

**Space Weather Highlights**  
**22 - 28 November 1999**

Solar activity was low for the first three days of the period and then increased to moderate to high levels for the remainder. Region 8771 (S14, L=173, class/area Eki/720 on 28 November) produced multiple M-class events during the period 25-28 November (see the Energetic Event list for event times/locations) including an X1/2B with a 260 SFU Tenflare on 27/1212UT. This region was starting to show some decay by the end of the period and was due to rotate off of the disk by 29 November. Region 8778 (S15, L=113, class/area Cao/80 on 24 November) produced an isolated M2/1B flare on 24/2156UT. The rest of the regions were mostly quiet and stable during the period.

Real-time solar wind data (SWEPAM) were available from the Advanced Composition Explorer (ACE) spacecraft for most of the period. Velocities ranged from 330 to 500 km/sec. There were periods of sustained southward IMF Bz detected during 23- 24 November.

No proton events were detected at geosynchronous orbit during the period.

The greater than 2 MeV electron varied from normal to moderate levels.

Geomagnetic field activity ranged from quiet to active levels during the first half of the period decreasing to quiet to unsettled during the second half. Isolated minor to major storming periods occurred during 24-25 November.

**Space Weather Outlook**  
**01 - 27 December 1999**

Solar activity is expected to range from low to high levels. Frequent C-class flares are likely. Isolated M-class flares will be possible throughout the period. There is also a chance for an isolated major flare as potentially active Regions 8765, 8766, and 8771 are due to return on 7-13 December.

There is a chance for a solar proton event at geosynchronous orbit when the above mentioned regions return starting on 07 December.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be at moderate to high levels during 05 - 10 December with normal to moderate levels during the remainder of the period.

The geomagnetic field is expected to be at unsettled to minor storm levels during 04 - 08 December due to recurrent coronal hole effects. Otherwise, activity is expected to vary between quiet and unsettled levels (barring any Earth-directed coronal mass ejections).



### 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	4
22 November	192	179	1340	C1.2	7	0	0	24	0	0	0	0
23 November	186	157	1220	C1.2	5	0	0	16	0	0	0	0
24 November	187	157	1090	C1.1	10	2	0	21	2	0	0	0
25 November	184	147	1100	C1.5	9	1	0	17	2	1	0	0
26 November	172	143	1030	C1.1	8	3	0	17	0	2	1	0
27 November	169	187	1160	C1.2	10	2	1	12	4	1	0	0
28 November	175	173	730	B9.9	8	3	0	20	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
	22 November	3.8E+5	1.2E+4	2.5E+3		1.1E+7
23 November	1.0E+6	1.3E+4	2.4E+3		1.1E+7	
24 November	3.9E+5	1.2E+4	2.6E+3		1.3E+7	
25 November	5.0E+5	1.3E+4	2.7E+3		1.2E+7	
26 November	5.8E+4	1.3E+4	2.7E+3		4.7E+6	
27 November	8.0E+4	1.3E+4	2.9E+3		1.0E+7	
28 November	2.4E+5	1.3E+4	2.8E+3		4.9E+6	

### Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	22 November	8	3-1-2-3-3-2-0-1	30	2-0-5-6-6-3-1-1	10
23 November	13	1-4-3-3-2-1-2-4	36	0-2-6-5-6-4-4-3	15	1-3-4-4-3-3-3-4
24 November	14	2-2-4-5-2-1-2-1	29	2-1-5-6-5-4-3-2	19	2-3-4-5-3-3-3-1
25 November	17	2-2-2-5-5-2-2-2	33	0-3-4-7-5-3-3-2	18	1-2-3-6-4-3-3-2
26 November	2	0-0-1-2-2-0-0-0	4	1-1-1-3-4-0-0-0	4	1-0-2-2-2-1-1-1
27 November	1	0-0-0-0-1-0-0-1	1	0-0-0-0-1-0-0-1	3	0-0-1-1-1-2-1-1
28 November	7	2-2-2-2-2-2-1-2	9	0-1-3-3-3-2-2-2	7	2-2-3-2-1-3-2-2

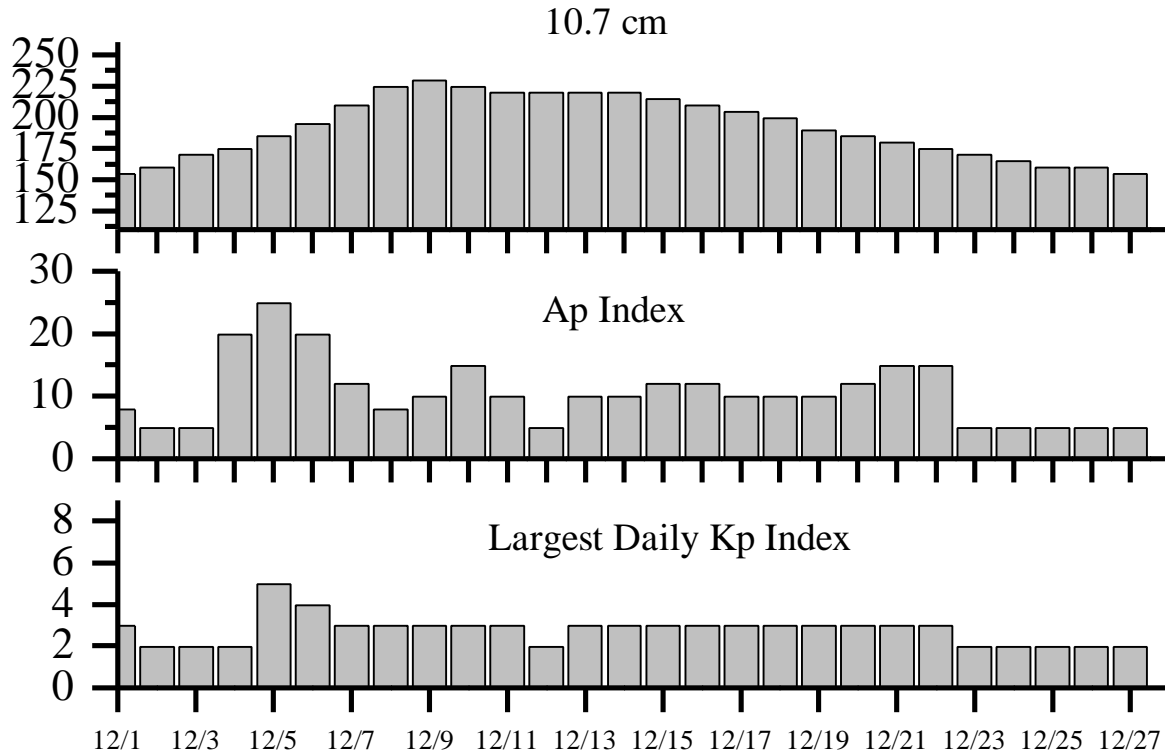


### *Alerts and Warnings Issued*

Date & Time of Issue (UT)	Type of Alert or Warning	Date & Time of Event (UT)
22 Nov 0024	3 - 245 MHz Bursts	21 Nov
22 Nov 0024	245 MHz Noise Storm	21 Nov
22 Nov 1505	K= 4 Observed	22 Nov 12 - 15
23 Nov 0600	K= 4 Observed	23 Nov 03 - 06
23 Nov 0634	K= 4 Warning	23 Nov 06 - 15
23 Nov 1436	CONTINUED K= 4 Warning	23 Nov 15 - 18
23 Nov 1655	CANCELLED K= 4 Warning	23 Nov 15 - 18
23 Nov 2018	Type II Radio Emission	23 Nov 1916
24 Nov 0058	8 - 245 MHz Bursts	23 Nov
24 Nov 0058	245 MHz Noise Storm	23 Nov
24 Nov 0901	K= 4 Observed	24 Nov 06 - 09
24 Nov 0904	K= 4 Warning	24 Nov 09 - 15
24 Nov 1159	K= 5 Observed	24 Nov 09 - 12
24 Nov 1459	A $\geq$ 20 Observed	24 Nov 1500
25 Nov 0142	13 - 245 MHz Bursts	24 Nov
25 Nov 0142	245 MHz Noise Storm	24 Nov
25 Nov 0959	K= 4 Warning	25 Nov 12 - 15
25 Nov 1136	K= 5 Warning	25 Nov 12 - 18
25 Nov 1155	CONTINUED A $\geq$ 20 Observed	24 Nov 1500
25 Nov 1157	K=6 Observed	25 Nov 09 - 12
26 Nov 0114	22 - 245 MHz Bursts	25 Nov
26 Nov 0114	245 MHz Noise Storm	25 Nov
26 Nov 0147	10cm Radio Burst 210 s.f.u.	26 Nov 0120
26 Nov 0147	X-Ray event M5.7/3B	26 Nov 0110
26 Nov 0942	Type II Radio Emission	26 Nov 0712
26 Nov 1413	X-Ray event M6.0/2N	26 Nov 1338
27 Nov 0108	5 - 245 MHz Bursts	26 Nov
27 Nov 0108	245 MHz Noise Storm	21 Nov
27 Nov 1219	X-Ray event X1.4/2B	27 Nov 1205
27 Nov 1309	10cm Radio Burst 260 s.f.u.	27 Nov 1208
28 Nov 0023	2 - 245 MHz Bursts	27 Nov



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
01 Dec	155	8	3	15 Dec	215	12	3
02	160	5	2	16	210	12	3
03	170	5	2	17	205	10	3
04	175	20	4	18	200	10	3
05	185	25	5	19	190	10	3
06	195	20	4	20	185	12	3
07	210	12	3	21	180	15	3
08	225	8	3	22	175	15	3
09	230	10	3	23	170	5	2
10	225	15	3	24	165	5	2
11	220	10	3	25	160	5	2
12	220	5	3	26	160	5	2
13	220	10	3	27	155	5	2
14	220	10	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				Rgn #	Lat	CMD	245	2695	II
24 Nov	2152	2156	2158	M2.2	.003	1B	S13E20	8778	6900	32		
24 Nov	2327	2337	2344	M3.0	.020	SF	S19W43	8771	400	82	1	
25 Nov	1859	1919	1929	M2.0	.021	2N	S15W48	8771		48		
26 Nov	0110	0123	0138	M5.7	.049	3B	S14W55	8771	120	210		
26 Nov	0350	0400	0414	M1.9	.017	2B	S19W58	8771				
26 Nov	1338	1343	1408	M6.0	.066	2N	S15W59	8771		77		
27 Nov	0236	0301	0312	M2.8	.038	1N	S19W71	8771				
27 Nov	0543	0549	0558	M1.2	.009	1N	S14W66	8771				
27 Nov	1205	1212	1216	X1.4	.046	2B	S15W68	8771		260		
28 Nov	0126	0146	0200	M3.5	.039	SN	S19W83	8771				
28 Nov	0549	0557	0607	M1.1	.010	SF	S15W81	8771				
28 Nov	1800	1917	1955	M1.6	.079							

### *Flare List*

Date	Time			X-ray Class.	Optical Imp / Brtns	Location Lat CMD	Rgn #
	Begin	Max	End				
22 November	0147	0149	0154		SF	S19W04	8771
	0216	0216	0223	C3.2	SN	S09W67	8765
	0253	0258	0304	C2.9			
	0344	0346	0351		SF	S15W67	8765
	0408	0435	0501		SF	S28E09	8776
	0445	0454	0535		SF	S18E01	8771
	0508	0514	0515		SF	N16W67	8768
	0618	0621	0627		SF	S16W01	8771
	0636	0636	0646		SF	S15W06	8771
	0651	0658	0711		SF	S19W07	8771
	0841	0841	0851		SF	S26E36	8777
	0948	0948	0954		SF	S14W65	8765
	1227	1227	A1312	C8.9	SF	S16W75	8765
	1441	1442	A1502		SF	N06E23	8772
	1652	1654	1656		SF	N15W78	8768
	1702	1703	1713	C1.6	SF	S18W03	8771
	1710	1711	1714		SF	S14E57	8778
	1723	1723	1728	C3.9	SF	S27E01	8776
	1755	1757	1806		SF	S14E56	8778
	1941	1949	2017	C3.5	SF	S15E54	8778
	2115	2115	2120		SF	S18W08	8771
	2154	2156	2204	C1.7	SF	S16W05	8771
	2302	2306	2313		SF	N18W50	8766
	2344	2354	0015		SF	N18W49	8766
	2345	2347	0000		SF	S15E50	8778



*Flare List-continued*

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
23 November	0222	0222	0234		SF	S16W15	8771
	0229	0231	0236		SF	N17W77	8768
	0342	0342	0350		SF	S14W10	8771
	0359	0405	0427	C2.0	SF	S16W16	8771
	0441	0446	0506		SF	S19W19	8771
	0509	0510	0512		SF	S19W19	8771
	0615	0618	0620		SF	S16W15	8771
	0625	0626	0644	C2.0	SF	S19W20	8771
	0654	0656	0659		SF	N04E13	8772
	0749	0749	0754		SF	S20W16	8771
	0937	0939	0941		SF	S19W22	8771
	0944	0945	0952		SF	S26E21	8777
23 November	1405	1410	1418	C1.8			
	1841	1841	1852		SF	S19W20	8771
	2046	2051	2055	C1.3			
	2216	2216	2226	C1.6	SF	S15W25	8771
	2222	2225	2254		SF	S16E39	8778
2333	2334	A2340		SF	S15E39	8778	
24 November	0056	0057	0123	C2.5	SF	S15E37	8778
	0135	0136	0145		SF	S15W30	8771
	0142	0207	0247		SF	S14E37	8778
	0213	0214	0221		SF	N18W75	8766
	0231	0231	0236		SF	S16W27	8771
	0305	0309	0332		SF	S19W31	8771
	0332	0354	0409		SF	S14W29	8771
	0634	0636	0644	C1.5	SF	S19W33	8771
	0715	0716	0721		SF	S19W34	8771
	0722	0723	0726		SF	S19W34	8771
	0746	0748	0750		SF	S14E34	8778
	0838	0839	0840		SF	S14W90	8765
	0854	0859	0907	C1.6			
	0919	0924	0927	C7.2			
	1004	1010	1022		SF	S14E27	8778
	1036	1044	1102	C1.9			
	1206	1222	1236	C9.6			
	B1501	1507	1518	C1.6	SF	S15E30	8778
	1540	1540	1547		SF	S15E30	8778
	1547	1548	1558		SF	S20W32	8771
1719	1724	1756	C1.6	SF	S16E28	8778	
1825	1825	1833		SF	S16W35	8771	
1845	1847	1900		SF	S15E25	8778	
1857	1929	2010	C6.6	1N	S13W38	8771	



*Flare List-continued*

Date	Time			X-ray Class.	Imp / Brtns	Optical	Rgn #	
	Begin	Max	End			Location Lat CMD		
24 November	2143	2143	2212		SF	S14W38	8771	
	2154	2156	2202	M2.2	1B	S13E20	8778	
	2233	2249	2323	C4.3			8771	
	2338	0001	0025	M3.0	SF	S19W43	8771	
25 November	0606	0621	0632	C1.6	SF	S19W46	8771	
	0628	0633	0638		SF	S12E21	8778	
	0641	0647	0658	C5.2	1N	S12E20	8778	
	0731	0734	0739	C1.4				
	0819	0826	0834	C3.2	SF	S13E15	8778	
	1015	1020	A1033	C1.9	SF	S15E15	8778	
	1312	1313	1317		SF	S13E12	8778	
	1508	1509	1512		SF	S14E09	8778	
	1521	1523	1542	C1.1	SF	S13W45	8771	
	1714	1717	1806	C7.4	1F	S16W45	8771	
	1841	1843	1850	C1.6	SF	S19W53	8771	
	1901	1919	1952	M2.0	2N	S15W48	8771	
	2110	2112	2117		SF	S07W56	8769	
	2118	2122	2125		SF	S08W55	8769	
	2135	2136	2142		SF	S13E06	8778	
	2215	2222	2224		SF	S10W52	8769	
	2302	2302	2306		SF	S12E11	8778	
	2322	2322	2337		SF	S19W56	8771	
	2339	2351	2356		SF	S19W56	8771	
	2342	2343	2354	C1.6	SF	S12E11	8778	
	2357	0003	0008		SF	S19W56	8771	
	26 November	0047	0049	0055		SF	S19W56	8771
		0057	0131	0223	M5.7	3B	S14W55	8771
		0105	0107	0110		SF	S12E10	8778
		0352	0357	0502	M1.9	2B	S19W58	8771
0439		0443	0557		SF	S12E08	8778	
0556		0558	0616	C2.8	SN	S19W59	8771	
0659		0701	0751	C3.9	SF	S12E07	8778	
0845		U0906	0926	C5.0	SF	S14W55	8771	
1059		1101	1108	C2.6	SF	S19W61	8771	
1343		1343	1501	M6.0	2N	S15W59	8771	
1423		1425	1427		SF	S12E03	8778	
1438		1441	1447		SF	S12E02	8778	
1707		1731	1738		SF	S15W60	8771	
1738		1743	1802		SF	S19W66	8771	
1757		1804	1842	C2.3	SF	S12W10	8778	
1942		1943	1955	C2.0	SF	S14W03	8778	
2030		2031	2034		SF	S13W57	8771	
2058	2104	2123	C1.4	SF	S15W60	8771		



*Flare List-continued*

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
26 November	2152	2214	2221	C3.1	SF	S19W68	8771
	2214	2220	2223		SF	S12E40	8781
27 November	0022	0023	0027		SF	S19W69	8771
	0030	0042	0057	C7.8	SF	S19W70	8771
	0204	0206	0220	C7.2	1N	S14W63	8771
	0238	0241	0330	M2.8	1N	S19W71	8771
	0450	0508	0543	C9.9			8778
	0453	0455	0539	C5.6	1N	S12W15	8778
	0541	0548	0623	M1.2	1N	S14W66	8771
	0723	0739	0759		SF	S15W07	8778
	0747	0748	0751	C2.3	SF	S12W62	8771
	0809	0826	0837		SF	S26W63	8776
	0815	0820	0846		SF	N05W38	8772
	0854	0900	0912		SF	S19W74	8771
	0953	1012	1018	C3.0			
	B1114	U1114	A1138	C2.8	SF	S15W66	8771
	1208	1212	1319	X1.4	2B	S15W68	8771
	1834	1837	1839	C1.5			
	1939	1943	1949	C1.2			
	2055	2055	2100		SF	S12W60	8773
	2106	2108	2111		SF	S12W60	8773
2239	2240	2307	C2.1	SF	S12W61	8773	
2303	2304	2309		SF	S14W79	8771	
28 November	0033	0051	0130	C2.8	SF	S19W83	8771
	0127	0129	0139		SF	S12W16	8778
	0136	0143	0227	M3.5	SN	S19W83	8771
	0251	0256	0302	C4.7			
	0552	0557	0608	M1.1	SF	S15W81	8771
	1036	1039	1045	C2.7			
	1131	1136	1143	C3.4			
	1133	1135	1151		SF	N04W54	8772
	1153	1153	1203	C5.3	SF	S16W79	8771
	1235	1235	1240		SF	S13W66	8773
	1354	1359	1408	C4.1			
	1432	1435	1445		SF	S13E28	8781
	1438	1439	1445		SF	S13W72	8771
1546	1546	1549		SF	S11E04	8780	
1553	1558	1602	C2.8				





**Flare List-continued**

Date	Time			X-ray Class.	Imp / Brtns	Optical	Rgn #
	Begin	Max	End			Location Lat CMD	
28 November	1702	1704	1713		SF	S14W70	8773
	1702	1704	1709	C5.1	SF	S13W73	8771
	1746	1747	1753		SF	S13W71	8773
	1800	1917	1955	M1.6			
	1956	1956	2006		SF	S15W33	8778
	2024	2026	2030		SF	S14W34	8778
	2121	2122	2131		SF	S14W35	8778
	2132	2143	2158		SF	S14W34	8778
	2133	2133	2140		SF	N10W15	8782
	2217	2218	2220		SF	S12E25	8781
	2243	2259	2307		SF	S14W36	8778

**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 8763</i>																
10 Nov	S13E74	245	0120	07	CAO	011	B	2			5	2				
11 Nov	S14E59	247	0170	09	DAO	011	B	3			6	1				
12 Nov	S15E46	247	0140	09	DSO	017	BG				5	1				
13 Nov	S14E32	248	0070	08	CSO	016	BG	3	1		7	1				
14 Nov	S15E18	249	0070	08	CSO	011	BG		1		4		1			
15 Nov	S14E04	250	0070	06	CSO	007	B	1			1	1				
16 Nov	S13W07	247	0040	04	CSO	004	B									
17 Nov	S13W20	247	0010	04	BXO	005	B									
18 Nov	S13W35	250	0010	01	BXO	002	B									
19 Nov	S13W48	250									1					
20 Nov	S13W61	250														
21 Nov	S13W74	250														
22 Nov	S13W87	250														
								9	2	0	29	6	1	0	0	

Crossed West Limb.

Absolute heliographic longitude: 250



**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 8765</i>																							
11 Nov	S10E72	234	0150	08	CAO	008	B																
12 Nov	S12E58	235	0350	10	DAC	017	BG														2		
13 Nov	S12E45	235	0490	10	DAC	016	BG	2													8		
14 Nov	S14E32	235	0640	12	EKC	031	BG	2	1												18	1	
15 Nov	S13E19	235	0820	14	EKC	034	BG	3	1												9	1	1
16 Nov	S12E06	234	0930	15	EKC	038	BGD	3	3												6	3	
17 Nov	S12W08	235	1190	15	EKC	041	BGD	5													6	1	
18 Nov	S12W20	235	1280	14	EKC	035	BGD	2													5	1	
19 Nov	S12W34	236	1120	14	EKC	031	BGD	1													10	1	
20 Nov	S13W47	236	0910	13	EKC	036	BGD		1												2		
21 Nov	S12W60	235	0790	12	EKC	025	BGD	1	3												7	1	1
22 Nov	S13W72	234	0720	12	EKC	014	BGD	2													4		
23 Nov	S12W85	234	0330	11	EKC	009	BGD																
24 Nov	S13W98	234	0060	02	HAX	001	A														1		
								21	9	0	78	9	2	0	0								

Crossed West Limb.

Absolute heliographic longitude: 234

<i>Region 8766</i>																							
13 Nov	N18E68	212	0060	06	DAO	005	B																
14 Nov	N17E57	210	0190	06	DAO	009	BD	1	1												13	1	
15 Nov	N17E44	210	0270	07	DKI	013	BD	2													8		
16 Nov	N18E31	209	0330	11	EKC	020	BGD		2												7	1	
17 Nov	N18E16	211	0360	12	EAC	024	BG		1												2	1	
18 Nov	N18E02	213	0300	12	EAI	020	BG	1													2		
19 Nov	N17W11	213	0250	13	EAI	025	BG														1		
20 Nov	N18W25	214	0180	13	EAI	026	BG																
21 Nov	N18W36	211	0120	10	DAO	014	B																
22 Nov	N17W49	211	0090	10	DAO	012	B														2		
23 Nov	N18W63	212	0040	12	ESO	011	B																
24 Nov	N18W76	212	0010	08	BXO	003	B														1		
25 Nov	N18W89	211																					
								4	4	0	36	1	2	0	0								

Crossed West Limb.

Absolute heliographic longitude: 213



**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 8768</i>																		
14 Nov	N17E33	234	0030	05	DSO	008	B											
15 Nov	N17E20	234	0030	06	DSO	007	B											
16 Nov	N17E05	235	0090	09	DAO	012	B		1			3						
17 Nov	N17W11	238	0180	11	EAI	018	B					3						
18 Nov	N17W24	239	0180	12	EAO	010	B											
19 Nov	N16W38	240	0150	13	EAO	008	B	1					1					
20 Nov	N17W54	243	0120	13	CSO	005	B	1				1						
21 Nov	N16W65	240	0080	11	CSO	009	B					5						
22 Nov	N16W78	240	0100	11	ESO	007	B					2						
23 Nov	N17W89	238	0060	04	CSO	004	B					1						
								2	1	0	15	1	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 235

<i>Region 8769</i>																		
15 Nov	S10E76	178	0030	01	HSX	001	A											
16 Nov	S10E65	175	0080	01	HAX	001	A					2						
17 Nov	S12E53	174	0110	02	HSX	001	A	2				4						
18 Nov	S10E37	178	0070	05	CAO	004	B											
19 Nov	S11E24	178	0040	04	CSO	005	B											
20 Nov	S12E10	179	0020	03	CSO	003	B											
21 Nov	S12W03	179																
22 Nov	S12W16	179																
23 Nov	S12W29	179																
24 Nov	S12W42	179																
25 Nov	S12W55	179										3						
26 Nov	S12W68	179																
27 Nov	S12W81	179																
								2	0	0	9	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 179



**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 8771</i>																	
17 Nov	S13E59	168	0070	16	CSO	013	B					1					
18 Nov	S14E46	169	0170	17	FAO	015	B	1	1			2	1				
19 Nov	S15E28	174	0150	09	DAI	022	BG	1				5					
20 Nov	S17E12	177	0180	09	DAI	020	BG		1			8		1			
21 Nov	S16E01	174	0220	12	EAI	032	BGD	1				3	1				
22 Nov	S16W11	173	0280	12	EAI	024	BG	2				8					
23 Nov	S14W26	175	0650	14	EKC	026	BG	3				11					
24 Nov	S15W40	176	0750	13	EKI	018	BG	3	1			11	1				
25 Nov	S15W51	173	0820	16	FKI	021	BG	4	1			6	1	1			
26 Nov	S14W63	172	0720	19	FKI	017	BGD	5	3			9		2	1		
27 Nov	S14W78	173	0720	15	EKI	015	BG	4	2	1		6	3	1			
28 Nov	S15W85	167	0170	11	EAO	006	B	3	2			6					
								27	11	1		76	7	5	1	0	

Still on Disk.

Absolute heliographic longitude: 174

<i>Region 8772</i>																	
18 Nov	N05E71	144	0020	01	HAX	001	A										
19 Nov	N05E55	147	0060	04	CSO	007	B										
20 Nov	N04E42	147	0030	03	CSO	004	B										
21 Nov	N04E29	146	0020	05	CSO	008	B										
22 Nov	N05E16	146	0040	06	CSO	010	B					1					
23 Nov	N06E04	145	0020	08	CSO	003	B					1					
24 Nov	N06W08	144	0010	02	AXX	003	A										
25 Nov	N07W20	142	0010	02	AXX	004	A										
26 Nov	N06W31	140	0000	00	AXX	001	A										
27 Nov	N10W45	140	0010	04	BXO	006	B					1					
28 Nov	N07W55	137	0000	00	AXX	001	A					1					
								0	0	0		4	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 145



**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

*Region 8773*

19 Nov S14E39	163	0030	04	CSO	009	B												
20 Nov S16E25	164	0030	03	CSO	005	B						2						
21 Nov S15E12	163	0020	03	BXO	006	B												
22 Nov S15W02	164	0020	07	CRO	007	B												
23 Nov S15W15	164	0010	03	CSO	004	B												
24 Nov S15W27	163	0010	03	BXO	004	B												
25 Nov S15W39	161	0010	07	BXO	005	B												
26 Nov S13W47	156	0030	07	DRO	005	B												
27 Nov S12W60	155	0020	10	BXO	004	B	1					3						
28 Nov S12W71	153	0020	06	BXO	003	B						3						
								1	0	0	0	8	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 164

*Region 8774*

19 Nov N22E69	133	0030	12	BXO	004	B												
20 Nov N20E56	133	0010	10	BXO	003	B												
21 Nov N20E43	133																	
22 Nov N20E30	133																	
23 Nov N20E17	133																	
24 Nov N20E04	133																	
25 Nov N20W09	133																	
26 Nov N20W21	130	0000	00	AXX	001	A												
27 Nov N20W34	129	0000	00	AXX	001	A												
28 Nov N20W47	129																	
								0	0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 133

*Region 8775*

19 Nov S17W18	220	0010	01	HRX	001	A												
20 Nov S16W31	220	0000	00	AXX	001	A												
21 Nov S16W44	220																	
22 Nov S16W57	220																	
23 Nov S16W70	220																	
24 Nov S16W83	220																	
								0	0	0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 220



**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 8776*

20 Nov S31E24	165	0030	04	CSO	005	B											
21 Nov S30E08	167	0020	06	DSO	012	B											
22 Nov S29W01	163	0080	07	DAO	012	B	1				2						
23 Nov S28W14	163	0040	06	DAO	005	B											
24 Nov S28W29	165	0080	11	EAO	006	B											
25 Nov S28W42	164	0050	10	CSO	003	B											
26 Nov S27W58	167	0050	08	CSO	003	B											
27 Nov S27W72	167	0080	06	DSO	004	B					1						
28 Nov S26W83	165	0090	07	DAO	003	B											
							1	0	0	3	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 163

*Region 8777*

21 Nov S26E40	135	0010	01	AXX	002	A											
22 Nov S26E27	135	0000	01	AXX	001	A					1						
23 Nov S27E14	135	0030	01	HSX	001	A					1						
24 Nov S27E01	135																
25 Nov S27W12	135																
26 Nov S27W25	135																
27 Nov S27W38	135																
28 Nov S27W51	135																
							0	0	0	2	0	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 135

*Region 8778*

21 Nov S14E62	113	0010	04	BXO	002	B											
22 Nov S12E48	114	0010	00	AXX	002	A	1				4						
23 Nov S16E36	113	0040	04	CAO	004	B					2						
24 Nov S15E23	113	0080	08	CAO	016	B	3	1			8	1					
25 Nov S14E10	112	0090	09	DSO	026	B	4				8	1					
26 Nov S14W05	114	0140	12	EAO	029	B	3	1			7						
27 Nov S14W19	114	0180	14	EAI	036	BG	2	1			1	1					
28 Nov S14W33	115	0200	15	EAI	031	BG					6						
							13	3	0	36	3	0	0	0	0		

Still on Disk.

Absolute heliographic longitude: 114



**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 8779</i>																	
24 Nov	S09W27	163	0010	03	BXO	002	B										
25 Nov	S09W44	166	0040	06	CSO	006	B										
26 Nov	S09W58	167	0010	04	BXO	003	B										
27 Nov	S11W70	165	0040	05	DRO	003	B										
28 Nov	S10W83	165	0040	01	HAX	001	A										
								0	0	0	0	0	0	0	0	0	
Still on Disk.																	
Absolute heliographic longitude: 163																	
<i>Region 8780</i>																	
24 Nov	S11E51	085	0030	03	CSO	003	B										
25 Nov	S11E38	084	0010	00	AXX	001	A										
26 Nov	S11E25	084															
27 Nov	S16E14	081	0000	00	AXX	001	A										
28 Nov	S11W03	085	0000	01	AXX	002	A					1					
								0	0	0	1	0	0	0	0	0	
Still on Disk.																	
Absolute heliographic longitude: 085																	
<i>Region 8781</i>																	
24 Nov	S13E71	065	0050	03	HAX	001	A										
25 Nov	S13E58	064	0070	02	HSX	001	A										
26 Nov	S13E47	062	0080	08	CSO	004	B					1					
27 Nov	S13E34	061	0100	09	DSO	013	B										
28 Nov	S13E22	060	0170	09	DAI	027	B					2					
								0	0	0	3	0	0	0	0	0	
Still on Disk.																	
Absolute heliographic longitude: 060																	
<i>Region 8782</i>																	
27 Nov	N11E01	094	0010	02	BXO	004	B										
28 Nov	N10W13	095	0040	05	CSO	009	B					1					
								0	0	0	1	0	0	0	0	0	
Still on Disk.																	
Absolute heliographic longitude: 094																	



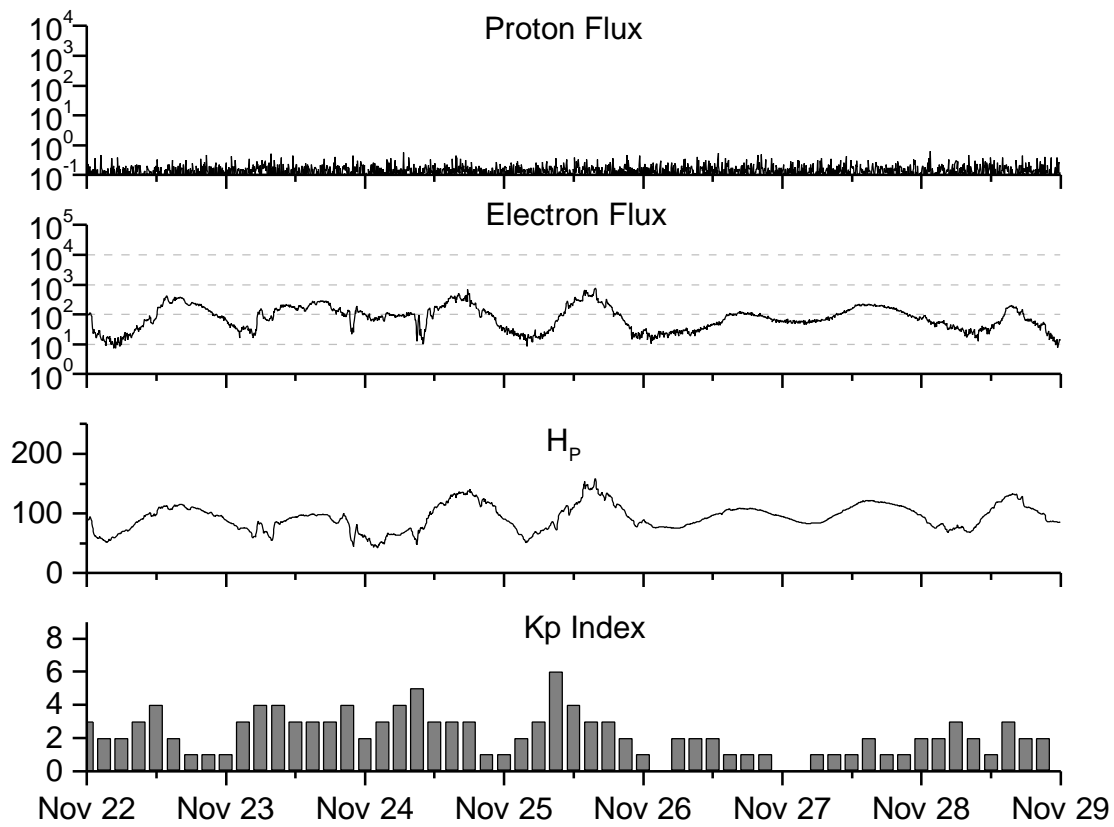
**Recent Solar Indices (preliminary)  
of the observed monthly mean values**

Month	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed values		Ratio	Smooth values		*Penticton	Smooth	Planetary	Smooth
	SWO	RI	RI/SWO	SWO	RI	10.7 cm	Value	Ap	Value
<b>1997</b>									
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
<b>1998</b>									
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
<b>1999</b>									
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	120.5	83.8	126.3	144.0	14	11.6
April	092.9	063.9	0.69	123.8	85.4	117.2	145.8	12	12.1
May	140.5	106.3	0.76			148.6		08	
June	208.3	137.4	0.66			169.8		07	
July	169.2	113.5	0.67			165.6		10	
August	136.1	93.7	0.69			170.8		15	
September	107.4	70.9	0.66			135.7		18	
October	167.7	116.4	0.69			164.9		18	

**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 22 November 1999*

*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.

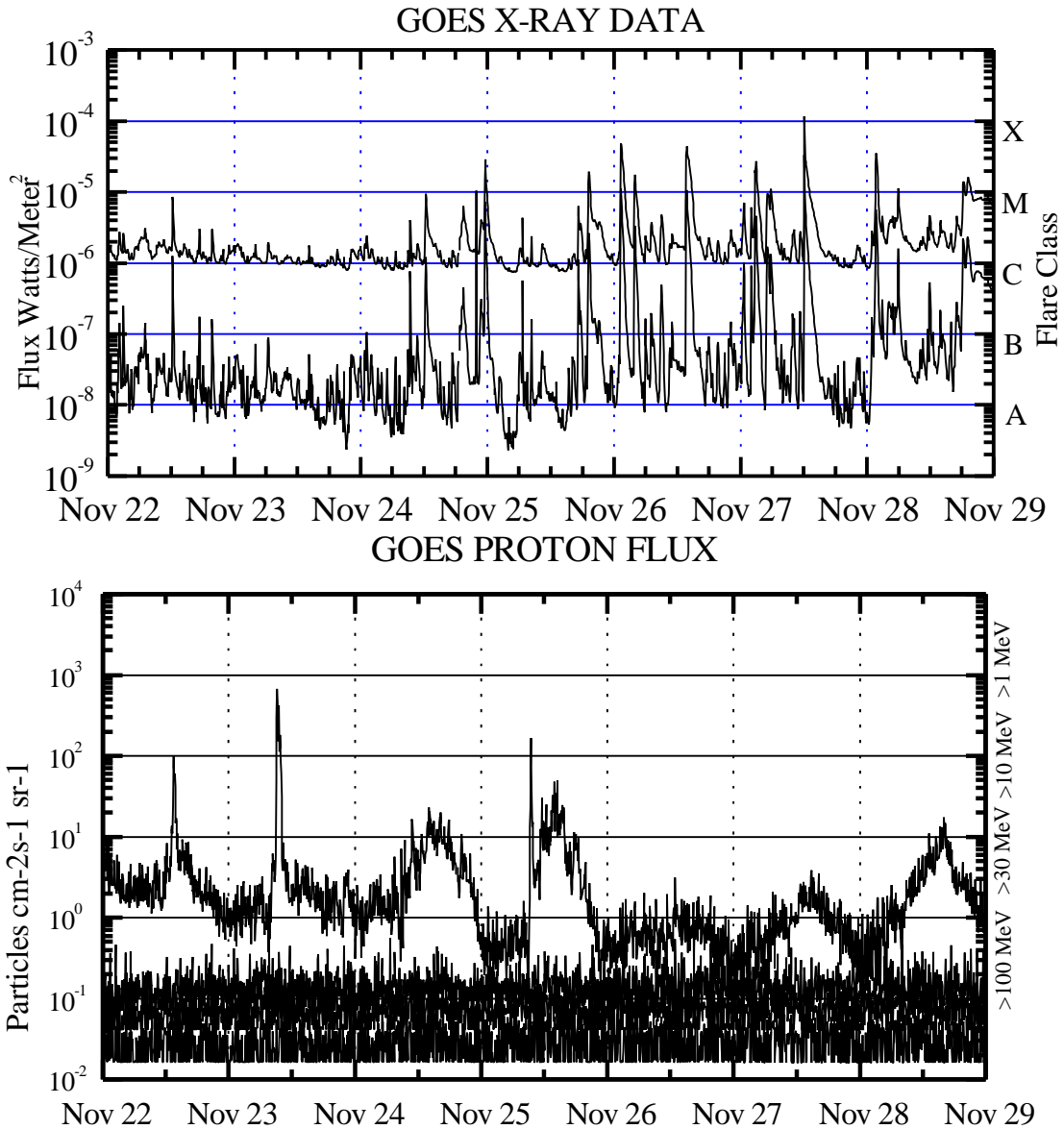
*Electrons* plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV at GOES-8.

*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 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>p</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.

