

Space Weather Highlights
19 - 25 May 2003

SWO PRF 1447
27 May 2003

Solar activity was at very low to low levels. The period began on 19 May with very low levels. Activity increased to low levels on 20 – 22 May. Region 364 (S24, L=295, class/area Dso/100 on 20 May) produced three C-class flares on 20 May. Region 362 (S12, L=245, class/area Dao/110 on 21 May) produced four C-class flares on 22 May. The largest event of the period was a C4 flare from Region 362 on 22 May at 0542 UTC. Activity on 23 – 24 May decreased to very low levels. The period ended on 25 May with low levels due to a C3 flare from Region 368 (S32, L=160, class/area Hax/180 on 22 May). As the period ended, Region 365 (S08, L=181, class/area Dai/190 on 25 May) entered a rapid growth phase.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft for most of the summary period. On 21 May, solar wind speed increased from 400 km/s to over 600 km/s due to a geo-effective coronal hole. Wind speed was steady on 22 May near 500 km/s and was in gradual decline on 23 May. On 24 May, solar wind speed increased to around 550 km/s and remained elevated at that level through the end of the period. The Bz component of the interplanetary magnetic field exhibited high speed flow signature for most of the period oscillating between +/- 8 nT. On 21 May, there was a brief period of southward Bz near -13 nT.

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 reached high levels on 23 – 25 May.

The geomagnetic field ranged from quiet to minor storm levels. The period began with quiet to unsettled levels on 19 – 20 May. On 21 May, a coronal hole rotated into a geo-effective position and produced quiet to minor storm levels through 23 May. High speed stream effects continued through the end of the period and produced unsettled to minor storm levels on 24 – 25 May.

Space Weather Outlook
28 May - 23 June 2003

Solar activity is expected to be at low to moderate levels. Moderate levels are expected early in the period as Region 365 continues to grow. Activity from beyond the northeast limb indicates new active regions will rotate onto the visible disk early in the forecast period. These new regions are expected to keep activity at moderate levels through the first half of the period.

Greater than 10 MeV proton events are not expected during the forecast period.

The greater than 2 MeV electron flux is likely to reach high levels on 30 May – 01 June, and again on 08 – 16 June due to recurring high speed solar wind streams.

The geomagnetic field is expected to range from quiet to active levels with some isolated major storm periods. A small coronal hole high speed flow is expected on the first couple of days of the period and may produce some minor storm periods. On 04 – 12 June, a large southern coronal hole will rotate into a geo-effective position and is expected to produce active to minor storm levels. The period should end with a third coronal hole high speed flow producing unsettled to active conditions on 17 – 22 June.



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
19 May	115	75	190	B2.0	1	0	0	1	0	0	0	0
20 May	117	77	370	B2.4	4	0	0	3	0	0	0	0
21 May	119	79	300	B2.6	1	0	0	0	0	0	0	0
22 May	118	110	500	B2.7	4	0	0	2	0	0	0	0
23 May	118	87	330	B2.5	0	0	0	1	0	0	0	0
24 May	117	84	320	B2.7	0	0	0	0	0	0	0	0
25 May	121	51	360	B2.5	1	0	0	6	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
19 May	9.1E+4	1.1E+4	2.4E+3		7.4E+6	
20 May	1.9E+5	1.1E+4	2.7E+3		6.0E+6	
21 May	4.7E+5	1.2E+4	2.8E+3		1.2E+7	
22 May	1.2E+6	1.2E+4	2.8E+3		1.0E+7	
23 May	6.9E+5	1.2E+4	2.9E+3		4.2E+7	
24 May	4.5E+5	1.2E+4	3.0E+3		3.1E+7	
25 May	3.1E+5	1.2E+4	2.7E+3		9.9E+7	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	19 May	9	3-2-1-1-2-2-3-3	15	3-3-2-4-3-4-2-2	12
20 May	9	3-2-2-2-3-1-2-2	20	5-3-3-4-3-4-1-2	12	3-3-3-3-3-2-3-3
21 May	13	3-3-2-1-2-3-3-4	24	3-4-2-2-4-5-5-3	20	3-4-2-2-3-4-4-5
22 May	15	4-4-3-2-3-2-3-2	45	4-5-4-5-7-5-3-2	25	5-5-4-3-4-4-3-2
23 May	18	3-3-3-4-3-4-3-3	41	3-5-5-7-4-4-3-2	21	3-4-4-5-3-4-3-3
24 May	14	2-3-4-2-3-2-3-3	33	2-5-5-4-6-4-3-3	22	3-5-5-3-4-3-4-3
25 May	14	4-4-3-2-2-2-2-3	26	4-4-4-5-2-5-3-2	22	5-5-4-3-2-4-3-4

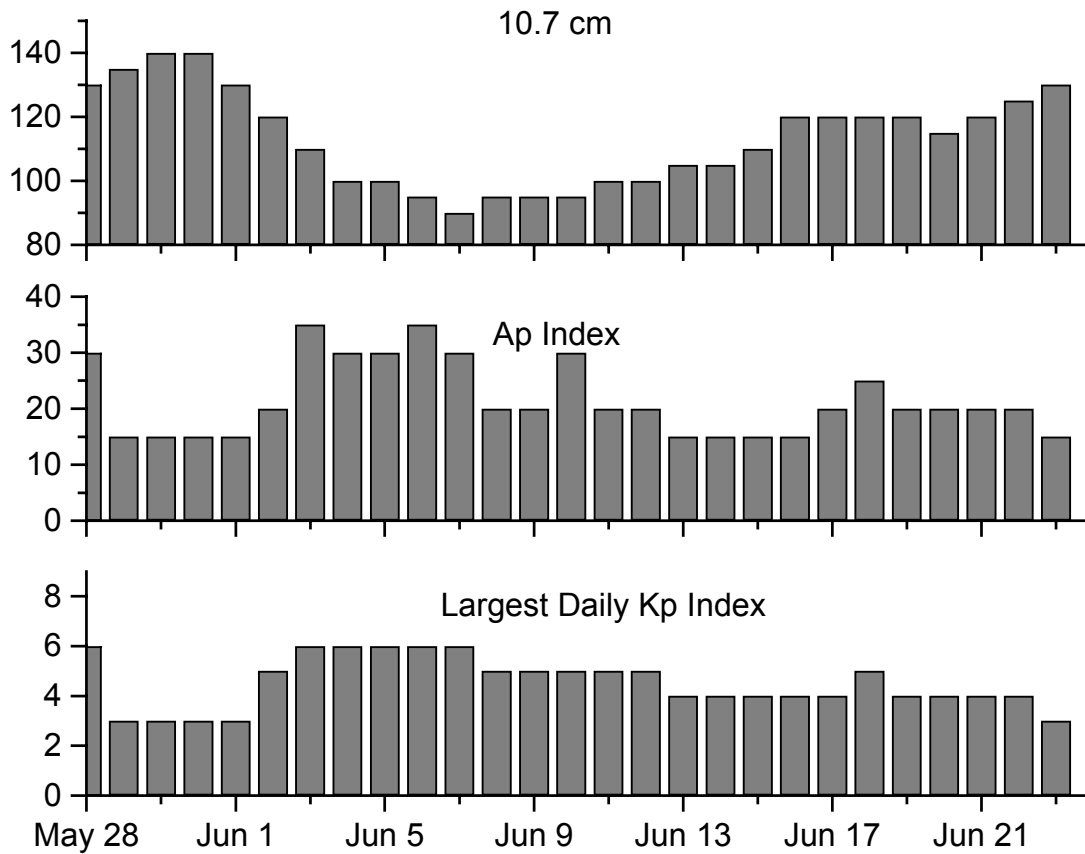


Alerts and Warnings Issued

<u>Date & Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date & Time of Event UT</u>
21 May 0410	ALERT: Geomagnetic K= 4	21 May 0409
21 May 1520	WARNING: Geomagnetic K= 4	21 May 1520 - 22 May 1500
21 May 1622	ALERT: Geomagnetic K= 4	21 May 1619
22 May 0011	1 - 245 MHz Burst	21 May
22 May 0104	WARNING: Geomagnetic K= 5	21 May 0110 - 22 May 1500
22 May 0302	ALERT: Geomagnetic K= 5	21 May 0300
22 May 1440	EXTENDED WARNING: Geomagnetic K= 4	21 May 1520 - 23 May 1500
22 May 2032	WATCH: Geomagnetic A \geq 20	23 May
23 May 1358	ALERT: Electron 2MeV Integral Flux > 1000pfu	23 May 1340
24 May 0020	1 - 245 MHz Burst	23 May
24 May 0501	ALERT: Geomagnetic K= 5	24 May 0501
24 May 0736	WARNING: Geomagnetic K= 4	24 May 0735 - 24 May 1500
24 May 0824	ALERT: Geomagnetic K= 4	24 May 0820
24 May 1355	ALERT: Electron 2MeV Integral Flux > 1000pfu	24 May 1335
24 May 1732	WARNING: Geomagnetic K= 4	24 May 1531 - 25 May 1500
24 May 1733	ALERT: Geomagnetic K= 4	24 May 1731
24 May 2032	WATCH: Geomagnetic A \geq 20	27 May
25 May 0251	ALERT: Geomagnetic K= 5	25 May 0250
25 May 0355	WARNING: Geomagnetic K= 5	25 May 0355 - 1500
25 May 1121	ALERT: Electron 2MeV Integral Flux > 1000pfu	25 May 1105
25 May 1658	WARNING: Geomagnetic K= 4	25 May 1658 - 26 May 1500
25 May 1659	ALERT: Geomagnetic K= 4	25 May 1658
25 May 2132	WATCH: Geomagnetic A \geq 20	26 May
25 May 2133	WATCH: Geomagnetic A \geq 20	27 May
25 May 2134	WATCH: Geomagnetic A \geq 20	28 May



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
28 May	130	30	6	11 Jun	100	20	5
29	135	15	3	12	100	20	5
30	140	15	3	13	105	15	4
31	140	15	3	14	105	15	4
01 Jun	130	15	3	15	110	15	4
02	120	20	5	16	120	15	4
03	110	35	6	17	120	20	4
04 Jun	100	30	6	18	120	25	5
05	100	30	6	19	120	20	4
06	95	35	6	20	115	20	4
07	90	30	6	21	120	20	4
08	95	20	5	22	125	20	4
09	95	20	5	23	130	15	3
10	95	30	5				



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

No Events Observed

Flare List

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
19 May	0942	1052	1131	B8.3			
	1444	1525	1604	B7.8			
	1924	1924	1926	B8.3	Sf	N19W64	356
	2226	2230	2240	B9.4			
	2301	2304	2309	B6.1			
20 May	0021	0025	0029		Sf	S25W30	364
	0046	0051	0057	B6.5			
	0110	0115	0123	B7.0			
	0206	0211	0216	C1.1			364
	0455	0457	0501	C1.0	Sf	S26W33	364
	0605	0610	0616	B5.6			
	0747	0751	0755	B5.3			
	0854	0858	0902	B6.8			
	1039	1045	1051	C1.0			364
	1341	1344	1351	B3.0			
21 May	1440	1450	1453	B7.2			
	1928	1932	1947	C1.4	Sf	S13E15	362
	2110	2113	2116	B4.3			
	0542	0604	0621	C1.2			362
	1522	1526	1530	B6.5			
22 May	0611	0617	0621	C1.1			362
	0642	0703	0712	C4.9			362
	1347	1354	1403	B5.5	Sf	S10W11	362
	1411	1416	1420	B5.6			
	1524	1528	1531	B7.2			
	1636	1723	1743	C1.1			362
23 May	2110	2113	2126	C1.1	Sf	S14W11	362
	0825	0834	0843	B7.0	Sf	S10W15	362
24 May	1144	1147	1150	B5.0			363
	1413	1417	1419	B4.9			368
	1424	1428	1432	B7.1			366
	2220	2229	2237	B7.1			366



Flare List - continued.

Date	Time			X-ray Class.	Imp / Brtns	Optical	Rgn
	Begin	Max	End			Location Lat CMD	
25 May	0426	0427	0433	B5.1	Sf	N16E40	370
	0810	0817	0833	B7.2	Sf	N11E31	366
	1540	1543	1545	B5.2			
	1716	1716	1721		Sf	S14E35	367
	1732	1747	1812	C3.0	Sf	S26E43	368
	2033	2036	2038	B5.2			365
	2214	2214	2225		Sf	S07E06	365
	2251	2251	2259	B7.5	Sf	S31E39	368

Region Summary

Date	Location		Sunspot Characteristics				Flares											
	Helio		Area (10 ⁻⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
	(° Lat ° CMD)	Lon						C	M	X	S	1	2	3	4			
<i>Region 356</i>																		
09 May	N15E63	337	0110	06	Dso	002	B											
10 May	N15E47	340	0030	01	Hsx	001	A											
11 May	N16E36	338	0060	05	Cso	002	B											
12 May	N17E22	339	0050	07	Cso	004	B											
13 May	N17E09	338	0060	04	Cao	006	B											
14 May	N17W04	338	0060	04	Cao	006	B											
15 May	N18W17	338	0060	05	Dao	009	B											
16 May	N18W29	337	0030	07	Cso	010	B											1
17 May	N18W44	339	0010	03	Bxo	004	B											
18 May	N17W54	336	0020	03	Cso	003	B											
19 May	N18W67	335	0020	03	Bxo	002	B											1
20 May	N18W80	335																
																		0
																		0
																		0
																		2
																		0
																		0
																		0
																		0

Crossed West Limb.

Absolute heliographic longitude: 338



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

Region 357

11 May	S16E70	304	0040	09	Cso	003	B											
12 May	S16E56	305	0070	11	Eso	006	B											
13 May	S16E43	304	0080	10	Dso	004	B											
14 May	S16E30	304	0050	09	Dso	004	B											
15 May	S17E18	304	0040	08	Dso	003	B											
16 May	S17E07	301	0050	03	Dao	004	B											
17 May	S15W06	301	0050	04	Dao	011	B											1
18 May	S16W20	302	0050	05	Dsi	014	B	1										1
19 May	S16W34	302	0060	07	Cao	018	B											
20 May	S15W48	303	0050	08	Cso	010	B											
21 May	S16W61	303	0040	09	Cao	008	B											
22 May	S16W73	302	0060	07	Cso	008	B											
23 May	S16W86	302																
										1	0	0	2	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 301

Region 358

12 May	N10E23	338	0000	01	Axx	002	A											
13 May	N09E10	337	0040	04	Dso	008	B											
14 May	N09W03	337	0080	06	Dao	009	B											
15 May	N08W17	338	0070	07	Dao	007	B											
16 May	N08W30	339	0030	07	Cso	003	B											
17 May	N08W46	341	0010	01	Hrx	003	A											
18 May	N08W59	341																
19 May	N08W72	341																
20 May	N08W85	341																
										0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 337

Region 360

14 May	S04W20	354	0000	01	Axx	001	A											
15 May	S05W34	355	0010	00	Axx	001	A											
16 May	S05W47	355																
17 May	S05W60	355																
18 May	S05W73	355																
19 May	S05W86	355																
										0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 354



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 361

15 May	N09E39	282	0020	01	Hrx	002	A										
16 May	N08E25	283	0030	02	Hsx	007	A										
17 May	N09E10	285	0010	02	Axx	003	A										
18 May	N10W01	283	0000	00	Axx	001	A										
19 May	N10W12	281															
20 May	N10W25	281															
21 May	N10W38	281															
22 May	N10W51	281															
23 May	N10W64	281															
24 May	N10W77	281															
25 May	N10W90	281															
																	0 0 0 0 0 0 0 0

Still on Disk.
 Absolute heliographic longitude: 283

Region 362

15 May	S10E77	244	0070	10	Dao	003	B										
16 May	S11E64	244	0240	10	Dao	011	B										
17 May	S11E50	245	0210	10	Dao	010	B										
18 May	S11E37	245	0110	08	Dso	010	Bg										
19 May	S11E23	245	0070	09	Cao	008	B										
20 May	S10E10	245	0090	08	Dso	011	Bg	1			1						
21 May	S12W03	245	0110	08	Dao	019	Bg	1									
22 May	S11W15	244	0100	08	Dso	015	B	4			2						
23 May	S11W30	246	0050	07	Dao	007	B				1						
24 May	S10W44	246	0030	07	Cro	004	B										
25 May	S10W57	246															
																	6 0 0 4 0 0 0 0

Still on Disk.
 Absolute heliographic longitude: 245

Region 363

18 May	S08W04	286	0000	01	Axx	001	A										
19 May	S08W17	286															
20 May	S08W30	286															
21 May	S08W43	286															
22 May	S08W56	286															
23 May	S08W69	286															
24 May	S08W82	286															
																	0 0 0 0 0 0 0 0

Still on Disk.
 Absolute heliographic longitude: 286



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 364

19 May	S26W29	297	0040	05	Cso	007	B										
20 May	S24W40	295	0100	07	Dso	012	B	3				2					
21 May	S26W54	296	0070	07	Dao	008	B										
22 May	S26W67	296	0050	08	Dao	009	B										
23 May	S26W80	296															
								3	0	0	2	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 297

Region 365

20 May	S06E68	187	0130	04	Dso	004	B										
21 May	S07E52	190	0080	03	Dao	004	B										
22 May	S07E38	191	0040	03	Cso	004	B										
23 May	S09E25	191	0020	01	Hsx	001	A										
24 May	S08E11	191	0020	03	Bxo	005	B										
25 May	S08E08	181	0190	06	Dai	016	B					1					
								0	0	0	1	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 181

Region 366

22 May	N11E62	167	0020	01	Axx	002	A										
23 May	N10E50	166	0020	03	Bxo	002	B										
24 May	N11E36	166	0010	01	Axx	001	A										
25 May	N11E23	166										1					
								0	0	0	1	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 166

Region 367

22 May	S14E69	160	0050	02	Cao	001	B										
23 May	S14E55	161	0030	01	Hsx	001	A										
24 May	S14E42	160	0070	02	Hsx	001	A										
25 May	S14E29	160	0040	04	Cso	004	B					1					
								0	0	0	1	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 160



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 368

22 May	S32E76	153	0180	02	Hax	001	A											
23 May	S32E62	154	0170	03	Hax	001	A											
24 May	S33E50	152	0170	02	Hsx	001	A											
25 May	S33E37	152	0130	02	Hax	001	A	1				2						
								1	0	0	0	2	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 152

Region 369

23 May	N12E08	208	0020	03	Cao	004	B											
24 May	N12W08	210	0010	01	Axx	001	A											
25 May	N12W21	210																
								0	0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 208

Region 370

23 May	N16E53	163	0020	01	Axx	001	A											
24 May	N16E38	164	0010	01	Axx	001	A											
25 May	N16E25	164										1						
								0	0	0	0	1	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 164

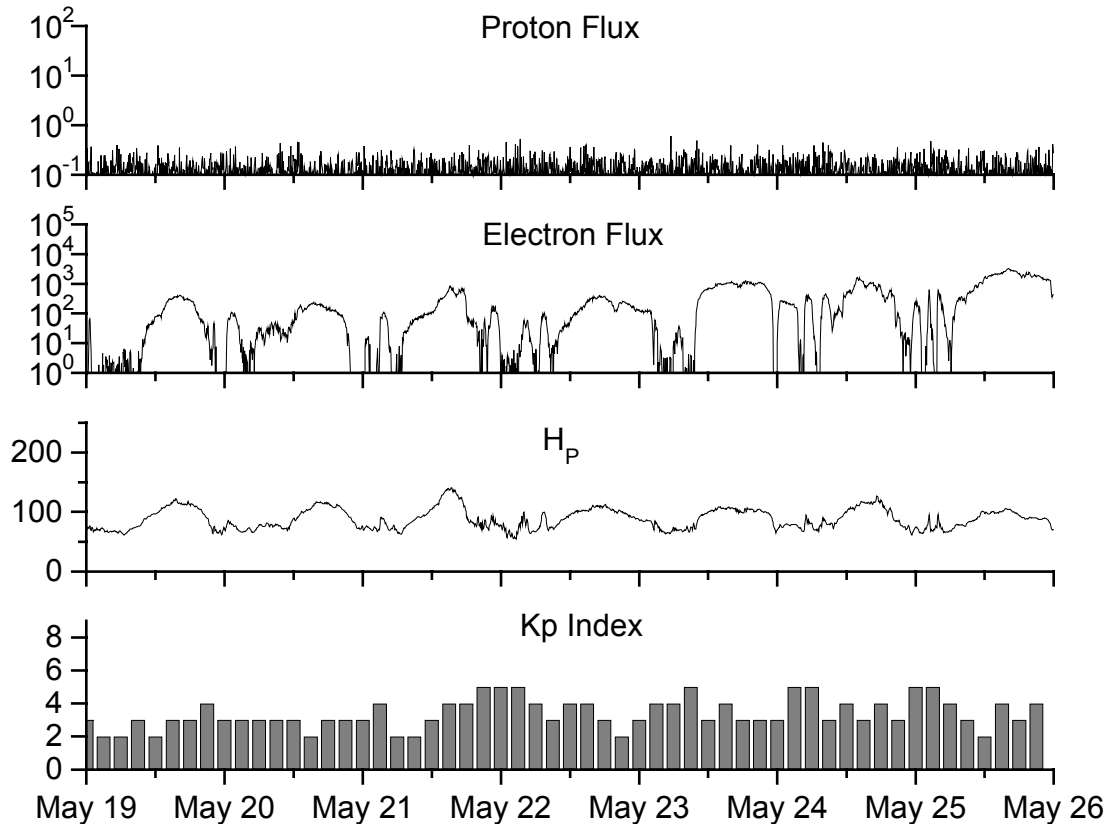


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

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									
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	132.2	0.61	184.5	114.6	235.6	193.9	09	12.2
2002									
January	189.0	114.1	0.60	184.8	113.5	227.3	194.6	08	12.4
February	194.5	107.4	0.55	188.6	114.7	205.0	197.2	10	12.8
March	153.1	98.4	0.64	188.9	113.4	180.3	195.7	10	13.0
April	194.9	120.7	0.62	186.2	110.5	189.8	191.5	15	13.2
May	204.1	120.8	0.59	183.6	108.9	178.4	188.0	15	13.3
June	146.0	88.3	0.60	179.9	106.3	148.7	183.0	11	13.5
July	183.5	99.9	0.54	175.4	102.7	173.5	173.5	13	13.9
August	191.0	116.4	0.61	169.3	98.7	183.9	169.5	16	14.3
September	206.4	109.6	0.53	163.4	94.6	175.8	164.2	14	14.9
October	153.9	97.5	0.63	158.7	90.5	167.0	159.5	23	15.5
November	159.8	95.5	0.60			168.7		16	
December	147.9	80.8	0.55			158.6		13	
2003									
January	149.3	79.5	0.53			144.6		13	
February	87.9	46.2	0.53			124.6		15	
March	119.7	61.5	0.51			132.3		19	
April	114.3	60.0	0.52			126.5		20	

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 19 May 2003

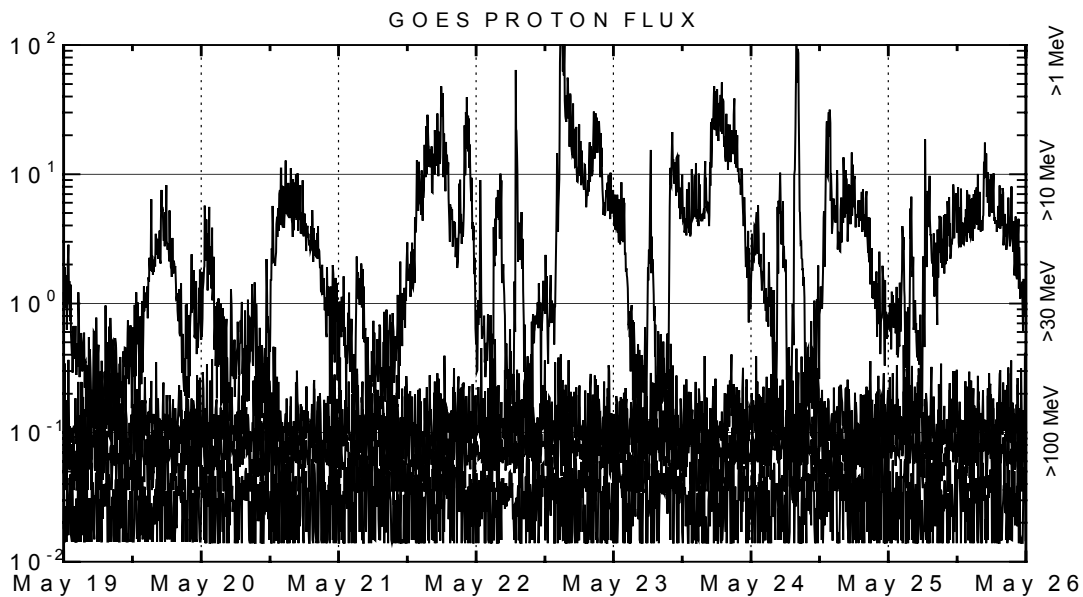
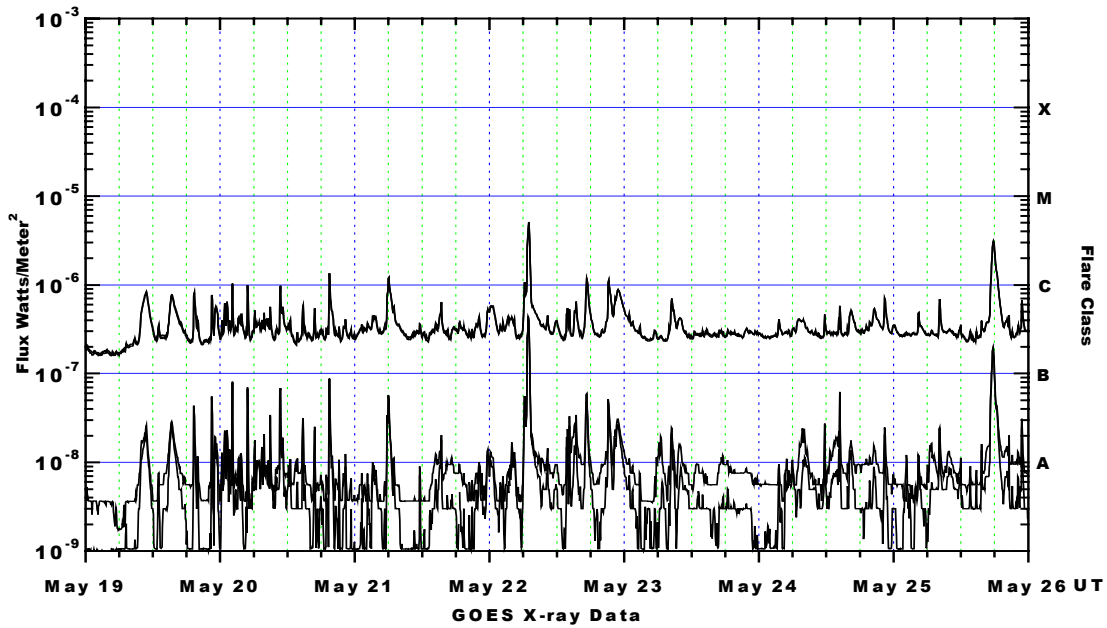
Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec-sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec-sr) with energies greater than 2 MeV at GOES-12.

H_p plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-12. 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 12 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.

