

Space Weather Highlights
20-26 July 1998

Solar activity ranged from very low to low. The largest flare of the period was a C8/SF on 24 July from Region 8280 (S22, L = 056, class/area Eho/500 on 24 July), which was otherwise stable for much of the period. Region 8282 (N32, L = 054, class/area Dki/560 on 26 July) grew at a moderate pace during 24 July to become a moderate-sized group containing a weak magnetic delta configuration. It produced isolated subflares as it grew, then stabilized on 25 July.

Real-time solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft during most of the period. There were two occurrences of note. The first was an apparent solar sector orientation shift to away conditions (ϕ angle near 135 degrees) early on 21 July with an accompanying velocity increase from 380 - 500 km/sec and increased Bz variability (plus 15 to minus 16 nT (GSM)). A brief density increase to 37 p/cc was also associated with the sector shift. The second occurred during 23 - 24 July as velocities increased from 400 - 760 km/sec while particle densities decreased from 10 - 02 p/cc. These changes were associated with a high speed coronal hole windstream.

There were no significant proton enhancements detected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude reached high levels late on 23 July, then remained at mostly high levels for the balance of the period.

The geomagnetic field was mostly quiet during 20 July. The field was disturbed during the first half of 21 July with active levels detected at middle latitudes and active to minor storm levels at high latitudes.

The field subsided to mostly quiet levels late on 21 July through 22 July. A coronal-hole-related disturbance occurred during 23 - 24 July with active to minor storm levels at middle latitudes and active to major storm levels at high latitudes. The geomagnetic field declined to quiet to unsettled levels during the last two days of the period.

Space Weather Forecast
29 July 1998 - 24 August 1998

Solar activity is expected to be low during most of the period with a chance for isolated M-class flares. No major flare activity is expected.

No proton enhancements are expected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be at moderate to high levels during 31 July - 04 August and 20 - 24 August. Otherwise, normal to moderate levels are expected.

The geomagnetic field is expected to be at quiet to unsettled levels during most of the period. However, active to minor storm levels are possible during 30 - 31 July and 19 - 20 August due to coronal hole effects.

NOTE: Effective 27 July 1998, GOES-8 is considered primary and GOES-10 back up for all SWO data and products. Since the GOES-10 spacecraft is inverted to the normal GOES orientation, its Space Environment Monitor (SEM) sensors have the following limitations: **X-rays**-No differences expected except at low levels. **particle data** - The inversion of GOES-10 relative to GOES-8 and -9 means that the sensors are looking in a different direction (east instead of West), and some differences will be observed during proton events. **magnetometer data** - The data are still being validated and will be released later.



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
20 July	112	90	210	B2.5	0	0	0	12	0	0	0	0
21 July	110	125	450	B5.4	0	0	0	2	0	0	0	0
22 July	114	145	640	B3.8	3	0	0	1	0	0	0	0
23 July	115	139	650	B3.1	3	0	0	4	0	0	0	0
24 July	125	111	810	B3.1	4	0	0	11	0	0	0	0
25 July	122	85	890	B2.7	2	0	0	5	0	0	0	0
26 July	119	80	1040	B2.2	0	0	0	5	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
20 July	2.9E+5	1.6E+4	4.1E+3		1.3E+8	
21 July	2.6E+5	1.6E+4	4.1E+3		4.0E+7	
22 July	1.3E+5	1.6E+4	4.1E+3		3.0E+6	
23 July	9.6E+5	1.6E+4	3.7E+3		2.1E+7	
24 July	2.4E+6	1.6E+4	4.0E+3		4.1E+8	
25 July	8.8E+5	1.5E+4	3.6E+3		8.5E+8	
26 July	7.9E+5	1.6E+4	4.0E+3		1.2E+9	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
20 July	3	1-1-1-0-1-0-1-2	2	2-2-1-0-0-0-1-0	6	2-1-1-1-2-2-2-3
21 July	11	1-4-4-2-2-2-1-1	*	1-5-6-*-2-2-1	15	2-4-4-3-2-2-3-2
22 July	8	1-1-1-2-3-3-2-3	10	2-1-1-3-4-3-1-2	8	2-1-1-2-2-3-2-4
23 July	25	3-5-4-4-4-3-3-3	62	4-5-6-7-6-6-4-3	37	3-5-6-5-5-4-3-4
24 July	18	4-3-2-4-3-3-3-3	31	3-4-4-6-4-4-3-3	22	3-4-4-5-3-4-3-3
25 July	10	2-3-4-2-1-2-2-1	30	2-4-6-5-5-3-2-2	16	3-4-4-3-2-3-3-2
26 July	5	2-2-2-2-1-1-1-1	*	*-_*-_*-_*-_*-_*-*	6	2-3-1-2-2-2-1-1

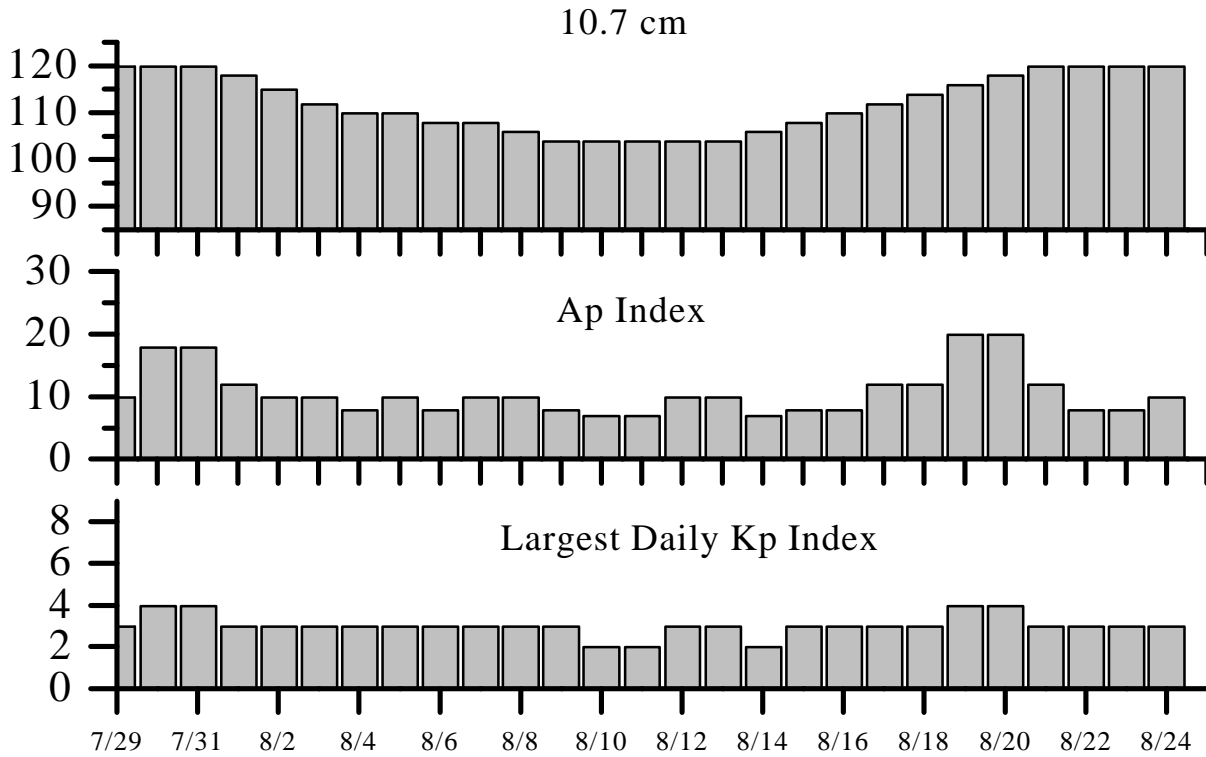


Alerts and Warnings Issued

<u>Date and Time of Issue (UT)</u>	<u>Type of Alert or Warning</u>	<u>Date and Time of Event (UT)</u>
21 Jul 0011	>2MeV Electron Event @ ≥ 1000 pfu CONTINUED	20 Jul
22 Jul 0010	>2MeV Electron Event @ ≥ 1000 pfu CONTINUED	21 Jul
23 Jul 0000	K= 4 Observed	22 Jul 21- 24
23 Jul 600	K= 5 Observed	23 Jul 03 - 06
23 Jul 0859	A ≥ 20 Observed	23 Jul 0900
23 Jul 2243	>2MeV Electron Event @ ≥ 1000 pfu	23 Jul 2240
24 Jul 0014	4-245 MHz Radio Bursts	23 Jul
24 Jul 0600	K= 5 Observed	24 Jul 03 - 06
24 Jul 0914	A ≥ 20 Observed CONTINUED	24 Jul
25 Jul 0052	>2MeV Electron Event @ ≥ 1000 pfu CONTINUED	24 Jul
25 Jul 0617	K= 4 Observed	25 Jul 03 - 06
26 Jul 0153	>2MeV Electron Event @ ≥ 1000 pfu CONTINUED	25 Jul
26 Jul 2359	>2MeV Electron Event @ ≥ 1000 pfu CONTINUED	26 Jul



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
29 Jul	120	10	3	12 Aug	104	10	3
30	120	18	4	13	104	10	3
31	120	18	4	14	106	7	2
01 Aug	118	12	3	15	108	8	3
02	115	10	3	16	110	8	3
03	112	10	3	17	112	12	3
04	110	8	3	18	114	12	3
05	110	10	3	19	116	20	4
06	108	8	3	20	118	20	4
07	108	10	3	21	120	12	3
08	106	10	3	22	120	8	3
09	104	8	3	23	120	8	3
10	104	7	2	24	120	10	3
11	104	7	2				



Energetic Events

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	½	Class	Integ	Imp	Location		Radio Flux		Intensity	
			Max		Flux		Brtns	Lat	CMD	Rgn	#	245

No Events Observed

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn #
	Begin	Max	End			Location	Lat CMD	
20 July	0048	0052	0059	B4.1				
	0742	0744	0747		SF	S24W54	8270	
	1010	1010	1016		SF	N19W55	8269	
	1029	1030	1032		SF	S25W56	8270	
	1034	1034	1037		SF	S23W57	8270	
	1129	1131	1134		SF	S24W55	8270	
	1404	1406	1427	B9.6	SF	S24W59	8270	
	1454	1454	1458		SF	N19W57	8269	
	1457	1457	1501		SF	S23W60	8270	
	1630	1631	1638		SF	S24W59	8270	
	1648	1649	1705		SF	N19W59	8269	
	1650	1658	1714		SF	S24W60	8270	
	1705	1707	1717		SF	N19W58	8269	
	21 July	1728	1733	1743	B8.9			
		0548	0549	0600		SF	N20W66	8269
		1644	1644	1701		SF	S13W40	8277
		2049	2056	2106	B6.8			
2337		2341	2344	B6.9				
22 July	0439	0503	0526	C6.5			8280	
	0704	0711	0716	C1.4				
	0902	0905	0907	B7.3				
	1651	1652	1658	C1.5	SF	S22E63	8280	
	1724	1734	1743	B5.8				
23 July	1951	1954	1957	B5.8				
	0401	0410	0422	B8.8				
	0745	0748	0750	B7.1				
	1248	1255	1305		SF	N14E51	8281	
	1602	1603	1614	C1.4	SF	S24E54	8280	
	1630	1631	1635	C1.1	SF	N17E48	8281	
	1742	1749	1758	C1.0	SF	N29E53	8282	
	2319	2324	2329	B6.9				



Flare List-continued

Date	Time			X-ray Class.	Optical		Rgn #	
	Begin	Max	End		Imp / Brtns	Location Lat CMD		
24 July	0333	0334	0345	C8.2	SF	S26E57	8280	
	0613	0620	0634		SF	S20E53	8280	
	0747	0751	0837		SF	N30E51	8282	
	0839	0844	0854		SF	N33E48	8282	
	1003	1005	1010		SF	N17E41	8281	
	1037	1042	1054		SF	N29E50	8282	
	1111	1122	1128		SF	N29E50	8282	
	1135	1148	1156		SF	N29E50	8282	
	1235	1236	1240		SF	N16E40	8281	
	1513	1513	1521		SF	N16E39	8281	
	1602	1604	1610		SF	N28E47	8282	
	1656	1712	1721		C1.3			
	1938	1944	1948		C2.1			
	2050	2053	2055		C1.1			
25 July	2122	2127	2135	B9.6				
	0419	0426	0432	C1.6				
	0553	0553	0610		SF	N25W11	8279	
	0616	0618	0622		SF	N13E32	8281	
	0904	0909	1016	C1.4	SF	S23E39	8280	
	1218	1218	1224		SF	N30E35	8282	
	1935	1940	1949	B6.9				
	2341	2345	2351	B4.3				
	26 July	0517	0518	0525		SF	S23E21	8280
		0619	0620	0629	B7.1	SF	S24E21	8280
1205		1206	1215		SF	S24E18	8280	
1236		1236	1253	B5.5	SF	S22E19	8280	
1626		1630	1638	B4.4				
2029		2037	2055		SF	S24E16	8280	



Region Summary-continued

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	4						
<i>Region 8271</i>																					
11 Jul	S09E63	205	0040	07	BXO	004	B														
12 Jul	S10E45	210	0020	03	CRO	003	B														
13 Jul	S11E28	214	0010	01	AXX	001	A														
14 Jul	S10E15	214	0040	02	HRX	002	A														
15 Jul	S10E02	214	0010	03	BXO	003	B														
16 Jul	S11W11	213	0000	00	AXX	001	A														
17 Jul	S11W24	213																			
18 Jul	S11W37	213																			
19 Jul	S11W50	213																			
20 Jul	S11W63	213																			
21 Jul	S11W76	213																			
22 Jul	S11W89	213																			

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 214

<i>Region 8272</i>																				
15 Jul	S28E55	161	0020	04	BXO	003	B	1												
16 Jul	S29E44	158	0030	07	BXO	006	B	1												
17 Jul	S28E31	158	0010	04	BXO	003	B													
18 Jul	S28E16	160	0000	03	BXO	002	B													
19 Jul	S28E03	160																		
20 Jul	S28W10	160																		
21 Jul	S31W18	154	0010	08	BXO	003	B													
22 Jul	S31W31	154																		
23 Jul	S32W43	153	0010	04	BXO	002	B													
24 Jul	S32W56	153																		
25 Jul	S32W69	153																		
26 Jul	S32W82	153																		

2 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 160



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	4							
<i>Region 8273</i>																						
15 Jul	S27E22	194	0040	05	CSO	005	B															
16 Jul	S28E06	196	0020	06	CRO	004	B															
17 Jul	S28W07	196	0030	07	CRO	007	B															
18 Jul	S27W20	196	0020	07	BXO	006	B															
19 Jul	S28W32	195	0010	08	BXO	004	B															
20 Jul	S28W45	195																				
21 Jul	S28W58	195				000																
22 Jul	S24W68	191	0000	00	AXX	001	A															
23 Jul	S24W81	191																				

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 196

<i>Region 8274</i>																						
15 Jul	S20E22	194	0010	03	BXO	002	B															
16 Jul	S21E08	194	0050	05	DAO	011	B															
17 Jul	S20W05	194	0150	08	DAO	011	B															
18 Jul	S20W19	195	0090	08	DSO	010	B															
19 Jul	S20W32	195	0130	09	DAO	010	B															
20 Jul	S20W46	196	0110	08	DSO	009	B															
21 Jul	S20W60	196	0090	10	DAO	005	B															
22 Jul	S20W76	199	0060	08	CSO	003	B															
23 Jul	S22W87	197	0000	00	AXX	001	A															

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 194



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

Region 8275

16 Jul	N16E64	138	0010	03	BXO	002	B										
17 Jul	N16E51	138	0010	00	AXX	001	A										
18 Jul	N14E37	139	0000	00	AXX	001	A										
19 Jul	N14E24	139															
20 Jul	N14E11	139															
21 Jul	N14W02	139															
22 Jul	N14W15	139															
23 Jul	N14W28	139															
24 Jul	N14W41	139															
25 Jul	N14W54	139															
26 Jul	N14W67	139															

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 139

Region 8276

19 Jul	S19E62	101	0000	00	AXX	001	A										
20 Jul	S19E48	102	0010	06	BXO	004	B										
21 Jul	S20E36	100	0000	04	BXO	002	B										
22 Jul	S21E19	104	0000	00	AXX	001	A										
23 Jul	S19E08	102	0010	03	BXO	002	B										
24 Jul	S21W07	104	0000	02	BXO	002	B										
25 Jul	S21W20	104															
26 Jul	S21W33	104															

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 104

Region 8277

20 Jul	S13W26	176	0020	05	CRO	006	B										
21 Jul	S13W41	177	0100	07	CSO	012	B										
22 Jul	S14W54	177	0110	07	DAO	009	B										
23 Jul	S18W68	178	0060	07	CAO	004	B										
24 Jul	S14W84	181	0030	01	HSX	001	A										

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 176



Region Summary-continued

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	4		
<i>Region 8278</i>																	
20 Jul	S28E52	098	0000	00	AXX	001	A										
21 Jul	S28E38	098	0010	04	BXO	003	B										
22 Jul	S27E26	097	0020	05	BXO	005	B										
23 Jul	S27E13	097	0010	06	BXO	007	B										
24 Jul	S27W03	100	0010	03	BXO	003	B										
25 Jul	S28W18	101	0000	00	AXX	001	A										
26 Jul	S28W31	101															
									0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 100

<i>Region 8279</i>																	
21 Jul	N26E33	103	0010	03	CRO	002	B										
22 Jul	N27E20	103	0030	05	DAO	006	B										
23 Jul	N26E06	104	0030	06	CSO	005	B										
24 Jul	N24W08	105	0030	05	CSO	005	B										
25 Jul	N24W22	105	0030	05	CSO	006	B										
26 Jul	N24W36	106	0020	05	BXO	005	B										
									0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 104

<i>Region 8280</i>																	
21 Jul	S21E75	061	0130	04	HKX	001	A										
22 Jul	S21E63	060	0340	13	EKO	008	B										1
23 Jul	S21E54	056	0470	12	EKI	013	B										1
24 Jul	S23E40	057	0500	11	EHO	010	B										1
25 Jul	S23E27	056	0430	10	DHO	013	B										1
26 Jul	S24E14	056	0450	11	EHO	013	B										
									4	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 056



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

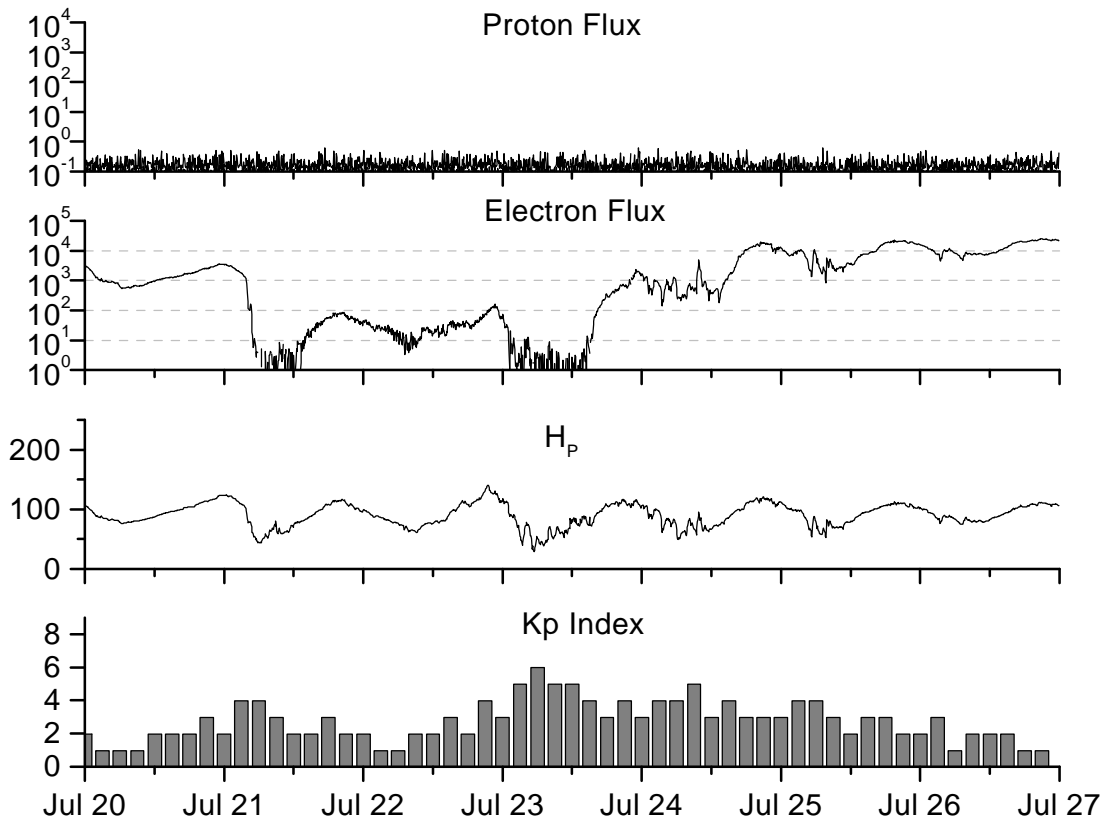
Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	Observed values SWO	Ratio RI	Smooth values RI/SWO	Smooth values SWO	Ratio RI	**Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
1996									
July	13.2	08.2	0.62	13.4	08.4	71.2	72.0	07	09.3
August	20.5	14.4	0.70	13.1	08.3	72.4	72.1	09	09.4
September	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
1997									
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	54.2	39.1*	98.8	94.2*	05*	09.3*
1998									
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*	
June	93.6	70.5*	0.75*			108.4*		11*	

*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 20 July 1998

Protons plot contains the five-minute averaged integral proton flux (protons/ cm²-sec-sr) as measured by GOES-9 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

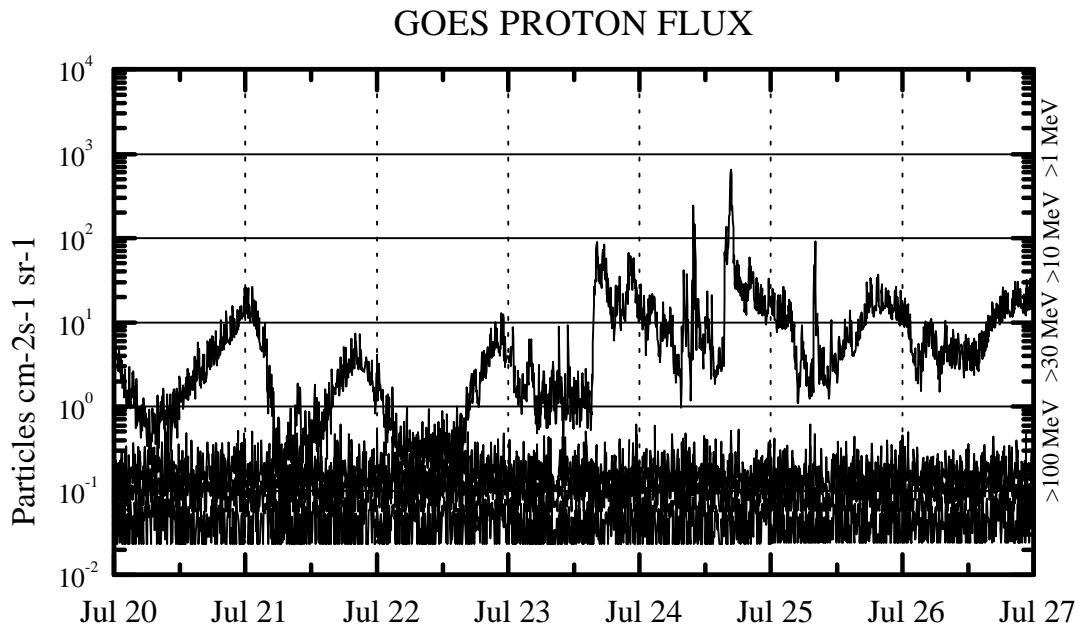
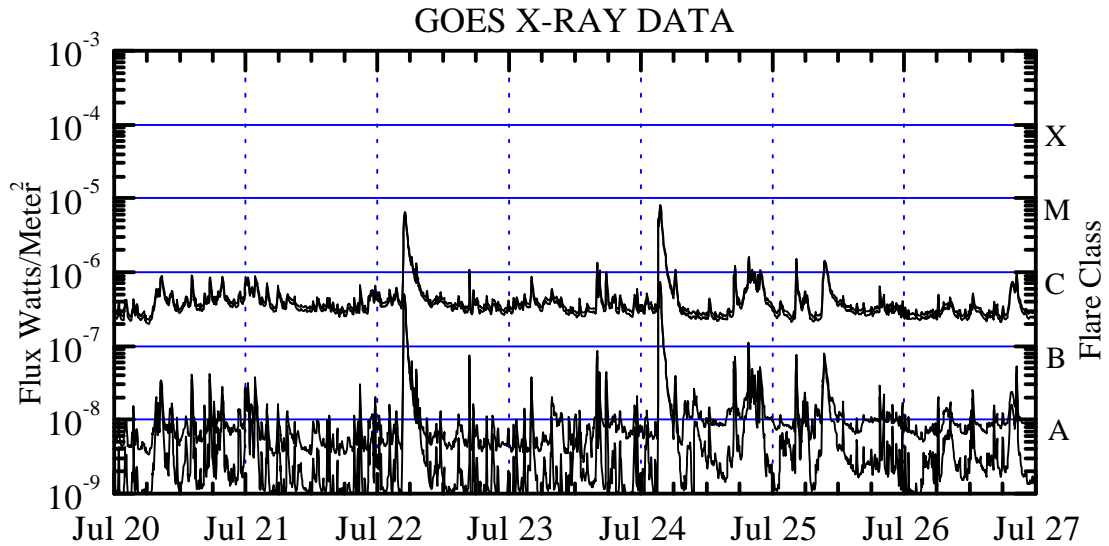
Electrons plot contains the five-minute averaged integral electron flux (electrons/ cm²-sec-sr) with energies greater than 2 MeV at GOES-9.

H_p 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_p plot contains the estimated planetary 3-hour K-index (derived by the USAF 55th 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_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 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/m²) 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/cm²-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/cm²-sec-sr) at greater than 10 MeV.

