

Space Weather Highlights
17 December – 23 December 2007

SEC PRF 1686
25 December 2007

Solar activity was very low to low. Activity reached low levels during 17 - 18 December due to isolated C-class flares from Region 978 (S09, L = 223, class/area Dac/340 on 13 December). The largest flare was a C2/Sf at 17/0716 UTC. Region 978 departed the visible disk early on 19 December.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels during 18 – 23 December.

The geomagnetic field was quiet to active during 17 - 20 December. Quiet to unsettled levels occurred during 21 - 23 December. ACE solar wind measurements indicated a recurrent co-rotating interaction region (CIR) occurred on 17 December. The CIR was associated with increased densities, velocities, and interplanetary magnetic field activity. Densities increased to a peak of 63 p/cc at 17/0516 UTC. CIR-associated IMF changes included increased Bt (peak 18 nT at 17/0511 UTC) and intermittent periods of increased southward Bz (minimum -18 nT at 17/0646 UTC). The CIR was followed by a high-speed stream. Velocities increased during 17 - 20 December, reached a peak of 763 km/sec at 20/2142Z, then gradually decreased during the remainder of the period.

Space Weather Outlook
26 December – 21 January 2008

Solar activity is expected to be very low to low. Isolated C-class flares are possible during 01 – 13 January due to the return of old Region 978.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach high levels during 26 - 31 December, 10 - 12 January, and 15 - 21 January.

The geomagnetic field is expected to be at quiet levels during 26 December - 06 January. Activity is expected to increase to unsettled levels during 06 - 08 January due to recurrence. Activity is expected to decrease to quiet levels during 09 - 12 January. Activity is expected to increase to unsettled to active levels during 13 - 16 January due to a recurrent coronal hole high-speed stream. Activity is expected to decrease to quiet to unsettled levels for the rest of the period as the high-speed stream subsides.



Daily Solar Data

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
17 December	80	14	100	B1.0	1	0	0	2	0	0	0	0
18 December	77	14	120	B1.1	3	0	0	1	0	0	0	0
19 December	75	0	0	A4.0	0	0	0	0	0	0	0	0
20 December	73	0	0	<A1.0	0	0	0	0	0	0	0	0
21 December	71	0	0	<A1.0	0	0	0	0	0	0	0	0
22 December	72	0	0	<A1.0	0	0	0	0	0	0	0	0
23 December	71	0	0	<A1.0	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)		
	>1 MeV	>10 MeV	>100 MeV	>.6 MeV	>2MeV	>4 MeV
17 December	2.1E+6	1.7E+4	3.9E+3		1.7E+6	
18 December	1.0E+7	1.7E+4	3.7E+3		6.4E+7	
19 December	3.1E+6	1.6E+4	3.6E+3		3.2E+8	
20 December	3.8E+6	1.7E+4	3.9E+3		3.9E+8	
21 December	2.9E+6	1.7E+4	3.6E+3		2.1E+8	
22 December	5.2E+6	1.7E+4	3.9E+3		3.4E+8	
23 December	3.4E+6	1.8E+4	3.9E+3		3.4E+8	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
17 December	12	2-2-3-3-3-3-1-3	32	2-1-5-5-6-5-3-2	17	2-2-4-4-4-4-2-4
18 December	11	3-3-2-2-3-2-2-3	43	3-4-4-7-6-4-3-3	18	3-4-3-4-4-2-3-3
19 December	7	2-3-1-2-2-2-2-1	14	2-3-4-4-3-1-2-2	8	2-4-2-2-2-1-2-2
20 December	10	3-3-1-2-2-3-2-2	18	2-2-3-3-4-5-3-2	12	3-3-2-2-2-4-3-2
21 December	9	3-2-3-2-2-2-2-1	17	3-3-3-4-3-4-3-1	11	3-3-3-2-2-3-3-1
22 December	7	1-3-2-1-2-2-2-2	9	0-0-2-3-4-3-2-1	7	1-2-2-1-2-2-3-2
23 December	4	2-2-2-1-1-1-0-1	10	2-3-2-4-3-2-0-1	6	2-2-2-2-2-1-0-2

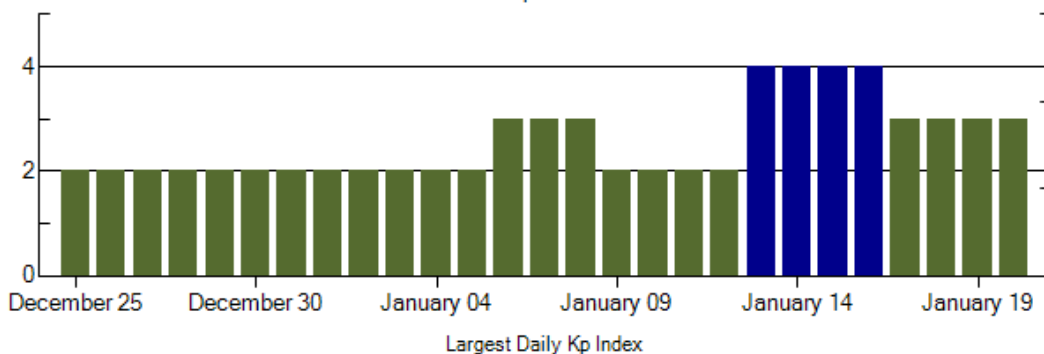
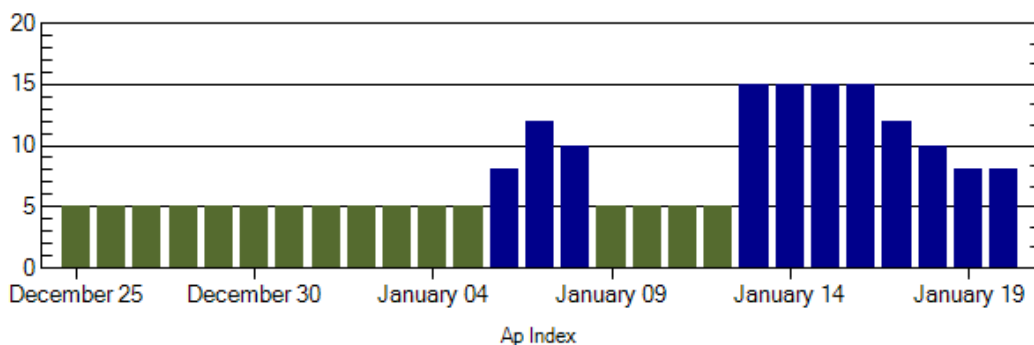
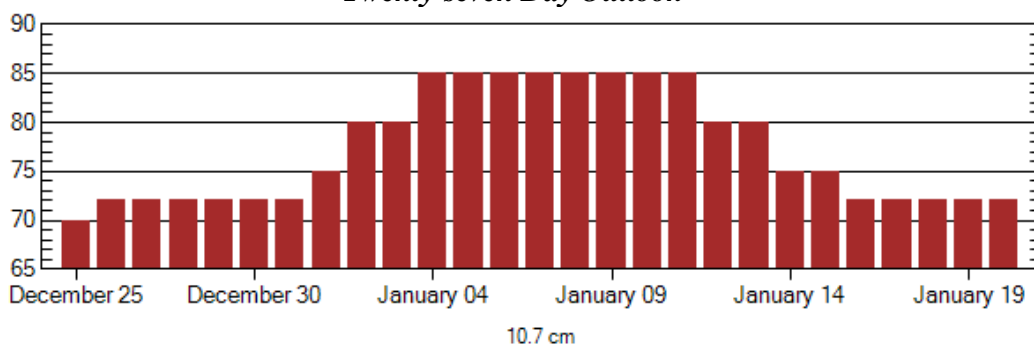


Alerts and Warnings Issued

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
17 Dec 0229	WARNING: Geomagnetic Sudden Impulse	17 Dec 0330 – 0400
17 Dec 0301	SUMMARY: Geomagnetic Sudden Impulse	17 Dec 0300
17 Dec 0655	WARNING: Geomagnetic K = 4	17 Dec 0700 – 1600
17 Dec 0855	ALERT: Geomagnetic K = 4	17 Dec 0855
17 Dec 0904	ALERT: Geomagnetic K = 5	17 Dec 0900
17 Dec 0919	WARNING: Geomagnetic K = 5	17 Dec 0920 – 1600
17 Dec 1602	EXTENDED WARNING: Geomagnetic K = 4	17 Dec 0700 – 2359
17 Dec 2308	EXTENDED WARNING: Geomagnetic K = 4	17 Dec 0700 – 18/1600
18 Dec 1330	ALERT: Electron 2MeV Integral Flux ≥ 1000 pfu	18 Dec 1315
18 Dec 1551	EXTENDED WARNING: Geomagnetic K = 4	17 Dec 0700 – 18/2359
18 Dec 2335	EXTENDED WARNING: Geomagnetic K = 4	17 Dec 0700 – 19/1600
19 Dec 0511	ALERT: Electron 2MeV Integral Flux ≥ 1000 pfu	19 Dec 0500
20 Dec 0502	ALERT: Electron 2MeV Integral Flux ≥ 1000 pfu	20 Dec 0500
20 Dec 0506	WARNING: Geomagnetic K = 4	20 Dec 0506 – 1600
20 Dec 0507	ALERT: Geomagnetic K = 4	20 Dec 0507
20 Dec 1543	EXTENDED WARNING: Geomagnetic K = 4	20 Dec 0506 – 2359
20 Dec 2356	EXTENDED WARNING: Geomagnetic K = 4	20 Dec 0506 – 21/1600
21 Dec 0942	ALERT: Electron 2MeV Integral Flux ≥ 1000 pfu	21 Dec 0920
22 Dec 0504	ALERT: Electron 2MeV Integral Flux ≥ 1000 pfu	22 Dec 0500
23 Dec 0501	ALERT: Electron 2MeV Integral Flux ≥ 1000 pfu	23 Dec 0500



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 Dec	72	5	2	09 Jan	85	5	2
27	72	5	2	10	85	5	2
28	72	5	2	11	85	5	2
29	72	5	2	12	80	5	2
30	72	5	2	13	80	15	4
31	72	5	2	14	75	15	4
01 Jan	75	5	2	15	75	15	4
02	80	5	2	16	72	15	4
03	80	5	2	17	72	12	3
04	85	5	2	18	72	10	3
05	85	5	2	19	72	8	3
06	85	8	3	20	72	8	3
07	85	12	3	21	72	5	2
08	85	10	3				



Energetic Events

Date	Time		X-ray		Optical Information			Peak		Sweep Freq	
	$\frac{1}{2}$		Integ		Imp/	Location	Rgn	Radio Flux		Intensity	
	Begin	Max	Max	Class	Brtns	Lat CMD	#	245	2695	II	IV
<i>No Events Observed</i>											

Flare List

Date	Time			Optical	Imp / Brtns	Location		Rgn
	Begin	Max	End	X-ray Class.		Lat	CMD	
17 December	0010	0047	0052	B3.7				
	0218	0222	0226	B1.5				
	0328	0335	0355	B2.6				
	0554	0601	0607	B2.5				
	0712	0714	0730	C2.2	Sf	S09W75		978
	0730	0731	0739		Sf	S10W78		978
	1802	1828	1843	B5.4				
	2030	2035	2037	B3.8				
	2058	2101	2105	B1.6				
	2106	2110	2113	B4.3				
	2120	2125	2131	B3.6				
	2226	2307	2311	B8.9				
	2353	0004	0014	B5.7				
18 December	0107	0112	0116	B7.9				
	0130	0134	0136	B2.4				
	0234	0237	0239	B1.9				
	0246	0250	0254	B1.4				
	0342	0345	0348	B1.3				
	0349	0353	0355	B1.5				
	0425	0429	0431	B2.2				
	0633	0643	0653	B3.6				
	0654	0701	0708	B3.8				
	0855	0900	0910	B1.8				
	0936	0940	0944	B2.9				
	0954	1000	1003	B2.5				
	1028	1038	1044	B1.5				
	1308	1320	1329	C2.1				
	1430	1434	1438	B6.3				
	1447	1452	1456	C1.1				
	1524	1524	1529	B8.4	Sf	S06W90		978
	1741	1747	1752	B5.7				
	1818	1822	1827	B5.8				
19 December	1827	1831	1834	B7.6				
	1907	1915	1921	C1.6				
	2235	2239	2242	B2.2				
	0036	0046	0053	B5.4				
	0137	0143	0146	B2.1				



Flare List-Continued

Date	Time			Optical	Imp / Brtns	Location	Rgn
	Begin	Max	End	X-ray Class.		Lat CMD	
19 December	0301	0305	0311	B2.0			
	0630	0732	0753	B2.9			
20 December	<i>No Flares Observed</i>						
21 December	<i>No Flares Observed</i>						
22 December	<i>No Flares Observed</i>						
23 December	<i>No Flares Observed</i>						

Region Summary

Location			Sunspot Characteristics												
			Flares												
Helio			Area (10 ⁻⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical				
Date	(° Lat ° CMD)	Lon						C	M	X	S	1	2		
Region 978															
06 Dec	S09E68	222	0070	06	Dso	005	B				1	1	1		
07 Dec	S09E54	223	0090	08	Dao	014	B				15		1		
08 Dec	S10E39	225	0160	10	Dkc	012	B				5				
09 Dec	S09E26	225	0220	10	Dkc	020	B				7				
10 Dec	S01E14	223	0250	12	Esi	022	Bg				2				
11 Dec	S07E01	223	0240	12	Eai	034	Bg				5	1	1		
12 Dec	S06W12	223	0200	10	Dai	029	Bg				5				
13 Dec	S08W25	224	0340	10	Dac	029	Bgd	2			12	1			
14 Dec	S09W40	224	0290	10	Dkc	025	B	1			4				
15 Dec	S10W52	223	0340	10	Dac	029	B								
16 Dec	S10W65	223	0240	10	Dai	018	Bg								
17 Dec	S09W78	223	0100	06	Cao	004	B	1			2				
18 Dec	S08W91	223	0120	03	Cao	004	B				1				
								4	0	0	59	3	3	0	0

Crossed West Limb.

Absolute heliographic longitude: 223



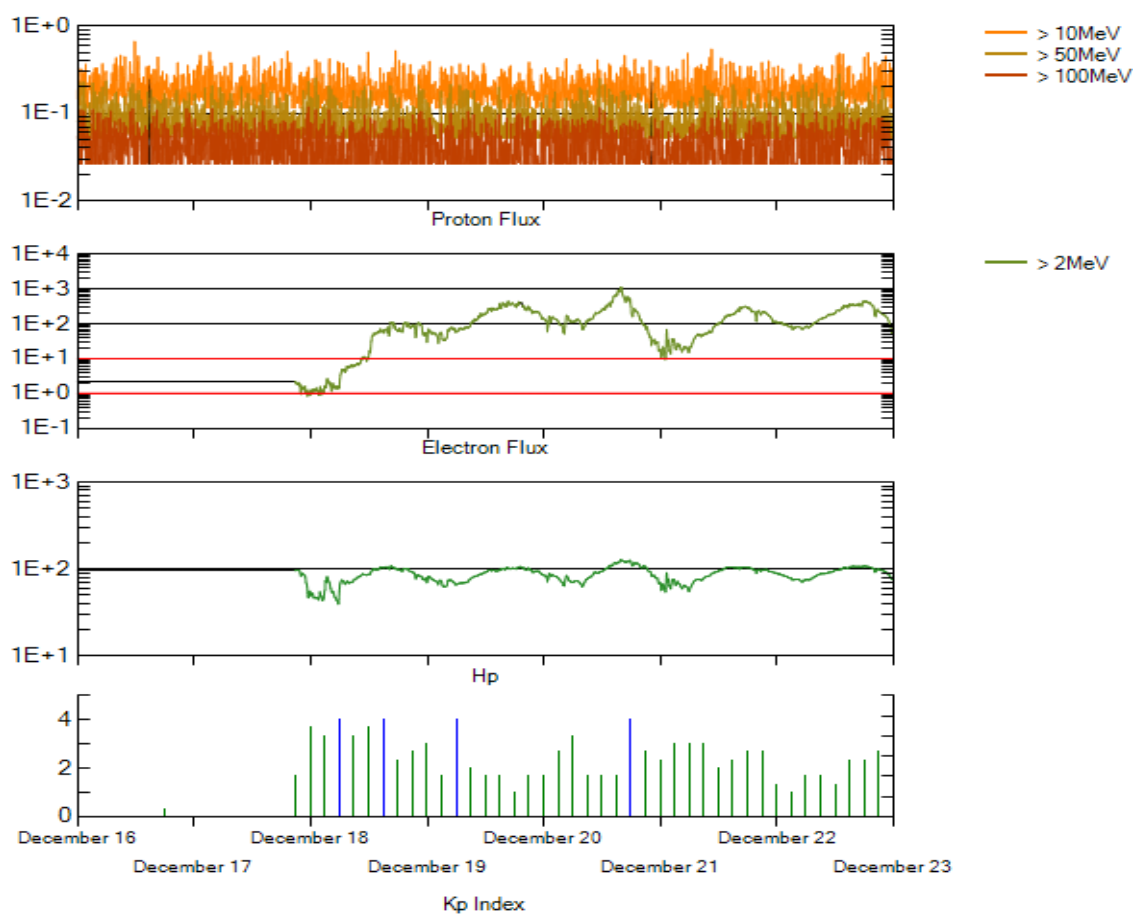
Recent Solar Indices (preliminary)
Of the observed monthly mean values

Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	Observed values	Ratio	Smooth values	*Penticton	Smooth	Planetary	Smooth		
	SEC	RI	RI/SEC	SEC	RI	10.7 cm	Value	Ap	Value
2005									
December	62.6	41.2	0.66	40.1	23.0	90.8	85.4	7	10.4
2006									
January	28.0	15.4	0.55	37.2	20.8	83.8	84.0	6	9.9
February	5.3	4.7	0.89	33.4	18.7	76.6	82.6	6	9.2
March	21.3	10.8	0.51	31.0	17.4	75.5	81.6	8	8.4
April	55.2	30.2	0.55	30.6	17.1	89.0	80.9	11	7.9
May	39.6	22.2	0.56	30.7	17.3	81.0	80.8	8	7.9
June	37.7	13.9	0.37	28.9	16.3	80.1	80.6	9	8.3
July	22.6	12.2	0.54	27.2	15.3	75.8	80.3	7	8.7
August	22.8	12.9	0.57	27.6	15.6	79.0	80.3	9	8.7
September	25.2	14.5	0.58	27.7	15.6	77.8	80.2	8	8.7
October	15.7	10.4	0.66	25.2	14.2	74.3	79.4	8	8.6
November	31.5	21.5	0.68	22.3	12.7	86.4	78.5	9	8.5
December	22.2	13.6	0.61	20.7	12.1	84.3	77.9	15	8.5
2007									
January	26.6	16.9	0.64	19.7	12.0	83.5	77.5	6	8.4
February	17.2	10.6	0.62	18.9	11.6	77.8	76.9	6	8.4
March	9.7	4.8	0.49	17.5	10.8	72.3	76.0	8	8.4
April	6.9	3.7	0.54	16.0	9.9	72.4	75.2	9	8.5
May	19.4	11.7	0.60	14.2	8.7	74.5	74.2	9	8.4
June	20.0	12.0	0.60			73.7		7	
July	15.6	10.0	0.64			71.6		8	
August	9.9	6.2	0.63			69.2		7	
September	4.8	2.4	0.50			67.1		8	
October	1.3	0.9	0.70			65.5		9	
November	2.5	1.7	0.68			69.7		5	

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 17 December 2007

Protons plot contains the five-minute averaged integral proton flux (protons/cm²–sec –sr) as measured by GOES-11 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

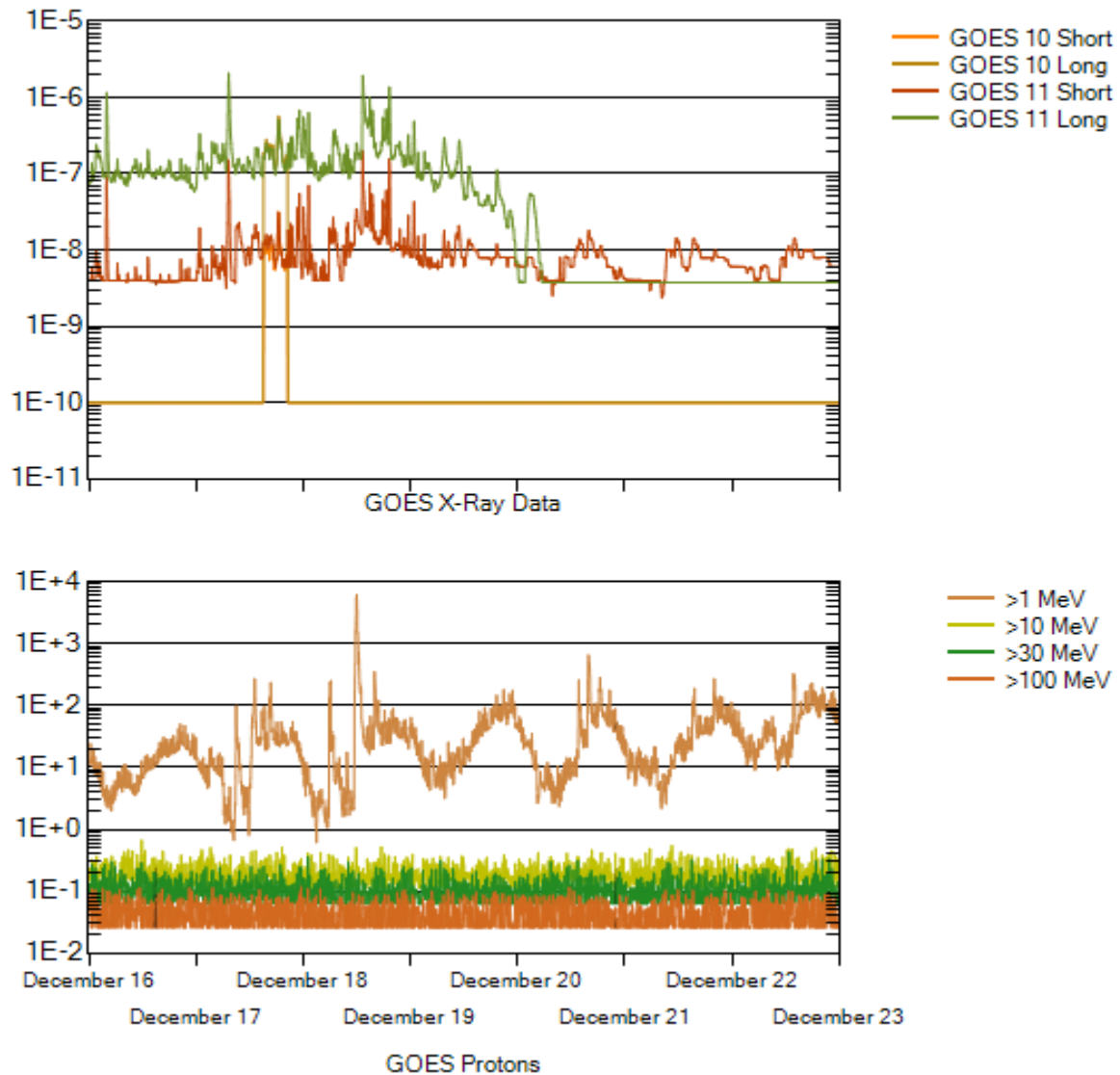
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²–sec –sr) with energies greater than 2 MeV at GOES-12 (W075).

Hp 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.

Kp plot contains the estimated planetary 3-hour K-index (derived by the Air Force Weather Agency) in real time from magnetometers at Meenook, 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 Kp values derived from a more extensive network of magnetometers.

The data included here are those now available in real time at the SEC 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 Kp are “global” parameters that are applicable to a first order approximation over large areas. H parallel 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/m^2) as measured by GOES 10 (W060) and GOES 11 (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 ($\text{protons/cm}^2\text{-sec-sr}$) as measured by GOES-11 (W135) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu ($\text{protons/cm}^2\text{-sec-sr}$) at greater than 10 MeV.

