

Space Weather Highlights
17-23 November 1997

Solar activity was mostly low. Region 8108 (N19, L = 113, class/area Eko/0420 on 17 November) produced isolated C-class subflares including a long-duration C1 X-ray event which began about 19/1700UT, reached maximum around 19/1910UT, and returned to background levels near 20/0600UT. A weak Type IV radio sweep was observed during 19/2017 - 2220UT and was probably associated with the long-duration X-ray event. Old Region 8100, which produced X-class flares last rotation, returned as a much-diminished area of extended, dull plage. A halo CME was observed around 17/0800UT, but could not be associated with a source on the visible disk.

Solar wind data were received from the WIND spacecraft a few hours per day. Velocities were steady at around 370 km/sec, then increased to 500 km/sec during 18 November. Velocities gradually decreased from 500 - 300 km/sec during 18 - 21 November. Velocities abruptly increased to around 550 km/sec early on 22 November and remained elevated for the rest of the period. Solar wind particle densities were enhanced during 17 - 18 November, peaking briefly near 35 p/cc. Densities declined to around 07 p/cc during 19 - 21 November. Densities increased to near 40 p/cc during 22 November, then decreased to 05 p/cc on the last day of the period. Bz was in the plus 05 to minus 05 nT (GSM) range through most of 21 November. Bz ranged from minus 33 to plus 25 nT from late 21 through 22 November, then hovered around zero for the rest of the period. Solar sector orientation was mostly toward (phi angle near 315 degrees) through 21 November. Orientation shifted to away (phi angle 135 degrees) on 22 November, then shifted back to toward conditions on 23 November.

There were no significant proton enhancements observed at geosynchronous altitude.

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

The geomagnetic field was at quiet to active levels during 17 - 18 November, then declined to mostly quiet levels from 19 - 21 November. A disturbance ranging from active to severe storm levels began shortly after 22/0900UT and continued through 23/1500UT. The field subsided to quiet to unsettled levels after 23/1500UT.

Space Weather Forecast
26 November 1997 - 22 December 1997

Solar activity is expected to range from low to moderate. C-class flare activity is expected during most days. Isolated M-class flares may occur during the period as well.

No significant proton enhancements are expected at geosynchronous altitude.

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 around 19 - 20 December.



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
17 November	94	74	450	B2.6	3	0	0	9	0	0	0	0
18 November	92	71	380	B1.3	0	0	0	3	0	0	0	0
19 November	99	62	290	A8.9	1	0	0	1	0	0	0	0
20 November	89	57	310	B3.5	0	0	0	3	0	0	0	0
21 November	96	52	360	B1.2	4	0	0	13	0	0	0	0
22 November	100	62	410	B1.7	2	0	0	2	0	0	0	0
23 November	100	70	350	B2.1	2	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
17 November	1.5E+5	1.8E+4	4.3E+3		2.7E+6	
18 November	3.7E+5	1.7E+4	3.6E+3		4.0E+6	
19 November	2.4E+5	1.6E+4	3.5E+3		4.1E+6	
20 November	1.9E+5	1.6E+4	3.4E+3		4.3E+6	
21 November	3.3E+5	1.5E+4	3.5E+3		5.6E+6	
22 November	1.5E+6	1.6E+4	3.3E+3		5.9E+5	
23 November	1.3E+6	1.4E+4	3.0E+3		1.6E+7	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
17 November	9	3-3-2-1-1-1-2-3	3	2-1-2-0-0-1-1-1	7	3-3-2-1-1-2-2-2
18 November	11	3-2-2-2-4-2-2-2	10	1-1-2-2-5-2-1-1	9	3-2-2-2-4-2-2-2
19 November	4	1-1-1-1-1-2-1-1	1	0-0-0-2-0-0-0-0	3	0-0-0-1-1-2-1-1
20 November	2	1-1-1-0-0-1-1-0	0	0-0-0-0-0-0-0-0	2	1-0-0-0-1-1-1-1
21 November	2	0-0-0-0-0-1-1-2	1	0-0-0-1-0-0-0-0	2	0-0-0-0-0-0-1-1
22 November	34	3-3-4-5-6-3-4-5	31	1-3-3-6-6-3-4-3	45	3-4-4-6-7-5-4-5
23 November	52	6-6-5-5-4-2-2-3	25	3-4-4-5-5-2-3-3	60	6-7-5-6-5-3-4-3

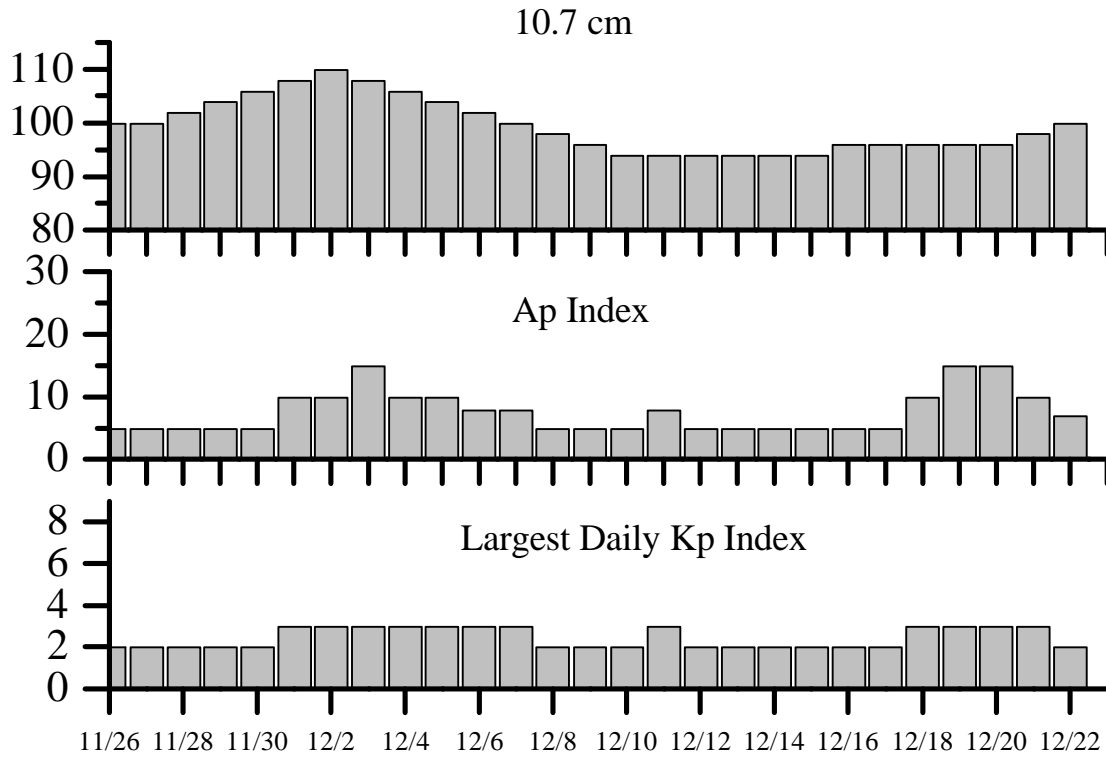


Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
18 Nov 0010	7- 245 MHz Bursts	17 Nov
18 Nov 0010	1-245 MHz Noise Storm	17 Nov
18 Nov 1458	K= 4 Observed	18 Nov 12–15
19 Nov 0010	7-245 MHz Bursts	18 Nov
19 Nov 0010	1-245 MHz Noise Storm	18 Nov
20 Nov 0010	3-245 MHz Bursts	19 Nov
20 Nov 0010	1-245 MHz Noise Storm	19 Nov
20 Nov 1921	A ≥ 20 Watch	23 Nov
21 Nov 1520	Type IV Radio Emission	19 Nov 2135
22 Nov 0010	1-245 MHz Bursts	23 Nov
22 Nov 0615	K= 4 Observed	22 Nov 03-06
22 Nov 1155	K= 5 Observed	22 Nov 09-12
22 Nov 1453	A ≥ 20 Observed	22 Nov 1453
22 Nov 1502	K= 6 Observed	22 Nov 12-15
22 Nov 2115	K= 4 Observed	22 Nov 18-21
23 Nov 0006	A ≥ 30 Observed	23 Nov 0000
23 Nov 0008	K= 5 Observed	22 Nov 21-24
23 Nov 0010	4-245 MHz Bursts	20 Nov
23 Nov 0010	1-245 MHz Noise Storm	20 Nov
23 Nov 0310	K= 6 Observed	23 Nov 00-03
23 Nov 0603	K ≥ 7 Observed	23 Nov 03-06
23 Nov 0604	A ≥ 50 Observed	23 Nov 0600
23 Nov 1632	A ≥ 20 Watch for	24 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
26 Nov	100	5	2	09 Dec	96	5	2
27	100	5	2	10	94	5	2
28	102	5	2	11	94	8	3
29	104	5	2	12	94	5	2
30	106	5	2	13	94	5	2
01 Dec	108	10	3	14	94	5	2
02	110	10	3	15	94	5	2
03	108	15	3	16	96	5	2
04	106	10	3	17	96	5	2
05	104	10	3	18	96	10	3
06	102	8	3	19	96	15	3
07	100	8	3	20	96	15	3
08	98	5	2	21	98	10	3
				22	100	7	2



Energetic Events

Date	Time (UT)		X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½ Max	Integ Class	Imp Brtns	Location		Rgn #	Radio Flux		Intensity	
						Lat	CMD		245	2695	II	IV
No Events Observed												

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical Location		Rgn #
	Begin	Max	End			Lat	CMD	
17 November	0022	0023	0027	B7.0	SF	N15E42		8108
	0322	0327	0329	B5.3				
	0337	0338	0342		SF	S22E61		8109
	0528	0532	0536	B4.8				
	0606	0607	0612		SF	N16E43		8108
	0635	0639	0649	B6.8				
	0651	0651	0656		SF	N17E39		8108
	0713	0716	0719	B3.1				
	0800	0803	0806	B2.3				
	0858	0951	0959	B8.9				
	1040	1043	1046	B3.3				
	1134	1141	1146	B2.7				
	1328	1354	1401	C2.6				
	1414	1417	1420	C1.3				
	1459	1507	1522	C8.6	SF	N21E30		8108
	2010	2010	2014					
	2030	2033	2035	B1.8				
2209	2209	2213		SF	N22E26		8108	
2215	2223	2231						
18 November	0424	0429	0431	B2.2				
	0550	0554	0558	B1.5				
	0645	0650	0656	B4.5	SF	N18E27		8108
	0835	0836	0849	B3.8				
	0935	0938	0940	B4.1				
	0942	0951	1002	B5.0				
	1145	1146	1223		SF	S19E46		8109
	1303	1309	1314	B1.8				
1544	1549	1554	B2.9					
19 November	1357	1402	1412	B2.8	SF	N24E05		8108
	1700	1910	2140	C1.6				
20 November	0021	0023	0032	B9.2	SF	N20E09		8108
	1109	1114	1123	B3.0				
	2210	2212	2230	B7.4	SF	N21W08		8108
	2309	2311	2318					
	2330	2336	2352	B1.5				



Flare List – continued.

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
21 November	0321	0324	0327	B4.7			
	0553	0557	0600	B2.4			
	0625	0628	0632	C1.1	SF	N23W12	8108
	0832	0833	0837		SF	N23W13	8108
	0901	0905	0912	B1.9			
	0919	0923	0930	B2.9			
	0954	0954	1002	B5.0	SF	N23W14	8108
	B1133	U1133	1142	B4.5	SF	N22W17	8108
	1248	1328	1336	C1.7	SF	N22W17	8108
	1528	1528	1534	B8.8	SF	N21W19	8108
	1600	1600	1605	C1.2	SF	N22W17	8108
	1609	1612	1616	B6.2			
	1620	1623	1627		SF	N22W18	8108
	1702	1704	1708	C1.1	SF	N21W19	8108
	1755	1758	1803		SF	N22W19	8108
	1820	1825	1834		SF	N22W19	8108
	1837	1837	1844		SF	N22W20	8108
	1908	1910	1913		SF	N22W20	8108
	2058	2105	2115	B4.2			
	2142	2146	2151	B3.9			
22 November	0018	0021	0025	B3.0			
	0228	0232	0235	B4.4			
	0613	0630	0654	C1.0			
	1053	1057	1101	B5.0			
	1204	1204	1218		SF	S17W12	8109
	1852	1900	1911	C1.1			
2243	2250	2256		SF	N20W30	8108	
23 November	0021	0032	0047	B9.0			
	0239	0240	0259	C2.0	SF	N22W40	8108
	0311	0315	0325		SF	N23W38	8108
	0617	0623	0632	B4.1			
	1002	1007	1012	B4.0			
	1254	1259	1308	B6.1	SF	N19W45	8108
	1400	1404	1409	B4.4			
	1538	1540	1556	C1.5	SF	N20W49	8108
	1919	1924	1930	B5.0			
2306	2307	2316	B7.6	SF	N20W53	8108	



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 8104

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																
17 Nov	N29W63	206																
18 Nov	N29W76	206																
19 Nov	N29W89	206																

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 206

Region 8105

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																
17 Nov	S29W90	233																

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 233



Region Summary- continued.

Date	Location		Sunspot Characteristics				Flares						
	° Lat ° CMD)	Helio	Area Lon (10 ⁻⁶ hemi)	Extent (helio)	Spot Class	Spot Count	X-ray		Optical				
							Class	C	M	X	S	1	2

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												
17 Nov	S24W82	225	0000	01	AXX	002	A												
										0	0	0	0	0	0	0	0	0	0

Crossed West Limb.

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								
17 Nov	N21E29	114	0420	14	EKO	036	BGD				8								
18 Nov	N19E16	114	0350	13	EKI	034	BG				2								
19 Nov	N19E03	113	0260	13	EAO	025	BGD				1								
20 Nov	N19W11	114	0260	14	EKO	031	BG				3								
21 Nov	N19W22	112	0330	13	EAI	028	BGD	4			13								
22 Nov	N19W38	115	0370	12	EAI	026	BGD				1								
23 Nov	N19W52	116	0280	13	EAI	018	BG	2			5								
										10	1	0	44	1	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 113

Region 8109

16 Nov	S18E66	090	0010	01	HRX	001	A												
17 Nov	S18E51	092	0030	06	CRO	006	B				1								
18 Nov	S19E38	092	0030	06	CSO	006	B				1								
19 Nov	S19E25	091	0030	08	DSO	006	B												
20 Nov	S19E11	092	0050	09	CSO	006	B												
21 Nov	S19E00	090	0030	08	CRO	004	B												
22 Nov	S19W18	095	0010	07	BXO	004	B				1								
23 Nov	S18W30	094	0030	10	CRO	006	B												
										0	0	0	3	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 090



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 8110</i>																	
18 Nov	N27E54	076	0000	00	AXX	001	A										
19 Nov	N28E39	077	0000	00	AXX	001	A										
20 Nov	N28E26	077															
								0	0	0	0	0	0	0	0	0	0
Died on Disk.																	
Absolute heliographic longitude: 077																	
<i>Region 8111</i>																	
22 Nov	N23E74	003	0030	04	CSO	002	B										
23 Nov	N24E61	003	0040	08	CRO	005	B										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 003																	
<i>Region 8112</i>																	
23 Nov	S17E59	005	0000	00	AXX	001	A										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 005																	



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

Month	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed SWO	values RI	Ratio RI/SWO	Smooth values SWO	RI	Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth 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*	

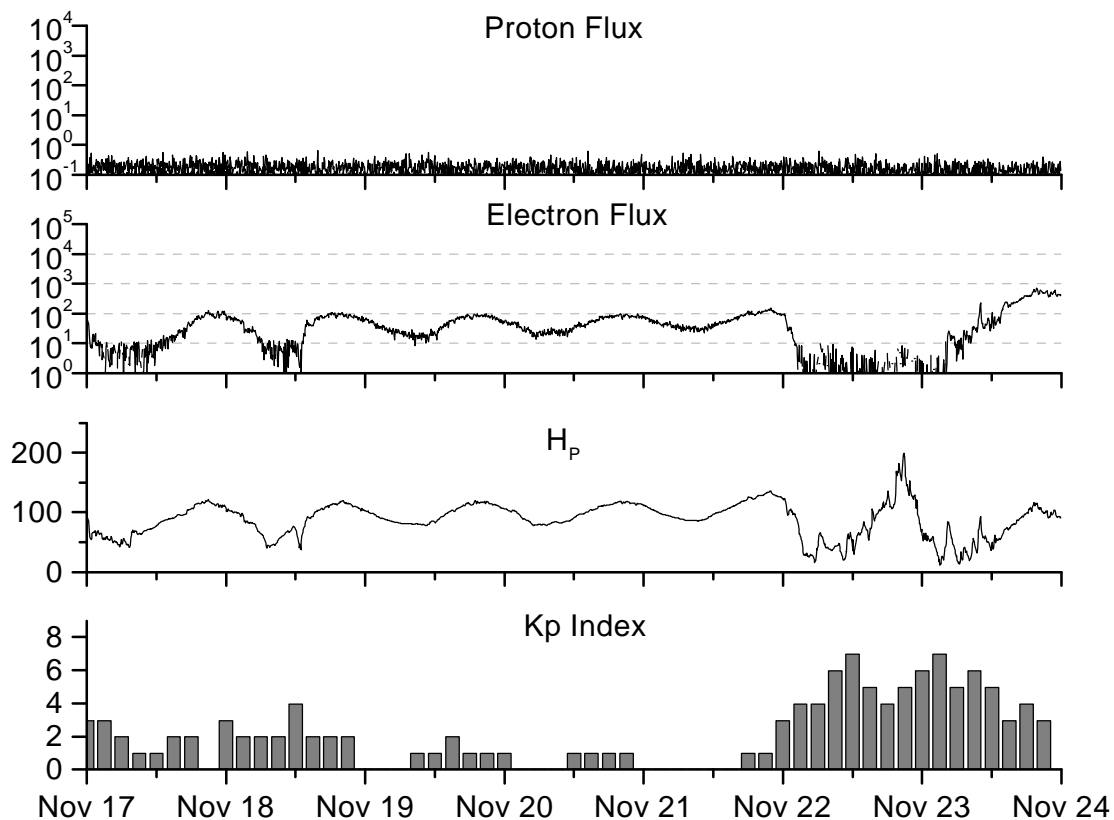
*Preliminary estimates.

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 18 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.

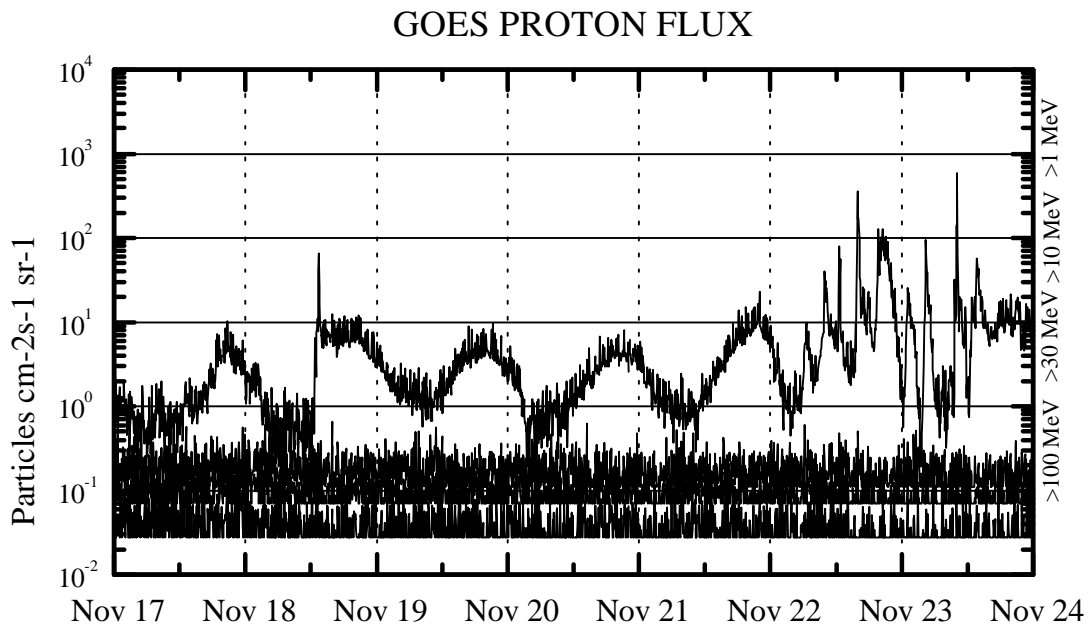
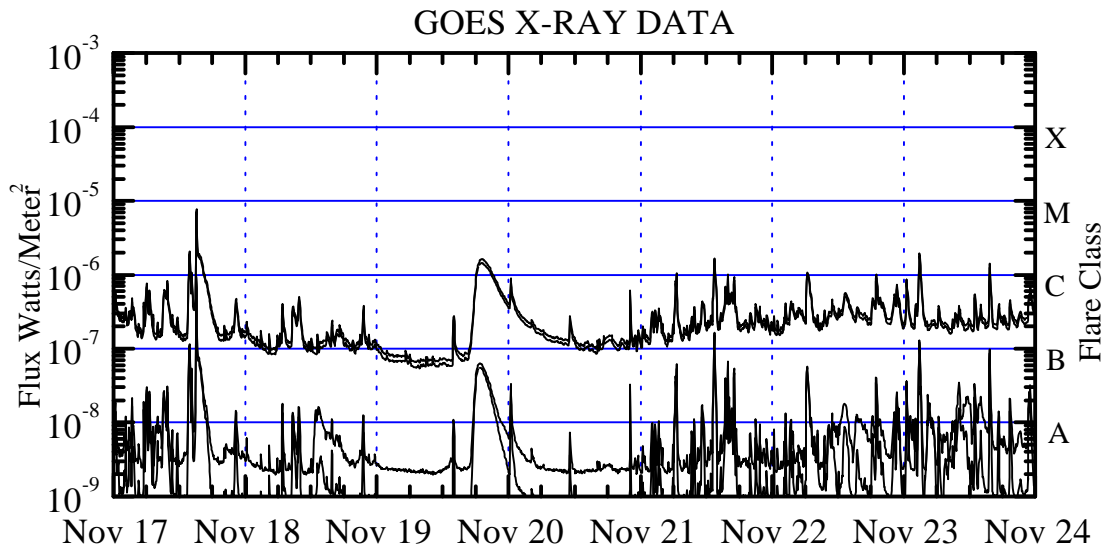
H_p plot contains the five minute averaged magnetic field H component in nanoteslas (nT) as measured by GOES-9. The H component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

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.

