

**Space Weather Highlights**  
**08-14 June 1998**

Solar activity ranged from very low to moderate. Isolated B- and C-class subflares occurred during most of the period. Isolated, long-duration M-class X-ray flares were detected at 11/1027UT and 13/0419UT. The 11/1027UT M1 flare had associated Types II and IV radio sweeps. LASCO/EIT images indicated the flare site was behind the northeast limb. Region 8242 (S22, L = 237, class/area Hsx/140 on 12 June) produced the 13/0419UT M1/1N flare which was accompanied by a Type IV radio sweep. Activity appeared to be on a downward trend by week's end.

Solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft during most of the period. Velocities gradually decreased from 580 - 340 km/sec during the period. Densities ranged from 02 - 05 p/cc during most of the period. However, a density enhancement occurred late on 13 June, peaking at 23 p/cc, then returned to pre-enhancement levels by midday on 14 June. Bz hovered around zero in the plus to minus 05 nT range (GSM) during most of the time, but became more variable on 14 June, and reached a maximum southerly deviation of minus 11 nT early in the day. Solar sector orientation was mostly toward (phi angle near 315 degrees) through 09 June, then shifted to away conditions (phi angle near 135 degrees) for the rest of the period.

There were no significant proton enhancements detected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude was at moderate to high levels during 08 - 10 June, then declined to normal to moderate levels for the remainder of the period.

The geomagnetic field was quiet to unsettled during most of the period. However, a brief disturbance occurred early 14 June with active to minor storm levels detected at all latitudes.

**Space Weather Forecast**  
**17 June - 13 July 1998**

Solar activity is expected to be low during most of the period.

No proton enhancements are expected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be at normal to moderate levels during most of the period.

The geomagnetic field is expected to be at quiet to unsettled levels.



### *Daily Solar Data*

Date	Radio Flux	Sun spot	Sunspot Area	X-ray Background	X-ray Flux			Flares				
	10.7 cm	No. ( $10^6$ hemi.)			C	M	X	S	1	2	3	4
08 June	117	104	520	B2.4	2	0	0	1	0	1	0	0
09 June	112	101	460	B3.2	0	0	0	0	0	0	0	0
10 June	112	103	600	B2.8	3	0	0	0	0	0	0	0
11 June	112	95	560	B7.2	0	1	0	2	0	0	0	0
12 June	112	122	690	B6.0	8	0	0	9	1	0	0	0
13 June	111	148	600	B5.0	7	1	0	9	1	0	0	0
14 June	102	104	470	B5.3	1	0	0	6	1	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
08 June	4.9E+5	1.5E+4	3.5E+3		2.0E+8	
09 June	6.0E+5	1.6E+4	3.5E+3		3.5E+8	
10 June	5.2E+5	1.6E+4	3.7E+3		1.1E+8	
11 June	3.6E+5	1.7E+4	3.8E+3		2.1E+7	
12 June	3.6E+5	1.7E+4	3.8E+3		1.2E+7	
13 June	4.4E+5	1.7E+4	3.8E+3		9.0E+6	
14 June	2.3E+5	1.6E+4	3.7E+3		2.6E+6	

### *Daily Geomagnetic Data*

Date	Middle Latitude		High Latitude		Estimated	
	Fredericksburg		College		Planetary	
	A	K-indices	A	K-indices	A	K-indices
08 June	10	3-2-3-1-2-2-3-2	20	3-2-4-4-4-4-3-2	12	3-2-3-3-3-3-3-3
09 June	8	1-1-3-2-2-2-2-3	10	2-1-4-3-2-2-2-1	10	1-1-3-3-2-2-3-2
10 June	16	2-1-3-2-4-2-3-5	20	1-1-4-5-5-2-2-3	15	2-2-3-3-4-3-3-4
11 June	7	3-2-2-2-2-1-2-0	5	3-2-2-1-0-1-1-1	8	3-2-2-2-2-3-2-1
12 June	6	2-3-2-1-1-1-2-1	11	3-4-3-3-2-0-1-0	8	2-4-2-2-2-2-2-2
13 June	4	0-1-0-0-1-1-3-2	3	0-1-0-0-1-2-2-1	6	2-1-1-1-2-2-3-2
14 June	15	3-5-2-3-2-1-2-3	18	2-4-4-4-4-2-1-2	15	3-5-3-3-3-3-2-2

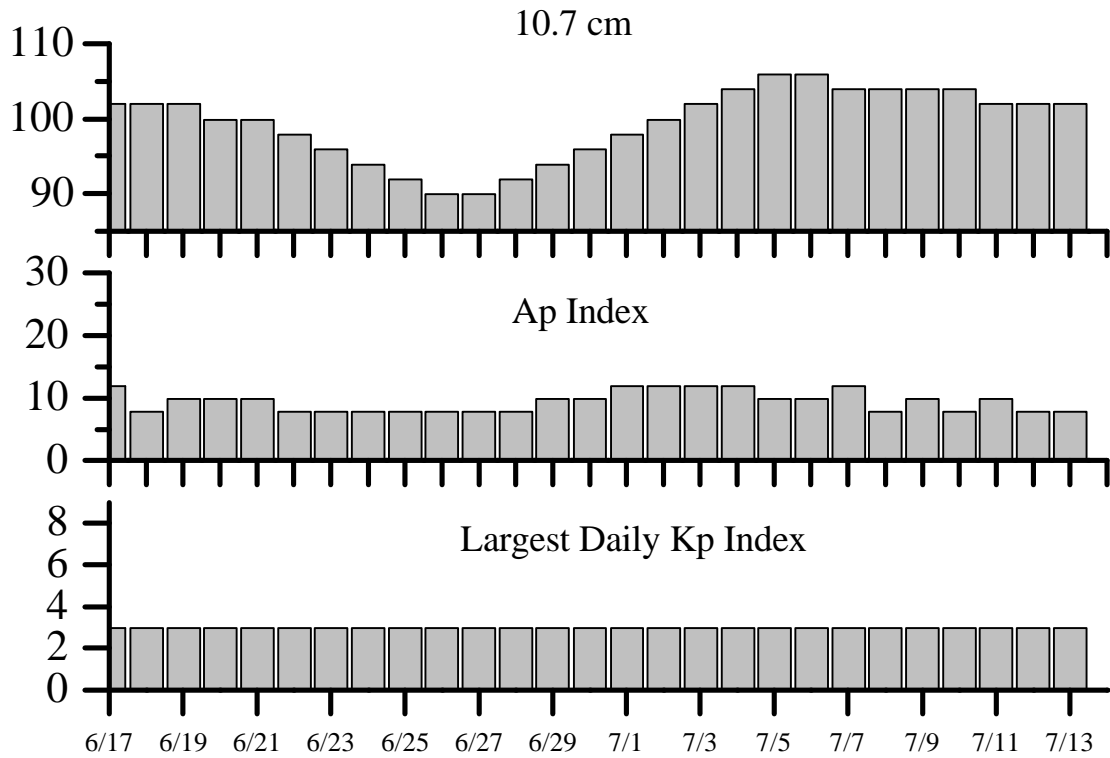


### *Alerts and Warnings Issued*

<u>Date and Time of Issue (UT)</u>	<u>Type of Alert or Warning</u>	<u>Date and Time of Event (UT)</u>
08 Jun 0012	245 Radio Burst	07 Jun
08 Jun 0012	5-245 Radio Noise Storms	07 Jun
08 Jun 0912	>2MeV Electron Event $\geq 1000$ pfu BEG	08 Jun 1998 0836
09 Jun 0021	245 Radio Burst	08 Jun
09 Jun 0021	245 Radio Noise Storm	08 Jun
10 Jun 0017	>2MeV Electron Event in Progress $\geq 1000$ pfu	09 Jun
10 Jun 0050	4-245 Radio Bursts	09 Jun
10 Jun 0050	245 Noise Storm	09 Jun
11 Jun 0006	K= 4 Observed	10 Jun 21- 24
11 Jun 0020	>2MeV Electron Event in Progress $\geq 1000$ pfu	10 Jun
11 Jun 0006	2-245 Radio Bursts	10 Jun
11 Jun 0006	245 Radio Noise Storm	10 Jun
11 Jun 1058	Type II Radio Emission	11 Jun 1006
11 Jun 1100	Type IV Radio Emission	11 Jun 1018
12 Jun 0604	K= 4 Observed	12 Jun 03- 06
13 Jun 0017	2-245 Radio Bursts	12 Jun
13 Jun 0017	245 Radio Noise Storm	12 Jun
13 Jun 0647	Type IV Radio Emission	13 Jun 0440
14 Jun 0027	4-245 Radio Bursts	13 Jun
14 Jun 0027	245 Radio Noise Storm	13 Jun
14 Jun 0605	K= 5 Observed	14 Jun 03- 06



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
17 June	102	12	3	01 July	98	12	3
18	102	8	3	02	100	12	3
19	102	10	3	03	102	12	3
20	100	10	3	04	104	12	3
21	100	10	3	05	106	10	3
22	98	8	3	06	106	10	3
23	96	8	3	07	104	12	3
24	94	8	3	08	104	8	3
25	92	8	3	09	104	10	3
26	90	8	3	10	104	8	3
27	90	8	3	11	102	10	3
28	92	8	3	12	102	8	3
29	94	10	3	13	102	8	3
30	96	10	3				



### *Energetic Events*

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½	Class	Integ	Imp	Location		Rgn	Radio Flux		Intensity	
			Max		Flux		Brtns	Lat		CMD	#	245	2695
11 Jun 98	0957	1027	1118	M1.4	.050							2	2
13 Jun 98	0415	0420	0428	M1.9	.011	1N	S27E54	8242	8900	42		2	2

### *Flare List*

Date	Time			X-ray	Imp /	Optical		Rgn
	Begin	Max	End			Class.	Brtns	
08 June	0335	0340	0349	B4.1				
	0639	0651	0806	B9.1				
	0945	0957	1031	B9.0				
	1349	1353	1358	B4.3				
	1558	1603	1700	C5.2	2N	S18W03	8232	
09 June	1956	2004	2008	C1.0	SF	S30W08	8232	
	0425	0432	0441	B6.1				
	0835	0839	0846	B4.0				
10 June	1610	1613	1615	B4.3				
	0224	0232	0244	C1.3				
	0402	0408	0413	C1.2				
11 June	0700	0707	0717	B7.2				
	2311	0014	0120	C1.1				
	0606	0607	0609		SF	S22W61	8240	
12 June	0957	1027	1118	M1.4				
	2249	2254	2302		SF	S20W68	8240	
	0023	0027	0031	B6.7				
	0032	0202	0248	C1.1				
	0251	0252	0256	C1.2	SF	S19W70	8240	
	0455	0456	0501	B9.3	SF	N18E11	8238	
	0539	0540	0544	C1.4	SF	S22W74	8240	
	0613	0617	0621	C1.0				
	0803	0805	0807		SF	S22W75	8240	
	0820	0827	0831	C1.1				
	0916	0919	A0925	C3.1	1F	S22W77	8240	
	1404	1408	1414		SF	S19W77	8240	
1558	1603	1605		SF	S19W77	8240		
2110	2110	2148	C2.1	SF	S25E54	8242		
2219	2233	2244		SF	S23E54	8242		
2247	2250	2253	B9.0					
2304	2319	2333	C1.8	SF	S24E53	8242		



*Flare List-continued*

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
13 June	0149	0155	0200	C1.4			
	0215	0357	0621	C2.6			
	0309	0311	0315		SF	S22E54	8242
	0418	0419	0439	M1.9	1N	S27E54	8242
	0623	0625	0630		SF	S24W59	8232
	0635	0637	0647		SF	S21W89	8240
	0909	0917	0932	C3.4			
	1203	1210	1215	C1.3			
	1423	1423	1426		SF	S26E46	8242
	1458	1532	1554	C2.9			8237
	1527	1527	1545		SF	S27W01	8237
	1555	1556	1613		SF	S28W12	8237
	1721	1728	1741	C2.4	SF	S23E43	8242
	1757	1759	1803	C1.3	SF	S20E45	8242
	2206	2210	2214		SF	S23E40	8242
	2349	0003	0020	B9.4			
	14 June	0103	0109	0113	C3.0		
0105		0109	0119		1N	S25E46	8242
0257		0257	0300		SF	S22E41	8242
0434		0438	0443	B6.5	SF	S31E12	8245
0519		0521	0527	B8.1	SF	S22E35	8242
0739		0739	0744		SF	N15E62	8243
0838		0841	0844	B6.6	SF	N15E62	8243
1528		1529	1540	B6.5	SF	N14E59	8243



## 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 8230</i>																		
30 May	S19E60	044	0040	07	CSO	005	B											
31 May	S20E48	043	0050	09	DSO	010	B											1
01 Jun	S20E35	043	0060	09	DSO	017	B											
02 Jun	S19E23	041	0200	10	DAO	018	B											
03 Jun	S20E09	042	0200	09	DAO	016	B											
04 Jun	S21W04	042	0220	10	DAO	021	B											
05 Jun	S20W16	041	0180	10	DAO	016	B											
06 Jun	S21W30	042	0160	10	DAO	010	B											
07 Jun	S21W42	041	0140	10	DAO	009	B											
08 Jun	S21W57	042	0100	11	CSO	004	B											
09 Jun	S18W74	046	0070	03	HAX	002	A											
10 Jun	S19W89	047	0070	03	HAX	001	A											

0 0 0 1 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 42

<i>Region 8231</i>																		
30 May	S21E33	071	0010	03	BXO	004	B											
31 May	S23E17	074	0000	00	AXX	001	A											
01 Jun	S23E04	074																
02 Jun	S23W09	074																
03 Jun	S23W22	074																
04 Jun	S23W35	074																
05 Jun	S23W48	074																
06 Jun	S23W61	074																

0 0 0 0 0 0 0 0

Died on Disk.

Absolute heliographic longitude: 74



### 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 8232</i>																		
02 Jun	S19E73	351	0220	03	HHX	001	A											
03 Jun	S19E62	349	0280	10	CHO	003	B					2						
04 Jun	S19E49	349	0360	10	CHO	008	B	2				6						
05 Jun	S18E33	352	0380	08	DKO	012	BG	3				5						
06 Jun	S19E19	353	0330	09	DHO	010	BG					1						
07 Jun	S20E09	350	0360	11	CHO	012	B	1				2	1					
08 Jun	S22W03	348	0340	12	CHO	015	B	1				1		1				
09 Jun	S21W18	350	0290	12	CKO	006	B											
10 Jun	S22W31	350	0360	12	CKO	012	B											
11 Jun	S21W42	347	0320	12	CKO	012	B											
12 Jun	S21W59	351	0290	04	HKX	003	A											
13 Jun	S21W72	350	0220	04	HHX	003	A					1						
14 Jun	S21W84	349	0180	03	HHX	002	A											
								7	0	0	0	18	1	1	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 348

<i>Region 8233</i>																		
03 Jun	N28E63	348	0010	05	BXO	002	B					7						
04 Jun	N28E48	350	0030	07	BXO	006	B											
05 Jun	N28E35	350	0020	08	BXO	006	B					2						
06 Jun	N28E20	352	0000	04	BXO	003	B											
07 Jun	N31E10	349	0010	02	AXX	004	A											
08 Jun	N29W01	346	0010	03	BXO	005	B											
09 Jun	N28W15	347	0000	01	BXO	002	B											
10 Jun	N28W28	347																
11 Jun	N28W41	347																
12 Jun	N28W54	347																
13 Jun	N28W67	347																
14 Jun	N28W80	347																
								0	0	0	0	9	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 346





### 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 8234</i>																	
04 Jun	N16E65	333	0020	08	BXO	004	B										
05 Jun	N16E52	333	0040	07	BXO	012	B										
06 Jun	N16E37	335	0020	09	BXO	006	B										
07 Jun	N16E21	338	0010	00	AXX	001	A										
08 Jun	N16E08	338															
09 Jun	N16W05	338															
10 Jun	N16W18	338															
11 Jun	N16W31	338															
12 Jun	N16W44	338															
13 Jun	N13W47	325	0000	00	AXX	001	A										
								0	0	0	0	0	0	0	0	0	
Died on Disk.																	
Absolute heliographic longitude: 338																	
<i>Region 8235</i>																	
06 Jun	N20W33	045	0000	02	BXO	003	B										
07 Jun	N20W46	045															
								0	0	0	0	0	0	0	0	0	
Died on Disk.																	
Absolute heliographic longitude: 45																	
<i>Region 8236</i>																	
06 Jun	N21W10	022	0020	05	DSO	006	B										
07 Jun	N21W23	022	0040	07	CSO	008	B				1						
08 Jun	N21W37	022	0040	08	CSO	004	B										
09 Jun	N21W51	023	0030	07	CRO	007	B										
10 Jun	N20W66	024	0020	08	BXO	005	B										
11 Jun	N21W82	027	0000	00	AXX	001	A										
								0	0	0	1	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 22



### 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 8237</i>																					
07 Jun	S24E69	290	0010	06	BXO	002	B														
08 Jun	S24E55	290	0020	06	AXX	003	A														
09 Jun	S25E43	289	0010	04	BXO	002	B														
10 Jun	S25E35	283	0010	00	AXX	002	A														
12 Jun	S20E05	287	0010	03	BXO	005	B														
13 Jun	S25W07	285	0010	04	BXO	003	B	1				2	1								
14 Jun	S25W20	285																			
												1	0	0	2	1	0	0	0		
Still on Disk.																					
Absolute heliographic longitude: 287																					
<i>Region 8238</i>																					
08 Jun	S19E06	339	0000	00	AXX	001	A														
09 Jun	S19W07	339																			
11 Jun	N19E15	290	0010	03	BXO	003	B														
12 Jun	N19E01	291	0000	03	BXO	003	B					1									
												0	0	0	1	0	0	0	0		
Died on Disk.																					
Absolute heliographic longitude: 291																					
<i>Region 8239</i>																					
08 Jun	N21E59	286	0010	05	BXO	002	B														
09 Jun	N21E46	286																			
10 Jun	N21E33	286																			
11 Jun	N21E20	286																			
12 Jun	N25E14	278	0010	04	BXO	004	B														
13 Jun	N25E03	275	0000	03	BXO	002	B														
14 Jun	N25W10	275																			
												0	0	0	0	0	0	0	0		
Still on Disk.																					
Absolute heliographic longitude: 275																					
<i>Region 8240</i>																					
09 Jun	S24W44	016	0030	06	DRO	008	B														
10 Jun	S25W55	013	0110	10	DAO	015	B														
11 Jun	S24W71	016	0110	10	DAO	010	B					2									
12 Jun	S24W82	014	0090	10	DSO	007	B	3				5	1								
13 Jun	S24W94	012	0060	04	HAX	002	A					1									
												3	0	0	8	1	0	0	0		
Crossed West Limb.																					
Absolute heliographic longitude: 16																					





### *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 8246</i>																
13 Jun	N14W48	326	0010	00	AXX	001	A									
14 Jun	N13W62	327	0000	00	AXX	001	A									
								0	0	0	0	0	0	0	0	0
Still on Disk.																
Absolute heliographic longitude: 326																
<i>Region 8247</i>																
13 Jun	S22E31	247	0010	00	AXX	001	A									
14 Jun	S23E17	248	0010	00	AXX	001	A									
								0	0	0	0	0	0	0	0	0
Still on Disk.																
Absolute heliographic longitude: 248																
<i>Region 8248</i>																
14 Jun	N21E02	263	0010	02	AXX	002	A									
								0	0	0	0	0	0	0	0	0
Still on Disk.																
Absolute heliographic longitude: 263																



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

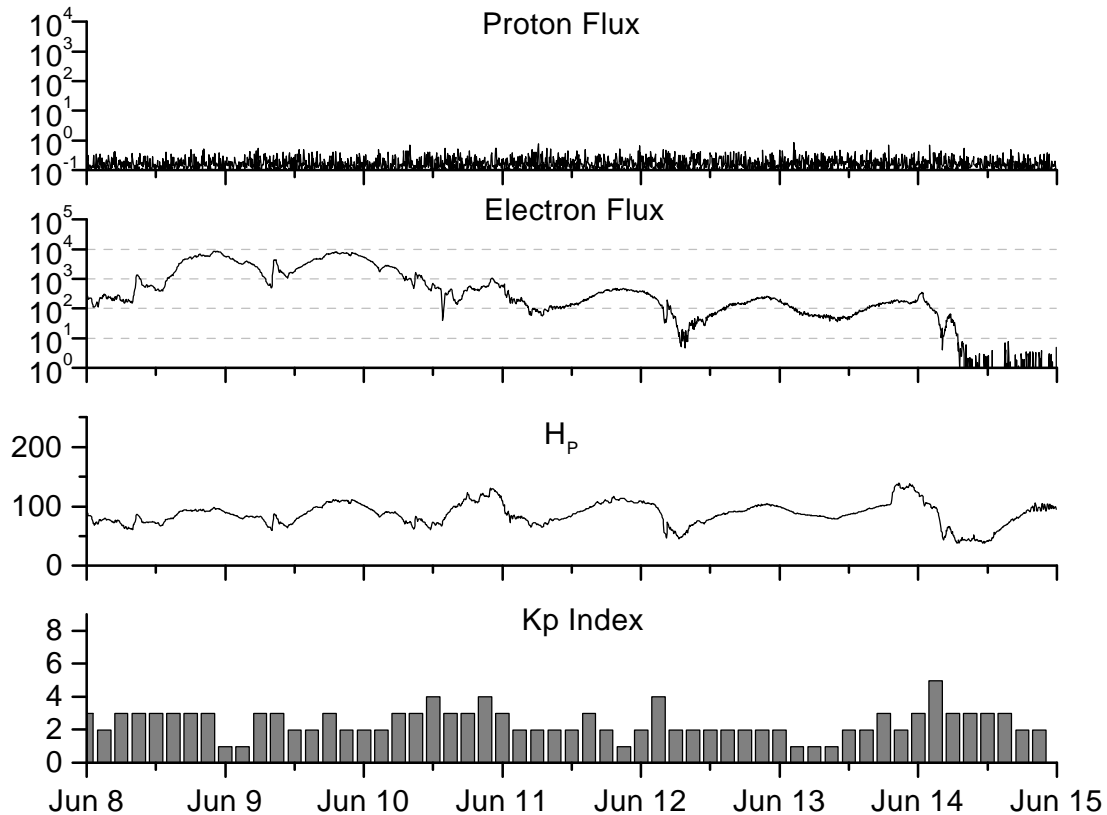
Month	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed SWO	values RI	Ratio RI/SWO	Smooth SWO	values RI	**Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
<b>1996</b>									
June	18.8	11.8	0.63	13.5	08.5	69.6	71.8	05	09.4
July	13.2	08.2	0.62	13.4	08.4	71.2	72.0	07	09.3
August	20.5	14.4	0.70	13.1	08.3	72.4	72.1	09	09.4
September	02.9	01.6	0.55	13.3	08.4	69.4	72.3	15	09.3
October	02.3	00.9	0.39	14.0	08.8	69.2	72.6	13	09.1
November	26.7	17.9	0.67	15.4	09.8	78.7	73.0	08	09.1
December	21.1	13.3	0.63	16.2	10.4	77.8	73.3	07	09.3
<b>1997</b>									
January	09.0	05.7	0.63	16.5	10.5	74.0	73.4	09	09.3
February	11.3	07.6	0.67	17.4	11.0	73.8	73.7	11	09.2
March	14.4	08.7	0.60	20.4	13.5	73.5	75.1	08	08.9
April	24.5	15.5	0.63	24.0	16.5	74.5	76.8	10	08.6
May	28.6	18.5	0.65	26.4	18.3	74.6	78.4	08	08.6
June	22.1	12.7	0.57	29.0	20.3	71.7	80.1	07	08.7*
July	17.0	10.4	0.61	32.4	22.6*	71.1	81.8*	06	08.5*
August	36.7	24.4	0.66	35.9	25.1*	79.0	83.4*	07	08.3*
September	52.8	51.3	0.88	40.5	28.4*	96.2	85.7*	10	08.2*
October	33.6	22.8	0.68	45.4	31.9*	84.9	88.6*	11	08.3*
November	53.5	39.0	0.73	49.3	35.1*	99.5	91.4*	11	08.7*
December	57.9	41.2	0.71			98.8		05*	
<b>1998</b>									
January	51.8	32.3*	0.62*			93.5*		07*	
February	54.4	40.7*	0.75*			93.6*		07*	
March	81.8	54.8*	0.67*			109.4*		11*	
April	73.6	53.3*	0.72*			108.3*		10*	
May	74.3	56.9*	0.77*			106.6*		18*	

\*Preliminary estimates.

The lowest smoothed sunspot indices 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.

\*\* From June 1991 onward, 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 01 June 1998*

*Protons* plot contains the five-minute averaged integral proton flux (protons/ cm<sup>2</sup>-sec-sr) as measured by GOES-9 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

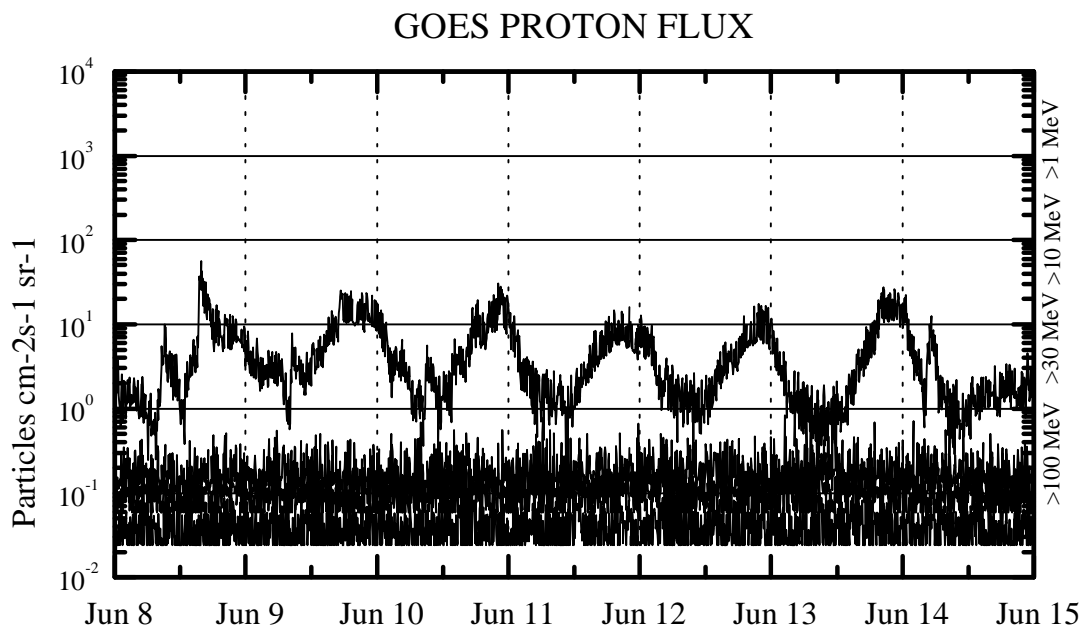
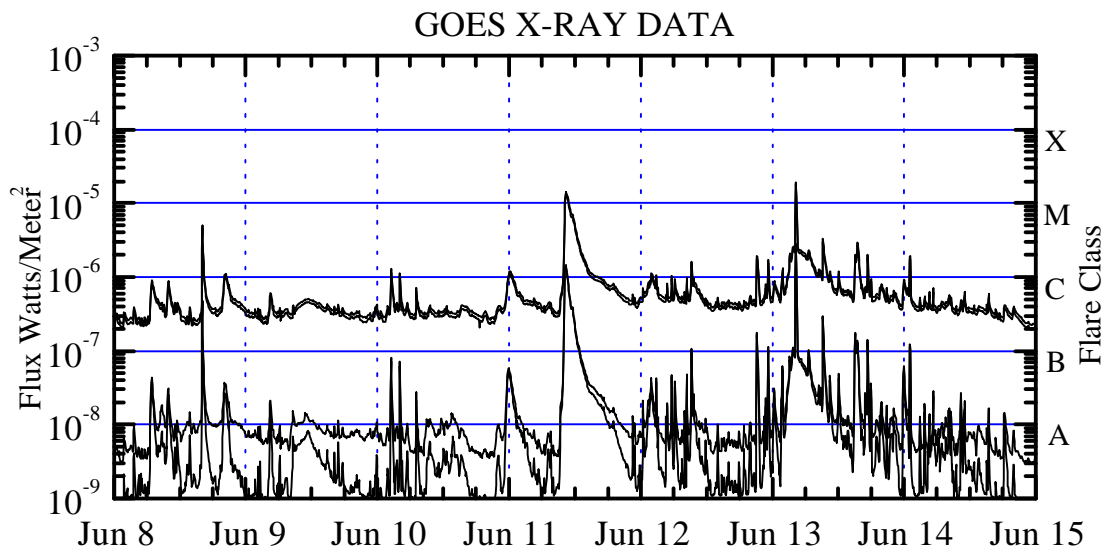
*Electrons* plot contains the five-minute averaged integral electron flux (electrons/ cm<sup>2</sup>-sec-sr) with energies greater than 2 MeV at GOES-9.

*H<sub>p</sub>* plot contains the five minute averaged magnetic field H component in nanoteslas (nT) as measured by GOES-9. 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 USAF 55<sup>th</sup> Space Weather Squadron) 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 a 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 9 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-9 (W135) 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.

