

**Space Weather Highlights**  
**17 - 23 June 2002**

**SWO PRF 1399**  
**25 June 2002**

Solar activity ranged from very low to moderate during the summary period. Activity was very low on 18 June, moderate on 23 June, and at low levels for the rest of the period. The only significant activity was an M1.6/2f flare at 23/0255 UTC from a spotless plage Region 9997 (N10, L = 015, class/area Bxo/010 on 18 June). Region 8 (S09, L290, class/area Dki/510 on 23 June) was the largest sunspot group on the disk and was relatively stable during the period. This region developed a beta-gamma magnetic configuration on 21 June and maintained it through the end of the summary

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft for most of the summary period. Wind velocities increased early on 19 June to approximately 525 km/s in conjunction with a weak coronal hole. Wind velocities gradually decreased over the next two days (20-21 June). Another weak coronal hole resulted in an increase in solar wind velocities starting on 23 June with peak velocities

There were no proton events during the period.

Greater than 2 MeV electron fluxes at geo-synchronous orbit were at normal levels for most of the summary period. Moderate levels were observed on 22 June.

Geomagnetic activity was quiet to unsettled for most of the summary period. Isolated active conditions were observed on 19-20 June due to a weak coronal hole effects.

Some minor storm conditions were observed at high latitude stations on 18-19 June.

**Space Weather Outlook**  
**26 June – 22 July 2002**

Solar activity is expected to be at low levels for most of the period.

No proton events are expected.

Greater than 2 MeV electron fluxes at geo-synchronous orbit are expected to be at normal to moderate levels for most of the period.

The geomagnetic field is expected to be at quiet to unsettled levels for most of the forecast period. Active conditions are possible on 29 June and again on 6-7 July.

***Please note:** As you may have noticed, Region number 10000 was assigned on June 14, 2002, Space Weather Operations is going through the sequence of Region numbers as 9998, 9999, 0000, 0001, and so on. SEC's product text discussions of the active regions will ignore the leading zeroes (for example, we will say 'Region number 5' rather than Region number '0005'). However, the flare lists as well as the USAF and IUWDS data exchange codes will preserve the 4-digit format. The necessity of using four digits is for operational purposes only. For historical purposes all regions beyond Region 9999 will be understood to be in a series of region numbers 10000 and higher.*



### *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
17 June	143	116	710	B3.7	2	0	0	2	0	0	0	0
18 June	143	174	950	B4.7	0	0	0	1	0	0	0	0
19 June	146	127	1060	B4.2	1	0	0	0	0	0	0	0
20 June	145	122	870	B4.5	2	0	0	0	0	0	0	0
21 June	140	113	940	B4.4	2	0	0	0	0	0	0	0
22 June	142	102	870	B4.2	1	0	0	1	0	0	0	0
23 June	143	144	960	B4.8	1	1	0	1	1	1	0	0

### *Daily Particle Data*

Date	Proton Fluence (protons/cm <sup>2</sup> -day-sr)			Electron Fluence (electrons/cm <sup>2</sup> -day-sr)		
	>1MeV	>10MeV	>100MeV	>6MeV	>2MeV	>4MeV
	17 June	3.7E+4	1.1E+4	2.5E+3		6.4E+5
18 June	7.1E+4	1.1E+4	2.4E+3		1.1E+6	
19 June	5.1E+4	1.1E+4	2.4E+3		1.7E+5	
20 June	4.1E+4	1.1E+4	2.4E+3		1.3E+6	
21 June	4.0E+4	1.1E+4	2.5E+3		1.7E+6	
22 June	5.4E+4	1.2E+4	2.7E+3		3.3E+6	
23 June	6.5E+4	1.3E+4	2.9E+3		2.3E+6	

### *Daily Geomagnetic Data*

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	17 June	5	2-2-2-1-1-1-1-1	7	2-3-2-2-0-1-3-0	7
18 June	8	1-0-1-2-3-2-3-3	19	1-1-1-2-4-5-5-3	11	2-0-1-3-3-3-3-3
19 June	13	3-3-2-3-2-2-2-4	18	3-4-3-5-2-3-2-2	16	4-3-3-3-3-3-3-4
20 June	6	2-2-2-2-4-4-2-1	9	2-2-2-4-3-0-1-1	10	2-3-2-3-3-3-3-3
21 June	5	1-2-1-1-3-1-1-1	8	2-3-2-1-1-1-2-3	8	2-3-1-2-2-3-3-2
22 June	6	1-1-1-2-1-1-3-2	4	1-1-1-2-1-1-2-2	9	1-2-1-2-2-3-3-3
23 June	12	2-3-3-3-3-2-3-2	15	2-3-3-4-4-2-3-2	14	2-3-3-3-3-3-3-3



*Alerts and Warnings Issued*

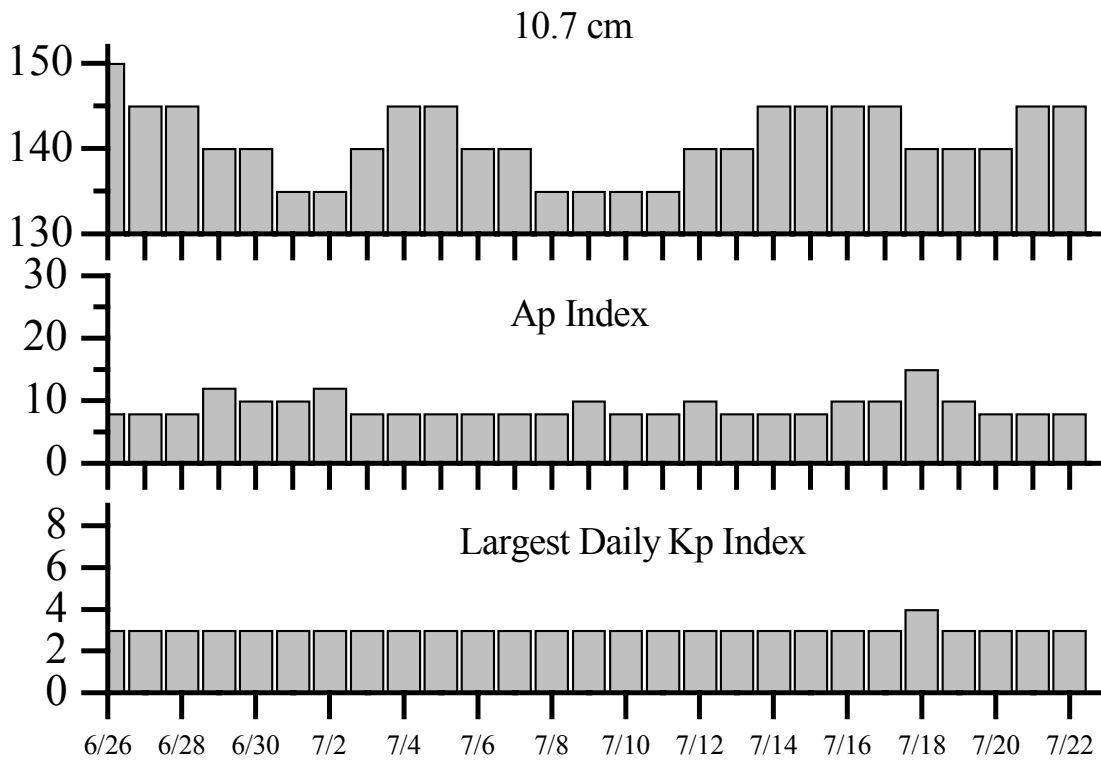
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<u>Date &amp; Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date &amp; Time of Event UT</u>
17 Jun 0059	245 MHz Radio Burst	16 Jun
18 Jun 0017	245 MHz Radio Burst	17 Jun
19 Jun 0012	245 MHz Radio Burst	18 Jun
19 Jun 0102	WARNING: Geomagnetic K = 4	19 Jun 0105 – 1500
19 Jun 0105	ALERT: Geomagnetic K = 4	19 Jun 0105
19 Jun 1628	WARNING: Geomagnetic K = 4	19 Jun 0105 – 1500
20 Jun 0008	2 – 245 MHz Radio Bursts	19 Jun
22 Jun 0008	245 MHz Radio Burst	21 Jun

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**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
26 Jun	150	8	3	10 Jul	135	8	3
27	145	8	3	11	135	8	3
28	145	8	3	12	140	10	3
29	140	12	3	13	140	8	3
30	140	10	3	14	145	8	3
01 Jul	135	10	3	15	145	8	3
02	135	12	3	16	145	10	3
03	140	8	3	17	145	10	3
04	145	8	3	18	140	15	3
05	145	8	3	19	140	10	4
06	140	8	3	20	140	8	3
07	140	8	3	21	145	8	3
08	135	8	3	22	145	8	3
09	135	10	3				



### *Energetic Events*

Date	Time		X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½ Max	Class	Integ Flux	Imp/Location		Rgn #	Radio Flux		Intensity	
						Brtns	Lat CMD		245	2695	II	IV
23 Jun 02	0215	0255	0324	M1.6	.041	2f	N13W70	9997		24		

### *Flare List*

Date	Time			X-ray Class.	Imp / Brtns	Optical Location Lat CMD	Rgn
	Begin	Max	End				
17 June	1519	1521	1525		Sf	S25W55	9991
	1846	1854	1906	C1.6			
	1932	1934	1936	B9.1			0000
	2001	2005	2019	C1.4	Sf	S22W59	9991
18 June	1301	1329	1341	B8.4			0000
	1438	1438	1447	B5.9	Sf	N18E03	0000
19 June	1001	1015	1024	C5.5			9991
	1504	1508	1512	B7.5			
	1820	1829	1838	B7.9			9992
20 June	1155	1222	1235	C1.3			9992
	1414	1519	1559	C2.9			9992
21 June	0424	0506	0622	C1.6			
	0902	0905	0908	B6.9			
	1717	1726	1732	B5.9			
	1959	2020	2058	C1.8			
22 June	0234	0236	0246	C2.0	Sf	N14E12	0005
	0334	0337	0339	B7.6			
	1057	1102	1105	B8.4			
23 June	0223	0245	0348	M1.6	2f	N13W70	9997
	0821	0823	0834	C1.9	1n	N14W08	0005
	1821	1821	1824	B6.7	Sf	N12W11	0005



### Region Summary

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	4			
<i>Region 9991</i>																		
07 Jun	S22E69	086	0300	03	Hkx	001	A											
08 Jun	S21E57	085	0250	03	Hhx	001	A											1
09 Jun	S22E43	085	0270	02	Hkx	001	A											
10 Jun	S22E30	085	0270	03	Hhx	001	A											
11 Jun	S22E17	085	0290	05	Dho	006	B											
12 Jun	S22E04	084	0340	06	Dho	010	B	1					1					
13 Jun	S20W09	084	0310	07	Cho	007	B											1
14 Jun	S21W21	083	0350	06	Cko	004	B											
15 Jun	S21W34	083	0290	04	Cho	003	B											
16 Jun	S21W47	083	0270	05	Hkx	002	A	1										2
17 Jun	S22W61	083	0330	04	Cko	002	B	1										2
18 Jun	S21W72	081	0250	03	Hhx	001	A											
19 Jun	S22W85	081	0220	08	Cho	004	B	1										
								4	0	0	7	0	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 084

<i>Region 9992</i>																			
08 Jun	S20E74	068	0010	01	Axx	001	A												
09 Jun	S20E60	068	0020	01	Axx	001	A												
10 Jun	S20E47	068	0050	05	Cso	005	B												
11 Jun	S20E34	068	0040	06	Cso	006	B												
12 Jun	S20E21	068	0040	03	Cso	007	B												
13 Jun	S18E08	067	0060	03	Dao	007	A												
14 Jun	S18W03	065	0020	03	Dso	005	B												
15 Jun	S17W18	067	0010	03	Bxo	002	B												
16 Jun	S18W32	068	0010	02	Bxo	002	B												
17 Jun	S18W45	067	0010	03	Bxo	003	B												
18 Jun	S17W64	073	0030	07	Bxo	006	B												
19 Jun	S18W80	076	0020	02	Bxo	002	B												
20 Jun	S17W92	075	0010	03	Bxo	002	B	2											
								2	0	0	0	0	0	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 065



**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	4			
<i>Region 9994</i>																		
09 Jun	N10E59	069	0010	00	Axx	001	A											
10 Jun	N10E46	069	0020	01	Hsx	002	A											
11 Jun	N10E33	069	0020	01	Hsx	002	A											
12 Jun	N10E20	069																
13 Jun	N10E07	069																
14 Jun	N10W06	069																
15 Jun	N10W19	069																
16 Jun	N10W32	069																
17 Jun	N10W45	069																
18 Jun	N10W58	069																
19 Jun	N10W71	069																
20 Jun	N10W84	069																

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 069

<i>Region 9995</i>																		
10 Jun	N10W01	116	0020	03	Cso	003	B											
11 Jun	N10W14	116	0010	03	Bxo	003	B											
12 Jun	N10W27	116	0010	03	Bxo	005	B											
13 Jun	N12W41	116	0020	03	Bxo	004	B											
14 Jun	N12W54	116																
15 Jun	N12W67	116																
16 Jun	N12W80	116																
17 Jun	N12W93	116																

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 116



**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	4	
<i>Region 9996</i>																
12 Jun	S27E46	042	0010	01	Axx	002	A									
13 Jun	S28E35	040	0010	01	Hrx	001	A									
14 Jun	S28E22	040														
15 Jun	S26E10	039														
16 Jun	S26W03	039														
17 Jun	S26W16	039														
18 Jun	S26W29	039														
19 Jun	S26W42	039														
20 Jun	S26W55	039														
21 Jun	S26W68	039														
22 Jun	S26W81	039														

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 039

<i>Region 9997</i>																
12 Jun	N08E73	015	0010	01	Axx	001	A									
13 Jun	N09E59	016	0010	01	Axx	001	A									
14 Jun	N09E46	016	0010	00	Axx	001	A									
15 Jun	N12E31	018	0010	08	Bxo	005	B									
16 Jun	N13E16	020	0020	03	Bxo	004	B									
17 Jun	N10E05	017	0010	04	Bxo	003	B									
18 Jun	N10W06	015	0010	03	Bxo	008	B									
19 Jun	N10W19	015														
20 Jun	N17W33	016														
21 Jun	N17W46	016														
22 Jun	N17W59	016														
23 Jun	N17W72	016														

1 1  
0 1 0 0 0 1 0 0

Still on Disk.

Absolute heliographic longitude: 017





**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	4			
<i>Region 0</i>																		
14 Jun	N18E50	012	0030	04	Dso	003	B	1										
15 Jun	N18E36	013	0090	04	Dao	013	B	1				1						
16 Jun	N18E24	012	0060	06	Dso	012	B	1										
17 Jun	N18E12	010	0030	07	Cso	009	B											
18 Jun	N16W01	010	0050	09	Dso	015	B					1						
19 Jun	N18W15	011	0010	05	Bxo	004	B											
20 Jun	N18W30	013	0010	04	Bxo	004	B											
21 Jun	N18W43	013																
									3	0	0	2	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 010

<i>Region 1</i>																		
14 Jun	N20E70	352	0070	04	Cso	002	B	1				3						
15 Jun	N20E58	351	0180	09	Dao	011	B											
16 Jun	N20E46	350	0190	09	Dao	012	B											
17 Jun	N20E33	349	0190	09	Dso	008	B											
18 Jun	N20E20	349	0190	08	Dso	006	B											
19 Jun	N20E06	350	0200	06	Cso	007	B											
20 Jun	N21W11	354	0170	06	Cso	006	B											
21 Jun	N21W22	352	0190	05	Cao	007	B											
22 Jun	N21W35	351	0160	03	Hsx	002	A											
23 Jun	N21W48	351	0150	05	Cko	006	B											
									1	0	0	3	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 350

<i>Region 2</i>																		
15 Jun	S24W08	057	0000	00	Axx	001	A											
16 Jun	S24W21	057																
17 Jun	S24W34	057																
18 Jun	S24W47	057																
19 Jun	S24W60	057																
20 Jun	S24W73	057																
21 Jun	S24W86	057																
									0	0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 057





**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 6*

18 Jun	S08W23	032	0030	03	Cro	004	B										
19 Jun	S07W38	034	0020	01	Axx	001	A										
20 Jun	S07W48	031	0000	01	Axx	001	A										
21 Jun	S07W60	030	0020	04	Cro	005	B										
22 Jun	S07W73	030															
23 Jun	S07W86	030															

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 032

*Region 7*

18 Jun	N12E17	352	0030	05	Cso	004	B										
19 Jun	N13E04	352	0040	05	Cso	006	B										
20 Jun	N14W09	352	0020	06	Dro	004	B										
21 Jun	N14W24	354	0010	00	Axx	001	A										
22 Jun	N14W37	353															
23 Jun	N14W50	354															

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 352

*Region 8*

18 Jun	S11E75	294	0140	03	Hax	001	A										
19 Jun	S10E65	291	0380	08	Dko	004	B										
20 Jun	S09E52	291	0480	07	Dko	009	B										
21 Jun	S08E39	291	0530	08	Dko	018	Bg										
22 Jun	S09E26	290	0470	10	Dki	025	Bg										
23 Jun	S09E13	290	0510	10	Dki	030	Bg										

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 290

*Region 9*

20 Jun	S19W66	049	0010	03	Bxo	003	B										
21 Jun	S18W79	049	0010	02	Bxo	002	B										

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 049



**Region Summary - continued.**

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 10</i>																					
22 Jun	S12E00	316	0020	03	Cso	004	B														
23 Jun	S12W13	316	0020	04	Cso	002	B														
								0	0	0	0	0	0	0	0	0	0	0	0	0	
Still on Disk.																					
Absolute heliographic longitude: 316																					
<i>Region 11</i>																					
22 Jun	S12E62	254	0050	06	Dao	004	B														
23 Jun	S12E49	254	0070	07	Dso	007	B														
								0	0	0	0	0	0	0	0	0	0	0	0	0	
Still on Disk.																					
Absolute heliographic longitude: 254																					
<i>Region 12</i>																					
23 Jun	N19E20	283	0010	01	Axx	001	A														
								0	0	0	0	0	0	0	0	0	0	0	0	0	
Still on Disk.																					
Absolute heliographic longitude: 283																					
<i>Region 13</i>																					
23 Jun	N04E07	296	0020	03	Bxo	003	B														
								0	0	0	0	0	0	0	0	0	0	0	0	0	
Still on Disk.																					
Absolute heliographic longitude: 296																					
<i>Region 14</i>																					
23 Jun	S18E50	253	0010	01	Axx	001	A														
								0	0	0	0	0	0	0	0	0	0	0	0	0	
Still on Disk.																					
Absolute heliographic longitude: 253																					

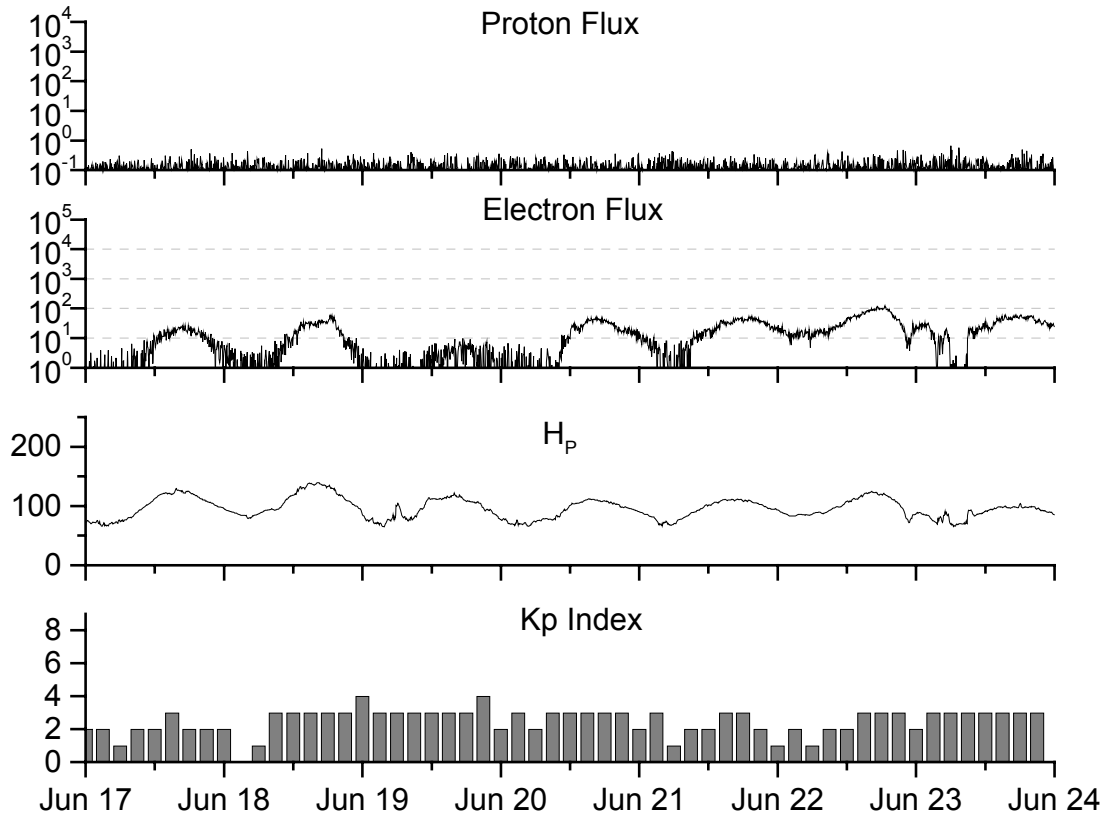


**Recent Solar Indices (preliminary)  
of the observed monthly mean values**

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>2000</b>									
June	190.3	124.9	0.66	172.0	118.7	179.8	179.7	15	15.1
July	236.7	169.1	0.71	173.0	119.7	204.7	180.2	21	14.8
August	166.6	130.5	0.78	171.8	118.6	163.1	179.5	16	14.2
September	157.9	109.9	0.70	169.0	116.2	182.1	177.1	18	14.2
October	138.9	100.1	0.72	166.2	114.4	167.7	175.6	18	14.6
November	149.9	106.5	0.71	162.7	112.7	178.8	173.6	17	14.6
December	146.4	104.5	0.71	160.8	112.1	173.6	172.0	08	14.4
<b>2001</b>									
January	142.7	95.1	0.67	156.3	108.8	166.7	168.8	08	13.8
February	131.0	80.1	0.61	151.4	104.2	147.3	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	178.3	171.7	18	12.7
May	135.1	97.3	0.72	163.1	108.8	148.7	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	163.2	188.8	13	12.5
September	229.1	150.7	0.66	178.8	114.3	233.3	191.3	12	12.3
October	197.4	125.6	0.64	179.5	114.1	208.2	191.9	18	11.9
November	178.6	106.5	0.60	183.7	115.6	212.5	193.6	14	11.9
December	217.5	131.8	0.61			236.6		08	
<b>2002</b>									
January	189.0	113.9	0.60			226.4		07	
February	194.5	108.0	0.56			205.1		09	
March	153.1	98.1	0.64			179.5		10	
April	194.9	120.4	0.62			189.7		15	
May	204.1	120.8	0.59			178.4		15	

**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 17 June 2002*

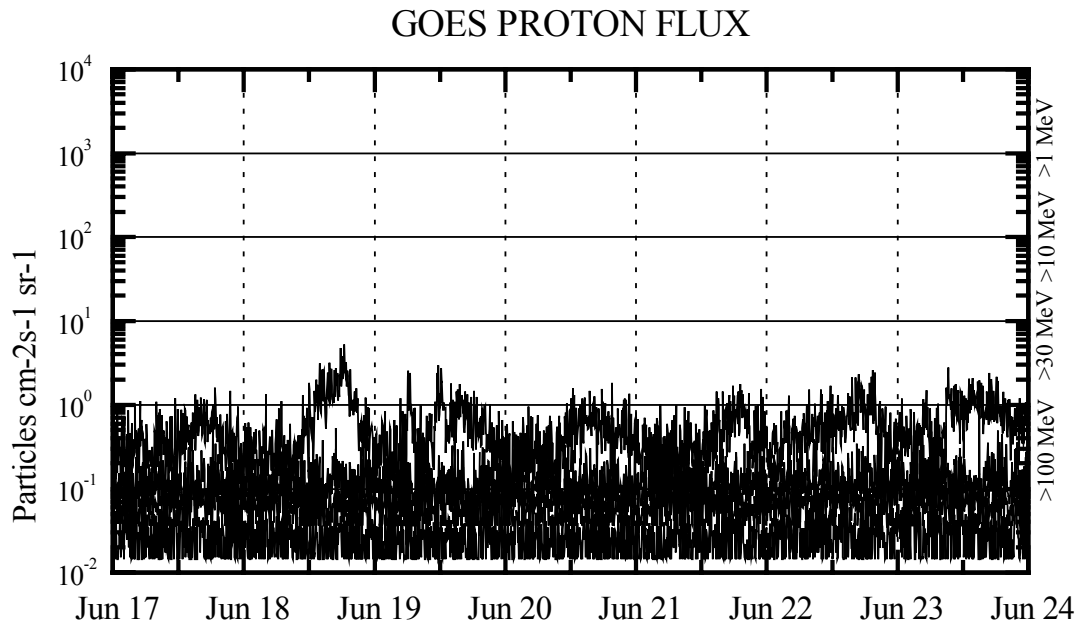
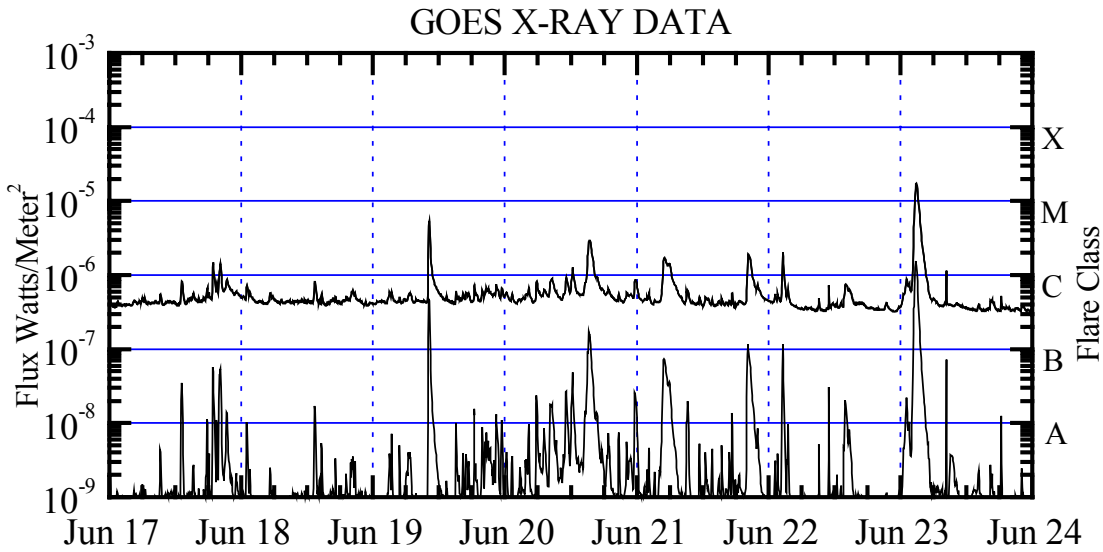
*Protons* plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-sec -sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

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

*H<sub>p</sub>* 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<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 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<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<sub>p</sub> 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/m<sup>2</sup>) 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<sup>2</sup> -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<sup>2</sup>-sec-sr) at greater than 10 MeV.

