

Space Weather Highlights 13 – 19 December 2004

**SWO PRF 1529
21 December 2004**

Solar activity was very low to low this period. Very low conditions persisted from 13 – 18 December. Region 711 (N13, L=311, class/area, Dai/120, on 13 December), exhibited minor magnetic complexity as it approached the west limb early in the period, but produced only occasional B-class activity. A full halo CME observed on LASCO imagery late on 15 December was determined to be a backside event. New Regions 712 (S10, L=148, class/area, Cso/030, on 18 December) and 713 (S10, L=125, class/area, Cso/120, on 19 December) rotated around the southeast limb on 17 December. Region 713 produced a single C1 flare, the only C-class flare of the entire period, on 19 December at 0414Z. A faint CME off the southeast limb was likely associated with this flare. The CME was not Earth directed.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft during most of the summary period. The period began with solar wind speed near 400 km/s. Solar wind speed was in a decline phase following the arrival of a CME on 12 December. A sustained period of southward Bz to near -10 nT ended early on 13 December as the IMF Bz rotated northward. Generally quiet solar wind conditions persisted on 14 and 15 December. Early on 16 December, an increase in the solar wind speed, temperature, and density, indicated the arrival of a high speed coronal hole stream. The stream was preceded by a co-rotating interaction region (CIR). Solar wind speed gradually increased to near 650 km/s by 17 December, before beginning its decline. The IMF Bz exhibited typical north-south fluctuations ranging +10 to -10 nT. The period ended with the solar wind speed back near 400 km/s.

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

The greater than 2 MeV electron flux at geosynchronous orbit increased to high levels on 18 and 19 December.

The geomagnetic field ranged from quiet to active levels with isolated minor storm periods at high latitudes. The period began at mostly quiet to unsettled levels with isolated high latitude active conditions. The disturbed periods were due to a CME that impacted the geomagnetic field on 12 December. Predominantly quiet to unsettled conditions persisted on 14 - 16 December, although the high latitudes experienced isolated active to minor storm levels. The onset of a high speed coronal hole stream on 16 December resulted in more disturbed geomagnetic conditions. Several periods of active to minor storm conditions were observed at high latitudes on 17 and 18 December. As the high speed stream subsided, the geomagnetic field settled to mostly quiet levels on 19 December.

Space Weather Outlook 22 December 2004 -17 January 2005

Solar activity is expected to be very low to low through the forecast period. There is a slight chance for an M-class flare.

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 22 - 29 December, 03 - 06 January, and 13 - 15 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 22 – 29 December, 03 - 06 January, and 13 – 16 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
13 December	90	22	120	A9.5	0	0	0	0	0	0	0	0
14 December	89	18	130	A8.7	0	0	0	0	0	0	0	0
15 December	89	28	170	B1.0	0	0	0	0	0	0	0	0
16 December	90	14	30	B1.5	0	0	0	0	0	0	0	0
17 December	90	40	140	B1.1	0	0	0	0	0	0	0	0
18 December	91	40	140	B1.1	0	0	0	0	0	0	0	0
19 December	94	29	130	B1.2	1	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
	13 December	3.4E+5	1.3E+4	2.8E+3		2.4E+6
14 December	2.6E+5	1.4E+4	3.1E+3		2.2E+6	
15 December	2.1E+5	1.4E+4	2.9E+3		5.2E+6	
16 December	4.1E+5	1.4E+4	3.2E+3		3.8E+6	
17 December	9.8E+5	1.4E+4	3.2E+3		9.5E+6	
18 December	1.2E+6	1.5E+4	3.4E+3		5.7E+7	
19 December	9.8E+5	1.4E+4	3.4E+3		7.8E+7	

Daily Geomagnetic Data

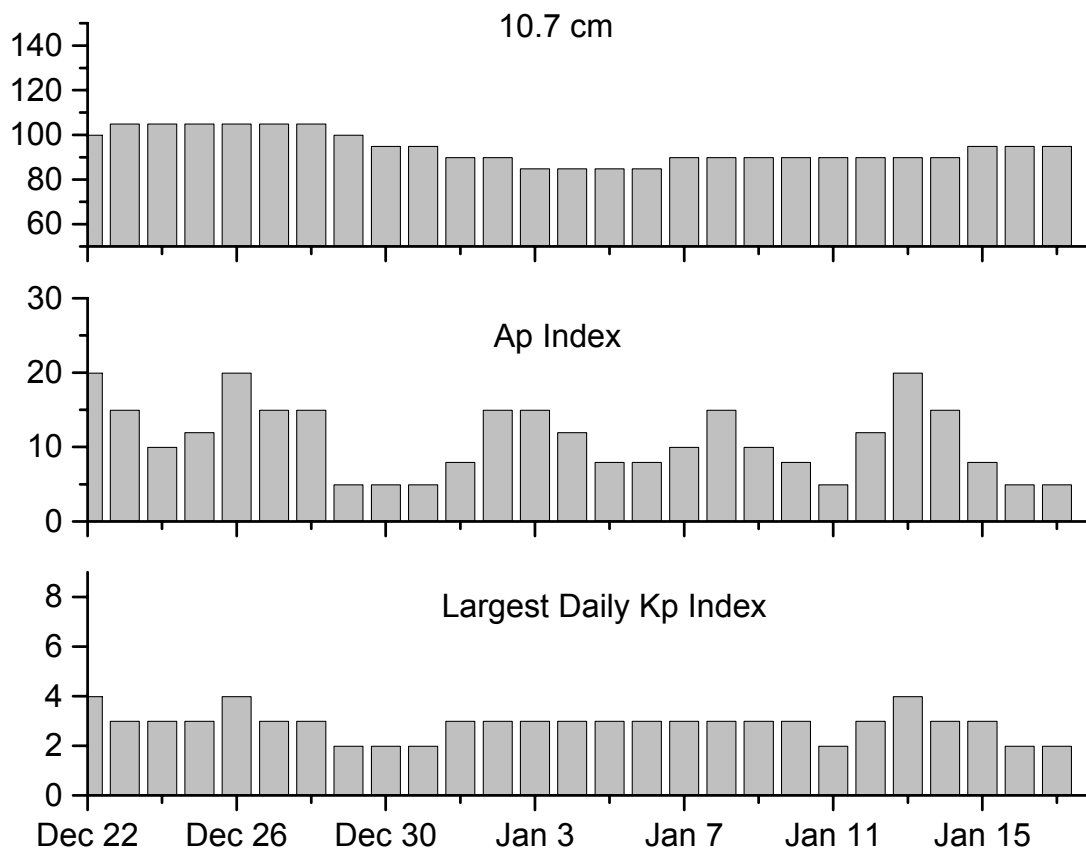
Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	13 December	8	3-3-3-1-2-1-1-1	7	3-3-3-2-1-1-0-0	11
14 December	4	0-1-1-2-2-1-1-1	13	0-1-3-4-5-1-1-1	7	0-1-2-3-2-1-2-2
15 December	3	1-1-2-0-1-1-1-1	6	1-1-3-1-1-3-1-1	6	1-1-2-1-1-2-2-2
16 December	8	1-3-1-0-2-1-3-3	12	1-1-1-1-5-3-2-3	10	1-3-2-1-2-2-4-3
17 December	9	3-2-2-2-2-2-2-3	29	3-5-5-4-4-5-2-3	15	3-4-4-3-2-3-2-3
18 December	8	3-3-2-2-2-2-1-0	22	3-2-2-5-6-2-2-1	12	4-4-2-2-3-2-1-1
19 December	1	1-0-0-0-0-0-1-1	2	1-0-1-2-0-0-0-0	4	1-0-1-1-1-2-1-1

Alerts and Warnings Issued

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UT
14 Dec 1150	WARNING: Geomagnetic K= 4 expected	14 Dec 1150 - 1500
16 Dec 2103	WARNING: Geomagnetic K= 4 expected	16 Dec 2105 - 17 Dec 1600
16 Dec 2305	ALERT: Geomagnetic K= 4	16 Dec 2304
17 Dec 0101	WARNING: Geomagnetic K= 5 expected	17 Dec 0110 - 1600
17 Dec 0420	ALERT: Geomagnetic K-index of 5	17 Dec 0419
17 Dec 1557	EXTENDED WARNING: Geomagnetic K= 5	17 Dec 0110 - 2359
17 Dec 2339	WARNING: Geomagnetic K= 4	17 Dec 2245 - 18 Dec 1600
17 Dec 2343	CANCEL WARNING: Geomagnetic K= 4	17 Dec 2339
18 Dec 1316	ALERT: Electron 2MeV Integral Flux > 1000pfu	18 Dec 1255
19 Dec 1101	ALERT: Electron 2MeV Integral Flux exceeded 1000pfu	19 Dec 1040



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
22 Dec	100	20	4	05 Jan	85	8	3
23	105	15	3	06	85	8	3
24	105	10	3	07	90	10	3
25	105	12	3	08	90	15	3
26	105	20	4	09	90	10	3
27	105	15	3	10	90	8	3
28	105	15	3	11	90	5	2
29	100	5	2	12	90	12	3
30	95	5	2	13	90	20	4
31	95	5	2	14	90	15	3
01 Jan	90	8	3	15	95	8	3
02	90	15	3	16	95	5	2
03	85	15	3	17	95	5	2
04	85	12	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

No Events Observed

Flare List

Date	Time			X-ray Class.	Optical		Rgn	
	Begin	Max	End		Imp / Brtns	Location Lat CMD		
13 December	0315	0319	0323	B1.5			711	
	1144	1147	1152	B1.4				
	1623	1630	1639	B2.8				711
	1701	1724	1730	B3.1				711
14 December	0103	0111	0113	B2.5			711	
	0815	0820	0824	B3.0			711	
	2011	2020	2028	B2.4			711	
	2105	2111	2118	B2.3			711	
	2121	2125	2129	B2.2			711	
	2343	2347	2355	B2.2			711	
15 December	0507	0528	0533	B3.1			711	
	0955	1108	1136	B6.2				
	2352	2355	2357	B2.3			711	
16 December	0758	0801	0804	B2.8				
	0945	0949	0954	B3.8			711	
	1245	1250	1259	B3.7				
17 December	1024	1042	1119	B3.9			712	
	1513	1517	1522	B1.9				
18 December	0006	0010	0014	B4.0			710	
	1147	1151	1154	B2.5			713	
19 December	0349	0414	0437	C1.8			713	
	0911	0920	0928	B2.3			713	



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 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										
06 Dec	N04E20	323	0010	11	Bxo	004	B										
07 Dec	N04E01	329	0020	04	Bxo	005	B										
08 Dec	N04W11	327	0020	07	Bxo	007	B	1			1						
09 Dec	N05W21	324	0030	07	Bxo	007	B										
10 Dec	N05W38	328	0010	01	Axx	001	A										
11 Dec	N05W51	328															
12 Dec	N05W64	328															
13 Dec	N05W77	328															
										1	0	0	1	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude:329

Region 710

08 Dec	S08E47	269	0020	01	Axx	002	A										
09 Dec	S07E33	270	0010	01	Axx	001	A	1			1						
10 Dec	S08E22	268	0010	03	Bxo	004	B										
11 Dec	S08E09	268															
12 Dec	S08W04	268															
13 Dec	S08W17	268															
14 Dec	S08W30	268															
15 Dec	S08W46	270	0020	07	Cao	004	B										
16 Dec	S06W61	272	0030	05	Dso	004	B										
17 Dec	S07W72	270	0050	13	Eai	005	B										
18 Dec	S07W82	267	0010	01	Axx	001	A										
										1	0	0	1	0	0	0	0

Still on Disk.

Absolute heliographic longitude:268

Region 711

10 Dec	N13W20	310	0020	04	Dso	004	B										
11 Dec	N13W34	311	0050	04	Dao	006	B										
12 Dec	N13W47	311	0100	06	Dao	016	B										
13 Dec	N13W60	311	0120	07	Dai	012	Bg										
14 Dec	N13W74	311	0130	07	Dso	008	Bg										
15 Dec	N13W88	312	0150	06	Dao	004	Bg										
										0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude:310



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 712

17 Dec	S10E50	148	0020	06	Dso	004	B											
18 Dec	S10E37	148	0030	05	Cso	005	B											
19 Dec	S11E24	147	0010	04	Bxo	002	B											
									0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude:147

Region 713

17 Dec	S10E70	128	0070	03	Hax	001	A											
18 Dec	S10E59	126	0100	07	Dao	004	B											
19 Dec	S10E46	125	0120	10	Cso	007	B	1										
								1	0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude:125

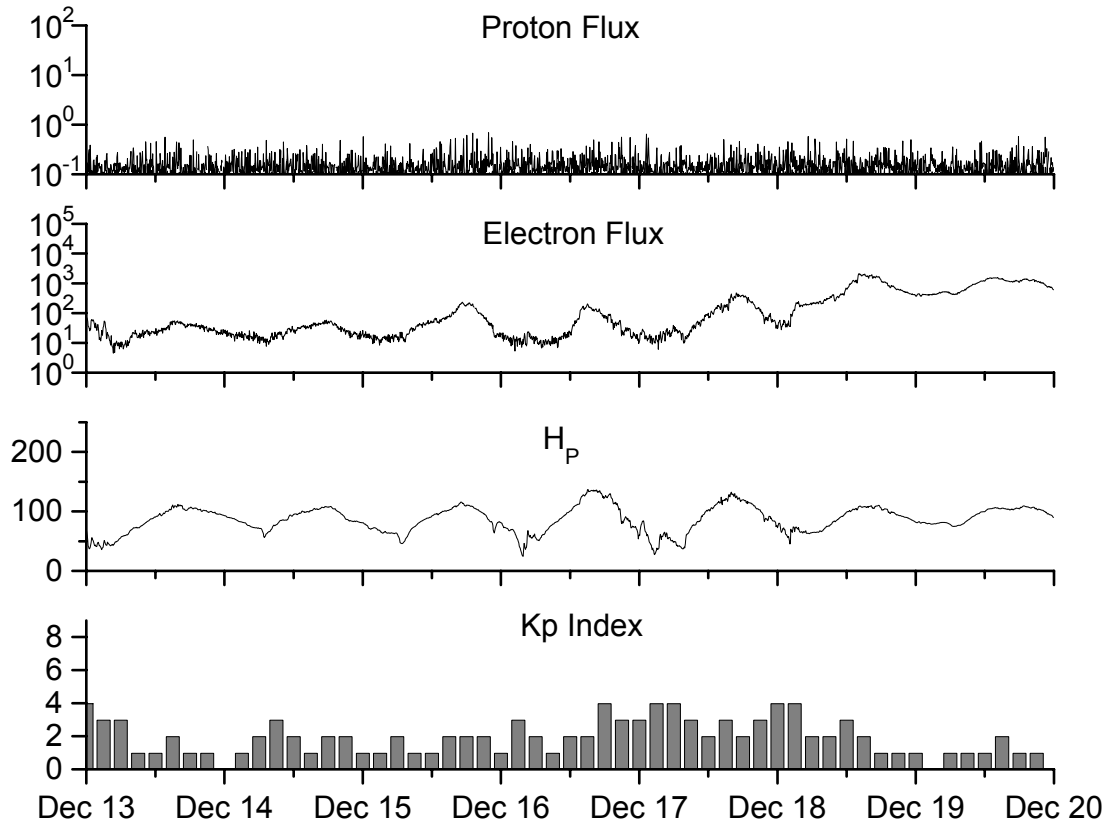


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	Observed SWO	values RI	Ratio RI/SWO	Smooth SWO	values RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
2002									
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	
November	70.5	43.7	0.62			113.2		26	

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 13 December 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.

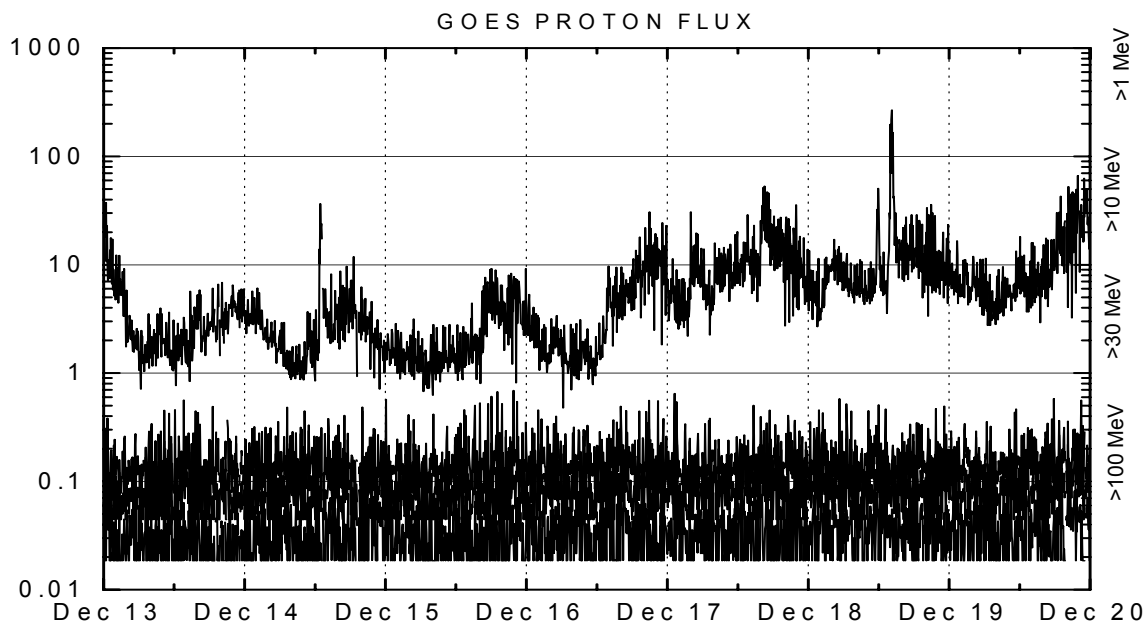
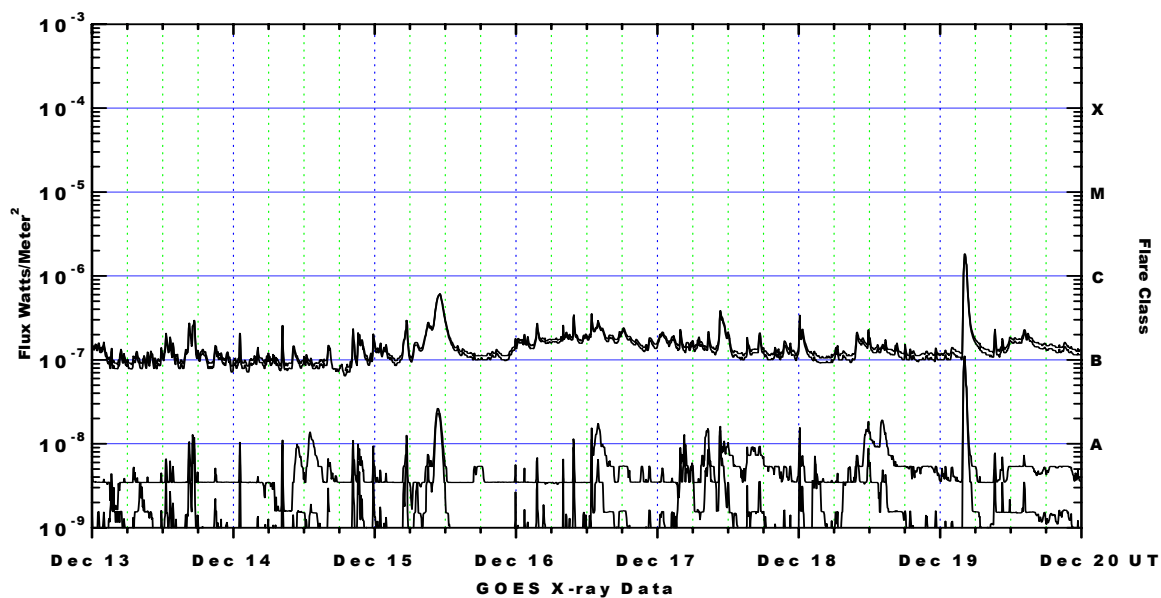
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-12 (W75).

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.

