

**Space Weather Highlights
16 - 22 Aug 1999**

Solar activity ranged from low to high levels. Activity was at low levels through 18 August with a few long-duration C-class flares detected. Activity increased to moderate levels on 19 August by virtue of an isolated M1/1N flare at 19/1205UT from Region 8672 (N15, L=347, class/area Cro/040 on 19 August). Activity rose to high levels on 20 August as Region 8674 (S25, L=247, class/area Dko/490 on 22 August) produced an impulsive M9/1N flare at 20/2308UT with an associated Type II radio sweep and 480 SFU Tenflare. This region produced another major flare on 21 August, an impulsive M5/1N at 21/2214UT accompanied by a 250 SFU Tenflare. Activity dropped to low levels on 22 August with a few C-class flares from Region 8674 including a C5/SN flare at 22/1412UT with Types II and IV radio sweeps. Active levels are also expected around 12 - 16 September. Otherwise, quiet to unsettled levels are expected.

Real-time solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft for most of the period. A coronal hole signature was evident through 20 August with high wind speeds (peak 820 km/second on 19 August), elevated proton temperatures, and low densities combined with periods of sustained southward IMF Bz (maximum southerly deflections to minus 14 nT (GSM)).

No proton events were detected at geo-synchronous orbit during the period.

The greater than 2 MeV electron flux was at normal levels at the start of the period, then rose to high levels on 17 August. Fluxes remained at high levels during the remainder of the period.

A geomagnetic field disturbance was in progress as the period began and continued until late 20 August. Active to minor storm levels occurred during the disturbance with brief major to severe storm periods detected at high latitudes. The disturbance, which ended late on 20 August, appeared to be due to a high-speed coronal hole windstream. Field activity declined to quiet to unsettled levels for the remainder of the period.

**Space Weather Outlook
25 August - 20 September 1999**

Solar activity is expected to range from low to moderate levels. There will be a chance for more major flare activity from Region 8674 before it departs the visible disk around 01 September.

There will be a slight chance for a proton event at geo-synchronous orbit.

The greater than 2 MeV electron flux at geo-synchronous altitude is expected to be at moderate to high levels during the first two days, then decrease to normal to moderate levels through 12 September. High levels are also expected around 13 - 18 September. Normal to moderate levels are expected for the remainder of the period.

Geomagnetic field activity is expected to be at unsettled to active levels on 25 August.



Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No. (10 ⁶ hemi.)	Sunspot Area	X-ray Background	Flares							
					X-ray Flux			Optical				
					C	M	X	S	1	2	3	
16 August	131	71	490	B5.3	2	0	0	5	0	0	0	0
17 August	141	67	460	B3.2	3	0	0	5	0	0	0	0
18 August	131	69	490	B9.1	3	0	0	3	0	0	0	0
19 August	135	68	490	C3.5	0	1	0	1	1	0	0	0
20 August	152	65	770	C1.8	5	3	0	9	1	0	0	0
21 August	161	79	1040	C1.0	5	2	0	3	2	0	0	0
22 August	173	78	1170	B7.9	10	0	0	8	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
16 August	1.9E+5	1.5E+4	3.4E+3		8.8E+5	
17 August	6.4E+5	1.4E+4	3.2E+3		3.0E+7	
18 August	6.6E+5	1.3E+4	3.0E+3		1.3E+8	
19 August	1.1E+6	1.4E+4	3.0E+3		5.9E+8	
20 August	3.0E+6	1.3E+4	2.4E+3		2.2E+8	
21 August	2.9E+5	1.2E+4	2.4E+3		2.5E+8	
22 August	2.5E+5	1.1E+4	2.4E+3		3.2E+8	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	16 August	22	2-2-4-5-4-3-4-3	*	*-*-*-*-*-*-*	29
17 August	25	5-4-5-3-4-3-3-2	*	*-*-*-*-*-*-*	27	5-4-5-4-4-4-3-3
18 August	28	4-5-5-3-4-4-3-3	*	*-*-*-*-*-*-*	26	4-5-5-4-4-4-3-3
19 August	19	3-3-4-3-4-2-3-4	41	3-5-6-5-6-4-3-3	22	3-5-4-4-3-3-3-4
20 August	22	3-5-4-4-4-2-2-3	65	4-4-6-7-6-7-2-3	33	3-5-5-5-5-4-3-3
21 August	4	1-1-2-1-2-2-1-0	10	2-2-2-3-2-4-1-1	6	1-2-2-2-2-2-2-2
22 August	7	0-1-3-1-1-2-2-3	18	0-1-3-3-5-4-4-2	11	1-1-3-2-3-3-3-3



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>
16 Aug 0035	1- 245 MHz Bursts	15 Aug
16 Aug 0902	K= 4 Observed	16 Aug from 0600 - 0900
16 Aug 0906	K= 4 Warning valid	16 Aug 0900 -1200
16 Aug 1208	A = 20 Observed	16 Aug 1200
16 Aug 1208	K= 5 Observed	16 Aug 0900 - 1200
16 Aug 1208	K= 5 Warning valid	16 Aug 1200 - 1500
16 Aug 1512	K= 4 Warning valid	16 /1500 - 17 /0000 Aug
17 Aug 0017	1- 245 MHz Burst	16 Aug
17 Aug 0056	K= 4 Warning	17 Aug 0100 - 1500
17 Aug 0300	K= 5 Observed	17 Aug 0000 - 0300
17 Aug 0532	Type II Radio Emission	17 Aug 0453
17 Aug 0600	A = 30 Observed	17 Aug 0600
17 Aug 0600	K= 5 Observed	17 Aug 03 - 06
17 Aug 0900	K= 5 Observed	17 Aug 06 - 09
17 Aug 0900	K= 5 Warning valid	17 Aug 09 - 12
17 Aug 1200	CONTINUED A = 30 Observed	17 Aug 0600
17 Aug 1528	Type II Radio Emission	17 Aug 1442
17 Aug 1637	>2MeV Electron Event = 1000pfu	17 Aug 1540
17 Aug 2032	K= 4 Observed	17 Aug 15 - 18
17 Aug 2032	K= 4 Warning	17/1800 –18/1500 Aug
18 Aug 0035	5-245 MHz Bursts	17 Aug
18 Aug 0035	245 MHz Noise Storm	17 Aug
18 Aug 0607	K= 5 Observed	18 Aug 03 -06
18 Aug 0607	K= 5 Warning	18 Aug 06 - 12
18 Aug 1200	CONTINUED >2MeV Electron Event = 1000pfu	17 Aug 1540
18 Aug 1503	CONTINUED K= 4 Warning	19 Aug 1500
18 Aug 2219	ENDED A = 30 Observed	17 Aug 0600
19 Aug 1200	CONTINUED A = 20 Observed	16 Aug 1200
19 Aug 1200	CONTINUED >2MeV Electron Event = 1000pfu	17 Aug 1540
20 Aug 0009	5-245 MHz Bursts	19 Aug
20 Aug 0313	K= 4 Warning	20 Aug 03 - 09
20 Aug 0600	K= 5 Observed	20 Aug 03 - 06
20 Aug 0829	CONTINUED K= 4 Warning	20 Aug 09 - 12
20 Aug 1200	CONTINUED A = 20 Observed	16 Aug 1200
20 Aug 1200	CONTINUED >2MeV Electron Event = 1000pfu	17 Aug 1540
20 Aug 1504	K-Index of 4 Observed	20 Aug 12 - 15
20 Aug 1504	K= 4 Warning valid	20 Aug 15 - 21
20 Aug 1921	10cm Radio Burst 180 s.f.u.	20 Aug 1827
20 Aug 1921	Type II Radio Emission	20 Aug 1839
20 Aug 2310	Rapid Alert: X-Ray event exceeded >M5 threshold	20 Aug 2309
20 Aug 2324	10cm Radio Burst 460 s.f.u.	20 Aug 2315
20 Aug 2356	Type II Radio Emission	20 Aug 2318
21 Aug 0059	10 - 245 MHz Bursts	20 Aug
21 Aug 0034	10cm Radio Burst 450 s.f.u.	21 Aug 0033
21 Aug 0034	X-Ray event M9.8/1N/S25E64	20 Aug 2303

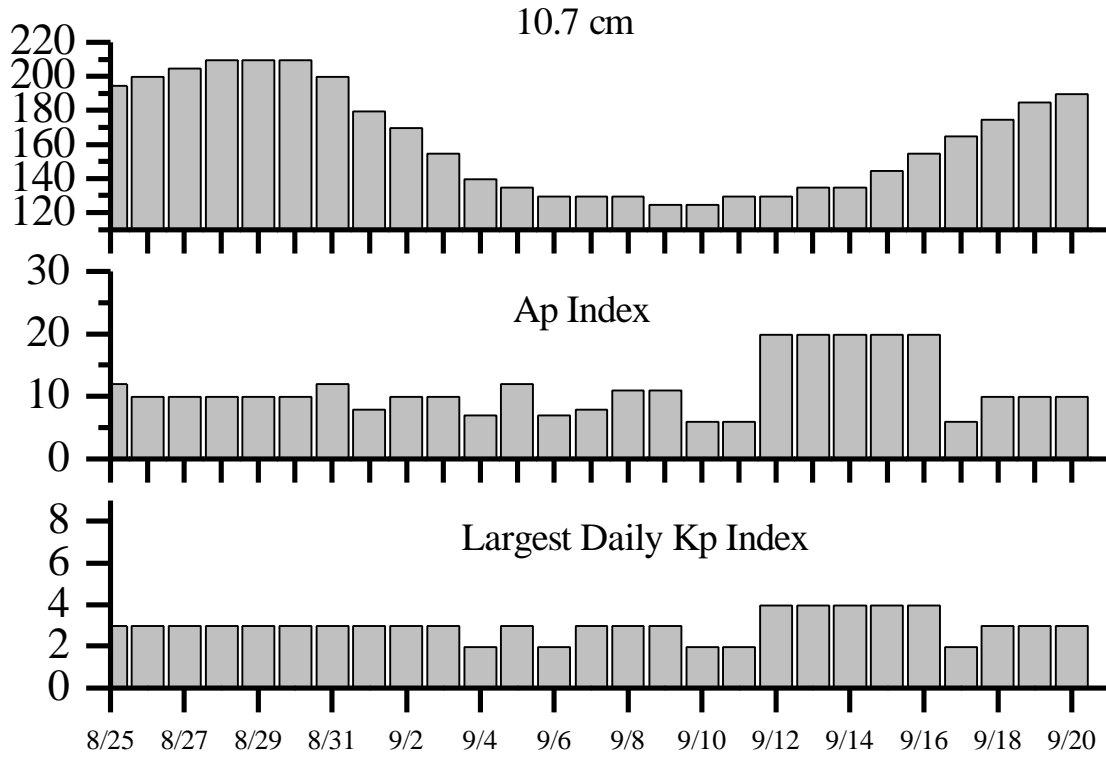


Alerts and Warnings Issued – continued.

Date and Time of Issue (UT)	Type of Alert or Warning	
21 Aug 1201	CONTINUED >2MeV Electron Event =1000pfu	17 Aug 1540
21 Aug 1734	10cm Radio Burst 290 s.f.u.	21 Aug 1633
21 Aug 1734	Type II Radio Emission	21 Aug 1652
21 Aug 2217	Rapid Alert: X-Ray event exceeded >M5 threshold	21 Aug 2212
21 Aug 2225	X-Ray event M5.9/1N/S24E52	21 Aug 2210
21 Aug 2232	10cm Radio Burst 250 s.f.u.	21 Aug 2212
22 Aug 0101	4 - 245 MHz Bursts	21 Aug
22 Aug 1201	CONTINUED >2MeV Electron Event = 1000pfu	17 Aug 1540
22 Aug 1507	Type II Radio Emission	22 Aug 1413



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
25 Aug	195	12	3	08	130	11	3
26	200	10	3	09	125	11	3
27	205	10	3	10	125	6	2
28	210	10	3	11	130	6	2
29	200	10	3	12	130	20	4
30	180	10	3	13	135	20	4
31	170	12	3	14	135	20	4
01 Sep	180	8	3	15	145	20	4
02	170	10	3	16	155	20	4
03	155	10	3	17	165	6	2
04	140	7	2	18	175	10	3
05	135	12	3	19	185	10	3
06	130	7	2	20	190	10	3
07	130	8	3				



Energetic Events

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	½	Class	Integ Flux	Imp/ Brtns	Location		Radio Flux		Intensity	
			Max				Lat	CMD	245	2695	II	IV
20 Aug	1236	1418	1706	M1.8	.180	SF	S28E75	8674	1900	51		
20 Aug	1825	1829	1832	M1.2	.003	SF	S23E66	8674	6100	180		
20 Aug	2303	2308	2310	M9.8	.020	1N	S25E64	8674	13000	480		2
21 Aug	1630	1634	1637	M3.7	.008	1B	S25E56	8674	9600	290		2
21 Aug	2210	2214	2216	M5.9	.010	1N	S24E52	8674	170	250		

Flare List

Date	Time			X-ray Class.	Optical Imp / Brtns	Location Lat CMD	Rgn #
	Begin	Max	End				
16 August	0018	0024	0045	C1.3	SF	N19E50	8668
	1147	1148	1154		SF	N23E50	8668
	1335	1335	1346		SF	N24E47	8668
	1634	1641	1645	B8.1	SF	N24E47	8668
	1727	1732	1739	B9.7			
17 August	2016	2026	2040	C1.2	SF	N24E40	8668
	0324	0326	0328	B9.5	SF	N23E42	8668
	B1247	U1250	1405	C2.6	SF	N26E35	8668
	1433	1435	1440		SF	S17W81	8662
	1505	1522	1634	C5.9	SF	N24E37	8668
18 August	2349	2352	0002	C4.9	SF	S18W84	8662
	0621	0627	0636	C3.0			
	0921	1043	1138	C7.8			
	1151	1154	1203		SF	N14E05	8672
	1717	1719	1725		SF	N14E02	8672
19 August	2107	2249	0208	C4.9			
	2148	2148	2152		SF	N15W0	8672
	1139	1149	1258		SF	N16E04	8668
	1159	1204	1238	M1.0	1N	N13W0	8672
	20 August	0003	0022	0126	C4.1		
0548		0553	0601	C2.5			
0716		0726	0745	C6.0			
0827		0833	0851		SF	N21W0	8668
1302		1302	1308		SF	S28E76	8674
1309		1313	1316		SF	S29E78	8674
1407		1408	1429	M1.8	SF	S28E75	8674
1535		1538	1546		SF	N14W2	8672
1551		1552	1605		SF	S26E75	8673
1712		1714	1718		SF	S24E68	8674



Flare List-continued

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
20 August	1828	1828	1835	M1.2	SF	S23E66	8674
	1923	1923	1928	C7.8	SF	S23E66	8674
	2054	2101	2106	C5.1			
	B2301	2310	2317	M9.8	1N	S25E64	8674
21 August	0152	0201	0221	C3.7			
	1103	1103	1106	C5.2	SF	S26E58	8674
	1414	1416	1418		SF	N22W1	8668
	1505	1513	1525	C2.2			
	1633	1634	1639	M3.7	1B	S25E56	8674
	1724	1745	1912	C2.0			
	1940	1941	1945		SF	S24E52	8674
	2208	2213	2220	M5.9	1N	S24E52	8674
	2316	2323	2343	C2.4			
22 August	0054	0114	0144	C1.3			
	0157	0218	0253	C2.9			
	0952	0956	1004	C1.3			
	B1123	U1123	A1128		SF	N24W3	8668
	1407	1412	1421	C5.3	SN	S28E43	8674
	1424	1432	1436	C2.0	SF	S28E43	8674
	1503	1504	1511	C2.1	SF	S25E44	8674
	1521	1522	1527		SF	S25E44	8674
	1548	1551	1600	C9.8	SF	S25E43	8674
	1724	1725	1728		SF	S25E42	8674
	1804	1805	1816	C2.1	SF	S27E40	8674
	2006	2022	2032	C1.8			
	2138	2149	2216	C2.0			



Region Summary

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

Region 8662

06 Aug	S16E60	087	0020	08	CRO	006	B												2
07 Aug	S16E50	084	0100	10	DAO	010	B												4
08 Aug	S16E35	085	0130	11	ESO	019	B	4											7
09 Aug	S16E21	086	0230	12	EAC	027	B												3
10 Aug	S16E07	086	0290	16	FAI	043	BG	4											5 1
11 Aug	S15W06	086	0290	16	FAI	039	BG												3
12 Aug	S16W19	086	0180	15	EAI	037	B												1
13 Aug	S16W33	087	0170	17	FAI	025	B	3											6
14 Aug	S16W46	087	0130	16	FSI	015	B	2											3
15 Aug	S15W59	087	0100	16	FSO	009	B	1											1
16 Aug	S15W75	089	0040	06	CSO	003	B												
17 Aug	S16W90	091	0040	02	HRX	001	A	1											2
15 0 0 36 2 0 0 0																			

Crossed West Limb.

Absolute heliographic longitude: 086

Region 8664

08 Aug	N23E15	105	0010	03	BXO	002	B												
09 Aug	N23E02	105	0010	04	BXO	004	B												
10 Aug	N23W1	105																	
11 Aug	N23W2	105																	
12 Aug	N23W3	105																	
13 Aug	N23W5	105																	
14 Aug	N23W6	105																	
15 Aug	N23W7	105																	
16 Aug	N23W8	105																	
0 0 0 0 0 0 0 0																			

Crossed West Limb.

Absolute heliographic longitude: 105



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 8673</i>																		
19 Aug	S17E81	254	0100	03	HSX	001	A											
20 Aug	S19E66	256	0280	05	HHX	002	A						1					
21 Aug	S19E55	253	0400	16	FHO	016	B											
22 Aug	S20E43	252	0490	10	DKO	013	B											
								0	0	0	1	0	0	0	0	0		
Still on Disk.																		
Absolute heliographic longitude: 252																		
<i>Region 8674</i>																		
20 Aug	S24E66	256	0180	11	EKO	005	B	1	3		6	1						
21 Aug	S25E60	248	0400	22	FAO	010	B	1	2		2	2						
22 Aug	S25E48	247	0440	22	FAI	018	B	5			7							
								7	5	0	15	3	0	0	0	0		
Still on Disk.																		
Absolute heliographic longitude: 247																		



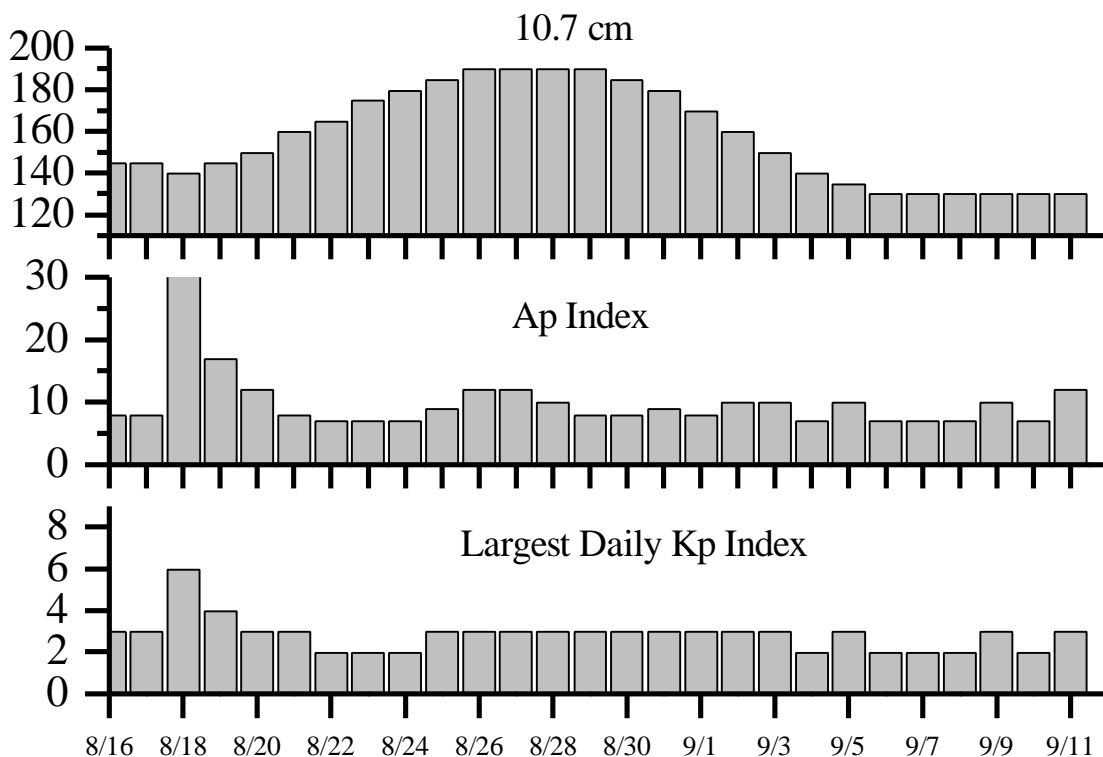
**Recent Solar Indices (preliminary)
of the observed monthly mean values**

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
1997									
August	36.7	24.4	0.66	35.9	25.0	79.0	83.4	07	08.3
September	52.8	51.3	0.88	40.5	28.3	96.2	85.7	10	08.4
October	33.6	22.8	0.68	45.4	31.8	84.9	88.6	11	08.6
November	53.5	39.0	0.73	49.3	35.0	99.5	91.3	11	09.0
December	57.9	41.2	0.71	54.2	39.0	98.8	94.2	05	09.5
1998									
January	51.8	31.9	0.62	60.6	43.7	93.4	97.5	08	09.9
February	54.4	40.3	0.74	67.4	48.8	93.4	101.7	08	10.5
March	81.8	54.8	0.67	73.3	53.4	109.1	105.8	13	11.1
April	73.6	53.4	0.73	77.7	56.5	108.3	109.1	10	11.3
May	74.3	56.3	0.76	81.4	59.3	106.7	112.4	18	11.6
June	93.6	70.7	0.76	85.9	62.4	108.4	116.2	10	11.9
July	98.3	66.2	0.67	90.3	65.4	114.0	120.3	11	12.2
August	118.6	91.7	0.77	93.7	67.8	136.0	124.1	18	12.4
September	119.0	92.9	0.78	96.1	69.4	138.4	126.8	13	12.5
October	77.0	55.5	0.72	97.7	70.5	117.3	127.9	13	12.5
November	99.5	74.0	0.74	101.3	73.0	140.2	130.0	16	12.3
December	120.8	81.9	0.69	108.8	77.9	150.1	134.3	08	11.9
1999									
January	94.3	62.4	0.66	116.5	82.5	142.6	139.0	10	11.8
February	93.4	66.1	0.70			142.0		11	
March	100.5	69.1	0.69			126.3		13	
April	92.9	63.9	0.69			117.3		12	
May	140.5	106.3	0.76			148.6		10	
June	208.3	137.4	0.66			170.0		08	
July	169.2	113.5	0.67			165.6		10	

NOTE: All smoothed values after January 1998 and monthly values after September 1998 are 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. * 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 16 August 1999

Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

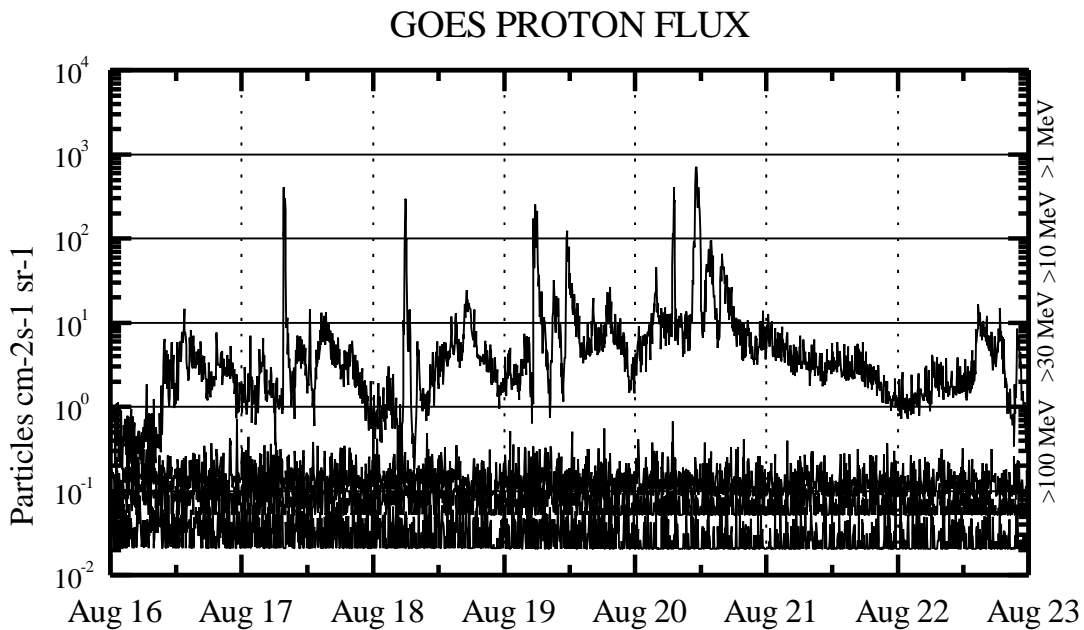
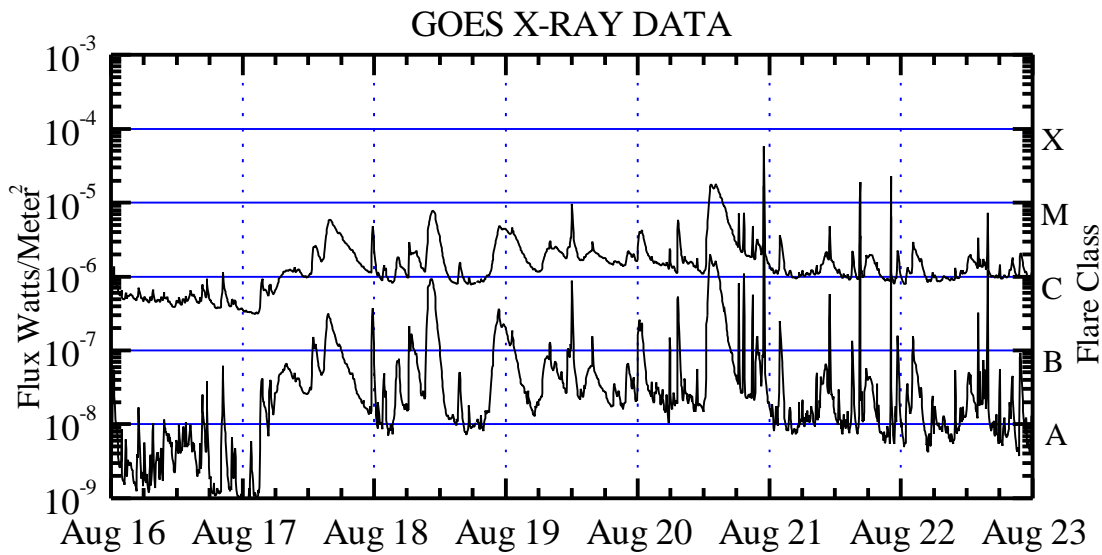
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-8.

H_p 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_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_{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 (watts / m²) 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/cm² –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/cm²-sec-sr) at greater than 10 MeV.

