

Space Weather Highlights
12 - 18 May 2003

SWO PRF 1446
20 May 2003

Solar activity was at very low to low levels. Activity was at very low levels for the first six days of the period, 12 - 17 May, with occasional B-class flares from several small, unimpressive regions. Activity reached low levels on 18 May due to a C1 flare at 1057 UTC from Region 357 (S16, L=304, class/area Dso/80 on 13 May). On 15 May, Region 362 (N11, L=244, class/area Dao/240 on 16 May) rotated onto the visible disk and represented the largest region on the disk during the period.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft for most of the summary period. At the beginning of the period, 12 May, solar wind velocity was near 700 km/s due to a coronal hole high speed flow. Late on 13 May, solar wind velocity increased to near 800 km/s with peak velocities near 850 km/s. On 14 May, velocity dropped back to near 700 km/s. By 15 May, velocity began a gradual decline that continued through the end of the period with velocity declining to 450 km/s. The Bz component of the interplanetary magnetic field exhibited a high speed flow signature for most of the period, ranging from +6 to -8 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 everyday of the period, 12 - 18 May. Electron flux reached very high levels on 13 and 18 May.

The geomagnetic field was at quiet to major storm levels. Effects of a coronal hole high speed flow was seen in the first half of the period with unsettled to active levels on 12 May and unsettled to minor storm levels on 13 - 14 May. As the high speed stream began to decline on 15 May, activity decreased to unsettled to active levels. Activity was at quiet to unsettled levels for the remainder of the period.

Space Weather Outlook
21 May - 16 June 2003

Solar activity is expected to range from very low to moderate levels during the period. Low to moderate levels are expected early in the period with the return of a zone of active longitude that contained old Regions 345, 349, and 348. These regions are expected to have C-class and possibly M-class potential. Very low to low level activity is expected when these regions depart around 03 June.

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 everyday of the -

The geomagnetic field is expected to range from quiet to major storm levels during the period. A relatively weak coronal hole high speed flow is expected to rotate into a geo-effective position on 21 - 22 May and could produce active to minor storm levels. A large negative polarity coronal hole high speed flow is expected on 27 - 30 May with major storm levels possible. A very large southern hemisphere coronal hole is due to return on 02 - 12 June with major storm levels possible.



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	
12 May	94	66	310	A7.4	0	0	0	0	0	0	0	0	0
13 May	96	59	190	A9.7	0	0	0	0	0	0	0	0	0
14 May	96	75	210	B1.0	0	0	0	0	0	0	0	0	0
15 May	99	97	290	B1.3	0	0	0	0	0	0	0	0	0
16 May	103	97	400	B1.5	0	0	0	1	0	0	0	0	0
17 May	102	81	290	B1.6	0	0	0	1	0	0	0	0	0
18 May	109	79	180	B1.7	0	0	0	1	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
12 May	1.8E+5	1.2E+4	2.4E+3		1.5E+7	
13 May	2.1E+6	1.1E+4	2.7E+3		2.6E+8	
14 May	1.6E+6	1.1E+4	2.3E+3		4.6E+8	
15 May	1.2E+6	1.1E+4	2.5E+3		3.6E+8	
16 May	7.7E+5	1.1E+4	2.5E+3		4.5E+8	
17 May	1.6E+5	1.1E+4	2.5E+3		2.7E+8	
18 May	6.0E+5	1.1E+4	2.5E+3		3.1E+8	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	12 May	14	3-4-3-2-2-2-3-3	23	3-3-4-5-5-3-2-2	18
13 May	24	4-3-3-3-4-5-3-4	41	3-3-5-6-6-5-4-3	27	4-3-4-5-4-4-4-4
14 May	17	4-3-3-3-3-3-3-3	42	4-5-6-5-5-5-4-2	27	5-5-5-4-3-4-4-3
15 May	19	3-4-4-2-3-4-3-3	44	3-4-6-6-6-5-3-2	23	4-4-4-4-4-4-3-3
16 May	9	3-1-2-2-2-1-3-3	10	2-2-3-3-3-2-2-2	9	3-2-2-2-2-2-3-3
17 May	6	2-3-2-1-1-1-2-1	16	2-3-3-4-5-2-1-1	9	3-3-3-2-3-2-1-1
18 May	7	2-2-2-1-1-1-2-3	8	1-3-3-1-1-2-2-2	10	2-2-2-2-3-3-3-3

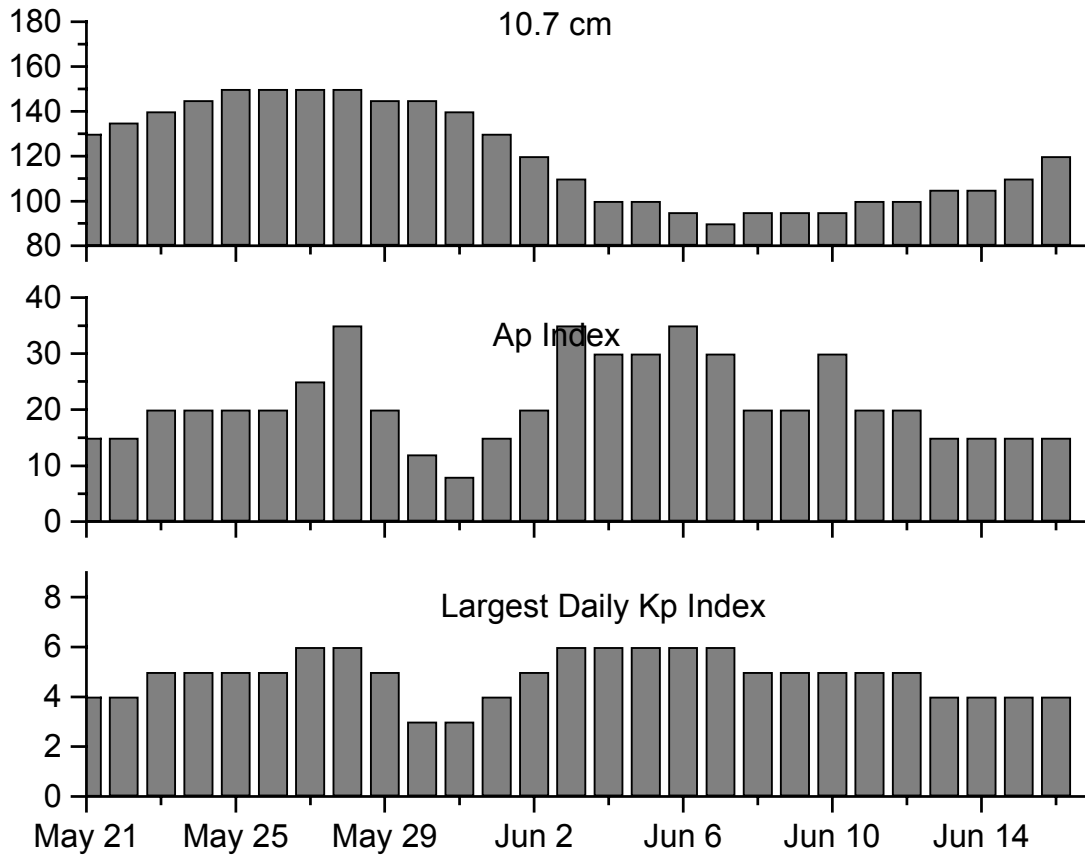


Alerts and Warnings Issued

<u>Date & Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date & Time of Event UT</u>
12 May 00	1 - 245 MHz Burst	11 May
12 May 0256	ALERT: Geomagnetic K= 4	12 May 0250
12 May 1117	ALERT: Electron 2MeV Integral Flux > 1000pfu	12 May 1015
12 May 1457	EXTENDED WARNING: Geomagnetic K= 6 expected	11 May 2355 - 12 May 2359
12 May 2340	WARNING: Geomagnetic K= 5 expected	12 May 2345 - 13 May 1500
13 May 0041	1 - 245 MHz Burst	12 May
13 May 1005	ALERT: Electron 2MeV Integral Flux > 1000pfu	13 May 0920
13 May 1151	ALERT: Geomagnetic K= 5	13 May 1151
13 May 1455	EXTENDED WARNING: Geomagnetic K= 5	12 May 2345 - 14 May 1500
13 May 1612	CANCEL WATCH: Geomagnetic A \geq 30	12 May 2142
13 May 2135	WATCH: Geomagnetic A \geq 20	14 May
13 May 2136	WATCH: Geomagnetic A \geq 20	15 May
14 May 0007	2 - 245 MHz Bursts	13 May
14 May 1106	ALERT: Electron 2MeV Integral Flux > 1000pfu	14 May 0915
14 May 1452	EXTENDED WARNING: Geomagnetic K= 5	14 May 2345 - 15 May 1500
15 May 1112	ALERT: Electron 2MeV Integral Flux > 1000pfu	14 May 0900
15 May 1457	WARNING: Geomagnetic K= 4	14 May 1500 - 16 May 1500
15 May 1713	ALERT: Geomagnetic K= 4	15 May 1711
16 May 0531	ALERT: Electron 2MeV Integral Flux > 1000pfu	16 May 0500
17 May 0515	ALERT: Electron 2MeV Integral Flux > 1000pfu	17 May 0500
18 May 0011	1 - 245 MHz Burst	17 May
18 May 0515	ALERT: Electron 2MeV Integral Flux > 1000pfu	18 May 0500



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
21 May	130	15	4	04 Jun	100	30	6
22	135	15	4	05	100	30	6
23	140	20	5	06	95	35	6
24	145	20	5	07	90	30	6
25	150	20	5	08	95	20	5
26	150	20	5	09	95	20	5
27	150	25	6	10	95	30	5
28	150	35	6	11	100	20	5
29	145	20	5	12	100	20	5
30	145	12	3	13	105	15	4
31	140	8	3	14	105	15	4
01 Jun	130	15	4	15	110	15	4
02	120	20	5	16	120	15	4
03	110	35	6				



Energetic Events

Date	Time		X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	1/2 Max	Class	Integ Flux	Imp/ Brtns	Location Lat CMD	Rgn #	245	2695	Intensity II IV

No Events Observed

Flare List

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
12 May	0029	0035	0037	B1.7			
	0606	0610	0612	B1.2			
	1735	1740	1745	B2.3			
	1853	1859	1901	B3.3			
	2136	2141	2143	B4.2			
13 May	0134	0138	0141	B2.7			
	1602	1632	1644	B2.7			
14 May	0032	0037	0040	B1.9			
	0728	0732	0737	B1.6			
15 May	2136	2143	2152	B5.7			356
16 May	2036	2038	2047		Sf	N15W29	356
17 May	0143	0147	0150		Sf	S16E05	357
	1319	1325	1329	B3.5			356
	1828	1835	1856	B3.2			357
18 May	1049	1057	1107	C1.0			
	1715	1715	1718	B5.3	Sf	S18W16	357
	1928	1939	1952	B6.3			



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

Region 351

30 Apr	N06E76	085	0090	03	Hkx	001	A											
01 May	N08E65	083	0150	03	Hax	001	A											
02 May	N08E51	082	0180	04	Hsx	001	A											
03 May	N08E38	082	0240	03	Hax	001	A											
04 May	N08E25	082	0220	04	Hhx	001	A											
05 May	N08E12	082	0180	03	Hsx	001	A											
06 May	N08W02	083	0190	03	Hax	001	A											
07 May	N08W15	082	0200	03	Hsx	001	A											
08 May	N08W27	080	0200	03	Hsx	001	A											
09 May	N10W41	081	0210	03	Hsx	001	A											
10 May	N09W55	082	0150	02	Hsx	001	A											
11 May	N09W67	081	0150	02	Hsx	001	A											
12 May	N08W82	083	0170	03	Hsx	001	A											

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 083

Region 353

04 May	S16E33	074	0020	02	Axx	002	A											
05 May	S16E20	074																
06 May	S16E07	074																
07 May	S16W09	076	0010	04	Bxo	006	B											
08 May	S16W22	076																
09 May	S16W35	076																
10 May	S16W48	076																
11 May	S16W61	076																
12 May	S16W74	076																

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 074



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 354

04 May	N19E58	049	0040	01	Hsx	001	A												
05 May	N19E47	047	0020	01	Hsx	001	A												
06 May	N19E33	048	0030	01	Hsx	001	A												
07 May	N19E21	046	0010	01	Axx	001	A												
08 May	N19E07	046	0020	01	Hsx	001	A												
09 May	N19W06	046																	
10 May	N19W19	046																	
11 May	N17W32	046	0000	00	Axx	001	A												
12 May	N17W45	046																	

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 046

Region 355

05 May	N12E45	049	0020	01	Hsx	001	A												
06 May	N12E31	050	0010	01	Hsx	001	A												
07 May	N13E17	050	0010	01	Hrx	001	A												
08 May	N13E04	050																	
09 May	N13W09	050																	
10 May	N13W22	050																	
11 May	N13W35	050																	
12 May	N13W48	050																	

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 050

Region 356

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												
17 May	N18W44	339	0010	03	Bxo	004	B												
18 May	N17W54	336	0020	03	Cso	003	B												

0 0 0 1 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 338



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 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
								1	0	0	0	2	0	0	0	0	0	0

Still on Disk.

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																
									0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 337

Region 359

12 May	S16W18	019	0020	04	Cso	003	B											
13 May	S16W32	019	0010	00	Axx	001	A											
14 May	S17W46	020	0020	03	Bxo	005	B											
15 May	S10W58	019	0020	01	Hrx	002	A											
16 May	S14W75	023	0020	02	Axx	002	A											
17 May	S14W88	023																
									0	0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 019



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 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																
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 354

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											
										0	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											
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 245

Region 363

18 May	S08W04	286	0000	01	Axx	001	A											
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 286

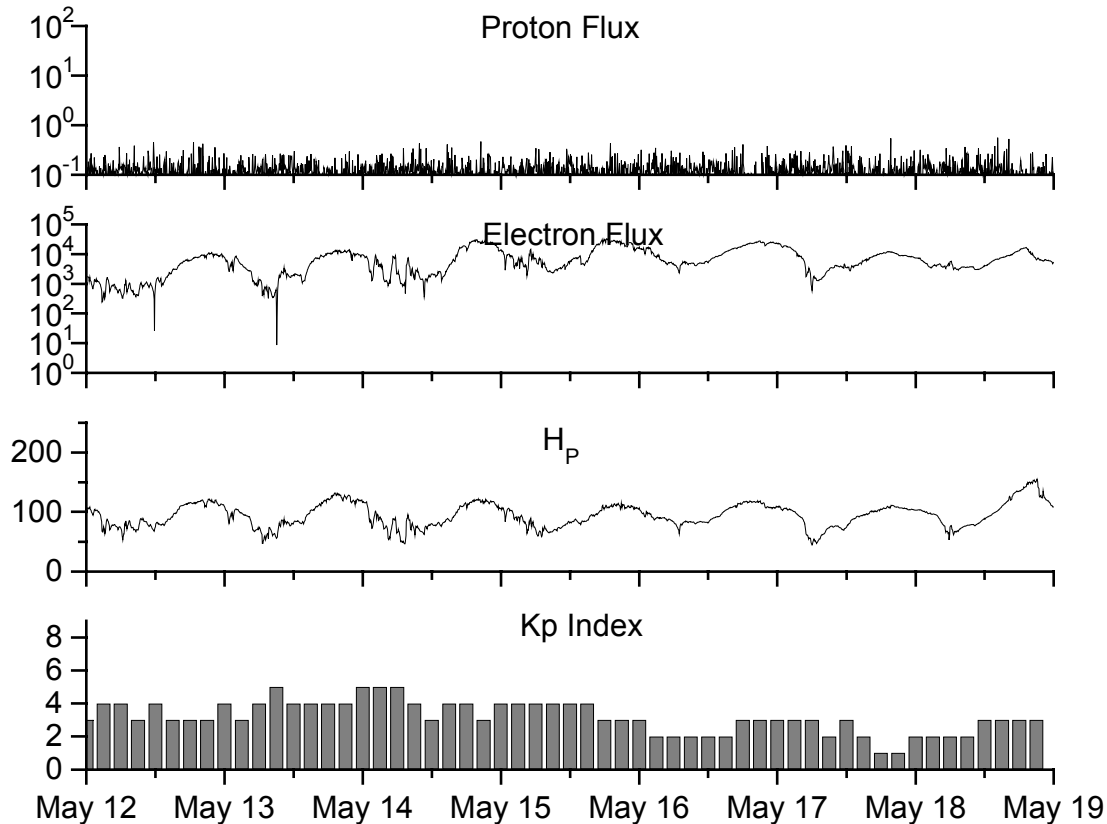


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

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 12 May 2003

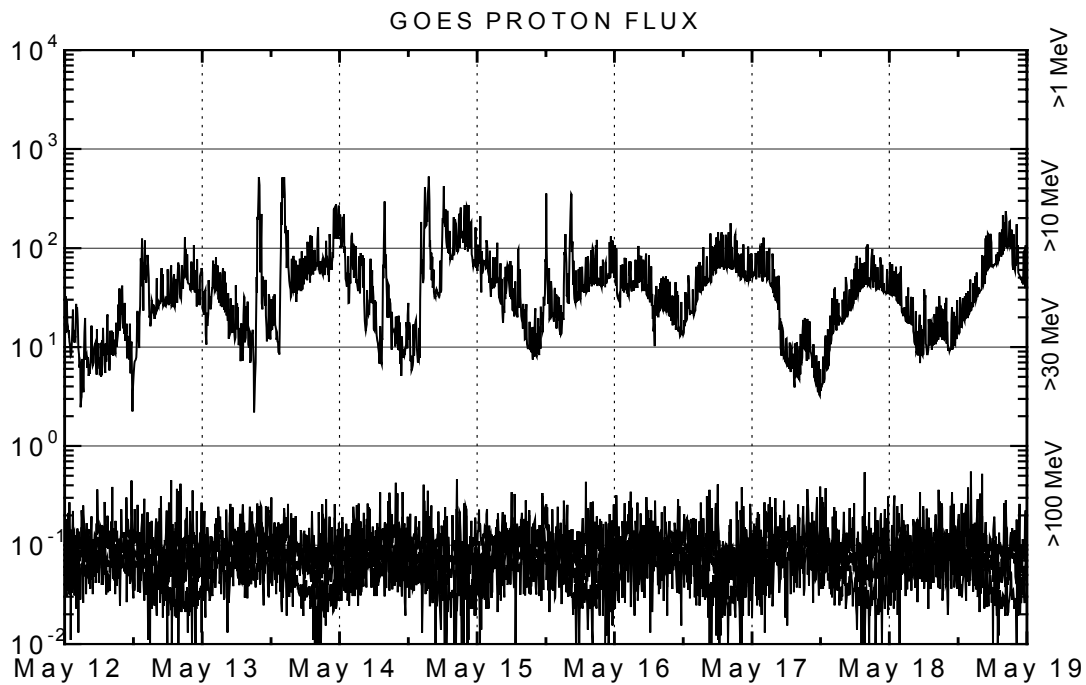
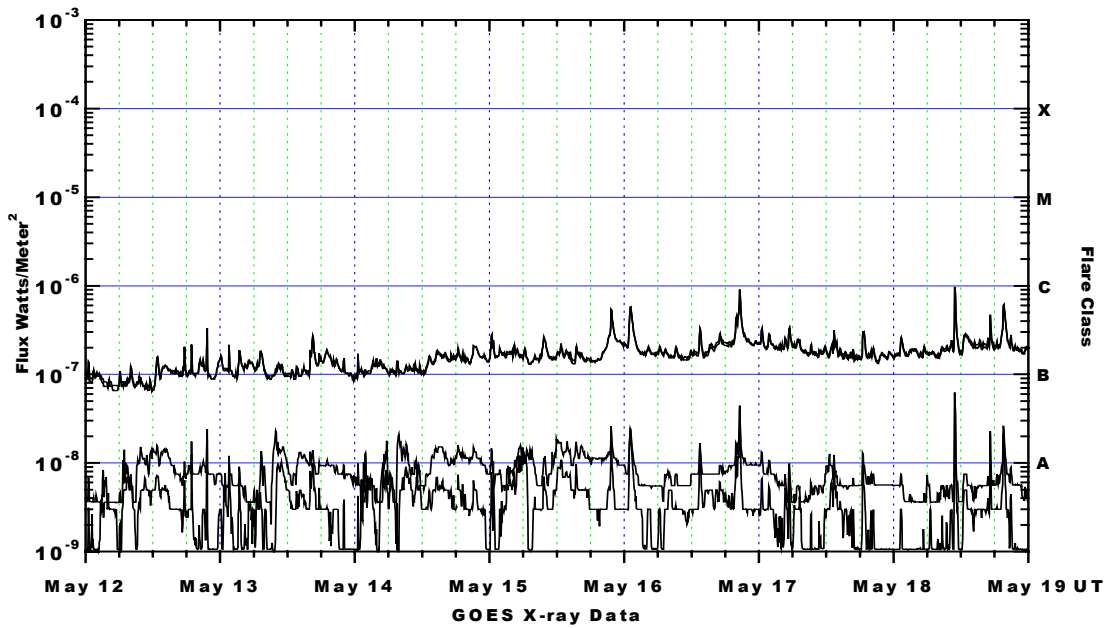
Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec-sr) as measured by GOES-10 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec-sr) with energies greater than 2 MeV at GOES-10.

H_p plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-10. 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 10 and 12 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-10 (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.

