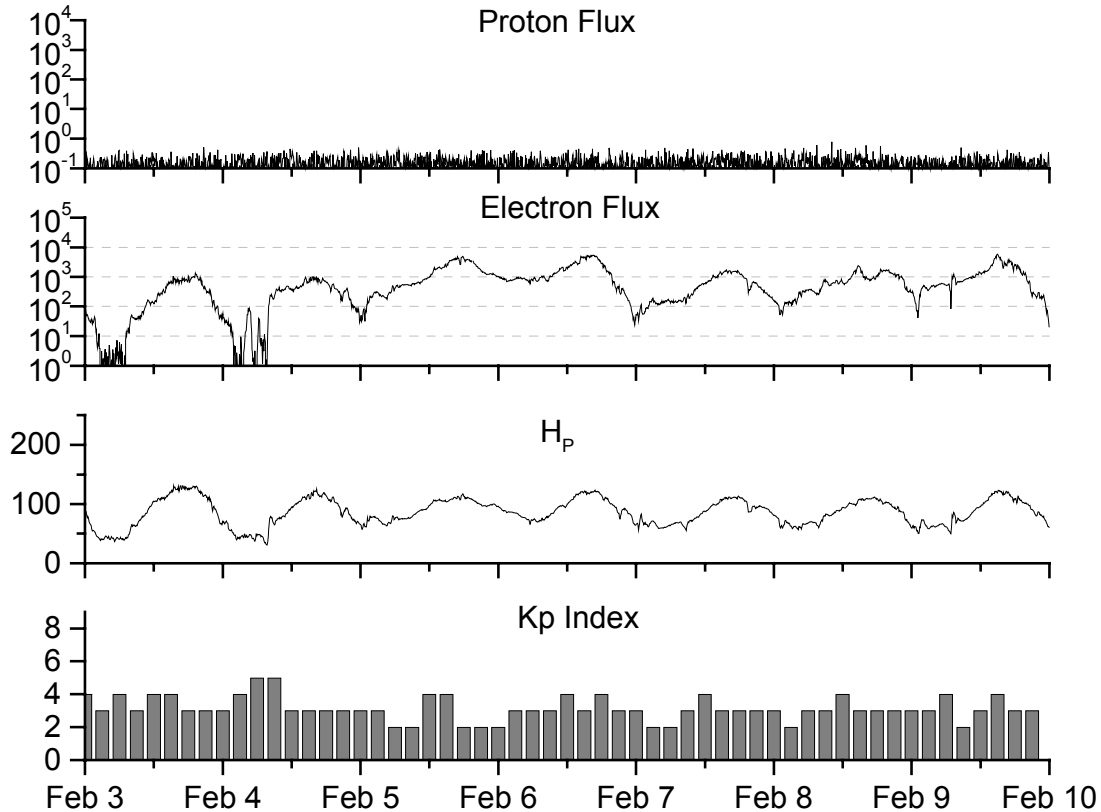


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

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
2001									
February	131.0	80.1	0.61	151.4	104.2	146.7	165.8	06	13.3
March	166.7	114.2	0.69	154.0	104.9	177.7	167.9	17	12.9
April	163.6	108.2	0.66	159.4	107.7	178.1	171.7	18	12.7
May	135.1	97.3	0.72	163.1	108.8	147.9	174.8	12	12.5
June	196.7	134.0	0.68	167.2	109.9	173.7	178.8	12	12.4
July	124.6	82.2	0.66	172.1	111.8	131.3	183.9	11	12.4
August	159.4	106.8	0.67	176.7	113.8	163.1	188.8	13	12.5
September	229.1	150.7	0.66	178.8	114.3	233.8	191.3	13	12.8
October	197.4	125.6	0.64	179.5	114.1	208.1	191.9	20	12.0
November	178.6	106.5	0.60	183.7	115.6	212.7	193.7	16	12.0
December	217.5	131.8	0.61	184.5	114.7	235.6	193.9	09	12.2
2002									
January	189.0	113.9	0.60	184.8	113.5	227.3	194.6	08	12.4
February	194.5	108.0	0.56	188.6	114.7	205.0	197.2	10	12.8
March	153.1	98.1	0.64	188.9	113.3	180.3	195.7	10	13.0
April	194.9	120.4	0.62	186.2	110.4	189.8	191.5	15	13.2
May	204.1	120.8	0.59	183.6	108.8	178.4	188.0	15	13.3
June	146.0	88.5	0.61	179.9	106.2	148.7	183.0	11	13.5
July	183.5	99.9	0.54	175.4	102.7	173.5	176.3	13	13.9
August	191.0	116.4	0.61			183.9		16	
September	206.4	109.3	0.53			175.8		14	
October	153.9	97.5	0.63			167.0		23	
November	159.8	95.0	0.59			168.7		16	
December	147.9	81.6	0.55			158.6		13	
2003									
January	150.0	79.5	0.53			144.0		13	

NOTE: All smoothed values after June 1999 and monthly values after December 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 03 February 2003

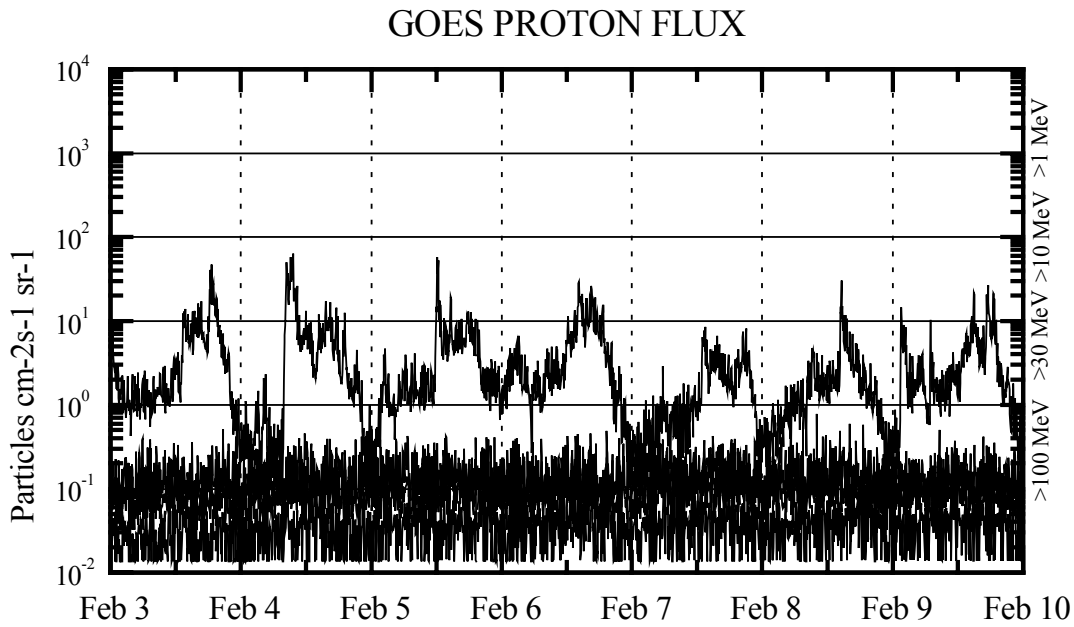
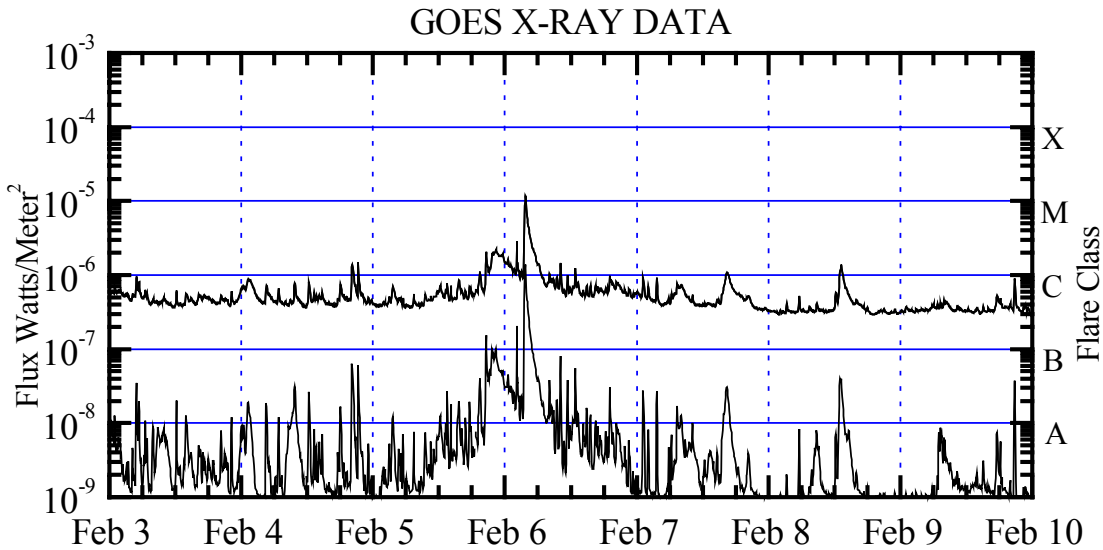
Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

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 Air Force Weather Agency) 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 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/m²) 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/cm²-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/cm²-sec-sr) at greater than 10 MeV.





Space
Environment
Center

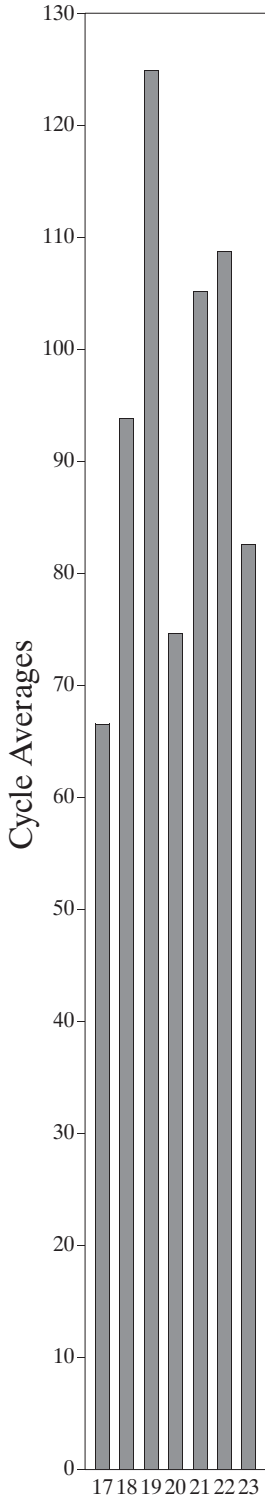
Sunspot Number (RI)

December 2002
(Month 75)

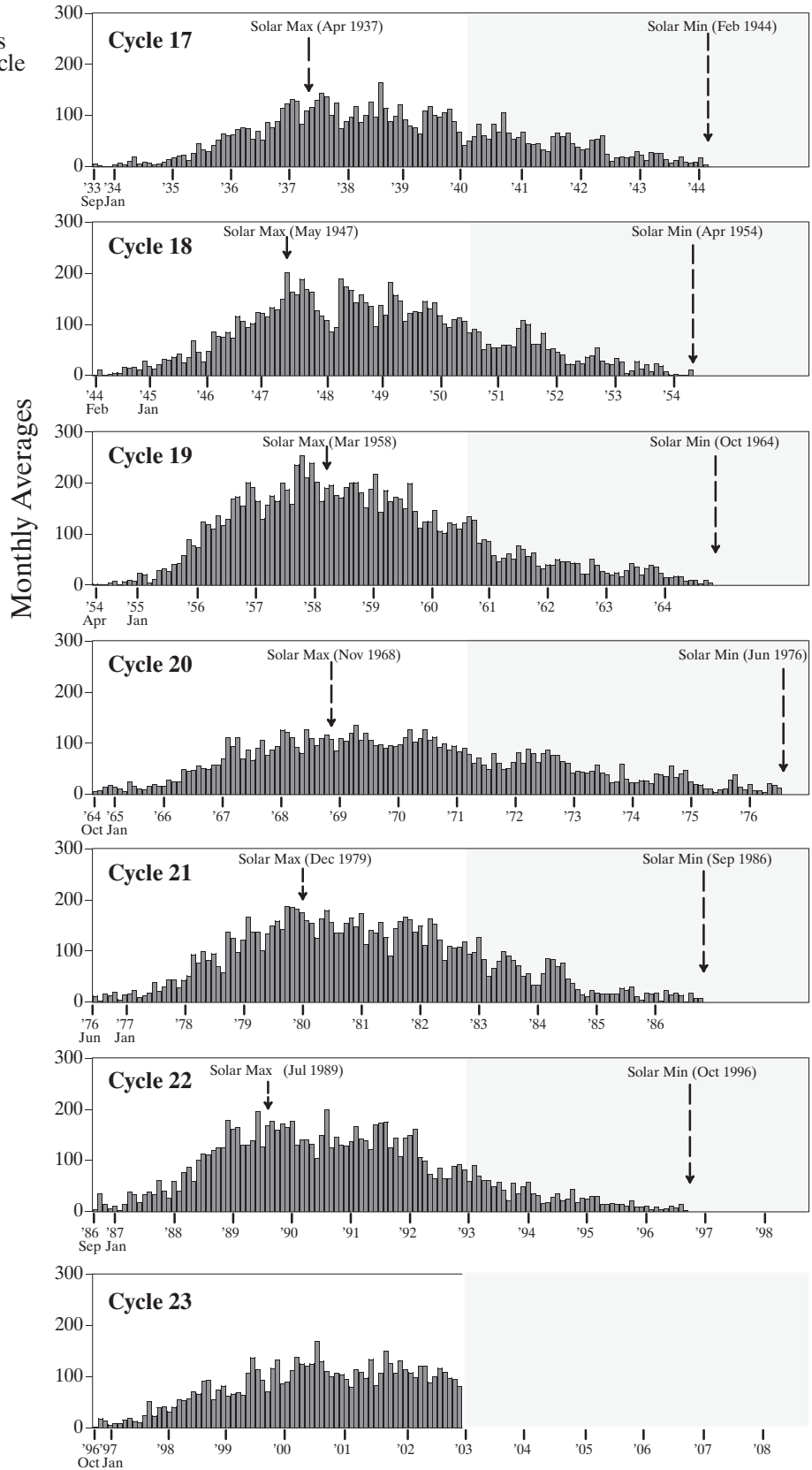
Preliminary data



Comparison of Cycles
at current month in cycle



K. Tegnell



Sudden Storm Commencements and Impulses



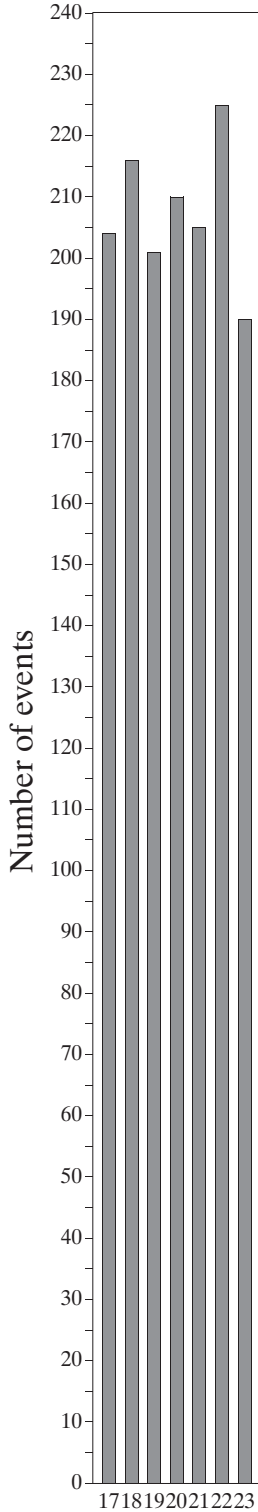
Space Environment Center



January 2003
(Month 76)

Preliminary data

Comparison of Cycles at current month in cycle



K. Tegnell

Cycle

