

## Space Weather Highlights 23 - 29 May 2005

SWO PRF 1552  
31 May 2005

Solar activity ranged from very low to moderate. The period began with very low conditions for the first three days, but quickly rose to low to moderate late on the 26th as Region 767 (S08, L=238, class/area, Dao/300 on 28 May) developed into an active flare producer. At 26/2139 UTC, the region produced a C8.6/1f flare. Associated with this flare was a faint CME observed on LASCO imagery. Just prior to the C8.6 flare, a long duration B7.5 flare occurred at 26/1420 UTC. A filament eruption was associated with the B7.5 and was followed by a full halo CME. The bulk of the CME, as seen on LASCO imagery at 26/1506 UTC, was directed mainly to the southwest. The plane-of-sky speed of the ejecta was approximately 575 km/s. The largest event of the period occurred at 27/1230 UTC when Region 767 produced an impulsive M1.1/2f flare with an associated 130 sfu Tenflare. New Region 769 (S07, L=153, class/area, Hsx/050 on 28 May) produced two low-level C-class flares as it rotated onto the disk on the 28th. This region is the return of old Region 758, which produced 24 C-class and 3 M-class flares on its last transit. The remainder of the disk and limb were quiet and stable.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft during most of the summary period. Solar wind speed ranged from a low of 275 km/s early on 28 May to a high of 560 km/s late on 29 May. The period began with solar wind steady at about 450 km/s and the Bz component of the IMF not varying much beyond +/- 5 nT. These conditions persisted through the 25th. Thereafter, and through 27 May, solar wind speeds slowly decayed, and hit the period's low of 275 km/s early on the 28th. At 28/0444 UTC, a small sudden impulse of 16 nT was recorded at the Boulder magnetometer. Just prior to this, ACE measurements indicated an increase in solar wind speed, temperature, and density, all indicative of a co-rotating interactive region in advance of a recurrent coronal hole high speed stream. By 28/1200 UTC, solar wind speeds increased to near 550 km/s, while the IMF Bz turned south and by the end of day on 28 May, was reading -12 nT. At 29/0953 UTC, a sudden impulse of 30 nT was recorded at the Boulder magnetometer as effects from the CME activity from 26 May arrived at Earth. Solar wind speed increased sharply from 370 km/s to over 500 km/s and peaked near 560 km/s late on 29 May. The IMF Bz responded with values ranging between +22 and -19 nT with an extended period of sustained southward Bz which occurred between 29/2100 UTC and 30/1900 UTC. The period ended with the IMF Bz south and steady at -11 nT and solar wind speeds near 510 km/s.

No greater than 10 MeV proton events were observed this period.

The greater than 2 MeV electron flux at geosynchronous orbit was at high levels on 23 and 25 – 28 May.

The geomagnetic field ranged from quiet to major storm levels. The period began with quiet to unsettled conditions, with some isolated high latitude minor storming midday on the 23rd, as effects from CME activity from the 16th and 17th waned. From late on the 23rd through most of the 28th, the geomagnetic field was at quiet levels. Late on 28 May, conditions increased to quiet to unsettled at middle latitudes and quiet to active at higher latitudes as a recurrent coronal hole solar wind stream became geoeffective. The summary period ended as conditions increased to minor storming at the middle latitudes, while the higher latitudes observed periods of major storming, as the 26 May CME arrived

## Space Weather Outlook 01 June - 27 June 2005

Solar activity is expected to be at mostly very low to low levels. Isolated M-class activity is possible from Region 767 and again with the return of old Region 759 (N12, L=055) on 03 June, which was an M-class flare producer on its previous transit.

A greater than 10 MeV proton event is not expected.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at high levels on 28 May – 02 June, 07 – 15 June, and 18 – 24 June.

The geomagnetic field is expected to range from quiet to minor storm. Recurrent coronal hole high speed wind streams are expected to produce active conditions on 01 June and active to minor storm levels on 11 – 13 June, and again on 25 – 27 June. Otherwise, expect quiet to unsettled conditions.



### *Daily Solar Data*

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10 <sup>-6</sup> hemi.)	X-ray Background	Flares							
					X-ray Flux			Optical				
					C	M	X	S	1	2	3	4
23 May	83	36	150	A6.6	0	0	0	0	0	0	0	0
24 May	85	40	170	A9.1	0	0	0	3	0	0	0	0
25 May	84	45	180	A7.3	0	0	0	0	0	0	0	0
26 May	90	72	190	A9.9	1	0	0	0	1	0	0	0
27 May	96	51	270	B1.9	3	1	0	6	1	1	0	0
28 May	92	71	390	B1.5	4	0	0	1	0	0	0	0
29 May	93	55	230	B1.1	0	0	0	0	0	0	0	0

### *Daily Particle Data*

Date	Proton Fluence (protons/cm <sup>2</sup> -day-sr)			Electron Fluence (electrons/cm <sup>2</sup> -day-sr)		
	>1 MeV	>10 MeV	>100 MeV	>.6 MeV	>2MeV	>4 MeV
	23 May	3.1E+5	1.5E+4	3.9E+3		4.8E+7
24 May	2.9E+5	1.5E+4	4.3E+3		2.0E+7	
25 May	3.4E+5	1.6E+4	5.0E+3		6.3E+7	
26 May	4.3E+5	1.6E+4	4.9E+3		8.3E+7	
27 May	5.4E+5	1.7E+4	5.3E+3		9.3E+7	
28 May	6.6E+5	1.6E+4	5.0E+3		3.6E+7	
29 May	3.7E+5	1.4E+4	3.5E+3		1.5E+6	

### *Daily Geomagnetic Data*

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	23 May	5	2-1-1-0-3-1-1-1	15	2-1-1-1-5-5-1-2	7
24 May	2	0-0-0-1-1-0-1-2	1	0-0-0-0-0-0-1-2	5	1-1-1-1-1-1-2-2
25 May	2	1-1-1-1-1-1-0-0	3	2-2-1-0-1-1-0-0	6	2-1-2-1-1-2-2-1
26 May	1	0-0-0-0-1-0-1-0	0	0-0-0-0-0-0-0-0	4	1-1-0-1-1-1-1-1
27 May	1	0-0-1-0-1-0-1-0	1	1-1-1-0-0-0-0-0	4	1-1-1-1-1-2-1-1
28 May	9	0-2-2-2-2-3-3-3	7	0-2-1-2-1-2-3-3	13	1-3-2-2-2-4-4-4
29 May	16	3-3-2-3-1-2-3-5	16	3-4-4-2-1-3-3-3	22	3-4-3-3-2-3-3-6

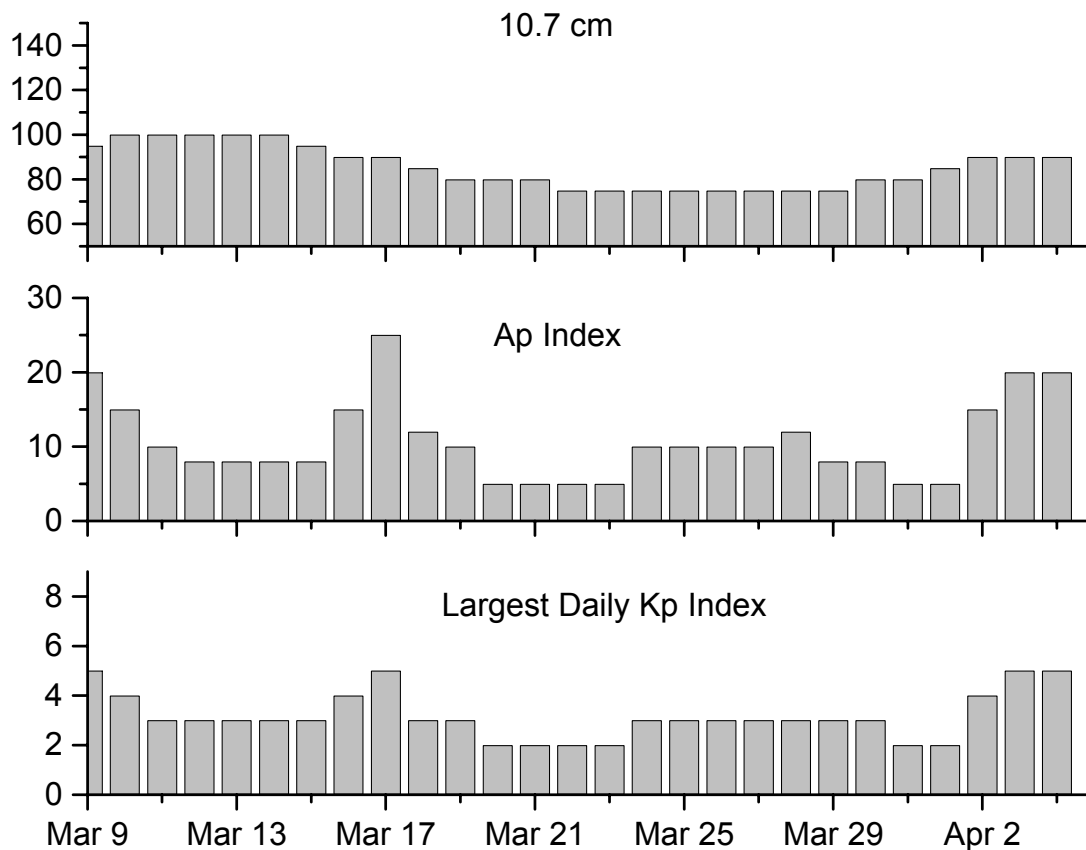


### *Alerts and Warnings Issued*

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
24 May 0004	2 – 245 MHz Radio Bursts	23 May
23 May 1330	ALERT: Electron 2MeV Integral Flux > 1000pfu	23 May 1310
25 May 1339	ALERT: Electron 2MeV Integral Flux > 1000pfu	25 May 1320
26 May 1142	ALERT: Electron 2MeV Integral Flux > 1000pfu	26 May 1125
26 May 2051	WATCH: Geomagnetic A $\geq$ 20	29 May
27 May 1121	ALERT: Electron 2MeV Integral Flux > 1000pfu	27 May 1100
27 May 1320	SUMMARY: 10cm Radio Burst	27 May 1226
28 May 0016	1 – 245 MHz Radio Burst	27 May
28 May 0016	1 – 245 MHz Radio Noise Storm	27 May
28 May 0501	SUMMARY: Geomagnetic Sudden Impulse	28 May 0444
28 May 1611	WARNING: Geomagnetic K = 4	28 May 1630 -2359
28 May 1613	ALERT: Electron 2MeV Integral Flux > 1000pfu	28 May 1535
28 May 1719	ALERT: Geomagnetic K = 4	28 May 1719
28 May 1730	WARNING: Geomagnetic K = 5	28 May 1730 -2359
28 May 2354	EXTENDED WARNING: Geomagnetic K = 4	28 May 1630 -29 May 1500
29 May 1030	SUMMARY: Geomagnetic Sudden Impulse	29 May 0953
29 May 1456	EXTENDED WARNING: Geomagnetic K = 4	28 May 1630 -29 May 2359
29 May 2240	WARNING: Geomagnetic K = 5	29 May 2245 –30 May 0300
29 May 2253	ALERT: Geomagnetic K = 5	29 May 2250
29 May 2301	EXTENDED WARNING: Geomagnetic K = 4	28 May 1630 -30 May 0900



### 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
01 Jun	95	15	4	15 Jun	85	10	3
02	95	12	3	16	85	10	3
03	95	10	3	17	90	10	3
04	90	10	3	18	90	10	3
05	90	10	3	19	90	8	3
06	85	15	3	20	90	8	3
07	85	15	3	21	90	5	2
08	85	15	3	22	90	5	2
09	85	12	3	23	90	8	3
10	85	8	3	24	90	12	3
11	85	15	4	25	90	18	4
12	85	20	5	26	90	20	5
13	85	15	4	27	90	15	4
14	85	10	3				



### *Energetic Events*

Date	Time			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	Max	Class	Flux	Imp/	Location		Radio Flux		Intensity	
						Brtns	Lat	CMD	#	245	2695	II
27 May	1153	1230	1240	M1.1	.010	2f	S08E04		767	140	130	

### *Flare List*

Date	Time			Optical X-ray Class.	Imp/ Brtns	Location Lat CMD	Rgn
	Begin	Max	End				
23 May	0838	0845	0851	B3.9			766
	1044	1049	1052	B2.6			766
	1248	1254	1301	B1.1			
	1329	1333	1337	B1.1			
	1519	1523	1526	B1.1			
	1908	1914	1922	B1.6			
	2213	2231	2310	B5.0			
	2344	2349	2353	B7.2			767
24 May	2359	0005	0008	B4.0			766
	0011	0012	0025		Sf	N13E45	766
	0305	0313	0327	B1.3			
	0437	0451	0506	B4.9			767
	0516	0516	0522	B5.0	Sf	S05E53	767
	0857	0905	0908	B6.3			767
	1503	1509	1516	B2.4			767
	1829	1831	1833		Sf	S08E39	767
25 May	0210	0215	0222	B2.1			767
	1440	1445	1453	B1.5			766
	1948	1953	1958	B1.1			
26 May	0900	0904	0910	B2.5			767
	1031	1059	1109	B2.5			767
	1138	1153	1208	B3.7			767
	1310	1420	1508	B7.5			767
	2103	2137	2223	C8.6	1f	S06E13	767
27 May	0047	0050	0053	B4.4			767
	0315	0510	0537		Sf	S08E07	767
	B0419	0419	0424		Sf	S08E09	
	B0501	0505	0517	C2.5	Sf	S08E09	767
	B0524	0525	0530		Sf	S08E08	
	B0608	0609	0612	B8.8	1f	S07E07	767
	0633	0635	0644	C6.9	Sf	S09E08	767
	0704	0709	0712	B3.0			
	0718	0733	0737		Sf	S08E05	767
	0758	0805	0809	B4.0			
	0933	0939	0942	B5.0			
	1108	1111	1119	B4.3			
1226	1230	1240	M1.1	2f	S08E04	767	



**Flare List – continued.**

Date	Begin	Time		Class.	Optical	Imp / Lat CMD	Location	Rgn
		Max	End		X-ray Brtns			
27 May		1350	1354	1400	B6.0			
		1728	1731	1735	B3.1			
		1749	1753	1759	B3.1			767
		1935	1940	1944	C1.1			767
		2057	2100	2106	B4.4			
28 May		0155	0206	0212	B5.2			767
		0222	0230	0250	C5.4	Sn	S08W06	767
		0456	0459	0501	C1.1			767
		0617	0636	0653	B5.2			
		0833	0837	0840	B6.3			767
		0943	0947	0949	B9.9			767
		1214	1223	1226	B8.3			
		1434	1440	1442	B5.7			
		1510	1514	1522	B2.9			
		1718	1726	1733	C1.0			
		2211	2217	2227	C1.7			
		2343	2348	2351	B3.6			769
29 May		0724	0729	0748	B2.5			769
		1957	2005	2012	B3.6			766
		2235	2310	2358	B3.4			

**Region Summary**

Date	Location		Sunspot Characteristics					Flares									
	Helio		Area (10 <sup>-6</sup> 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 763</i>																	
11 May	S14E70	016	0110	05	Dao	004	B										
12 May	S14E57	016	0150	09	Dao	008	B	1				1					
13 May	S15E45	015	0200	10	Dao	014	B										
14 May	S16E31	015	0130	10	Dao	013	B						2				
15 May	S15E16	017	0140	09	Dai	019	B	5	1			1	1				
16 May	S16E04	016	0190	12	Eai	028	Bg	6	2			9	1				
17 May	S14W10	017	0140	11	Eai	024	Bg	3	1			2	2				
18 May	S16W24	018	0120	12	Eai	017	Bg	2				1					
19 May	S16W35	016	0010	03	Bxo	002	B										
20 May	S16W48	016															
21 May	S16W61	016															
22 May	S16W74	016															
23 May	S16W87	016															
								17	4	0	16	4	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 016



**Region Summary – continued.**

Date	Location		Sunspot Characteristics				Flares							
	° Lat ° CMD)	Helio	Area (10 <sup>-6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical			
		Lon						C	M	X	S	1	2	3

*Region 765*

19 May	N09E65	276	0030	01	Hsx	001	A												
20 May	N09E51	276	0020	01	Hsx	001	A												
21 May	N08E36	278	0010	01	Axx	001	A												
22 May	N08E23	278	0010	01	Axx	001	A												
23 May	N08E10	278																	
24 May	N08W03	278																	
25 May	N08W16	278																	
26 May	N08W29	278																	
27 May	N08W42	278																	
28 May	N08W55	278																	
29 May	N08W68	278																	

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 278

*Region 766*

21 May	N15E75	239	0060	02	Hax	005	A												
22 May	N15E62	239	0090	07	Dao	007	B												
23 May	N15E49	239	0050	10	Dso	008	B												
24 May	N13E37	238	0040	08	Cso	008	B					1							
25 May	N14E23	238	0040	06	Dao	006	B												
26 May	N14E08	240	0030	05	Dro	007	B												
27 May	N13W06	241	0010	00	Hrx	001	A												
28 May	N13W19	241	0020	02	Axx	003	A												
29 May	N13W32	241																	

0 0 0 1 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 241

*Region 767*

21 May	S07E80	234	0060	02	Hax	001	A												
22 May	S07E67	234	0100	07	Dso	004	B												
23 May	S07E54	234	0100	07	Dao	008	Bg												
24 May	S08E40	235	0130	09	Dso	012	B					2							
25 May	S07E26	235	0140	11	Eso	019	Bg												
26 May	S08E12	236	0140	10	Dac	031	Bg	1					1						
27 May	S08W02	237	0240	11	Eki	017	Bg	3	1			4	1	1					
28 May	S08W16	238	0300	10	Dao	025	Bg	2				1							
29 May	S09W31	240	0200	10	Dai	020	Bg												

6 1 0 7 2 1 0 0

Still on Disk.

Absolute heliographic longitude: 237



***Region Summary – continued.***

Date	Location		Sunspot Characteristics				Flares							
	( ° Lat ° CMD)	Helio	Area (10 <sup>-6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical			
		Lon						C	M	X	S	1	2	3

*Region 768*

26 May	S08W48	296	0020	03	Dro	004	B										
27 May	S08W63	298	0020	04	Dro	003	B										
28 May	S10W77	299	0020	05	Bxo	002	B										
29 May	S10W90	299															

0 0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 296

*Region 769*

28 May	S07E69	153	0050	01	Hsx	001	A										
29 May	S08E59	150	0010	01	Axx	001	A										

0 0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 150

*Region 770*

29 May	N12E00	209	0020	04	Cso	004	B										
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0 0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 209



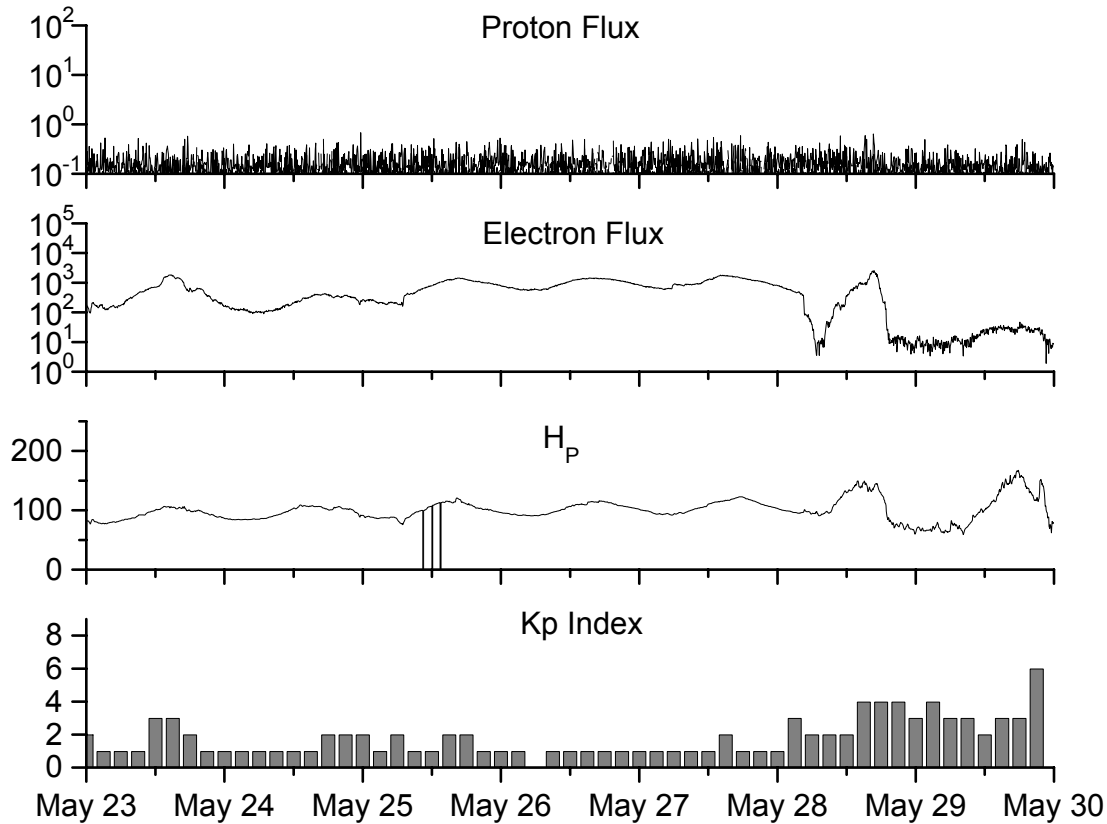


**Recent Solar Indices (preliminary)  
of the observed monthly mean values**

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
<b>2003</b>									
May	89.6	55.2	0.62	118.3	67.8	129.3	133.1	26	21.0
June	118.4	77.4	0.65	113.6	65.2	129.4	130.2	24	21.5
July	132.8	85.0	0.64	106.9	62.0	127.8	127.2	19	22.0
August	114.3	72.7	0.64	102.8	60.3	122.1	125.2	23	22.2
September	82.6	48.8	0.59	100.7	59.8	112.3	123.7	18	21.8
October	118.9	65.5	0.55	96.6	58.4	153.1	121.8	35	21.1
November	118.9	67.3	0.57	93.6	57.0	153.1	120.1	28	20.0
December	75.4	46.5	0.62	91.4	55.0	115.1	118.0	16	18.6
<b>2004</b>									
January	62.3	37.7	0.61	87.9	52.0	114.1	116.3	22	18.1
February	75.6	45.8	0.61	84.2	49.4	107.0	115.5	13	17.7
March	81.0	49.1	0.61	80.9	47.2	112.2	114.6	14	16.9
April	59.3	39.3	0.66	77.9	45.6	101.2	112.3	11	15.5
May	77.3	41.5	0.54	74.1	43.9	99.8	109.2	8	14.3
June	78.9	43.2	0.55	70.4	41.7	97.4	107.2	8	14.0
July	87.8	51.0	0.58	68.3	40.2	118.5	105.9	23	13.8
August	69.5	40.9	0.59	66.6	39.3	110.1	105.0	11	13.8
September	50.0	27.7	0.55	63.7	37.6	103.1	103.7	10	13.6
October	77.9	48.4	0.62	61.3	35.9	105.7	102.1	9	13.5
November	70.5	43.7	0.62			113.2		26	
December	34.7	17.9	0.52			94.6		11	
<b>2005</b>									
January	52.0	31.3	0.60			102.4		22	
February	45.4	29.1	0.64			97.3		11	
March	41.0	24.8	0.60			90.0		12	
April	41.5	24.4	0.59			85.9		12	

**NOTE:** All smoothed values after September 2002 and monthly values after March 2003 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 23, RI= 120.8, occurred April 2000. \*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 23 May 2005*

*Protons* plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-sec-sr) as measured by GOES-11 (W114) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

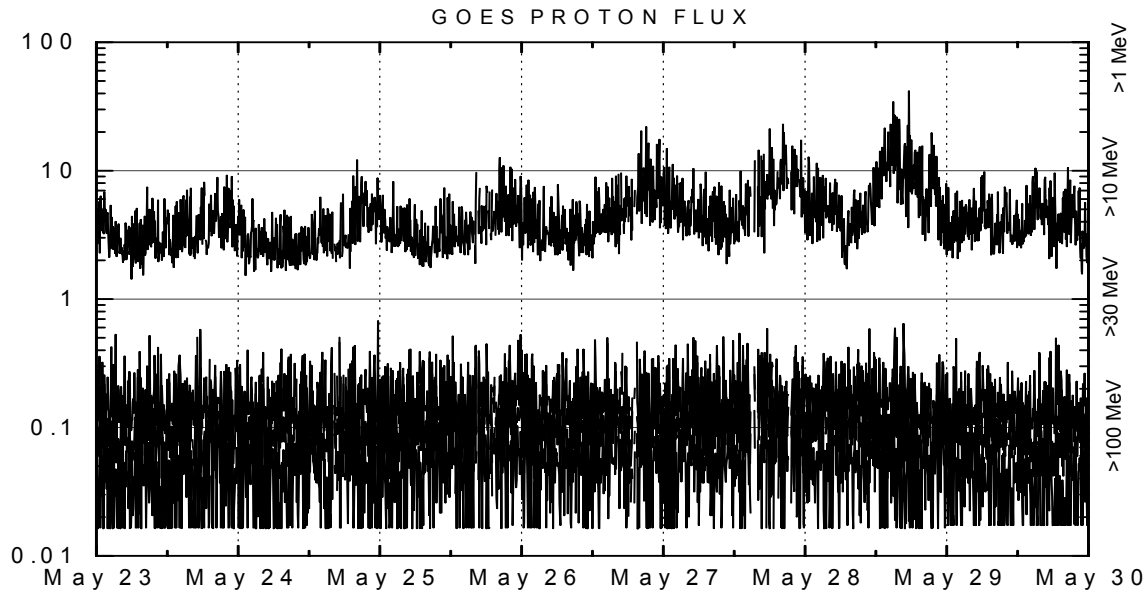
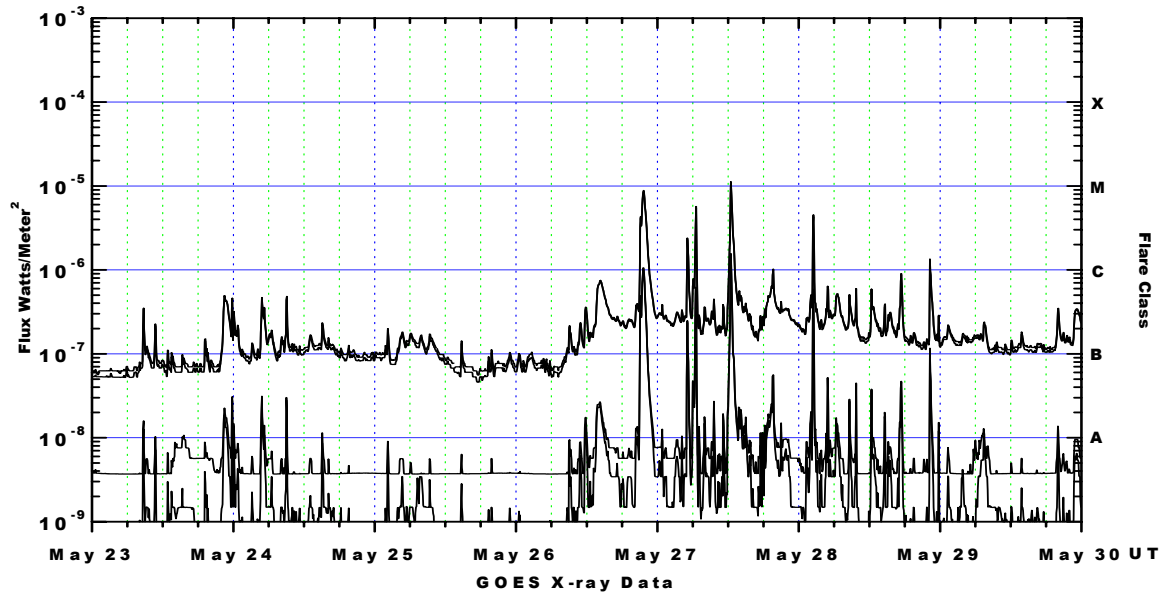
*Electrons* plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec-sr) with energies greater than 2 MeV at GOES-12 (W75).

*H<sub>p</sub>* 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<sub>p</sub>* 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 Hartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC), British Geological Survey (BGS) and the US Geological Survey. These may differ from the final K<sub>p</sub> 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<sub>p</sub> are "global" parameters that are applicable to a first order approximation over large areas. H parallel 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 ( $\text{watts/m}^2$ ) as measured by GOES 12 (W75) and GOES 10 (W135) 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 ( $\text{protons/cm}^2\text{-sec-sr}$ ) as measured by GOES-11 (W114) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu ( $\text{protons/cm}^2\text{-sec-sr}$ ) at greater than 10 MeV.

