

**Space Weather Highlights**  
**24 June - 30 June 2002**

**SWO PRF 1400**  
02 July 2002

Solar activity was at very low-to-low levels with isolated B- and C-class X-ray flares during most of the period. Sunspot groups of interest included Regions 8, 17, and 19. Region 8 (S10, L = 291, class/area Dki/540 on 25 June) was large with a minor degree of magnetic complexity and began to gradually decay on 27 June. It was the possible source for a long-duration B-class X-ray enhancement late on 27 June, which was associated with a partial-halo CME. Region 17 (S19, L = 235, class/area Dso/100 on 30 June) produced isolated B-class subflares. It was moderate in size and complexity and gradually developed as the period progressed. Region 19 (S18, L = 150, class/area Dko/450 on 30 June) rotated into view on 30 June as a large, moderately complex group with mixed polarities (and a possible delta magnetic configuration) within its trailer spots. A long-duration C2 X-ray flare occurred during 30/0915 – 1625 UTC associated with an eruptive prominence and CME off the southeast limb.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft for most of the summary period. A weak disturbance passed ACE during 29 - 30 June associated with minor increases in velocity, IMF total field intensity, density, and temperature. The partial-halo CME of 27 June may have been the source for this disturbance.

There were no proton events during the period.

Greater than 2 MeV electron fluxes at geo-synchronous orbit were at normal to moderate levels during the summary period.

Geomagnetic field activity was at quiet to unsettled levels through 29 June. Activity increased to quiet to active levels on 30 June, likely due to weak CME effects.

**Space Weather Outlook**  
**03 July - 29 July 2002**

Solar activity is expected to be at low to moderate levels. There is a chance for isolated low-level M-class flares through 12 July. Low activity levels are expected after 12 July.

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.

Geomagnetic field activity is expected to be at quiet to unsettled levels during the majority of the period. However, active periods will be possible during 06 – 07, 16 and 20 July due to coronal hole effects.



### 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
24 June	150	133	960	B3.2	1	0	0	1	0	0	0	0
25 June	145	127	950	B3.2	0	0	0	1	0	0	0	0
26 June	144	102	860	B3.6	2	0	0	2	0	0	0	0
27 June	139	106	820	B2.9	0	0	0	1	0	0	0	0
28 June	137	94	730	B3.3	2	0	0	1	0	0	0	0
29 June	143	105	950	B3.9	4	0	0	1	0	0	0	0
30 June	147	111	1070	B5.9	3	0	0	2	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)		
	>1MeV	>10MeV	>100MeV	>6MeV	>2MeV	>4MeV
24 June	4.5E+4	1.2E+4	2.6E+3		4.3E+6	
25 June	5.2E+4	1.2E+4	2.5E+3		6.5E+6	
26 June	5.1E+4	1.1E+4	2.6E+3		6.4E+6	
27 June	4.8E+4	1.3E+4	2.7E+3		8.3E+6	
28 June	7.6E+4	1.2E+4	2.7E+3		1.1E+7	
29 June	5.9E+4	1.3E+4	2.8E+3		7.3E+6	
30 June	8.9E+4	1.2E+4	2.7E+3		1.0E+6	

### Daily Geomagnetic Data

Date	Middle Latitude		High Latitude		Estimated	
	Fredericksburg		College		Planetary	
	A	K-indices	A	K-indices	A	K-indices
24 June	5	2-1-1-1-1-2-1-2	6	2-2-2-2-1-2-1-1	10	3-2-2-2-3-3-3-2
25 June	8	2-2-1-1-3-2-1-3	12	3-2-1-3-3-4-2-2	11	3-2-2-3-3-3-2-3
26 June	5	3-1-1-0-1-2-1-2	5	3-1-0-0-1-3-1-1	8	3-2-1-2-3-3-2-2
27 June	3	1-1-0-1-1-1-2-0	0	0-1-0-0-0-0-0-0	7	2-1-1-2-3-3-2-1
28 June	2	0-0-0-1-2-1-1-1	7	0-0-0-0-0-4-4-1	7	2-1-1-2-2-3-3-2
29 June	5	1-0-0-1-2-1-3-2	4	1-1-0-2-1-1-2-2	9	2-1-1-2-3-3-3-3
30 June	12	2-3-3-3-3-1-2-3	21	2-4-5-5-3-2-2-2	16	2-3-3-4-3-3-3-3



*Alerts and Warnings Issued*

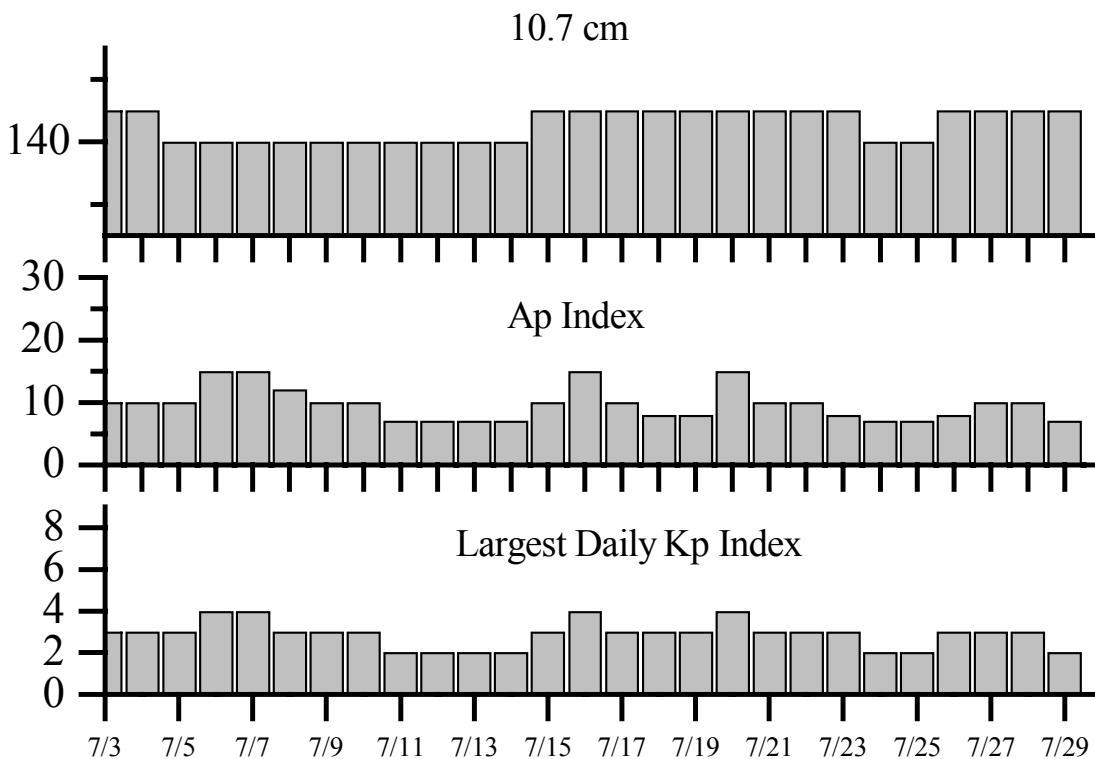
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Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UT
26 Jun 0010	3 - 245 MHz Bursts	25 Jun
27 Jun 0006	6 - 245 MHz Bursts	26 Jun
27 Jun 0006	1 - 245 MHz Noise Storms	26 Jun
28 Jun 0259	7 - 245 MHz Bursts	27 Jun
28 Jun 0259	1 - 245 MHz Noise Storms	27 Jun
29 Jun 0100	1 - 245 MHz Bursts	28 Jun
30 Jun 0020	1 - 245 MHz Bursts	29 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
03 Jul	145	10	3	18 Jul	145	10	3
04	145	10	3	19	145	8	3
05	140	10	3	20	145	8	4
06	140	15	4	21	145	15	4
07	140	15	4	22	145	10	3
08	140	12	3	23	145	10	3
09	140	10	3	24	140	8	3
10	140	10	3	25	140	7	2
11	140	7	2	26	145	7	2
12	140	7	2	27	145	8	3
14	140	7	2	28	145	10	3
15	145	7	2	29	145	10	3
16	145	10	3	30	145	7	2
17	145	15	4				



***Energetic Events***

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

**No Events Observed**

***Flare List***

Date	Time			X-ray Class.	Imp / Brtns	Optical Location		Rgn
	Begin	Max	End			Lat	CMD	
24 June	1525	1606	1659	C1.4				
	1806	1807	1810					
25 June	0155	0159	0201	B6.1	Sf	S13E04		0008
	1514	1515	1522	B5.6				
	1609	1614	1621	B6.5				
26 June	1902	1914	1919	B6.7	Sf	N24E61		0000
	0623	0630	0647	C1.5				
	0757	0820	0904	C1.9				
	1623	1624	1626	B4.4				
	1715	1719	1723	B4.3				
	1846	1851	1856	B7.4				
	2005	2009	2013	B6.1				
27 June	2255	2259	2302	B5.6	Sf	N11W65		0005
	0033	0040	0044	B4.1				
	0340	0342	0349	B6.6				
	1017	1029	1041	B4.2				
28 June	1914	1917	1921	B3.8	Sf	S11W45		0008
	0213	0222	0229	B4.8				
	0628	0630	0646	C1.1				
	1038	1044	1057	B6.1				
	1523	1547	1611	B7.6				
	1844	1848	1850	B8.4				
	2002	2011	2014	C1.3				
29 June	2224	2231	2234	B6.8	Sf	N15W70		0018
	0022	0034	0037	C2.6				
	0414	0419	0424	B6.1				
	0637	0640	0643	C1.2				
	0724	0728	0732	B7.0				
	0846	0851	0859	B9.0				
	0927	0933	0937	C2.0				
	1247	1253	1257	B8.4				
	1540	1550	1559	C1.1				
	1731	1732	1745					
1745	1748	1751	B7.5					



**Flare List- continued.**

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
30 June	0149	0152	0155	B9.2			
	0915	1257	1625	C2.1			
	1903	1903	1907		Sf	S15E62	0019
	1948	1949	2000	C1.7	Sf	S19W22	0017
	2107	2115	2124	C1.4			
	2211	2215	2221	B9.6			

**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 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										
24 Jun	N20W61	351	0120	02	Hsx	001	A										
25 Jun	N20W75	352	0100	02	Hsx	002	A										
26 Jun	N20W92	356	0070	03	Hsx	001	A					1					
								1	0	0	4	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 350



**Region Summary - continued.**

Date	Location		Sunspot Characteristics				Flares											
	( ° Lat ° CMD)	Helio Lon	Area (10 <sup>-6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
								C	M	X	S	1	2	3	4			
<i>Region 5</i>																		
16 Jun	N13E74	322	0070	02	Hsx	001	A											
17 Jun	N13E62	320	0120	02	Hsx	001	A											
18 Jun	N12E53	316	0160	12	Cso	006	B											
19 Jun	N12E37	319	0130	02	Hsx	001	A											
20 Jun	N13E24	319	0150	02	Hsx	001	A											
21 Jun	N13E11	319	0170	05	Cao	006	B											
22 Jun	N13E00	316	0170	09	Dso	017	B	1			1							
23 Jun	N13W13	316	0170	09	Dso	014	B	1			1	1						
24 Jun	N14W29	319	0140	08	Dso	008	B											
25 Jun	N11W44	321	0100	05	Dso	006	B											
26 Jun	N12W59	323	0080	06	Dso	002	B											
27 Jun	N12W72	322	0110	07	Cso	002	B				1							
28 Jun	N13W84	321	0070	04	Cso	003	B											
29 Jun	N13W95	319	0060	02	Hax	001	A											
								2	0	0	3	1	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 316

<i>Region 7</i>																		
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	354																
23 Jun	N14W50	354																
24 Jun	N14W63	354																
25 Jun	N14W76	354																
26 Jun	N14W89	354																
								0	0	0	0	0	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 352



**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 8</i>																		
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											
24 Jun	S10W01	291	0530	09	Dki	014	Bg											1
25 Jun	S11W15	292	0540	08	Dki	016	Bg											1
26 Jun	S12W29	293	0540	08	Dko	011	Bg											
27 Jun	S12W41	291	0520	09	Cko	009	Bg											
28 Jun	S10W56	293	0460	04	Hkx	004	A	1						1				
29 Jun	S10W69	293	0410	05	Cko	004	B											
30 Jun	S10W83	294	0340	04	Hkx	001	A											
										1	0	0	0	3	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 291

*Region 10*

22 Jun	S12E00	316	0020	03	Cso	004	B											
23 Jun	S12W13	316	0020	04	Cso	002	B											
24 Jun	S13W27	317	0020	04	Cso	004	B											
25 Jun	S13W40	317																
26 Jun	S13W53	317																
27 Jun	S13W66	317																
28 Jun	S13W79	317																
29 Jun	S13W92	317																
										0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 316







**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 14*

23 Jun	S18E50	253	0010	01	Axx	001	A												
24 Jun	S17E37	253	0000	00	Axx	001	A												
25 Jun	S17E24	253																	
26 Jun	S17E11	253																	
27 Jun	S17W02	253																	
28 Jun	S17W15	253																	
29 Jun	S17W28	253																	
30 Jun	S17W41	253																	

Still on Disk.

Absolute heliographic longitude: 253

*Region 15*

24 Jun	S27E39	251	0030	05	Cro	002	B												
25 Jun	S27E26	251	0030	06	Cso	005	B												
26 Jun	S26E12	252	0040	06	Dso	008	B												
27 Jun	S28W01	251	0030	06	Dro	009	B												
28 Jun	S26W16	253	0030	07	Dao	005	B												
29 Jun	S26W29	253																	
30 Jun	S26W42	253																	

Still on Disk.

Absolute heliographic longitude: 251

*Region 16*

25 Jun	S15E71	206	0050	02	Hsx	001	A												
26 Jun	S15E57	207	0070	02	Hsx	001	A												
27 Jun	S15E43	207	0070	02	Hsx	001	A												
28 Jun	S16E31	206	0100	06	Cso	006	B												
29 Jun	S16E18	206	0080	05	Cso	005	B												
30 Jun	S15E04	207	0060	05	Cso	003	B												

Still on Disk.

Absolute heliographic longitude: 207

*Region 17*

27 Jun	S19E14	236	0010	01	Axx	002	A												
28 Jun	S19E02	235	0020	03	Cso	005	B												
29 Jun	S19W11	235	0040	04	Dso	007	B												
30 Jun	S19W23	234	0100	07	Dso	015	B	1				1							

Still on Disk.

Absolute heliographic longitude: 235



***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 18*

29 Jun	N15W73	297	0040	03	Cso	003	B												1					
30 Jun	N14W84	295	0040	07	Bxo	002	B																	

Still on Disk.

Absolute heliographic longitude: 297

*Region 19*

29 Jun	S17E72	152	0270	06	Dko	006	B																	
30 Jun	S18E61	150	0450	10	Dko	010	Bg																	

Still on Disk.

Absolute heliographic longitude: 150

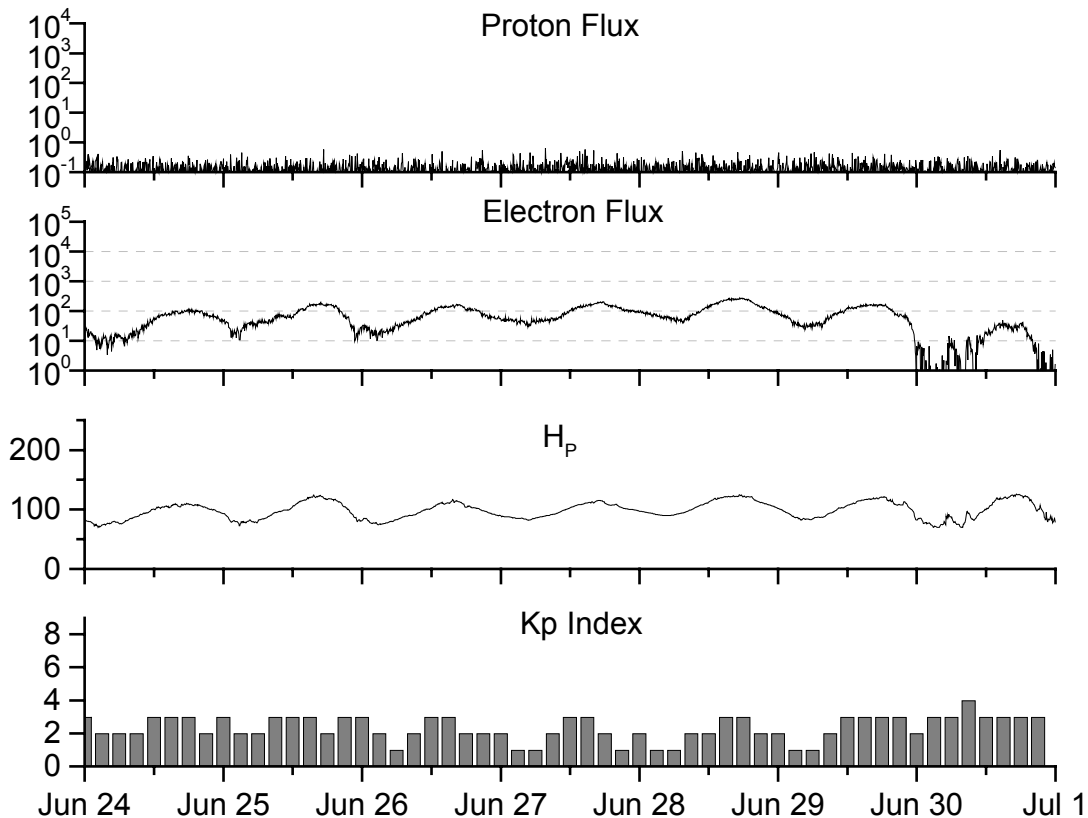


**Recent Solar Indices (preliminary)  
of the observed monthly mean values**

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 24 June 2002*

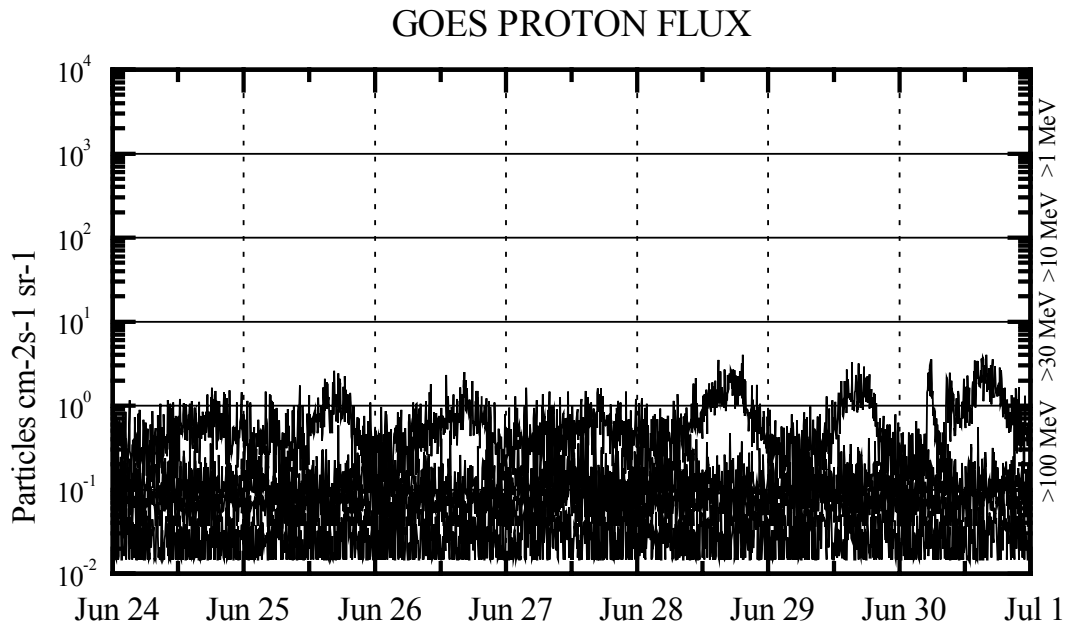
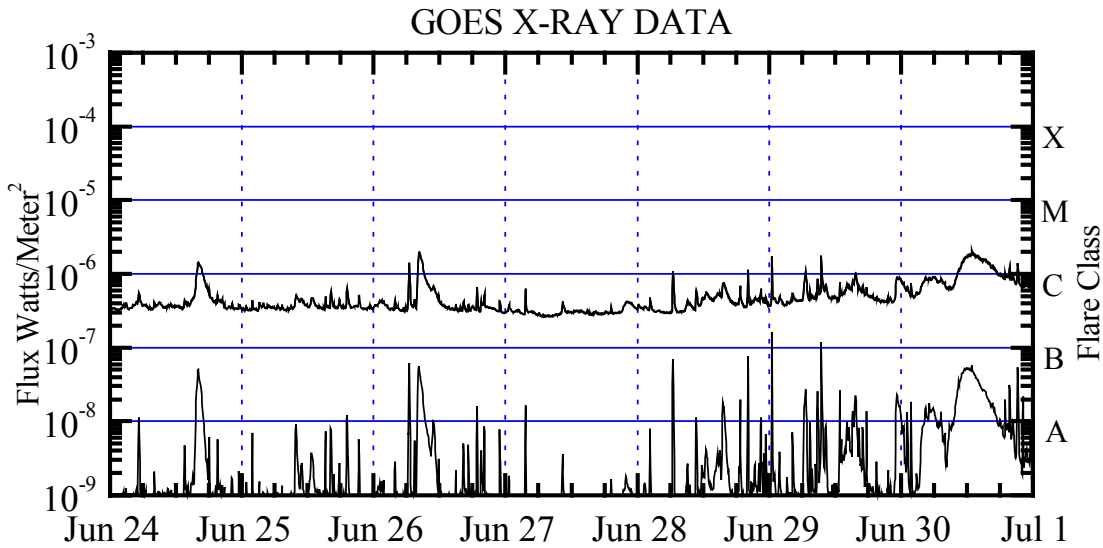
*Protons* plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-sec -sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

*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>parallel</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.

