

**Space Weather Highlights
13-19 September 1999**

Solar activity was predominately low with a single moderate event occurring during the period. Region 8690 (N16, L=025, class/area Eao/310 on 17 September) produced an M1/SF flare at 17/0120UT. A partial-halo Coronal Mass Ejection (CME) was observed by the LASCO/SOHO spacecraft following a 50-degree disappearing solar filament (DSF) that occurred 16/1508-1615UT. Region 8699 (N23, L=003, class/area Eso/170 on 19 September) Showed rapid growth at the beginning of the period, and then stabilized for the remainder, producing minor c-class subflares. The other region of note was Region 8700 (N12, L=290, class/area Dri/070 on 19 September) which developed a mixed polarity sunspot group and produced numerous c-class flares.

Real-time solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft for most of the period. The majority of the period was dominated by high speed coronal hole conditions. Wind speeds were high, ranging from 550 to 650 km/sec until September 19th when the wind speed dropped to 410 km/sec. IMF Bz fluctuated between northward and southward for most of the week with prolonged periods of predominately southward conditions. ACE real-time solar wind measurements indicated the arrival of a high speed shock at 15/0700UT. At that time the wind speed increased to 700 km/sec with a short period of sustained southward Bz that reached a maximum of minus 15 nT. This event was followed by a sudden impulse at Earth at 15/2019UT (8 nT, as measured by the Boulder USGS Magnetometer).

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

The greater than 2 MeV electron flux rose to high levels from September 17-19.

The geomagnetic field was at quiet to minor storm conditions, with minor to major conditions occurring at high latitudes. These conditions were associated with a high-speed coronal hole stream. Conditions on September 15 increased to minor storm levels at mid-latitudes and severe storming at high latitudes in conjunction with the high-speed shock discussed above. The effects of the high-speed stream began to diminish on September 19th with quiet to unsettled conditions.

**Space Weather Outlook
22 September - 18 October 1999**

Solar activity is expected to range from low to moderate levels with a slight chance for major flares.

There will be a slight 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.

Geomagnetic field activity is expected vary from quiet to unsettled levels during most of the period.



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	
13 September	155	183	800	B6.0	5	0	0	4	1	0	0	0
14 September	156	158	850	B6.0	13	0	0	3	0	0	0	0
15 September	155	155	880	B6.9	6	0	0	7	0	0	0	0
16 September	158	153	1030	B5.7	7	0	0	5	0	0	0	0
17 September	158	144	930	B5.7	8	1	0	12	0	1	0	0
18 September	152	152	670	B9.5	5	0	0	11	0	0	0	0
19 September	149	113	570	B8.2	5	0	0	8	1	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
13	1.2E+6	1.3E+4	2.6E+3		2.1E+7	
14	1.9E+6	2.2E+4	2.5E+3		8.2E+7	
15	4.3E+6	1.6E+4	2.6E+3		4.0E+8	
16	2.0E+6	1.3E+4	2.5E+3		1.7E+8	
17	4.2E+5	1.2E+4	2.6E+3		1.6E+8	
18	4.4E+5	1.2E+4	2.7E+3		1.4E+8	
19	2.8E+5	1.4E+4	3.0E+3		1.3E+8	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	13 September	23	4-5-4-3-3-3-4-2	*	6-6-6-6-5-5-5-*	38
14 September	22	4-5-5-3-2-3-3-2	34	3-5-6-5-3-5-2-2	23	4-5-5-3-3-3-3-3
15 September	21	4-3-5-5-3-1-2-2	*	3-5-7-7-5-4-5	32	4-3-5-7-4-3-3-2
16 September	18	3-4-4-4-2-3-3-2	63	3-6-7-6-6-5-3-5	32	3-6-5-5-4-4-3-2
17 September	9	2-1-1-2-3-3-3-2	32	3-2-3-4-6-6-4-2	15	3-2-2-3-4-4-4-2
18 September	13	1-3-2-4-4-3-1-1	*	*-*-*-*-*-*-*	16	2-3-3-4-4-4-3-2
19 September	9	2-3-1-3-3-1-2-2	18	3-3-2-5-5-2-1-1	10	2-3-2-3-3-3-2-2

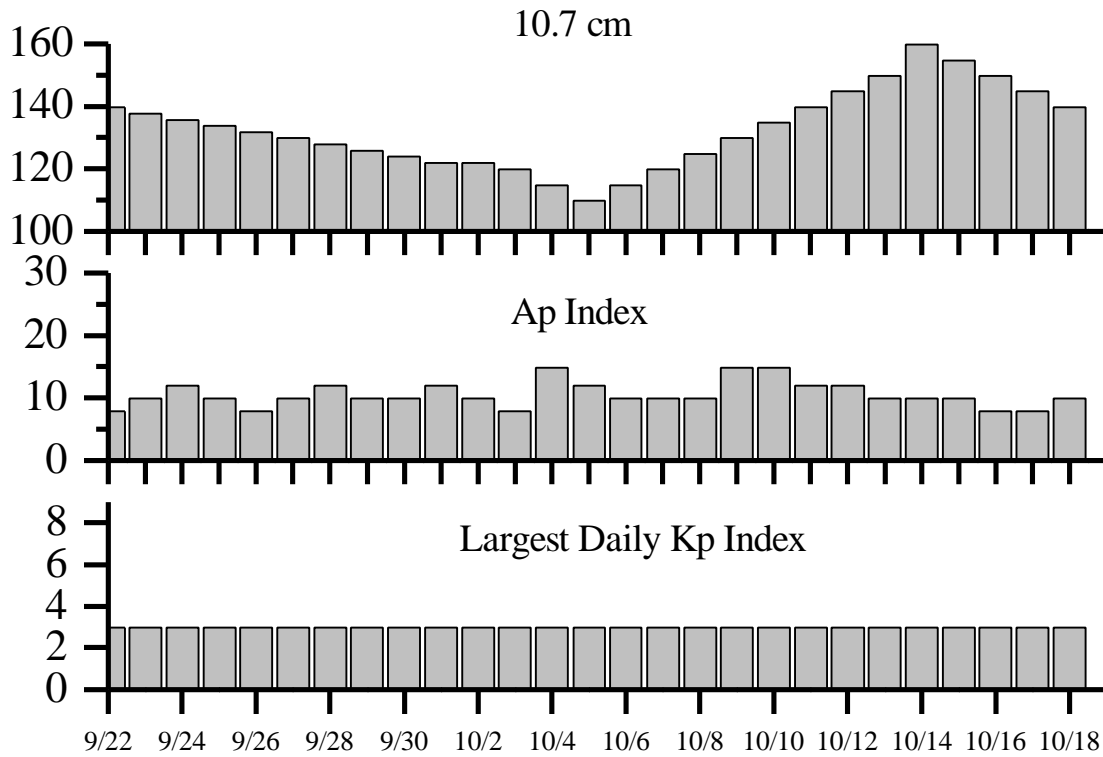


Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
13 Sep 0000	A \geq 20 Observed	12 Sep 2359
13 Sep 0137	A \geq 30 Warning valid	12 Sep 0400 - 13 Sep 1500
13 Sep 0300	A \geq 30 Observed	13 Sep 0300
13 Sep 0300	K= 6 Observed	13 Sep 00 - 03
13 Sep 0300	K= 6 Warning valid	13 Sep 03 - 12
13 Sep 1201	CONTINUED A \geq 30 Observed	13 Sep 0300
13 Sep 1713	Type II Radio Emission	13 Sep 1622
13 Sep 1752	K= 4 Warning valid	13 Sep 1800 - 14 Sep 1500
13 Sep 2130	K= 4 Observed	13 Sep 18 - 21
14 Sep 0100	5 - 245 MHz Burst	13 Sep
14 Sep 0019	>2MeV Electron Event \geq 1000pfu	14 Sep 0005
14 Sep 0600	ENDED A \geq 30 Observed	14 Sep 0000
14 Sep 0600	K= 5 Observed	14 Sep 03 - 06
14 Sep 0600	K= 5 Warning valid	14 Sep 0600 - 16 Sep 1200
14 Sep 1200	CONTINUED A \geq 20 Observed	12 Sep 2359
14 Sep 1200	CONTINUED >2MeV Electron Event \geq 1000pfu	14 Sep 0005
15 Sep 0050	4 - 245 MHz Bursts	14 Sep
15 Sep 1200	CONTINUED A \geq 20 Observed	12 Sep 2359
15 Sep 1200	>2MeV Electron Event \geq 1000pfu CONTINUED	14 Sep 0005
15 Sep 2111	Sudden Impulse Observed at Boulder 8 nT	15 Sep 2019
16 Sep 0103	4 - 245 MHz Bursts	15 Sep
16 Sep 1154	A \geq 20 Observed CONTINUED	12 Sep 2359
16 Sep 1156	>2MeV Electron Event \geq 1000pfu CONTINUED	14 Sep 0005
16 Sep 2157	A \geq 20 Watch	17 Sep
17 Sep 0015	1 - 245 MHz Bursts	16 Sep
17 Sep 1205	>2MeV Electron Event \geq 1000pfu CONTINUED	14 Sep 0005
18 Sep 1154	>2MeV Electron Event \geq 1000pfu CONTINUED	14 Sep 0005
18 Sep 1157	K= 4 Observed	18 Sep 09 - 12
18 Sep 1406	A \geq 30 Watch	20 Sep
18 Sep 1501	K= 4 Observed	18 Sep 12 - 15
18 Sep 1800	K= 4 Observed	18 Sep 15 - 18
19 Sep 1154	>2MeV Electron Event \geq 1000pfu CONTINUED	14 Sep 0005



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
22 Sep	140	8	3	06 Oct	115	10	3
23	138	10	3	07	120	10	3
24	136	12	3	08	125	10	3
25	134	10	3	09	130	15	3
26	132	8	3	10	135	15	3
27	130	10	3	11	140	12	3
28	128	12	3	12	145	12	3
29 Sep	126	10	3	13	150	10	3
30	124	10	3	14	160	10	3
01 Oct	122	12	3	15	155	10	3
02	122	10	3	16	150	8	3
03	120	8	3	17	145	8	3
04	115	15	3	18	140	10	3
05	110	12	3				



Energetic Events

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	Max	Class	Flux	Imp/ Brtns	Location Lat CMD	Rgn #	Radio Flux		Intensity	
									245	2695	II	IV
17 Sep	0114	0120	0123	M2.1	.006	SF	N14W64	8690	120			

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn #
	Begin	Max	End			Location Lat CMD		
13 Sep	0040	0048	0109	B9.8				
	0611	0614	0618	B7.6				
	0717	0724	0729	C2.5				
	0805	0846	0932	C4.9				8699
	0818	0838	0847		SF	N22E10		8699
	1633	1634	1639		SF	N15W17		8690
	B1638	1644	1759	C2.6	1N	N15E06		8693
	1735	1737	1740	C2.1	SF	N17E75		8700
	1933	1941	1944	C1.7				
	2242	2246	2303		SF	N21E03		8699
14 Sep	0054	0058	0102	C1.2				
	0202	0206	0208	C1.0				
	0211	0216	0227	C1.1				
	0230	0235	0239	C2.8				
	0329	0342	0357	C2.2				
	0359	0402	0404	C2.8				
	0544	0548	0553	C1.5				
	0646	0701	0724	C2.0				
	0920	0924	0928	C1.9				
	1049	1103	1109	C1.2				7
	1317	1321	1345	C1.1				
	1402	1403	1424	C1.8	SF	N13W28		8690
	1433	1434	1439		SF	N16E64		8700
1604	1605	1610	C1.0	SF	N20W04		8699	



Flare List-continued

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
15 Sep	0201	0205	0209	C1.2			
	0306	0309	0311	B9.4			
	0422	0427	0430	C1.1			
	B1200	U1200	1208	C2.2	SF	N11E45	8700
	1250	1405	1448	C2.9			
	1340	1346	1356		SF	N11E48	8700
	1929	2016	2027		SF	N13E46	8700
	2103	2103	2108	C1.2	SF	N15E48	8700
	2105	2108	2111	C1.5	SF	N22W20	8699
	2136	2137	2306		SF	N14E48	8700
	2219	2219	2232		SF	S31W26	8692
	16 Sep	0022	0026	0029	C1.0		
0131		0131	0139	C1.9	SF	N22W26	8699
0209		0212	0214	C1.0			
0325		0330	0346	C7.7	SF	N13E46	8700
0534		0534	0541	C1.2	SF	N22W28	8699
0958		1004	1008	C1.3			
1304		1305	1313	B9.9	SF	S26W35	8692
B2218		2220	2227	C1.1	SF	S25W46	8692
17 Sep	0115	0119	0130	M2.1	SF	N14W64	8690
	B0512	U0513	0527	C2.1	SF	N14E29	8700
	1027	1030	1033	C1.4			
	1130	1138	1142		SF	N19W80	8703
	1150	1204	1232	C4.5	SF	N18W81	8703
	1317	1318	1321		SF	N18W83	8703
	1354	1356	1414	C1.7	SF	N11E24	8700
	1433	1437	1444	C1.4			
	1552	1600	1612		SF	N13W70	8690
	1648	1650	1653		SF	N19W82	8703
	1737	1738	1744		SF	N21W82	8690
	1744	1747	1750		SF	N12W72	8690
	1755	1803	1827	C3.1	SF	S27W50	8692
	1953	1956	2001	C1.5	SF	N25W45	8699
	2205	2214	2303	C8.8	2F	N14E19	8700



Flare List-continued

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
18 Sep	0000	0007	0013		SF	N12E19	8700
	0439	0443	0450		SF	N11E17	8700
	0443	0443	0447		SF	N25W51	8699
	0625	0625	0628		SF	N11E15	8700
	0857	0902	0909	C1.7			
	0916	0920	0923	C1.9	SF	N25W52	8699
	1132	1133	1141		SF	N25W52	8699
	1414	1421	1459	C2.4	SF	N11E12	8700
	1514	1605	1609	C2.9			
	1820	1822	1827	C2.3	SF	N24W58	8699
	1930	1931	1943		SF	N14E07	8700
	2115	2137	2149		SF	N14E06	8700
	2151	2156	2200		SF	N14E06	8700
	19 Sep	0312	0316	0324	C1.7	SF	N14E03
0451		0451	0455		SF	N11E04	8700
0645		0645	0652	C1.2	SF	N22W67	8699
B1116		U1116	A1135	C3.2	SF	N21W68	8699
1225		1227	1230		SF	S26W75	8692
1322		1324	1326		SF	S30W71	8692
1409		1411	1416		SF	S30W73	8692
1418		1439	1503	C4.9	SF	N21W71	8699
2306		2308	2321	C9.6	1F	N21W76	8699



Region Summary

Date	Location		Sunspot Characteristics					Flares															
	(° Lat ° CMD)	Helio Lon	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical												
								C	M	X	S	1	2	3	4								
<i>Region 8690</i>																							
06 Sep	N13E73	024	0060	03	DAO	003	B																
07 Sep	N13E60	024	0080	03	DAO	005	BG	1				1											
08 Sep	N13E47	024	0050	04	DSO	008	BD		1				1										
09 Sep	N13E33	025	0040	05	CSO	014	BG	1				1											
10 Sep	N13E20	025	0060	06	DSO	014	B					1											
11 Sep	N14E06	026	0100	07	DSI	023	B					1											
12 Sep	N14W06	024	0090	08	DSI	025	B					1											
13 Sep	N15W20	025	0150	10	DAI	034	B					1											
14 Sep	N15W34	026	0210	10	DSI	031	B	1				1											
15 Sep	N15W48	027	0300	12	EKI	030	B																
16 Sep	N16W62	027	0440	12	EKI	023	B																
17 Sep	N16W74	025	0310	11	EAO	013	B		1			4											
18 Sep	N16W87	025	0110	10	DSO	007	B																
								3	2	0	11	1	0	0	0	0							

Crossed West Limb.

Absolute heliographic longitude: 026

Region 8692

07 Sep	S25E74	010	0090	08	DSO	006	B														
08 Sep	S27E60	011	0230	11	ESO	008	B														
09 Sep	S26E48	010	0340	10	DAO	012	BGD					1									
10 Sep	S27E36	009	0320	12	EAI	022	BG					5									
11 Sep	S27E23	009	0270	12	EAO	016	BG														
12 Sep	S26E11	007	0230	11	EAO	019	B					2									
13 Sep	S28W01	006	0260	12	EAI	030	B														
14 Sep	S27W14	006	0200	12	ESO	023	B														
15 Sep	S26W27	006	0160	13	CSO	019	B					1									
16 Sep	S26W41	006	0170	13	ESO	016	B	1				2									
17 Sep	S25W53	004	0170	12	EAO	008	B	1				1									
18 Sep	S25W69	007	0110	11	CSO	005	B														
19 Sep	S23W84	009	0060	02	HSX	001	A					3									
								2	0	0	15	0	0	0	0	0					

Still on Disk.

Absolute heliographic longitude: 006



Region Summary-continued

Date	Location		Sunspot Characteristics				Flares										
	(° Lat ° CMD)	Helio Lon	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical						
								C	M	X	S	1	2	3	4		
<i>Region 8701</i>																	
13 Sep	N18E13	352	0010	03	BXO	004	B										
14 Sep	N18E00	352															
15 Sep	N18W13	352															
16 Sep	N18W26	352															
17 Sep	N18W39	352															
18 Sep	N18W52	352															
19 Sep	N18W65	352															
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 352																	
<i>Region 8702</i>																	
16 Sep	N22E28	297	0000	03	BXO	002	B										
17 Sep	N22E15	297															
18 Sep	N24E03	295	0010	03	BXO	003	B										
19 Sep	N24W10	295															
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 295																	
<i>Region 8703</i>																	
17 Sep	N21W92	043	0000	01	AXX	001	A	1			4						
								1	0	0	4	0	0	0	0	0	0
Crossed West Limb.																	
Absolute heliographic longitude: 043																	
<i>Region 8704</i>																	
17 Sep	S21E63	248	0070	03	HSX	001	A										
18 Sep	S21E52	246	0110	10	CSO	005	B										
19 Sep	S22E42	243	0180	12	CSO	007	B										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 243																	
<i>Region 8705</i>																	
18 Sep	S11E28	270	0010	01	AXX	002	A										
19 Sep	S11E15	270															
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 270																	
<i>Region 8706</i>																	
19 Sep	N19E77	208	0080	02	HSX	001	A										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 208																	

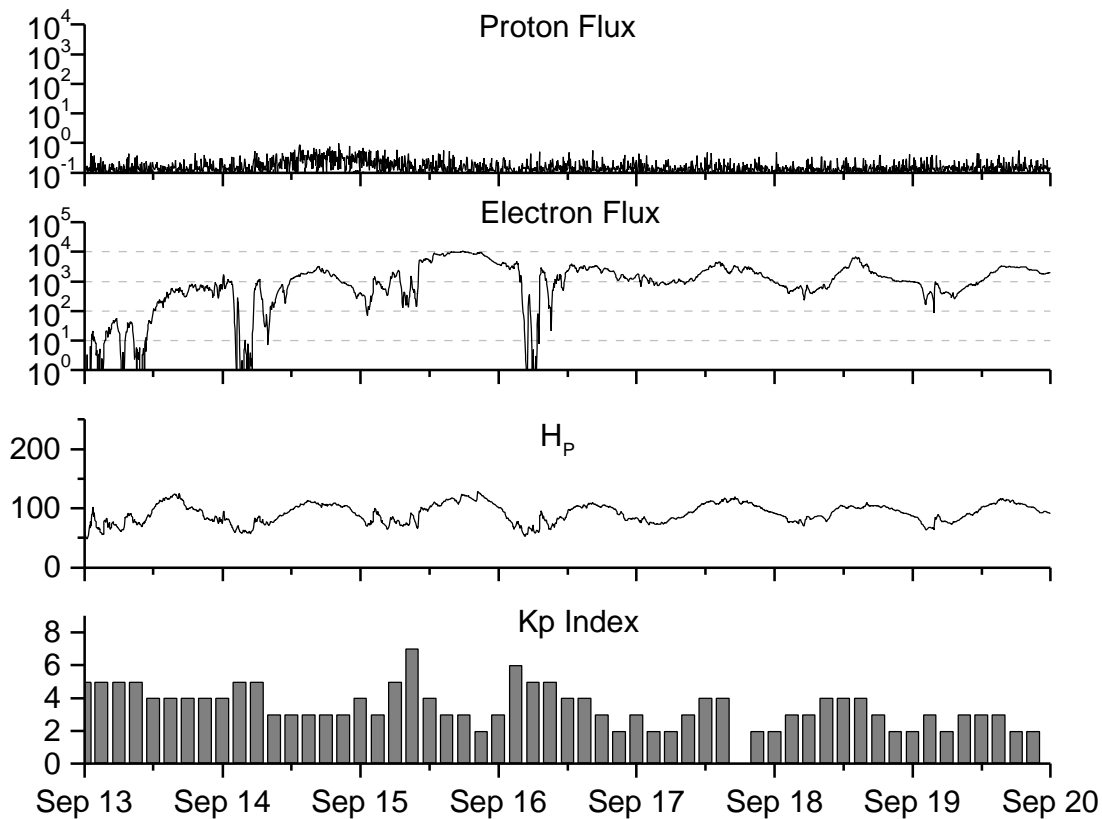


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

Month	Sunspot Numbers				Radio Flux		Geomagnetic		
	Observed values SWO	RI	Ratio RI/SWO	Smooth values SWO	RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
1997									
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	82.6	142.6	139.0	10	11.7
February	93.4	66.3	0.71	120.2	84.6	142.0	142.6	12	11.6
March	100.5	68.8	0.68			126.3		14	
April	92.9	63.9	0.69			117.2		12	
May	140.5	106.3	0.76			148.6		08	
June	208.3	137.4	0.66			170.0		07	
July	169.2	113.5	0.67			165.6		10	
August	136.1	93.7	0.69			170.8		15	

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 13 September 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.

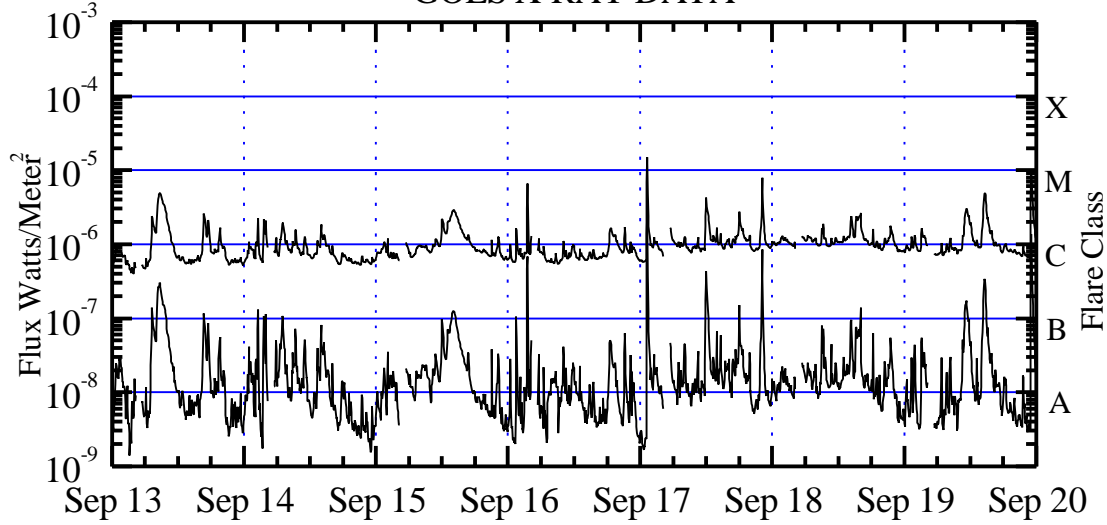
Hp plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-8. The H component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

Kp 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 Kp values derived from a more extensive network of magnetometers.

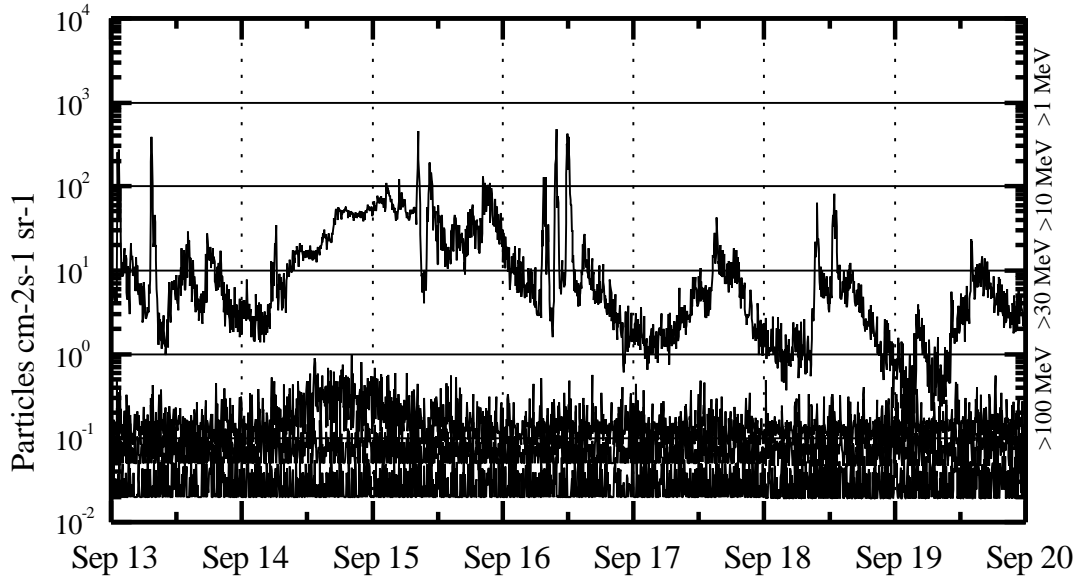
The data included here are those now available in real time at the SWO and are incomplete in that they do not include the full set of parameters and energy ranges known to cause satellite operating anomalies. The proton and electron fluxes and Kp are “ global ” parameters that are applicable to a first order approximation over large areas. Hparallel is subject to more localized phenomena and the measurements generally are applicable to within a few degrees of longitude of the measuring satellite.



GOES X-RAY DATA



GOES PROTON FLUX



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.

