

Space Weather Highlights 29 November – 05 December 2004

**SWO PRF 1527
07 December 2004**

Solar activity ranged from very low to moderate this period. Region 707 (S17, L=073, class/area, Dsc/240 on 01 December) produced eight minor C-class flares from 29 November through 01 December. Thereafter, through the end of the summary, this region showed steady decay and produced only B-class activity. Region 708 (N09, L=035, class/area, Dsi/150 on 02 December) produced the most significant activity of the period with two M-class flares, one each on 01 and 02 December. An M1.1/Sn Tenflare (130 sfu) was observed at 01/0720 UTC with a Type IV sweep and weak discrete radio signatures. Early on 03 December at 0006 UTC, Region 708 produced an M1.5/2f Tenflare (520 sfu) with Type II and IV radio emissions. LASCO/EIT imagery observed a full halo CME from this event at 03/0026 UTC. Solar activity levels decayed to very low on 04 – 05 December.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft during most of the summary period. The period began under the influence of a high speed coronal hole wind stream. A solar sector boundary crossing preceded the onset of the high speed wind stream. Solar wind speed reached a maximum of near 690 km/s midday on 30 November and the IMF Bz fluctuated between +10 and -12 nT early on the 29th. By 01 December, wind speed began a gradual decline in velocity and the IMF Bz became mostly neutral. By early on 05 December, wind speed had decayed to near 275 km/s. At 05/0656 UTC, a shock was recorded at ACE marking the arrival of the 03 December full halo CME. A sudden impulse (47 nT) was observed at the Boulder magnetometer at 0747 UTC. Solar wind speed jumped to near 450 km/s, temperature and density increased, and the Bz component of the IMF rotated strongly northward to 35 nT. By the end-of-day on 05 December, the IMF Bz turned weakly negative to -5 nT.

No greater than 10 MeV proton events were observed this period. However, an enhancement to near 2 pfu was observed beginning midday on 03 December and was still enhanced at the end of the summary period. This enhancement was a result of the M1.5 X-ray event early on 03 December.

The greater than 2 MeV electron flux at geosynchronous orbit was at high levels on 01 – 05 December.

The geomagnetic field ranged from quiet to minor storming this period. The high speed stream on 29 November through 01 December produced mostly unsettled to active periods at all latitudes with an isolated period of minor storming observed at high latitudes midday on 30 November and another minor storm period observed at mid latitudes early on 01 December. Quiet levels persisted from midday on 01 December through early on the 5th with an isolated period of active conditions observed at mid latitudes. The summary period ended with quiet conditions.

Space Weather Outlook 08 December - 03 January 2005

Solar activity is expected to be very low to low through most of the forecast period. Isolated moderate levels are possible after 23 December when old Region 708 is due to return.

A greater than 10 MeV proton event is not expected.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at high levels on 08 – 11 December, 18 – 19 December, 23 - 28 December, and 03 January.

The geomagnetic field is expected to range from mostly quiet to active levels with isolated minor storm periods. High speed coronal hole streams are expected to produce occasional storm periods on 07 – 08 December, 17 – 18 December, 22 - 27 December, and 02 – 03 January.



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
29 November	111	40	440	B1.6	2	0	0	1	0	0	0	0
30 November	111	42	420	B1.9	2	0	0	2	0	0	0	0
01 December	111	52	450	B2.3	5	1	0	6	0	0	0	0
02 December	106	62	470	B1.9	0	1	0	0	0	1	0	0
03 December	101	58	450	B1.7	0	0	0	0	0	0	0	0
04 December	97	43	280	B1.4	0	0	0	0	0	0	0	0
05 December	96	46	230	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
	29 November	7.4E+5	1.5E+4	5.1E+3		7.9E+6
30 November	8.8E+5	1.4E+4	3.1E+3		2.7E+7	
01 December	1.3E+6	1.3E+4	3.0E+3		7.8E+7	
02 December	1.3E+6	1.3E+4	3.1E+3		7.5E+7	
03 December	3.1E+6	6.7E+4	3.3E+3		8.4E+7	
04 December	3.8E+6	6.3E+4	3.2E+3		8.7E+7	
05 December	1.8E+7	2.6E+4	3.0E+3		1.0E+8	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	29 November	20	3-3-3-4-3-4-3-4	16	2-2-3-3-4-4-3-3	15
30 November	16	3-4-3-2-3-3-3-3	24	3-3-3-5-4-4-4-3	15	3-4-3-2-3-3-3-3
01 December	11	1-3-4-2-2-2-2-3	13	2-2-4-4-3-2-2-2	13	1-3-5-2-1-2-1-2
02 December	4	1-1-2-0-1-2-2-1	3	1-0-2-0-1-2-1-0	4	1-1-2-0-1-2-1-1
03 December	1	0-0-0-0-1-0-1-0	1	0-0-0-0-0-0-1-1	3	0-1-1-0-1-1-1-1
04 December	0	0-0-0-0-0-0-1-0	0	0-0-0-0-0-0-0-0	1	0-0-0-0-0-1-0-0
05 December	7	0-1-4-2-1-2-1-1	2	0-0-2-1-0-1-1-0	8	0-1-4-2-1-2-2-1

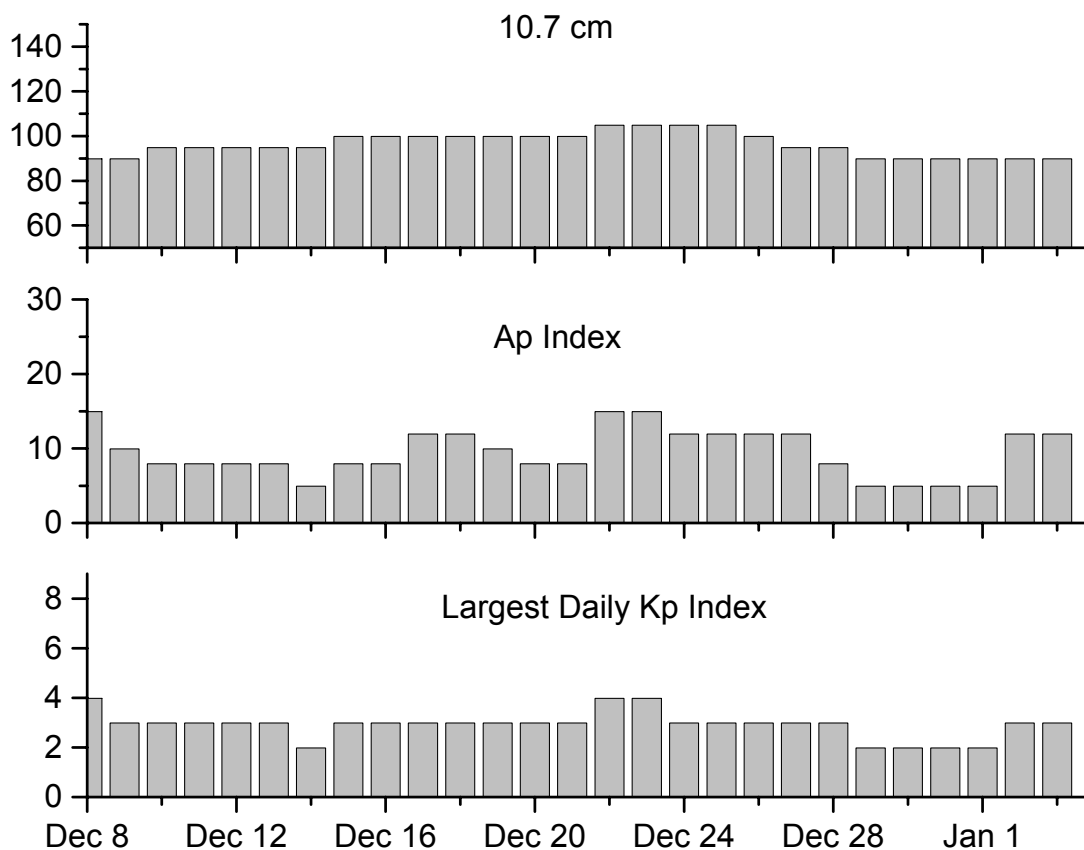


Alerts and Warnings Issued

<u>Date & Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date & Time of Event UT</u>
29 Nov 0535	EXTENDED WARNING: Geomagnetic K = 4	28 Nov 2230 - 29 Nov 1500
29 Nov 1132	ALERT: Geomagnetic K = 4	29 Nov 1132
29 Nov 1553	WARNING: Geomagnetic K = 4	29 Nov 1555 -2359
29 Nov 1623	ALERT: Geomagnetic K = 4	29 Nov 1621
29 Nov 2355	EXTENDED WARNING: Geomagnetic K = 4	29 Nov 1555 - 30 Nov 0600
30 Nov 0556	EXTENDED WARNING: Geomagnetic K = 4	29 Nov 1555 -
30 Nov 1604	WARNING: Geomagnetic K= 4 expected	30 Nov 1605 -2359
01 Dec 0726	SUMMARY: 10cm Radio Burst	01 Dec 0704
01 Dec 0730	ALERT: Type IV Radio Emission	01 Dec 0707
01 Dec 0809	WARNING: Geomagnetic K = 4	01 Dec 0809 - 1500
01 Dec 0811	ALERT: Geomagnetic K = 4	01 Dec 0809
01 Dec 0922	ALERT: Electron 2MeV Integral Flux > 1000pfu	01 Dec 0900
02 Dec 1242	ALERT: Electron 2MeV Integral Flux > 1000pfu	02 Dec 1220
03 Dec 0011	ALERT: Type II Radio Emission	02 Dec 2353
03 Dec 0021	ALERT: Type IV Radio Emission	02 Dec 2357
03 Dec 0104	SUMMARY: 10cm Radio Burst	02 Dec 2348
03 Dec 1107	ALERT: Electron 2MeV Integral Flux > 1000pfu	03 Dec 1045
03 Dec 2201	WATCH: Geomagnetic A \geq 30	05 Dec
04 Dec 1121	ALERT: Electron 2MeV Integral Flux > 1000pfu	04 Dec 1100
05 Dec 0730	WARNING: Geomagnetic Sudden Impulse	05 Dec 0730 - 0830
05 Dec 0732	ALERT: Electron 2MeV Integral Flux > 1000pfu	05 Dec 0715
05 Dec 0749	WARNING: Geomagnetic K = 4	05 Dec 0750 - 1500
05 Dec 0752	WARNING: Geomagnetic K = 5	05 Dec 0753 - 1500
05 Dec 0754	SUMMARY: Geomagnetic Sudden Impulse	05 Dec 0747
05 Dec 0756	ALERT: Geomagnetic K = 4	05 Dec 0753
05 Dec 1456	EXTENDED WARNING: Geomagnetic K = 4	05 Dec 0750 - 2359



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
08 Dec	90	15	4	22 Dec	105	15	4
09	90	10	3	23	105	15	4
10	95	8	3	24	105	12	3
11	95	8	3	25	105	12	3
12	95	8	3	26	100	12	3
13	95	8	3	27	95	12	3
14	95	5	2	28	95	8	3
15	100	8	3	29	90	5	2
16	100	8	3	30	90	5	2
17	100	12	3	31	90	5	2
18	100	12	3	01 Jan	90	5	2
19	100	10	3	02	90	12	3
20	100	8	3	03	90	12	3
21	100	8	3				



Energetic Events

Date	Time		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
01 Dec	0700	0720	0741	M1.1	.018	Sn	N06E20	708	270	130	1	
02 Dec	2344	0006	0035	M1.5	.029	2f	N09E03	708	3400	520	2	2

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical Location Lat CMD	Rgn
	Begin	Max	End				
29 November	B0137	0138	0155	C3.2	Sf	S18E14	707
	1936	2137	2151	C2.0			707
30 November	0359	0359	0402	B7.7	Sf	S13E01	707
	0642	0658	0731	C4.8	Sf	N08E30	708
	1054	1102	1106	C1.8			707
01 December	0020	0024	0031	B3.2			
	0142	0144	0154	C1.9	Sf	S14W18	707
	0606	0612	0620	B3.7			
	0706	0715	0816	M1.1	Sn	N06E20	708
	1007	1010	1013	B9.0			707
	1257	1306	1309	C1.3			707
	1601	1603	1612	C2.6	Sf	S19W20	707
	1615	1620	1633	C4.2	Sf	S18W20	707
	1733	1734	1739		Sf	S17W19	707
	1823	1830	1843	C1.5	Sf	S17W20	707
02 December	2057	2105	2117	B9.9			706
	0257	0300	0303	B3.4			
	0347	0350	0352	B3.3			707
	0353	0356	0359	B3.6			707
	0542	0545	0548	B2.7			
	0617	0621	0624	B2.5			
	1234	1240	1242	B7.3			707
	1808	1814	1817	B3.8			
	2349	0001	0119	M1.5	2f	N09E03	708
	03 December	1302	1308	1315	B8.0		
04 December	0726	0746	0808	B4.9			
05 December	1705	1710	1715	B3.1			706



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 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										
22 Nov	N13E25	142	0110	10	Dso	007	B										
23 Nov	N12E11	143	0090	09	Dso	006	B										
24 Nov	N13W04	145	0090	08	Dao	007	B										
25 Nov	N13W17	145	0070	06	Dao	006	B										
26 Nov	N12W30	145	0060	03	Cao	006	B										
27 Nov	N13W44	145	0030	03	Hax	003	A										
28 Nov	N13W54	142	0010	08	Bxo	003	B										
29 Nov	N13W67	142															
30 Nov	N13W80	142															

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude:145

Region 706

24 Nov	S08E71	070	0080	06	Dao	005	B	3		2							
25 Nov	S08E56	072	0070	07	Dao	006	B										
26 Nov	S07E44	071	0140	08	Dao	005	B										
27 Nov	S07E31	070	0120	06	Cao	006	B										
28 Nov	S07E19	069	0150	05	Cso	006	B										
29 Nov	S08E05	070	0120	03	Hsx	001	A										
30 Nov	S08W08	070	0110	02	Hsx	002	A										
01 Dec	S07W21	070	0080	03	Hsx	002	A										
02 Dec	S05W26	062	0090	07	Cso	003	B										
03 Dec	S06W48	070	0080	04	Cao	003	B										
04 Dec	S07W62	071	0080	03	Cao	004	B										
05 Dec	S07W74	070	0070	02	Hsx	001	A										

3 0 0 2 0 0 0 0

Still on Disk.

Absolute heliographic longitude:070



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

Region 707

24 Nov	S16E68	073	0080	01	Hax	001	A										
25 Nov	S15E57	071	0110	06	Cao	006	B										
26 Nov	S16E42	073	0150	06	Dai	009	Bg										
27 Nov	S16E27	074	0170	07	Dai	014	Bg										
28 Nov	S15E14	074	0170	09	Cao	015	B										
29 Nov	S14E02	073	0170	06	Cao	008	B	2			1						
30 Nov	S14W12	074	0180	05	Dao	009	B	1			1						
01 Dec	S17W24	073	0240	06	Dsc	016	Bg	5			5						
02 Dec	S14W37	073	0230	07	Dac	019	B										
03 Dec	S14W49	071	0190	04	Dao	009	B										
04 Dec	S13W64	073	0110	05	Dao	003	B										
05 Dec	S13W77	073	0080	05	Hax	001	A										
								8	0	0	7	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude:073

Region 708

26 Nov	N08E81	034	0120	03	Hax	001	A										
27 Nov	N10E67	034	0100	02	Hsx	001	A										
28 Nov	N10E56	032	0140	03	Cso	002	B										
29 Nov	N10E40	035	0150	03	Hsx	001	A										
30 Nov	N11E27	035	0130	03	Hsx	001	A	1			1						
01 Dec	N09E14	035	0130	05	Cso	004	B		1		1						
02 Dec	N09E01	035	0150	06	Dsi	010	B		1					1			
03 Dec	N08W12	034	0160	08	Cso	005	B										
04 Dec	N09W26	035	0090	02	Cao	006	B										
05 Dec	N09W41	037	0070	03	Hsx	002	A										
								1	2	0	2	0	1	0	0	0	0

Still on Disk.

Absolute heliographic longitude:035

Region 709

03 Dec	N06E61	321	0020	01	Axx	001	A										
04 Dec	N06E48	321	0000	00		000											
05 Dec	N06E31	325	0010	05	Axx	002	A										
								0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 325

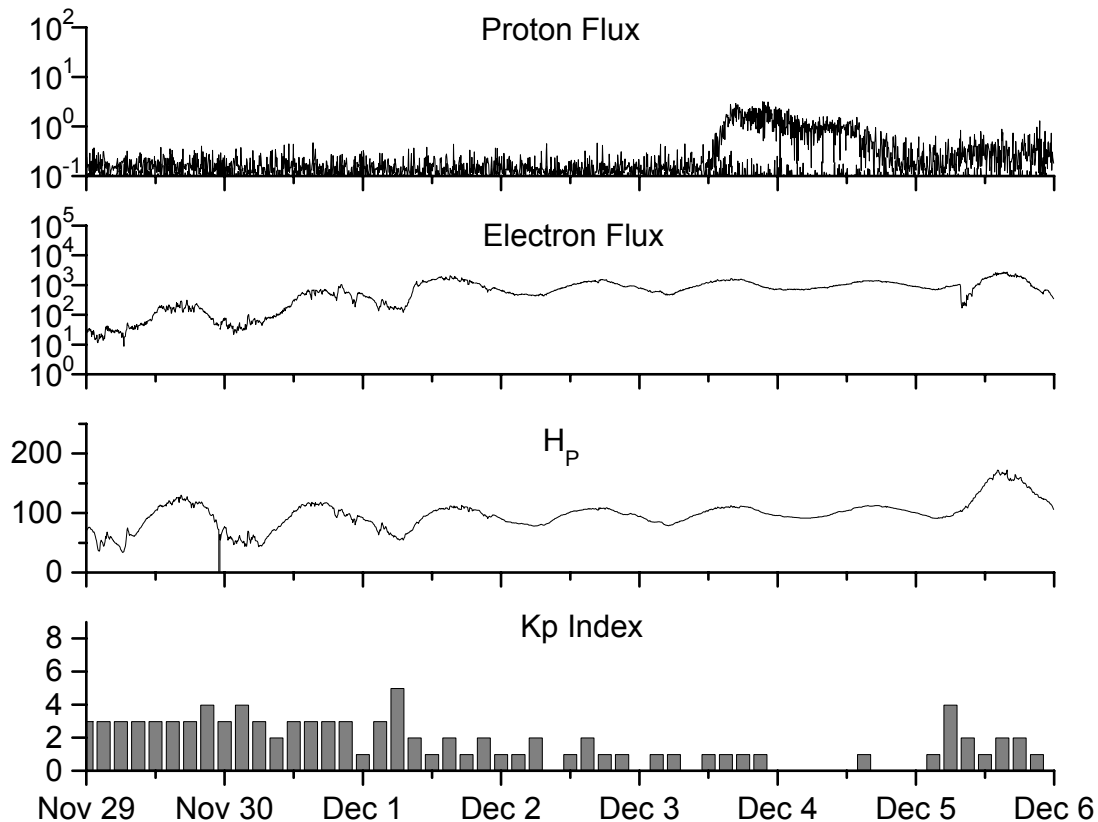


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

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 29 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.

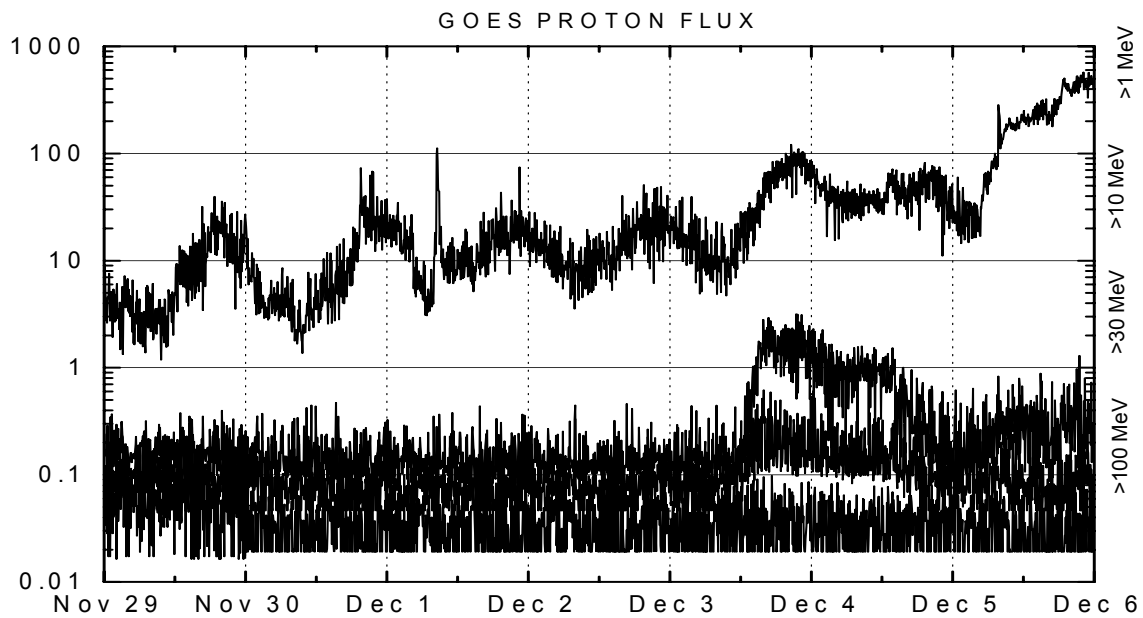
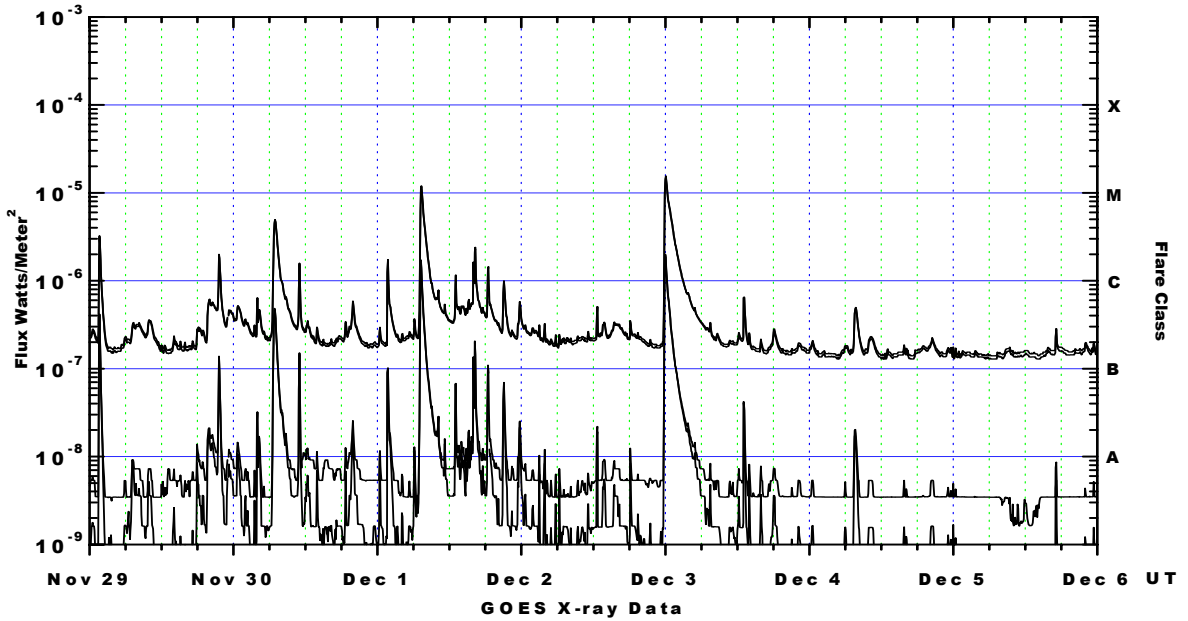
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-12 (W75).

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.

