

Solar activity was at very low to low levels. Activity was very low during 12 – 13 December due to isolated B-class flares from Region 1135 (N19, L = 078, class/area Bxo/020 on 16 December). Activity increased to low levels during 14 – 15 December due to isolated C-class flares from Region 1133 (N15, L = 178, class/area Hsx/200 on 07 December) and Region 1135. Activity decreased to very low levels during 16 – 19 December with occasional B-class flares from Region 1135.

No Proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels 16 - 17 December; otherwise it remained at normal levels.

Geomagnetic activity was at quiet to unsettled levels during 12 – 14 December with active to minor storm levels detected at high latitudes on 14 December. Activity increased to unsettled to active levels early on 15 December, then decreased to mostly quiet levels after 15/0600 UTC. Mostly quiet levels continued through the balance of the period. The enhanced activity during 14 – 15 December was due to recurrent coronal hole high-speed stream (CH HSS) effects.

### **Space Weather Outlook** **22 December 2010 - 17 January 2011**

Solar activity is expected to be at very low levels with a slight chance for C-class activity throughout the forecast period. Old Region 1130 (N13, L = 331) and old Region 1132 (N10, L = 251) are expected to rotate back on the visible disk on 19 December and 24 December respectfully.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at normal levels on 13 -14 December. Activity is expected to increase to moderate to high levels from 15-20 December. Normal levels are expected for the remainder of the period.

Geomagnetic field activity is expected to be quiet to unsettled on 15-16 December due to a recurrent CH HSS. Quiet conditions are expected from 17-18 December and then the return of quiet to unsettled conditions is expected from 19-20 December due to a second CH HSS. Activity is expected to again decrease to mostly quiet levels from 21 -23 December. The geomagnetic field is expected to be quiet to unsettled from 24-25 December due to a third recurrent CH HSS. Mostly quiet levels are expected for the remainder of the period.



### *Daily Solar Data*

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10 <sup>-6</sup> hemi.)	X-ray Background	Flares						
					X-ray Flux			Optical			
					C	M	X	S	1	2	3 4
13 December	88	46	370	B1.1	0	0	0	0	0	0	0 0
14 December	90	33	320	B1.0	1	0	0	1	0	0	0 0
15 December	87	11	50	A9.9	1	0	0	0	0	0	0 0
16 December	84	23	80	A8.9	0	0	0	0	0	0	0 0
17 December	82	11	0	A6.7	0	0	0	0	0	0	0 0
18 December	81	0	0	A5.1	0	0	0	0	0	0	0 0
19 December	81	0	0	A4.3	0	0	0	0	0	0	0 0

### *Daily Particle Data*

Date	Proton Fluence (protons/cm <sup>2</sup> -day-sr)			Electron Fluence (electrons/cm <sup>2</sup> -day-sr)		
	>1 MeV	>10 MeV	>100 MeV	>.6 MeV	>2MeV	>4 MeV
13 December	2.2e+06	1.4e+04	3.0e+03		8.6e+05	
14 December	1.2e+06	1.4e+04	3.1e+03		2.5e+06	
15 December	8.3e+05	1.3e+04	3.2e+03		2.2e+07	
16 December	4.4e+05	1.3e+04	3.2e+03		4.3e+07	
17 December	8.1e+05	1.4e+04	3.5e+03		5.1e+07	
18 December	6.4e+05	1.3e+04	3.5e+03		2.0e+07	
19 December	5.7e+05	1.4e+04	3.2e+03		1.9e+07	

### *Daily Geomagnetic Data*

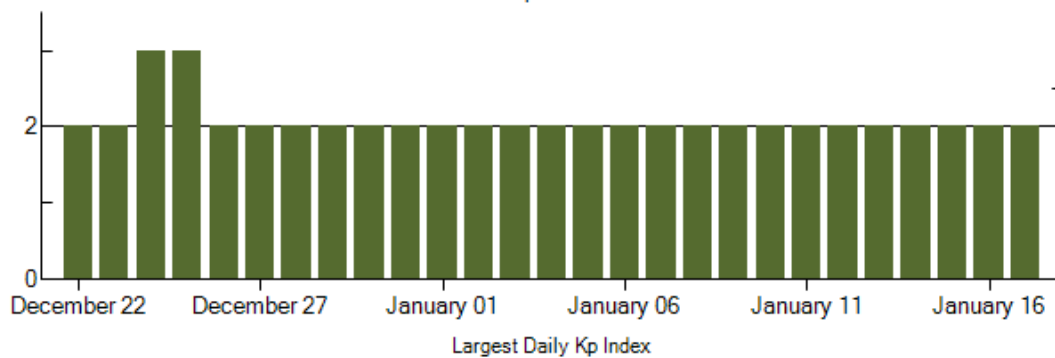
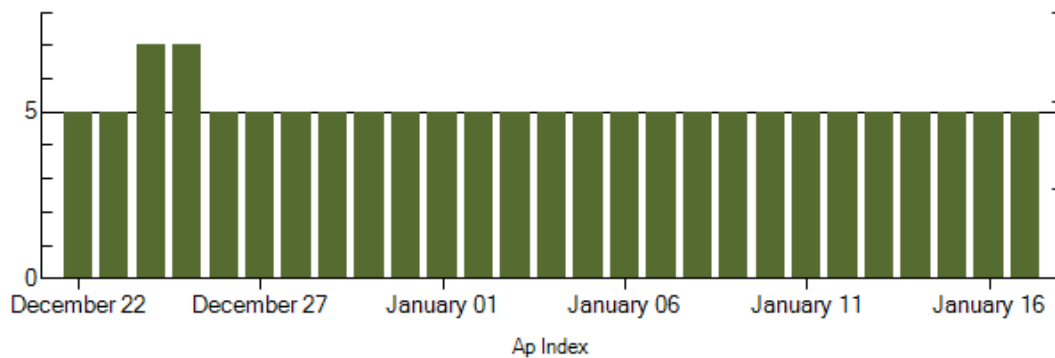
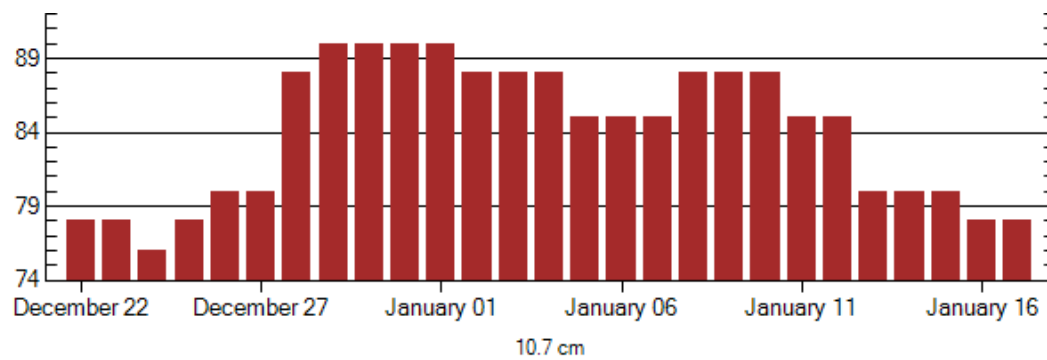
Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
13 December	5	2-2-1-0-1-1-2-2	7	2-1-3-2-2-1-1-2	5	2-2-2-0-0-0-2-2
14 December	10	1-2-2-2-2-3-3-3	19	2-1-2-4-5-4-3-3	11	1-2-2-3-3-3-2-3
15 December	8	3-4-1-1-2-1-1-0	11	3-2-2-2-4-3-1-1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

### *Alerts and Warnings Issued*

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
14 Dec 2127	WARNING: Geomagnetic K = 4	14 Dec 2130 - 15/1600
15 Dec 0300	ALERT: Geomagnetic K = 4	15 Dec 0257
15 Dec 0323	WARNING: Geomagnetic K = 5	15 Dec 0330 - 1500
16 Dec 1453	ALERT: Electron 2MeV Integral Flux >= 1000pfu	16 Dec 1435
17 Dec 1149	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	16 Dec 1435

### *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	78	5	2	05 Jan	85	5	2
23	78	5	2	06	85	5	2
24	76	5	2	07	85	5	2
25	78	7	2	08	88	5	2
26	80	5	2	09	88	5	2
27	80	5	2	10	88	10	3
28	88	5	2	11	85	8	3
29	90	5	2	12	85	5	2
30	90	5	2	13	80	5	2
31	90	5	2	14	80	5	2
01 Jan	90	5	2	15	80	5	2
02	88	5	2	16	78	8	3
03	88	5	2	17	78	5	2
04	88	5	2				



### ***Energetic Events***

Energy Events											
Date	Time			X-ray		Optical Information			Peak		Sweep Freq
	$\frac{1}{2}$			Integ		Imp/	Location	Rgn	Radio Flux		Intensity
	Begin	Max	Max	Class	Flux	Brtns	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	
13 December	1324	1330	1339	B2.7				1135
	2240	2245	2247	B1.8				
14 December	1543	1552	1618	C2.3	SF	N16W55		1133
15 December	0427	0435	0441	B5.0				1135
	0627	0639	0650	C5.3				1135
	1205	1210	1216	B5.8				1135
	1437	1440	1442	B2.2				1134
	2220	2225	2230	B1.6				1135
	2323	2329	2335	B3.6				1135
16 December	0400	0427	0530	B7.4				1135
	2225	2230	2237	B4.9				
	2354	0002	0009	B4.0				
17 December	0021	0025	0028	B1.8				
	0406	0412	0419	B3.3				
	0717	0744	0759	B4.9				1135
	0902	0906	0913	B2.1				1135
	1131	1137	1141	B1.3				
	2153	2253	2321	B2.4				1135
18 December	No Flares Observed							
19 December	0444	0455	0506	B1.1				1135



### Region Summary

Date	Location		Sunspot Characteristics					Flares							
	° Lat ° CMD)	Helio	Area (10 <sup>-6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical				
		Lon						C	M	X	S	1	2	3	4
Region 1131															
02 Dec	N30E68	208	240	5	HSX	1	A								
03 Dec	N31E53	211	390	4	HHX	1	A								
04 Dec	N30E40	211	350	5	CHO	2	B								
05 Dec	N31E28	210	310	4	HHX	1	A								
06 Dec	N31E15	209	410	4	HHX	1	A								
07 Dec	N31E03	208	430	7	CHO	12	B								
08 Dec	N31W10	209	330	4	HAX	1	A								
09 Dec	N32W23	208	310	5	HHX	1	A								
10 Dec	N31W35	207	320	4	HHX	1	A								
11 Dec	N31W47	205	300	5	CHO	2	B								
12 Dec	N31W58	204	290	5	DHO	2	B								
13 Dec	N30W72	204	270	4	HHX	1	A								
14 Dec	N32W85	203	240	5	HSX	1	A								
								0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 208

<i>Region 1133</i>															
04 Dec	N14E72	180	100	2	HHX	1	A								
05 Dec	N14E58	180	80	2	HSX	1	A								
06 Dec	N16E43	178	160	2	HSX	2	A								
07 Dec	N15E31	181	200	2	HSX	2	A								
08 Dec	N14E18	179	120	3	HRX	1	A								
09 Dec	N15E05	178	90	2	HSX	1	A								
10 Dec	N15W09	181	90	2	HSX	1	A								
11 Dec	N15W22	180	110	3	CSO	3	B								
12 Dec	N14W33	179	90	2	HSX	1	A								
13 Dec	N14W48	179	80	2	HSX	1	A								
14 Dec	N15W61	179	80	2	HSX	1	A	1			1				
15 Dec	N13W74	180	50	1	HSX	1	A								
16 Dec	N16W94	186	60	1	HSX	1	A								
								1	0	0	1	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 178



### *Region Summary - continued*

Date	Location		Sunspot Characteristics					Flares							
	(° Lat ° CMD)	Helio	Area (10 <sup>-6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			S	Optical			
		Lon						C	M	X		1	2	3	4
<i>Region 1134</i>															
13 Dec	N18W33	164	20	3	CAO	3	B								
14 Dec	N18W46	162			AXX	1	A								
15 Dec	N18W59	167													
16 Dec	N18W72	167													
17 Dec	N18W85	167													
								0	0	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 164

*Region 1135*

13 Dec	N18E56	75			AXX	1	A								
14 Dec	N18E43	75													
15 Dec	N18E30	75									1				
16 Dec	N19E17	76	20	3	BXO	2	B								
17 Dec	N19E02	78		1	AXX	1	A								
18 Dec	N19W11	78													
19 Dec	N19W24	78													
								1	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 78

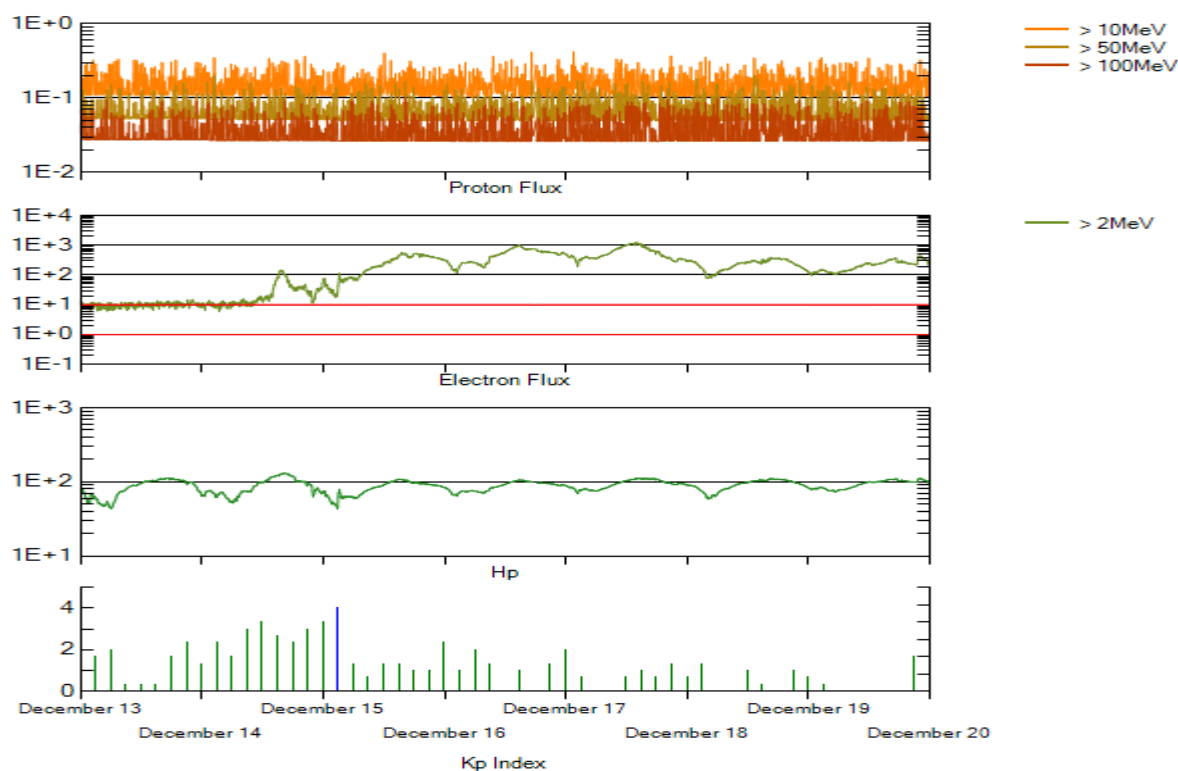


***Recent Solar Indices (preliminary)***  
***Of the observed monthly mean values***

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
2008									
December	1.3	0.8	0.62	2.7	1.7	69.2	68.5	4	4.9
2009									
January	2.8	1.3	0.46	3.0	1.8	69.8	68.7	4	4.7
February	2.5	1.4	0.56	3.1	1.9	70.0	68.8	5	4.7
March	0.7	0.7	1.00	3.4	2.0	69.2	69.0	5	4.6
April	1.2	0.8	1.00	3.7	2.2	69.7	69.3	4	4.3
May	3.9	2.9	0.74	3.8	2.3	70.5	69.7	4	4.1
June	6.6	2.9	0.39	4.4	2.7	68.6	70.2	4	4.0
July	5.0	3.2	0.70	5.8	3.6	68.2	71.0	4	3.9
August	0.3	0.0	0.00	7.7	4.8	67.4	72.1	5	3.8
September	6.6	4.3	0.64	9.9	6.2	70.5	73.3	4	3.8
October	7.0	4.8	0.66	11.3	7.1	72.3	74.1	3	4.1
November	7.7	4.1	0.55	12.4	7.6	73.6	74.5	3	4.5
December	15.7	10.8	0.68	13.6	8.3	76.8	74.9	2	4.8
2010									
January	21.3	13.2	0.62	14.8	9.3	81.1	75.5	3	5.0
February	31.0	18.8	0.60	16.7	10.6	84.7	76.5	5	5.1
March	24.7	15.4	0.62	19.1	12.3	83.3	77.5	5	5.3
April	11.2	8.0	0.71	21.4	14.0	75.9	78.3	10	5.5
May	19.9	8.7	0.44	23.8	15.5	73.8	79.0	8	5.7
June	17.9	13.6	0.75			72.6		7	
July	23.1	16.1	0.70			79.9		5	
August	28.2	19.6	0.70			79.7		8	
September	35.6	25.2	0.71			81.1		5	
October	35.0	23.5	0.67			81.6		6	
November	36.1	21.6	0.60			82.5		5	

**NOTE:** Values are final except for the most recent 6 months which are considered preliminary. Cycle 23 started in May 1996 with an RI=8.0. Cycle 23 maximum was April 2000 with an RI=120.8. Solar minimum for cycle 23 was December 2008.





*Weekly Geosynchronous Satellite Environment Summary*  
*Week Beginning 13 December 2010*

The proton flux plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>–sec–sr) as measured by GOES-13 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV. The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>–sec–sr) with energies greater than 2 MeV at GOES-13.

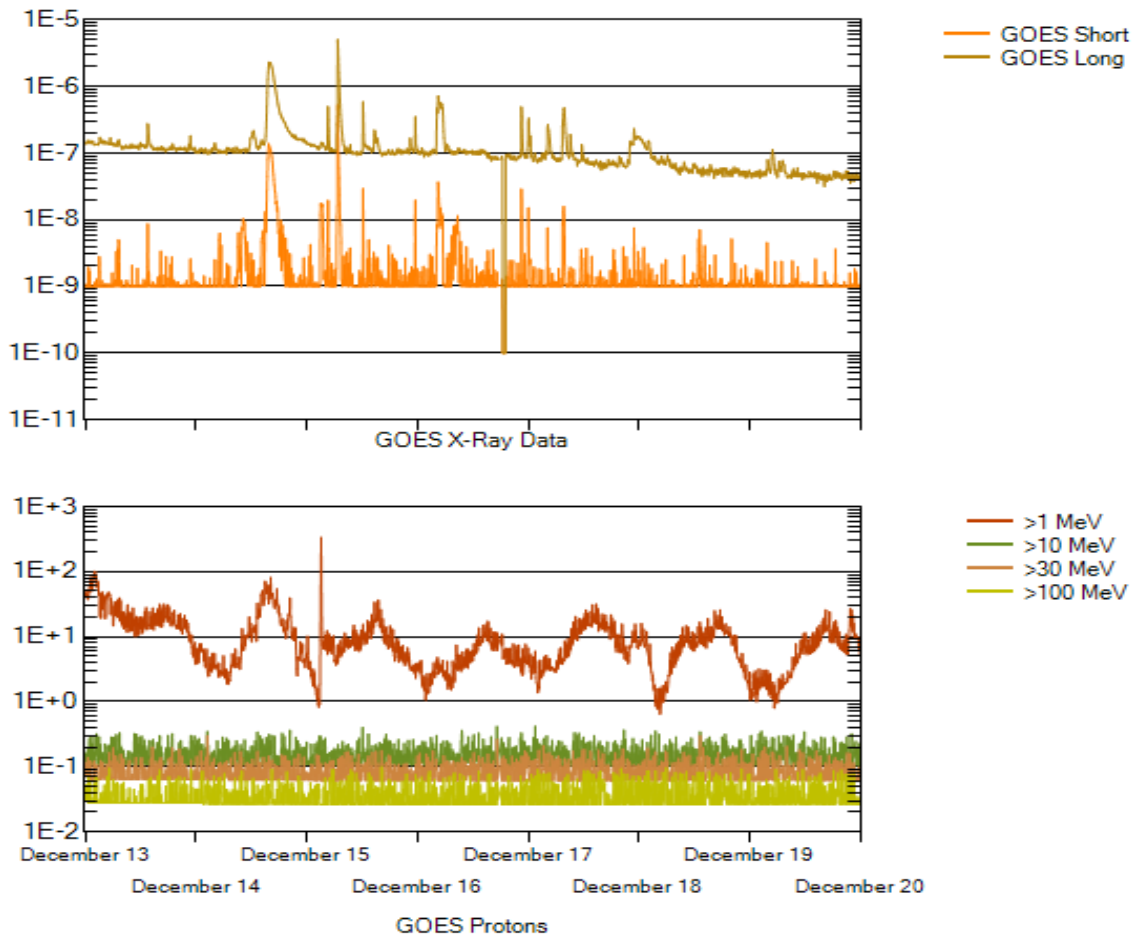
The Hp plot contains the five minute averaged Hp magnetic field component in nanoteslas (nT) as measured by GOES-13. The Hp component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

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

The data included here are those now available in real time at the SWPC 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*

The x-ray plot contains five-minute averaged x-ray flux ( $\text{Watts/m}^2$ ) as measured by GOES 14 (W105) in two wavelength bands, 0.05 - 0.4 and 0.1 - 0.8 nm. The letters A, B, C, M and X refer to x-ray event levels for the 0.1 - 0.8 nm band.

The proton plot contains the five-minute averaged integral proton flux ( $\text{protons/cm}^2\text{-sec-sr}$ ) as measured by GOES-13 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.

