

Space Weather Highlights 15 – 21 November 2004

**SWO PRF 1525
23 November 2004**

Solar activity ranged from very low to low this period. Very low levels occurred on 17, 20 – 21 November, while low levels were observed on 15 – 16 and 18 - 19 November. Activity levels declined markedly this period as old Region 696 (N09, L=026, class/area, Ekc/910 on 06 November) quietly rotated around the west limb on 12 November. The most active group on the disk this period was Region 700 (N04, L=312, class/area, Eao/320 on 16 November), which produced 14 low-level C-class flares. The largest event was an impulsive C4.9 limb event observed at 19/0512 UTC as Region 700 rotated around the west limb. East limb activity late on 21 November portended the return of old Regions 693 (S17, L=074) and 698 (S09, L=062) on or about 23 November. All other regions on the disk were quiet and stable.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft during most of the summary period. Solar wind speed ranged from a low of near 310 km/s early on 19 November to a high near 640 km/s early on 21 November. The period began under the influence of weak transient flow. These conditions persisted through early on 16 November when for a period of about 24 hours, small perturbations in the solar wind resulted in variability in the IMF Bz which included some southward orientation to near -10 nT. Late on the 19th, the IMF Bz began to fluctuate between +/-10 nT while temperature, density, and solar wind speed increased, all indicative of a co-rotating interactive region and high speed stream (HSS). A pronounced reverse shock occurred early on 21 November as the HSS transitioned from a compression region to a rarefaction region. The characteristic step in solar wind speed was accompanied by a sharp drop in density while the IMF Bz trended mostly south to -5nT. These conditions persisted through the end of the summary period.

No greater than 10 MeV proton events were observed this period.

The greater than 2 MeV electron flux at geosynchronous orbit was at high levels the entire summary period.

The geomagnetic field, through early on 20 November, was at quiet to unsettled levels. At high latitudes, active conditions persisted from 16/0800 – 1500 UTC and again from 17/0700 – 1200 UTC. By about 0500 UTC on 20 November, activity increased to unsettled to active, and by 20/1030 UTC, activity further increased at high latitudes to major to severe storm levels as a transequatorial coronal hole high speed wind stream became geoeffective. The summary period ended with predominately quiet to active levels observed at all latitudes with an isolated reading of minor storming midday on 21/1200 UTC at mid-latitudes and a period of minor to major storming observed at high latitudes from 22/1000 – 1600 UTC.

Space Weather Outlook 24 November - 20 December 2004

Solar activity is expected to be at mostly low to moderate levels as old Regions 693 (23 November), 698 (24 November), and 696 (26 November) are due to return. Flare and CME activity from the southeast limb would suggest that either (or both) Regions 693 and 698 are still quite active.

A greater than 10 MeV proton event is possible early in the period with major flare activity from returning active regions.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at high levels on 24 November and again on 06 – 11 Dec.

The geomagnetic field is expected to range from mostly quiet to unsettled. From 06 – 10 December, a recurrent coronal hole high speed solar wind stream is expected to become geoeffective.



Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10 ⁻⁶ hemi.)	X-ray Background	Flares							
					X-ray Flux			Optical				
					C	M	X	S	1	2	3	4
15 November	106	57	320	B1.9	3	0	0	0	0	0	0	0
16 November	108	46	410	B2.5	5	0	0	3	0	0	0	0
17 November	105	59	330	B2.0	0	0	0	4	0	0	0	0
18 November	104	77	210	B2.0	3	0	0	0	0	0	0	0
19 November	102	61	210	B2.5	3	0	0	0	0	0	0	0
20 November	99	40	180	B1.1	0	0	0	0	0	0	0	0
21 November	101	27	120	B1.4	0	0	0	0	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			
15 November	106	57	320	B1.9	3	0	0	0	0	0	0	0
16 November	108	46	410	B2.5	5	0	0	3	0	0	0	0
17 November	105	59	330	B2.0	0	0	0	4	0	0	0	0
18 November	104	77	210	B2.0	3	0	0	0	0	0	0	0
19 November	102	61	210	B2.5	3	0	0	0	0	0	0	0
20 November	99	40	180	B1.1	0	0	0	0	0	0	0	0
21 November	101	27	120	B1.4	0	0	0	0	0	0	0	0

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	15 November	2	0-0-1-0-1-1-2-0	0	0-0-0-0-0-0-0-0	3
16 November	5	0-0-3-2-2-2-1-1	15	0-0-4-4-4-4-2-1	8	0-1-3-3-2-2-2-2
17 November	7	1-1-3-2-1-0-2-3	9	1-1-4-4-2-0-1-0	6	1-1-3-2-1-1-1-1
18 November	4	2-1-0-0-1-3-2-0	1	0-0-1-0-0-0-1-0	3	0-0-0-1-1-1-1-1
19 November	3	0-2-1-0-0-1-2-1	1	0-0-0-0-0-1-1-1	4	0-2-0-0-1-2-2-2
20 November	12	3-3-2-3-3-3-2-2	38	2-4-3-7-6-3-3-2	18	3-4-3-4-4-3-3-3
21 November	9	2-1-2-2-3-2-3-2	32	2-1-3-6-6-5-2-3	16	2-1-3-5-4-3-2-2

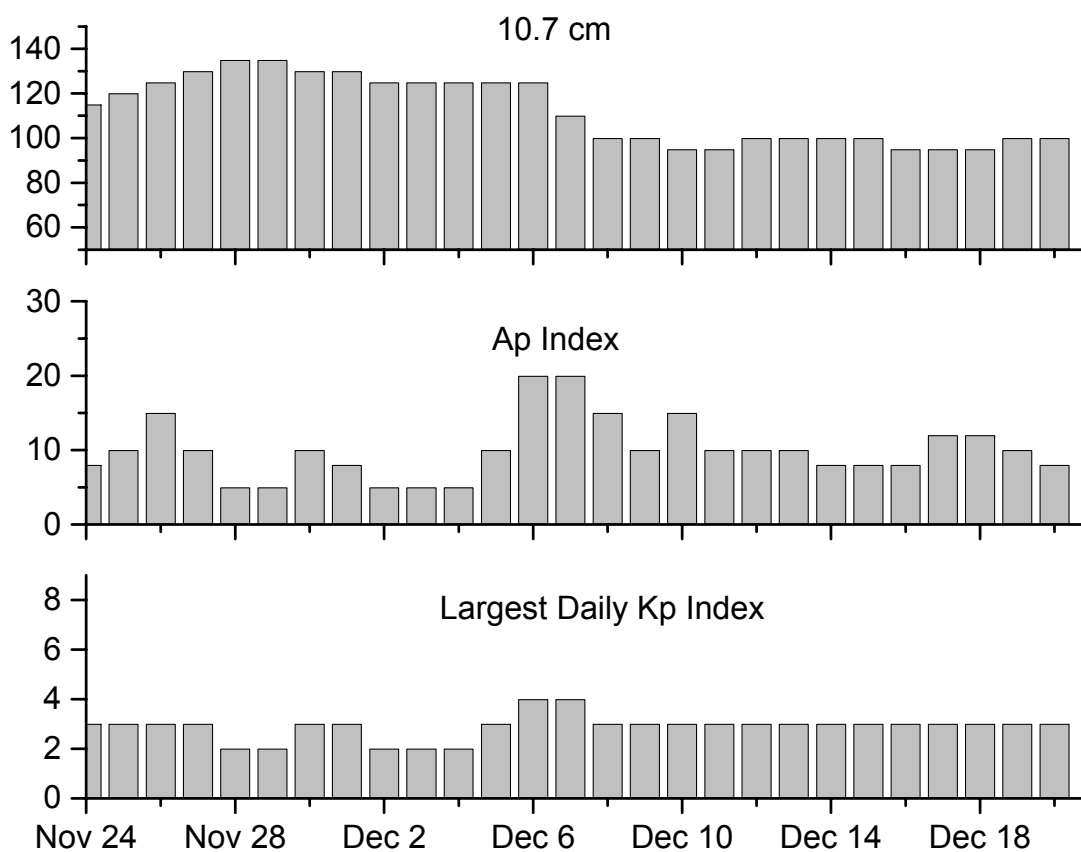


Alerts and Warnings Issued

<u>Date & Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date & Time of Event UT</u>
15 Nov 0512	ALERT: Electron 2MeV Integral Flux > 1000pfu	15 Nov 0500
16 Nov 0516	ALERT: Electron 2MeV Integral Flux > 1000pfu	16 Nov 0500
17 Nov 0713	WARNING: Geomagnetic K= 4	17 Nov 0715 - 1600
17 Nov 0720	ALERT: Geomagnetic K= 4	17 Nov 0718
17 Nov 0757	ALERT: Electron 2MeV Integral Flux > 1000pfu	17 Nov 0735
18 Nov 0015	2 – 245 MHz Radio Bursts	17 Nov
18 Nov 0719	ALERT: Electron 2MeV Integral Flux > 1000pfu	18 Nov 0700
19 Nov 0515	ALERT: Electron 2MeV Integral Flux > 1000pfu	19 Nov 0500
20 Nov 0445	WARNING: Geomagnetic K= 4	20 Nov 0445 -1600
20 Nov 0447	ALERT: Geomagnetic K= 4	20 Nov 0448
20 Nov 1235	ALERT: Electron 2MeV Integral Flux > 1000pfu	20 Nov 1225
21 Nov 1107	WARNING: Geomagnetic K= 4	21 Nov 1107 - 1500
21 Nov 1112	ALERT: Geomagnetic K= 4	21 Nov 1111
21 Nov 1140	WARNING: Geomagnetic K= 5	21 Nov 1139 - 1500
21 Nov 1145	ALERT: Geomagnetic K= 5	21 Nov 1144
21 Nov 1416	ALERT: Electron 2MeV Integral Flux > 1000pfu	21 Nov 1355
21 Nov 1455	EXTENDED WARNING: Geomagnetic K= 4	21 Nov 1107 - 2359
21 Nov 2355	EXTENDED WARNING: Geomagnetic K= 4	21 Nov 1107 – 22 Nov 1500



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
24 Nov	115	8	3	08 Dec	100	15	3
25	120	10	3	09	100	10	3
26	125	15	3	10	95	15	3
27	130	10	3	11	95	10	3
28	135	5	2	12	100	10	3
29	135	5	2	13	100	10	3
30	130	10	3	14	100	8	3
01 Dec	130	8	3	15	100	8	3
02	125	5	2	16	95	8	3
03	125	5	2	17	95	12	3
04	125	5	2	18	95	12	3
05	125	10	3	19	100	10	3
06	125	20	4	20	100	8	3
07	110	20	4				



Energetic Events

Date	Time		X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	Max	Class	Flux	Imp/	Location	Radio Flux		Intensity	
						Brtns	Lat CMD	245	2695	II	IV

No Events Observed

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn
	Begin	Max	End			Location	Lat CMD	
15 November	0046	0049	0053	B2.6				700
	0443	0453	0457	B7.6				
	0617	0626	0651	C1.2				700
	0904	0925	0947	C1.5				700
	1103	1107	1109	B6.6				700
	1312	1327	1335	B6.1				
	1526	1530	1532	B7.0				700
	2121	2136	2159	C1.3				700
16 November	0012	0013	0018	C1.4	Sf	N07W51		700
	0058	0101	0104	B4.8				
	0144	0144	0148	C1.1	Sf	N07W52		700
	0223	0228	0231	C1.0	Sf	N08W52		700
	0329	0332	0336	B6.7				700
	0421	0438	0456	C1.0				700
	0557	0602	0604	B8.5				700
	0611	0617	0625	C1.0				700
	0732	0735	0740	B4.6				700
	1247	1252	1255	B9.0				700
	2017	2020	2022	B4.1				700
17 November	2300	2305	2312	B4.2				700
	0108	0111	0113	B3.5				
	0241	0245	0247	B6.3				700
	0935	0938	0941	B4.4				700
	1025	1028	1031	B2.8				
	1100	1103	1108	B3.4				700
	1355	1359	1402	B3.6				700
	1743	1746	1750	B2.4				
	2110	2117	2120	B3.7				
	2324	2332	0015		Sf	S14W35		699
	2328	2328	2332		Sf	S09W27		702
18 November	2332	2337	2340		Sf	S09W27		702
	2348	2349	2359		Sf	N13E51		
	0459	0502	0507	B3.5				700
	1124	1128	1132	B3.7				
	1449	1456	1458	C3.6				700
1712	1718	1728	B5.0					
1944	1948	1951	C1.9				700	



Flare List – continued.

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
18 November	2258	2305	2311	C1.9			700
19 November	0043	0052	0057	C2.9			700
	0213	0220	0228	C3.4			700
	0503	0512	0519	C4.9			700
	0724	0729	0734	B7.4			700
20 November	2331	2337	2344	B2.2			
21 November	1022	1026	1031	B2.5			701
	1624	1656	1739	B5.4			
	2016	2022	2031	B3.3			
	2147	2204	2209	B6.1			704



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	4								
<i>Region 699</i>																							
09 Nov	S16E66	272	0020	01	Hrx	002	A																
10 Nov	S15E53	272	0030	01	Hsx	001	A																
11 Nov	S14E38	273	0030	01	Hsx	001	A																
12 Nov	S14E27	271	0030	08	Cso	003	B																
13 Nov	S15E17	268	0040	10	Dao	004	B																
14 Nov	S13E03	269	0080	10	Dro	011	B	1															
15 Nov	S13W10	269	0050	11	Eao	006	B																
16 Nov	S13W23	269	0030	09	Dso	004	B																
17 Nov	S13W36	269	0020	03	Cro	002	B					1											
18 Nov	S13W50	269	0010	01	Axx	002	A																
19 Nov	S14W65	271	0000	01	Axx	001	A																
20 Nov	S14W78	271																					
								1	0	0	1	0	0	0	0	0							

Still on Disk.

Absolute heliographic longitude: 269

Region 700

11 Nov	N04W02	313	0020	05	Dso	007	B														
12 Nov	N05W14	312	0030	05	Dso	006	B														
13 Nov	N05W27	312	0080	08	Dac	013	Bg														
14 Nov	N04W40	312	0080	09	Dri	026	Bg	1													
15 Nov	N04W53	312	0200	10	Dai	018	Bg	3													
16 Nov	N04W67	312	0320	13	Eao	011	Bg	5			3										
17 Nov	N04W80	312	0180	10	Dso	005	Bg														
18 Nov	N04W93	312	0030	04	Dao	002	Bg	3													
								12	0	0	3	0	0	0	0	0					

Crossed West Limb.

Absolute heliographic longitude: 313



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 701

11 Nov S16E70	241	0080	07	Cso	002	B													
12 Nov S17E60	238	0100	08	Cso	002	B													
13 Nov S17E45	240	0100	07	Cao	003	B													
14 Nov S15E30	242	0070	02	Hax	002	A													
15 Nov S15E17	242	0070	05	Cso	003	B													
16 Nov S15E04	242	0060	02	Hsx	001	A													
17 Nov S15W09	241	0050	02	Hsx	001	A													
18 Nov S15W22	241	0060	02	Hsx	001	A													
19 Nov S16W34	240	0050	02	Hsx	001	A													
20 Nov S16W48	241	0050	04	Hsx	002	A													
21 Nov S15W61	241	0030	02	Hsx	001	A													

Still on Disk.

Absolute heliographic longitude: 242

Region 702

17 Nov S10W27	259	0080	06	Dso	011	B														2	
18 Nov S10W40	259	0050	08	Dso	010	B															
19 Nov S11W54	260	0060	10	Dso	006	B															
20 Nov S09W72	265	0020	02	Hrx	001	A															
21 Nov S09W85	265																				

Still on Disk.

Absolute heliographic longitude: 259

Region 703

18 Nov N13E46	173	0010	01	Axx	001	A															
19 Nov N12E34	172	0030	01	Axx	002	A															
20 Nov N13E33	160																				
21 Nov N13E20	160																				

Still on Disk.

Absolute heliographic longitude: 160

Region 704

18 Nov N12E75	144	0050	01	Hax	001	A															
19 Nov N13E62	144	0070	02	Hsx	001	A															
20 Nov N12E51	142	0110	08	Dao	007	B															
21 Nov N12E39	141	0090	09	Dso	006	B															

Still on Disk.

Absolute heliographic longitude: 141

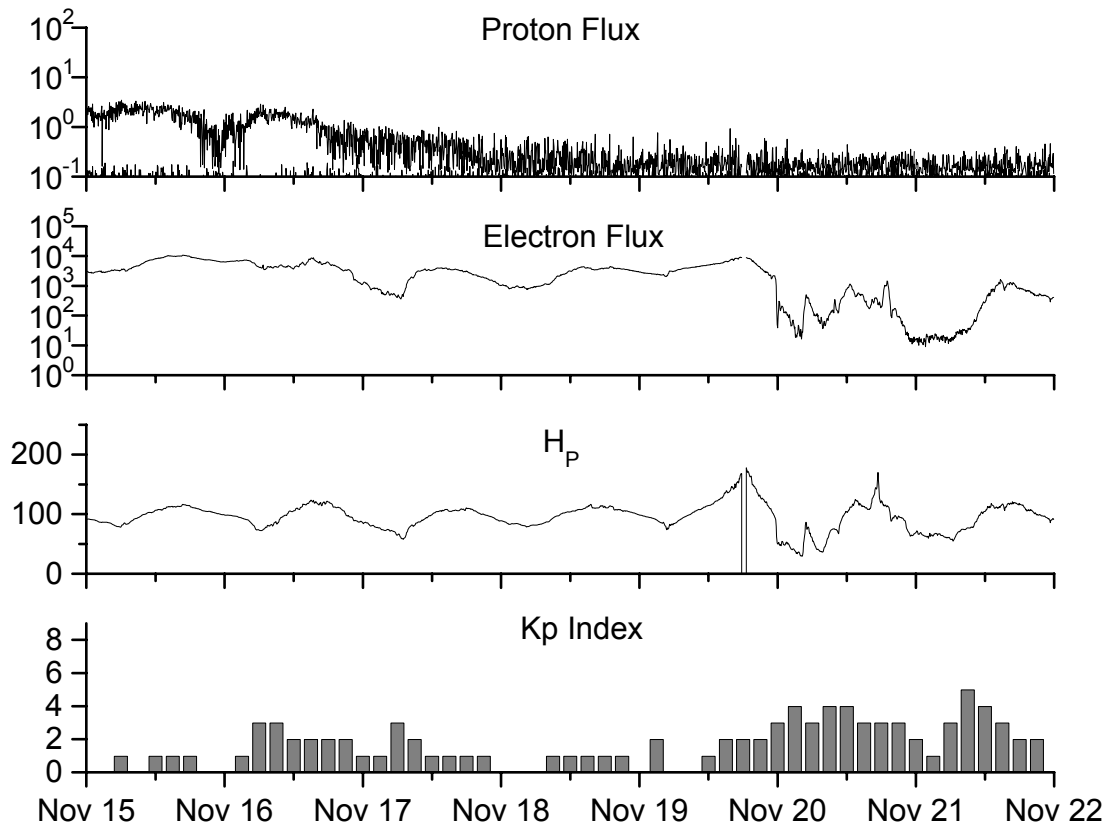


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

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
2002									
November	159.8	95.5	0.60	150.9	85.2	168.7	154.8	16	16.3
December	147.9	80.8	0.55	144.6	82.1	158.6	150.9	13	17.0
2003									
January	149.3	79.7	0.53	141.7	81.0	144.0	149.2	13	18.2
February	87.0	46.0	0.53	136.4	78.5	124.5	144.7	17	18.9
March	119.7	61.1	0.51	128.1	74.2	132.2	139.5	21	19.4
April	119.7	60.0	0.50	121.5	70.3	126.3	135.0	20	20.1
May	89.6	55.2	0.62	118.3	67.8	129.3	133.1	26	21.0
June	118.4	77.4	0.65	113.6	65.2	129.4	130.2	24	21.5
July	132.8	85.0	0.64	106.9	62.0	127.8	127.2	19	22.0
August	114.3	72.7	0.64	102.8	60.3	122.1	125.2	23	22.2
September	82.6	48.8	0.59	100.7	59.8	112.3	123.7	18	21.8
October	118.9	65.5	0.55	96.6	58.4	153.1	121.8	35	21.1
November	118.9	67.3	0.57	93.6	57.0	153.1	120.1	28	20.0
December	75.4	46.5	0.62	91.4	55.0	115.1	118.0	16	18.6
2004									
January	62.3	37.7	0.61	87.9	52.0	114.1	116.3	22	18.1
February	75.6	45.8	0.61	84.2	49.4	107.0	115.5	13	17.7
March	81.0	49.1	0.61	80.9	47.2	112.2	114.6	14	16.9
April	59.3	39.3	0.66	77.9	45.6	101.2	112.3	11	15.5
May	77.3	41.5	0.54			99.8		8	
June	78.9	43.2	0.55			97.4		8	
July	87.8	51.0	0.58			118.5		23	
August	69.5	40.9	0.59			110.1		11	
September	50.0	27.7	0.55			103.1		10	
October	77.9	48.4	0.62			167.0		9	

NOTE: All smoothed values after September 2002 and monthly values after March 2003 are preliminary estimates. The lowest smoothed sunspot index number for Cycle 22, RI = 8.0, occurred in May 1996. The highest smoothed sunspot number for Cycle 23, RI= 120.8, occurred April 2000. *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 15 November 2004*

Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by GOES-11 (W103) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

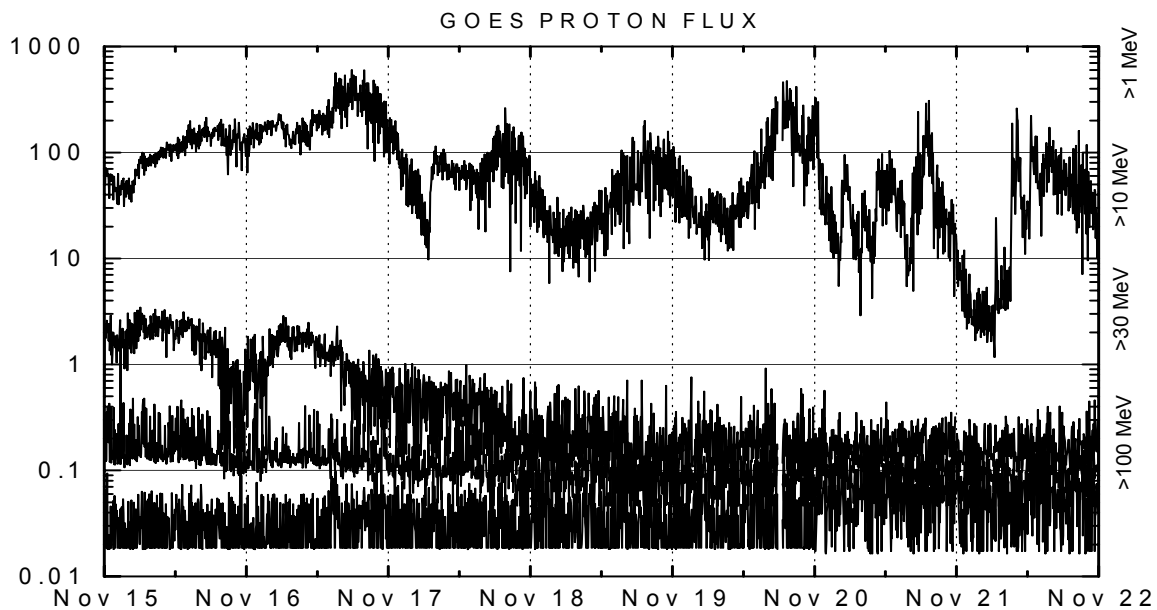
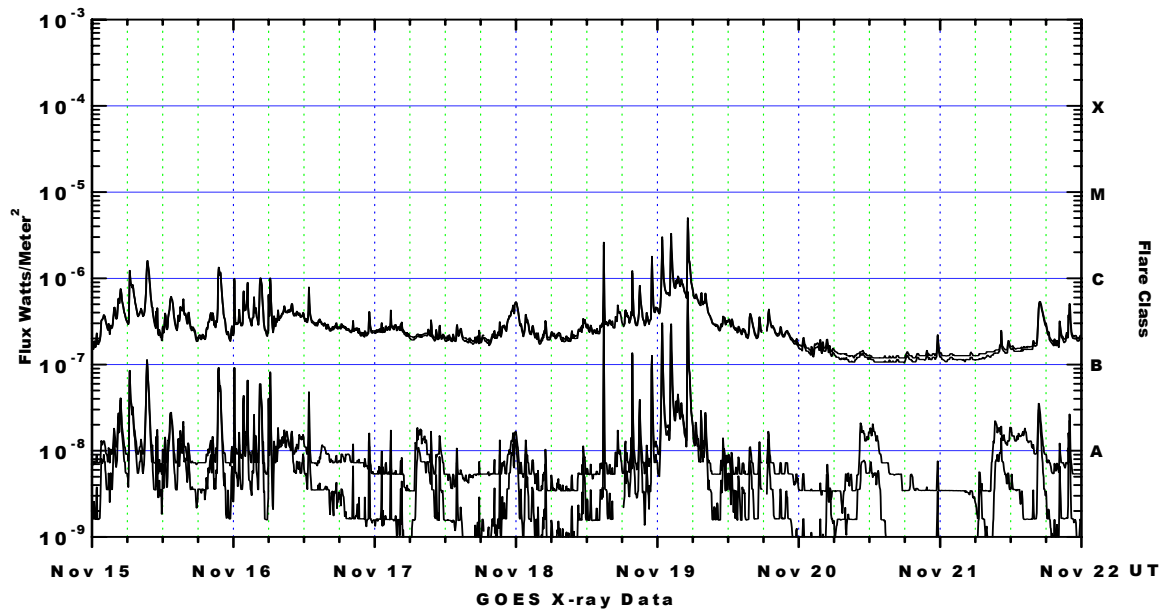
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-12 (W75).

H_p plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-12. 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 Air Force Weather Agency) 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 Hartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC), British Geological Survey (BGS) 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 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 12 (W75) and GOES 10 (W135) 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-11 (W103) 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.

