

Space Weather Highlights
10-16 November 1997

Solar activity ranged from low to moderate. Region 8108 (N20, L = 114, class/area Eao/0400 on 15 November) produced an M1/1N flare at 15/2246UT with minor discrete radio bursts across the spectrum. The region also produced two C-class flares of interest: a C3/SF at 14/0131UT with an associated Type II radio sweep along with minor discrete radio bursts, and a long-duration C4/SF at 14/1038UT with an associated partial-halo CME observed off the northeast limb. A large (greater than 180 degrees) optically uncorrelated CME was observed at 13/2241UT (GOES spacecraft detected an energetic particle enhancement shortly after the CME; see the discussion below).

Solar wind data were received from the WIND spacecraft a few hours per day. Velocities gradually declined from 390 to 300 km/sec during 10 - 13 November, then increased to an average of 330 km/sec for the rest of the period. Particle densities were enhanced during 10 November (peak = 25 p/cc) and again during 13 - 14 November (peak = 30 p/cc). Bz generally ranged from minus 06 to plus 06 nT (GSM) and was southward directed during most of 10 and 11 November. Solar sector orientation was mostly away (phi angle near 135 degrees) during 10 - 11 November, although it abruptly shifted to toward orientation (phi angle near 315 degrees) for several hours starting late 10 November. Orientation was not readily discernible during the rest of the period.

The greater than 10 MeV proton flux at geosynchronous altitude became enhanced around 13/2300UT returning to background levels by 15 November.

The greater than 2 MeV electron flux at geosynchronous altitude was at normal to moderate levels.

The geomagnetic field was at quiet to unsettled levels during most of the period. However, active levels were observed at all latitudes during the first half of 10 November.

Space Weather Forecast
19 November 1997 -15 December 1997

Solar activity is expected to range from low to moderate. Region 8108 may produce M-class flares. The return of old Region 8100 (which produced X-class flares on 04 and 06 November) brings increased chances for M-class activity during 23 November - 05 December.

Chances for energetic proton events/enhancements at geosynchronous altitude may increase during 23 November - 05 December with the return of old Region 8100.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be at normal to moderate levels.

The geomagnetic field is expected to be quiet to unsettled during most days. However, brief active intervals are possible during the first five days of the forecast period.



Daily Solar Data

Date	Radio	Sun	Sunspot	X-ray	X-ray Flux			Flares				
	Flux 10.7 cm	spot No. (10^6 hemi.)	Area	Background	C	M	X	S	1	2	3	4
10 November	89	28	120	B1.1	4	0	0	3	0	0	0	0
11 November	92	28	160	B2.0	4	0	0	8	0	0	0	0
12 November	87	26	100	B2.5	4	0	0	0	0	0	0	0
13 November	90	41	180	B2.4	10	0	0	2	0	0	0	0
14 November	93	48	350	B1.9	3	0	0	8	0	0	0	0
15 November	96	35	450	B2.3	2	1	0	2	1	0	0	0
16 November	96	58	390	B4.1	3	0	0	3	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
10 November	1.5E+6	1.2E+5	5.1E+3		1.0E+6	
11 November	5.2E+5	5.3E+4	4.4E+3		3.2E+6	
12 November	3.8E+5	3.1E+4	4.7E+3		5.2E+6	
13 November	4.8E+5	2.6E+4	5.2E+3		7.0E+6	
14 November	8.7E+5	7.2E+4	5.6E+3		2.3E+6	
15 November	3.1E+5	2.3E+4	4.9E+3		7.5E+6	
16 November	2.0E+5	1.9E+4	4.6E+3		7.1E+6	

Daily Geomagnetic Data

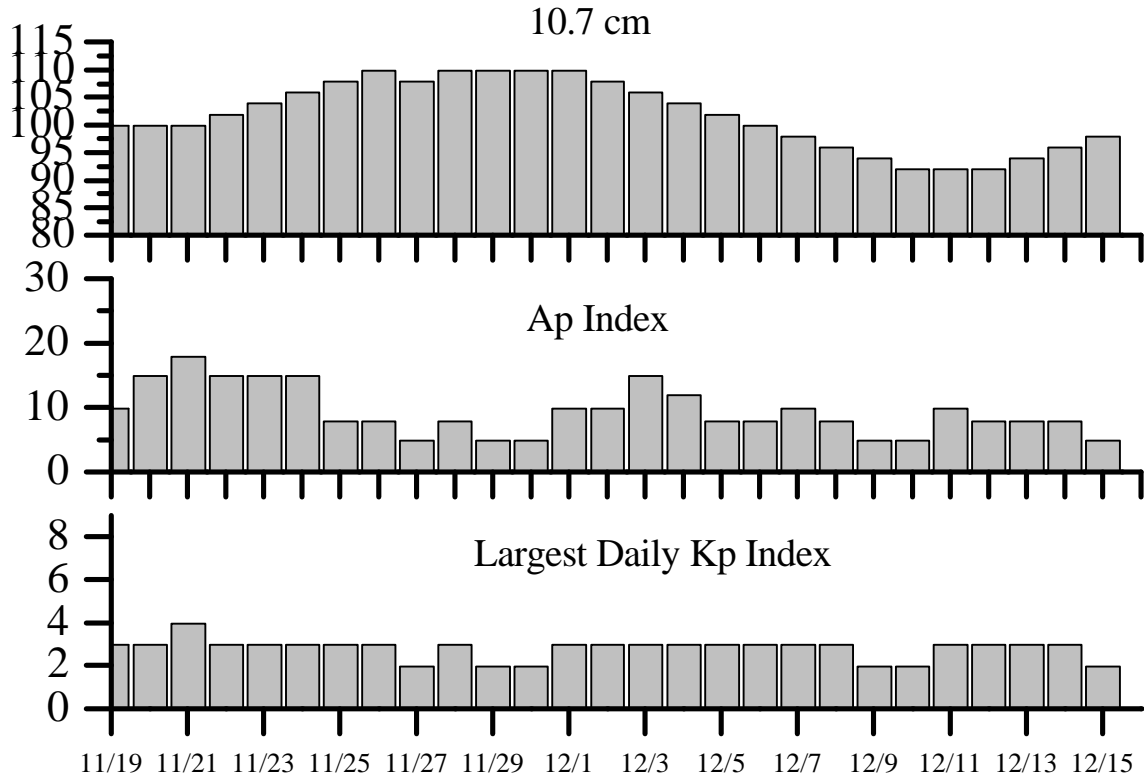
Date	Middle Latitude		High Latitude		Estimated	
	Fredericksburg		College		Planetary	
	A	K-indices	A	K-indices	A	K-indices
10 November	13	4-3-4-2-2-2-1-2	9	2-3-3-2-4-0-0-1	10	3-3-4-2-2-3-1-1
11 November	6	2-3-2-1-1-2-1-1	*	0-0-3-3-*--*-*	6	1-3-2-2-2-2-1-1
12 November	2	0-0-1-1-0-1-1-1	0	0-0-0-1-0-0-0-0	3	1-0-1-2-0-0-1-1
13 November	5	1-1-1-2-1-1-2-2	2	0-0-0-1-2-1-1-0	4	0-1-1-2-1-2-2-1
14 November	8	1-1-2-2-2-2-3-3	6	0-0-2-3-3-2-2-0	11	1-1-3-3-3-3-3-3
15 November	10	3-3-2-1-2-2-2-3	6	0-2-3-2-3-2-1-0	7	2-3-2-2-2-2-3-2
16 November	9	2-3-2-2-2-2-2-3	*	*-*-*-*-*-*-*	9	2-3-2-2-3-2-2-2

Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
14 Nov 0149	Type II Radio Emission	14 Nov 0137
15 Nov 2320	2695MHz Radio Burst 110 s.f.u.	15 Nov 2248



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
19 Nov	100	10	3	02 Dec	108	10	3
20	100	15	3	03	106	15	3
21	100	18	4	04	104	12	3
22	102	15	3	05	102	8	3
23	104	15	3	06	100	8	3
24	106	15	3	07	98	10	3
25	108	8	3	08	96	8	3
26	110	8	3	09	94	5	2
27	108	5	2	10	92	5	2
28	110	8	3	11	92	10	3
29	110	5	2	12	92	8	3
30	110	5	2	13	94	8	3
01 Dec	110	10	3	14	96	8	3
				15	98	5	2



Energetic Events

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½	Class	Integ Flux	Imp Brtns	Location		Rgn #	Radio Flux		Intensity	
			Max				Lat	CMD		245	2695	II	IV
15 Nov	2231	2246	2310	M1.0	.016	1N	N20E64		8108	26	110		

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical Location		Rgn #
	Begin	Max	End			Lat	CMD	
10 November	0349	0355	0411	B6.7				
	0525	0531	0544	C1.6	SF	N22W59	8103	
	0601	0604	0608		SF	N22W59	8103	
	0703	0709	0717	C4.0	SF	N22W60	8103	
	1139	1146	1151	C1.4				
	1251	1307	1315	C1.5				
	1349	1354	1359	B9.3				
	1622	1630	1636	B4.0				
	1644	1649	1655	B8.9				
	1756	1759	1801	B5.9				
11 November	0244	0431	0438	C1.2				
	0526	0527	0530		SF	N26W71	8103	
	0716	0717	0723	C4.7	SF	N26W71	8103	
	0955	0955	1000		SF	N31W35	8106	
	1022	1022	1024	C1.8	SF	N18W76	8103	
	1139	1141	1146		SF	N22W74	8103	
	1157	1202	1206	C1.3				
	1209	1213	1221		SF	N22W75	8103	
	1253	1258	1300		SF	N21W76	8103	
	1310	1319	1347	B9.1	SF	N22W77	8103	
	1526	1529	1531	B5.7				
	1545	1548	1551	B5.8				
	1602	1606	1609	B6.7				
	1714	1721	1728	B8.6				
	1918	1926	1929	B8.9				
	2137	2141	2144	B6.3				
	2212	2217	2231	B9.5				
2317	2321	2327	B5.5					
12 November	0110	0119	0124	B6.7				
	0517	0521	0526	B6.1				
	0633	0644	0653	C2.4				
	1008	1013	1017	B6.3				
	1055	1104	1108	C1.0				
	1133	1138	1141	B6.1				
	1316	1325	1331	B8.1				
	1702	1713	1723	C1.6				



Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
12 November	2037	2042	2050	B6.0			
	2054	2102	2110	C2.0			
	2220	2230	2248	B5.9			
13 November	0624	0631	0635	C1.1			
	0725	0728	0736	B5.4			
	0934	0944	0947	B8.5			
	1047	1050	1053	C1.3			
	1103	1112	1126	C1.4			
	1142	1145	1147	C2.0			
	1250	1253	1256	B8.9			
	1311	1314	1317	B9.7			
	1401	1405	1407	B5.1			
	1426	1433	1436	C1.3			
	1504	1508	1513	C2.3			
	1619	1622	1624	B9.3			
	1742	1744	1754	C1.0	SF	N29W65	8106
	1800	1804	1807	C1.6			
	1859	1903	1906	C1.1			
1931	1931	1936	B7.2	SF	N29W67	8106	
2009	2018	2021	C1.7				
2335	2340	2348	B4.1				
14 November	0025	0029	0031	B4.9			
	0127	0129	0132	C3.6	SF	N21E74	8108
	0242	0253	0302	B5.8			
	0352	0356	0359	B3.2			
	0404	0408	0410	B4.2			
	0603	0607	0622	B6.5			
	0709	0713	0715	C1.4			
	0831	0835	0839	B7.8			
	0938	0943	1040	C4.6	SF	N21E70	8108
	1508	1508	1513	B8.2	SF	N29W75	8106
	1516	1525	1531		SF	N18E70	8108
	1517	1518	1522		SF	N16E70	8108
	1524	1525	1531		SF	N16E69	8108
	1651	1658	1710	B8.0			
	1913	1914	1918	B4.9	SF	N16E68	8108
2147	2148	2150		SF	N19E74	8108	
15 November	0133	0136	0201	C2.2	SF	N19E64	8108



Flare List – continued.

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
15 November	0414	0417	0420	B3.0			
	1025	1041	1052	C1.0			
	1155	1156	1159	B3.9	SF	N30W83	8106
	1316	1319	1323	B2.8			
	2237	2242	2338	M1.0	1N	N20E64	8108
16 November	0123	0130	0134	C1.0	SF	N18E56	8108
	0659	0702	0704	B2.2			
	0848	0851	0854	B3.3			
	1214	1222	1226	B3.1			
	1310	1314	1323	B4.3			
	1717	1721	1725	B3.6			
	1733	1741	1744	B8.3			
	1819	1826	1829	C1.9			
	2016	2021	2023	C1.4			
	2130	2131	2137	B5.6	SF	N18E46	8108
2158	2158	2202		SF	N18E46	8108	
2207	2210	2212	B5.1				

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 8102</i>																
02 Nov	N30E12	328	0050	04	CAO	007	B									
03 Nov	N30E02	324	0000	00	AXX	001	A									
04 Nov	N30W12	325														
05 Nov	N30W25	325														
06 Nov	N30W38	325														
07 Nov	N30W51	325														
08 Nov	N30W64	325														
09 Nov	N30W77	325														
10 Nov	N30W90	325														

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 324



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 8103</i>																	
04 Nov	N24E09	304	0030	04	BXO	011	B					8					
05 Nov	N23W03	303	0040	07	DRO	012	B	1				3					
06 Nov	N22W17	304	0080	09	CAO	019	B					2					
07 Nov	N22W33	307	0050	10	CSO	011	BG	1				1					
08 Nov	N23W42	302	0060	11	CSO	009	B										
09 Nov	N20W60	307	0020	05	BXO	007	B					1					
10 Nov	N19W70	304	0110	07	DAO	007	B	2				3					
11 Nov	N20W82	303	0120	09	DAO	004	B	2				7					
12 Nov	N20W93	301	0060	07	CAO	003	B										
								6	0	0	0	25	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 303

<i>Region 8104</i>																	
07 Nov	N30E72	202	0010	00	AXX	002	A										
08 Nov	N28E55	205	0030	01	AXX	001	A										
09 Nov	N30E41	206	0010	00	AXX	001	A										
10 Nov	N29E28	206	0010	00	AXX	001	A										
11 Nov	N29E15	206															
12 Nov	N29E02	206															
13 Nov	N29W11	206															
14 Nov	N29W24	206															
15 Nov	N29W37	206															
16 Nov	N29W50	206															
								0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 206

<i>Region 8105</i>																	
08 Nov	S35E21	239	0010	03	BXO	002	B										
09 Nov	S29E14	233	0010	04	BXO	003	B										
10 Nov	S29E01	233															
11 Nov	S29W12	233															
12 Nov	S29W25	233															
13 Nov	S29W38	233															
14 Nov	S29W51	233															
15 Nov	S29W64	233															
16 Nov	S29W77	233															
								0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 233



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

Region 8106

11 Nov	N28W44	265	0040	05	CSO	004	B					1						
12 Nov	N28W56	264	0040	08	CAO	003	B											
13 Nov	N28W71	266	0060	05	CSO	005	B	1				2						
14 Nov	N28W84	265	0020	01	HRX	001	A					1						
										1	0	0	4	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 265

Region 8107

13 Nov	S25W26	221	0030	04	DRO	004	B											
14 Nov	S24W40	221	0040	06	CAO	008	B											
15 Nov	S24W52	220	0050	07	CSO	003	B											
16 Nov	S26W69	225	0020	01	HRX	001	A											
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 221

Region 8108

13 Nov	N21E78	117	0090	03	HAX	002	A											
14 Nov	N19E67	114	0290	11	EAO	009	B	2				7						
15 Nov	N20E58	110	0400	15	EAO	012	BG	1	1			1	1					
16 Nov	N21E42	114	0360	13	EAI	026	BG	1				3						
										4	1	0	11	1	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 114

Region 8109

16 Nov	S18E66	090	0010	01	HRX	001	A											
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 090



**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
1995									
November	15.7	09.0	0.57	18.5	11.4	74.2	73.2	09	10.8
December	16.2	10.0	0.62	17.6	10.8	72.6	72.8	09	10.0
1996									
January	17.6	11.5	0.65	16.8	10.4	74.5	72.4	09	09.8
February	09.1	04.4	0.48	16.2	10.1	71.5	72.2	10	09.8
March	12.1	09.2	0.76	15.4	09.7	70.7	72.1	11	09.9
April	08.5	04.8	0.56	13.6	08.5	69.3	71.6	11	09.7
May	11.8	05.5	0.47	12.9	08.0	70.1	71.4	07	09.5
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	08.5*	69.4	72.3	15	09.3
October	02.3	00.9	0.39	14.0	08.9*	69.2	72.6	13	09.1
November	26.7	17.9	0.67	15.4	09.9*	78.7	73.0	08	09.1
December	21.1	13.3	0.63	16.2	10.5*	77.8	73.3	07	09.3
1997									
January	09.0	06.5*	0.72*	16.5	10.6*	74.0	73.4	09	09.3*
February	11.3	07.6*	0.67*	17.4	11.2*	73.8	73.7	11	09.2*
March	14.4	08.8*	0.61*	20.4	13.7*	73.5	75.1*	08	09.0*
April	24.5	15.8*	0.64*	24.0	16.7*	74.5	76.8*	10	08.6*
May	28.6	18.5*	0.65*			74.6		08	
June	22.1	13.1*	0.59*			71.7		07	
July	17.0	10.5*	0.62*			71.1		06*	
August	36.7	24.7*	0.67*			79.0		08*	
September	58.2	51.3*	0.88*			96.2*		10*	
October	33.6	23.3*	0.69*			85.0*		10*	

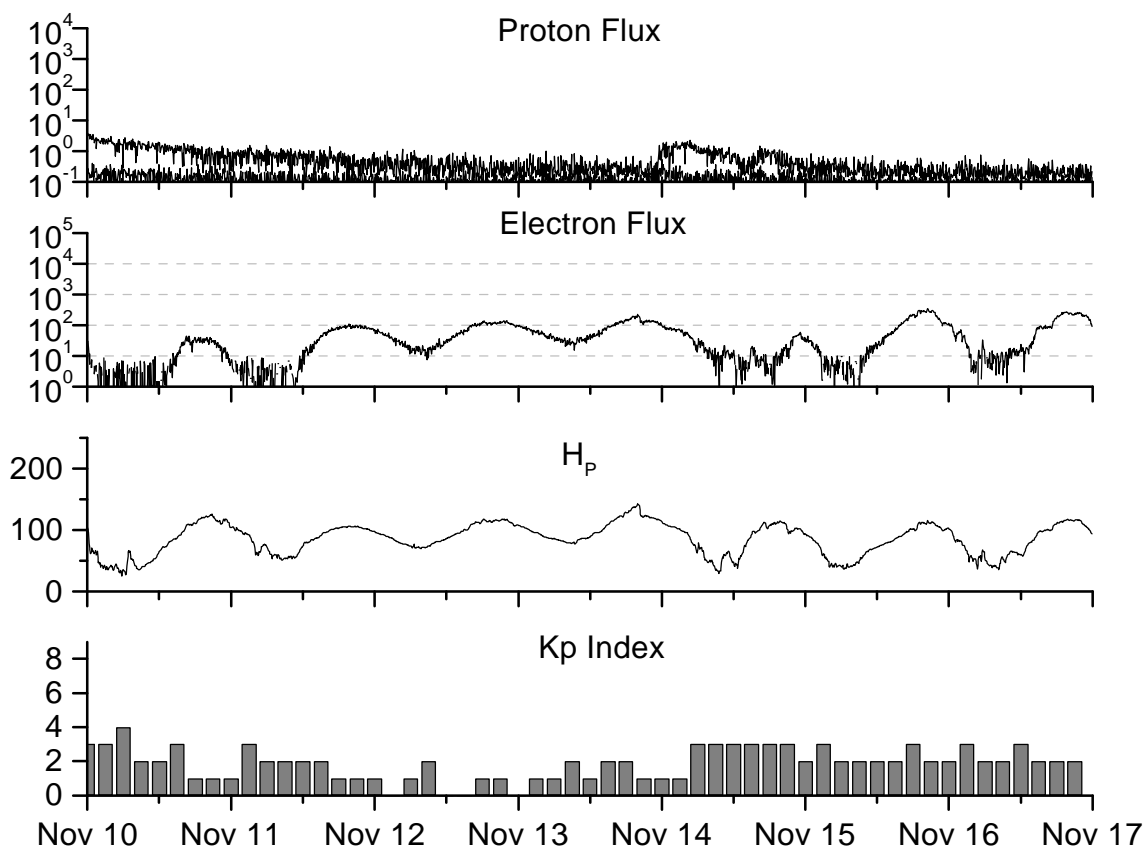
*Preliminary estimates.

October 1996 has been selected as the start of Solar Cycle 23.

The highest smoothed sunspot number for Solar Cycle 22, RI=158.5 occurred in July 1989.

The highest smoothed 10.7cm Radio Flux value for Solar Cycle 22, of 213.1, occurred in June 1989.





Weekly Geosynchronous Satellite Environment Summary

Week Beginning 10 November 1997

Protons plot contains the five-minute averaged integral proton flux (protons/ cm^2 -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^2 -sec-sr) with energies greater than 2 MeV at GOES-9.

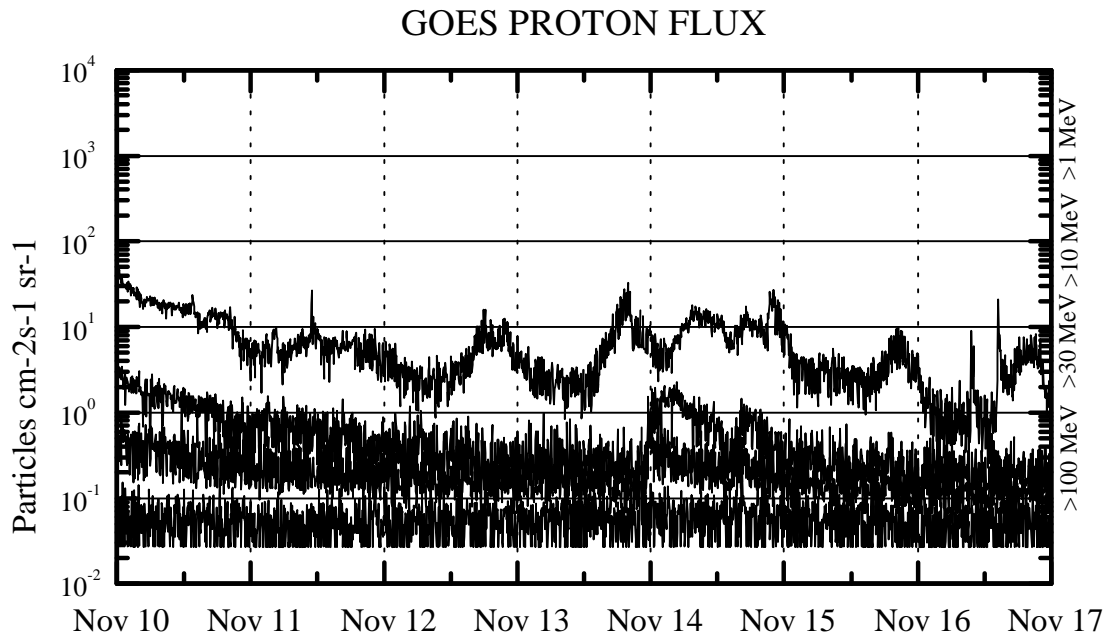
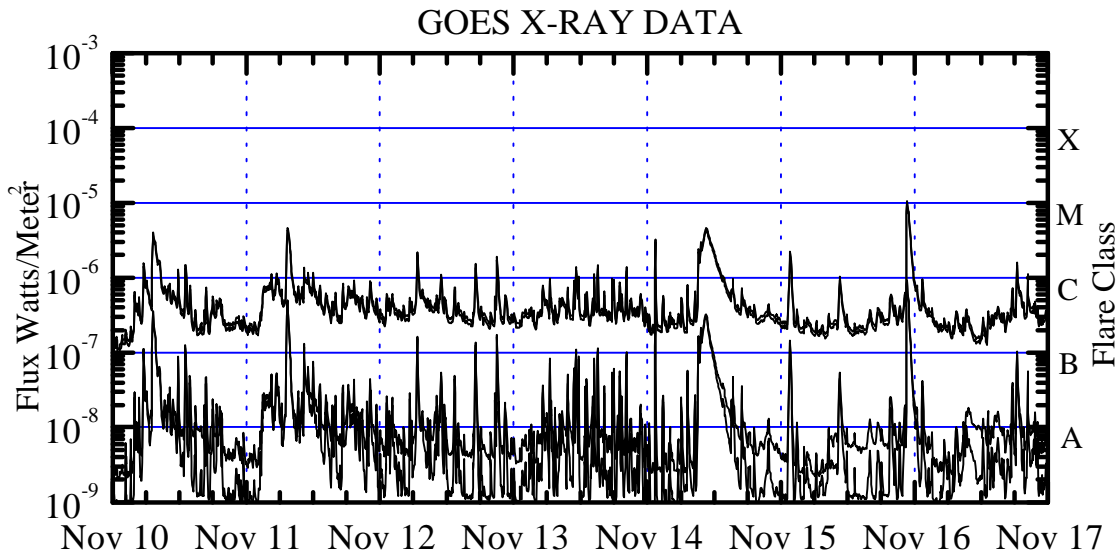
H_p plot contains the five minute averaged magnetic field H component in nanoteslas (nT) as measured by GOES-9. The H component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

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

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.

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.

