

**Space Weather Highlights**  
**04-10 January 1999**

Solar activity was low. Isolated B- and C-class subflares occurred each day. A long-duration C8 X-ray flare occurred at 07/0006UT with an associated Type II radio sweep. Space-based images indicated the flare originated from beyond the west limb, perhaps from old Region 8421 (N27, L = 171, class/area Ekc/710 on 30 December), which crossed the limb on 05 January. Another optically uncorrelated C-class flare occurred at 08/0306UT, also associated with a Type II radio sweep. Once old Region 8421 departed the disk, 10.7 cm solar radio flux levels dropped to the lowest levels since last October.

Real-time solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft during most of the period. Velocities increased from 320 to 530 km/sec on 07 January, then remained elevated (360 - 570 km/sec) for the rest of the period. Particle densities were elevated on 06 January with a peak of 34 p/cc. Densities dropped to the 01 to 03 p/cc range during 08 - 10 January. IMF Bz was mostly southward (maximum deflections to minus 10 nT (GSM)) through 05 January, then hovered around zero for the rest of the period. However, Bz became more variable on 06 January with maximum southerly deflections to minus 16 nT. Another period of increased variability occurred on 08 January with southerly deflections to minus 11 nT. Phi readings indicated a shift from a positive (away, phi angle near 135 degrees) to a negative (toward, phi angle near 315 degrees) solar sector on 05 January. The Earth remained in a negative sector for the balance of the period.

No significant proton flux enhancements were detected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude was at normal to moderate levels.

The geomagnetic field was at quiet to unsettled levels during most of the period. However, an active period occurred at all latitudes during 09/0100 - 0300UT.

**Space Weather Forecast**  
**13 January 1999 - 08 February 1999**

Solar activity is expected to be low during most of the period. However, given the point in the increasing phase of Cycle 23 (January is month 28 of the cycle), isolated M-class flares may occur sometime during the period.

No significant proton enhancements are expected at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be at normal to moderate levels during most of the period with high levels possible during the first few days.

The geomagnetic field is expected to be at quiet to unsettled levels, barring any Earth-directed coronal mass ejections.



### *Daily Solar Data*

Date	Radio Flux 10.7 cm	Sun spot No. ( $10^6$ hemi.)	Sunspot Area	X-ray Background	Flares							
					X-ray Flux			Optical				
					C	M	X	S	1	2	3	4
04 January	147	94	550	B6.8	4	0	0	3	0	0	0	0
05 January	137	87	490	B6.6	5	0	0	0	0	0	0	0
06 January	126	70	260	B7.0	5	0	0	5	0	0	0	0
07 January	115	125	260	C2.1	0	0	0	0	0	0	0	0
08 January	116	99	150	B2.3	2	0	0	2	0	0	0	0
09 January	115	70	160	B2.2	1	0	0	0	0	0	0	0
10 January	110	62	210	B2.7	1	0	0	1	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)		
	>1MeV	>10MeV	>100MeV	>.6MeV	>2MeV	>4MeV
04 January	8.3E+5	1.8E+4	3.6E+3		1.2E+6	
05 January	5.1E+5	1.9E+4	4.0E+3		2.7E+6	
06 January	5.8E+5	1.6E+4	4.0E+3		4.1E+6	
07 January	1.1E+5	1.6E+4	3.8E+3		2.6E+6	
08 January	2.4E+5	1.6E+4	4.1E+3		6.8E+6	
09 January	9.7E+4	1.5E+4	3.7E+3		1.2E+7	
10 January	9.6E+4	1.5E+4	4.0E+3		2.7E+7	

### *Daily Geomagnetic Data*

Date	Middle Latitude		High Latitude		Estimated	
	Fredericksburg		College		Planetary	
	A	K-indices	A	K-indices	A	K-indices
04 January	6	0-1-2-3-2-2-0-2	15	0-2-4-4-5-2-1-1	7	1-2-3-2-3-2-1-2
05 January	6	2-3-2-1-1-1-0-2	8	1-3-2-3-3-1-0-1	8	3-3-2-3-1-1-2-1
06 January	8	2-1-3-1-3-2-2-2	7	1-0-3-2-3-2-2-1	9	1-0-3-1-3-3-3-2
07 January	6	1-1-2-2-2-2-1-2	13	1-0-1-3-5-4-2-1	6	1-0-1-2-3-3-2-2
08 January	13	3-2-3-4-3-2-3-1	17	2-2-3-4-4-4-3-2	14	3-2-3-4-3-3-3-3
09 January	9	4-2-3-0-1-1-2-2	10	3-2-3-3-3-1-1-1	8	3-2-3-1-1-1-1-2
10 January	5	2-1-2-3-1-1-0-1	10	2-1-3-5-2-0-0-0	4	2-0-2-3-1-1-1-1



*Alerts and Warnings Issued*

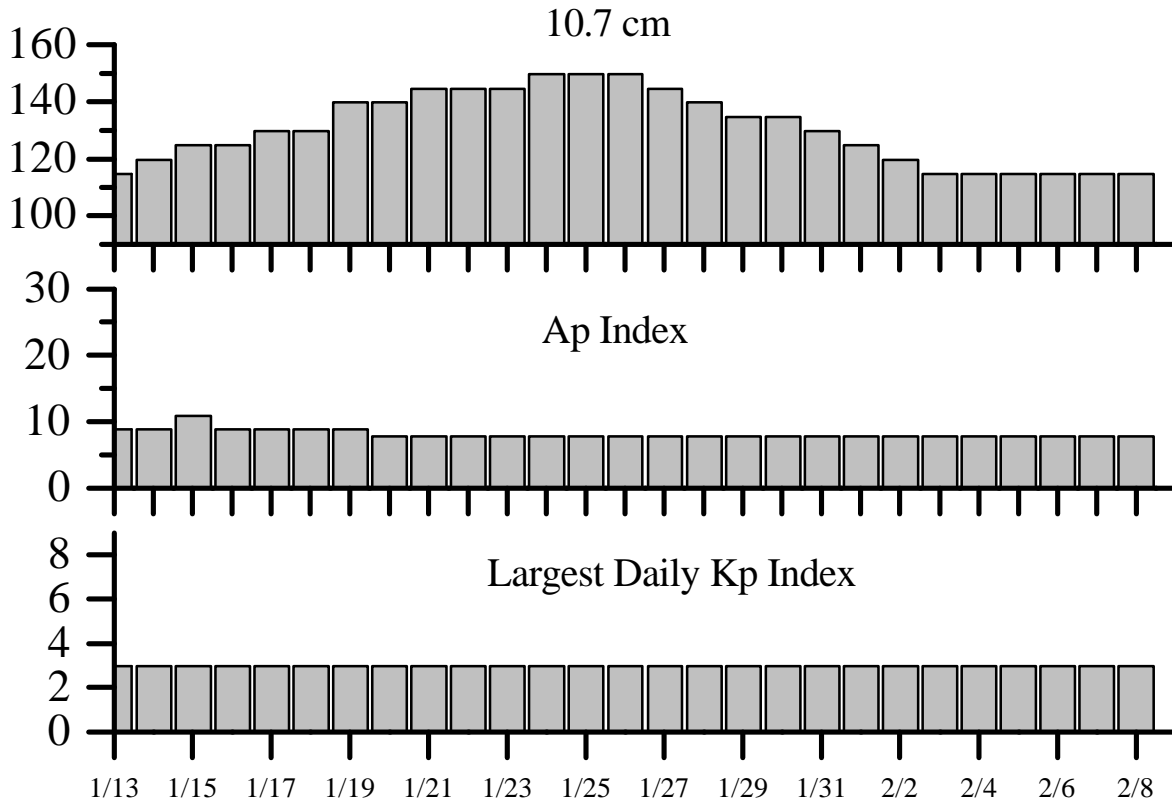
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<u>Date and Time of Issue (UT)</u>	<u>Type of Alert or Warning</u>	<u>Date and Time of Event (UT)</u>
03 Jan 0103	2- 245 MHz Radio Bursts	03 Jan
04 Jan 2104	A $\geq$ 20 Watch	07 Jan
05 Jan 0054	1-245 MHz Radio Burst	04 Jan
06 Jan 1409	K = 4 Warning	06 Jan 1500 - 07 Jan 0000
06 Jan 0115	1-245 MHz Radio Burst	06 Jan
07 Jan 0025	Type II Radio Emission	07 Jan 0004
08 Jan 0334	Type II Radio Emission	08 Jan 0004
08 Jan 1159	K = 4 Observed	08 Jan 09 -12

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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
13 Jan	115	9	3	27	145	8	3
14	120	9	3	28	140	8	3
15	125	11	3	29	135	8	3
16	125	9	3	30	135	8	3
17	125	9	3	31	130	8	3
18	130	9	3	01 Feb	125	8	3
19	140	9	3	02	120	8	3
20	140	9	3	03	115	8	3
21	145	8	3	04	115	8	3
22	145	8	3	05	115	8	3
23	145	8	3	06	115	8	3
24	150	8	3	07	115	8	3
25	150	8	3	08	115	8	3
26	150	8	3				



***Energetic Events***

Date	Time (UT)		X-ray	Optical Information			Peak		Sweep Freq	
	Begin	Max	Integ	Imp	Location	Rgn	Radio Flux		Intensity	
			Class	Flux	Brtns	Lat CMD	#	245	2695	II

**No Events Observed**

***Flare List***

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn #	
	Begin	Max	End			Location	Lat CMD		
04 January	0630	0630	0635		SF	N15E13		8426	
	0830	0836	0839	C3.6					
	0914	0919	0923	C1.1					
	1601	1602	1604		SF	N20W71		8420	
	1718	1721	1726		SF	N22W32		8428	
	2057	2101	2106	C1.4					
	2235	2239	2241	C1.7					
05 January	0457	0502	0506	C2.3					
	0554	0558	0601	C1.1					
	0626	0639	0646	C1.6					
	1247	1250	1254	C1.5					
06 January	1334	1343	1355	C1.6					
	0039	0045	0052	C1.7					
	0818	0822	0824	B7.6					
	1139	1140	1144		SF	N16W22		8426	
	1221	1228	1240	C1.2					
	1322	U1333	A1342	C1.2	SF	N14W20		8426	
	1338	U1341	A1342	C1.3	SF	S27E60		8431	
	1731	1738	1754		SF	N14W19		8426	
07 January	1925	1926	1930		SF	N15W21		8426	
	2354	0006	0043	C8.0					
	1501	1511	1524	B4.8					
	08 January	0253	0306	0324	C2.3				
		0503	0509	0517	B5.2				
0959		1015	1037	C3.7	SF	S29E31		8431	
09 January	B1115	U1116	A1145		SF	S28E31		8431	
	1841	1923	2005	C1.0					
10 January	0245	0258	0312	C1.0	SF	S28E10		8431	
	2144	2148	2157	B3.9					



### 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		
<i>Region 8421</i>																	
23 Dec	N29E80	170	0090	03	HAX	002	A					1					
24 Dec	N27E64	173	0120	05	DAO	006	B	1	1			3	1				
25 Dec	N27E52	172	0170	08	DAO	010	B	4	1			5					
26 Dec	N26E40	170	0270	09	DAI	011	B	4				9	1				
27 Dec	N27E26	171	0290	11	EAI	032	BG	4				7					
28 Dec	N26E13	171	0360	13	EAC	047	BG		2			6	1				
29 Dec	N26E00	171	0610	13	EKC	046	BGD	9				20					
30 Dec	N26W14	172	0710	13	EKC	070	BGD	7	1			14					
31 Dec	N27W27	171	0670	15	EKC	055	BGD	5				10	1				
01 Jan	N27W37	169	0660	14	EKC	043	BGD	2				4					
02 Jan	N26W53	172	0580	15	EKC	035	BGD	1				2					
03 Jan	N26W67	173	0560	16	FKC	032	BGD	1				1					
04 Jan	N26W79	172	0400	13	EAO	017	BG										
05 Jan	N26W89	168	0180	11	EAO	004	B										
								38	5	0	82	4	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 171

<i>Region 8422</i>																	
24 Dec	S23E75	162	0070	10	CAO	005	B										
25 Dec	S26E68	156	0130	09	DSO	004	B										
26 Dec	S23E51	159	0160	07	DSO	008	B	1				1					
27 Dec	S23E38	159	0190	07	DAO	016	B					2					
28 Dec	S23E26	158	0180	09	DAO	019	B	1				3					
29 Dec	S23E13	158	0120	08	CSO	014	B					1					
30 Dec	S23W01	159	0130	08	CSO	017	B										
31 Dec	S23W15	159	0120	07	CAO	008	B										
01 Jan	S24W26	158	0090	09	CAO	006	B										
02 Jan	S22W41	160	0090	02	HSX	002	A										
03 Jan	S23W52	158	0080	06	CSO	004	B	1				2	1				
04 Jan	S22W67	160	0070	02	HSX	001	A										
05 Jan	S22W80	159	0070	02	HAX	001	A										
06 Jan	S22W90	156	0060	02	HAX	001	A										
								3	0	0	9	1	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 159





**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			Optical			
		Lon						C	M	X	S	1	2	3

*Region 8429*

02 Jan	N34E38	081	0000	00	AXX	001	A											
03 Jan	N34E25	081																
04 Jan	N34E12	081																
																		0 0 0 0 0 0 0 0

Died on Disk.

Absolute heliographic longitude: 081

*Region 8430*

03 Jan	S25E50	056	0000	01	AXX	002	A											
04 Jan	S26E40	053	0010	01	BXO	002	B											
05 Jan	S26E27	053																
06 Jan	S26E14	053																
07 Jan	S26E09	044	0020	03	BXO	006	B											
08 Jan	S28W03	043	0030	05	CRO	007	B											
09 Jan	S26W26	053																
10 Jan	S26W39	053																
																		0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 043

*Region 8431*

04 Jan	S28E69	024	0010	01	AXX	001	A											
05 Jan	S28E56	023	0030	01	HSX	001	A											
06 Jan	S28E43	023	0030	05	CRO	003	B	2			1							
07 Jan	S28E31	022	0030	03	BXO	004	B											
08 Jan	S28E19	021	0010	05	BXO	007	B	1			2							
09 Jan	S28E06	021	0040	04	DSO	006	B											
10 Jan	S28W07	021	0040	03	CAO	005	B	1			1							
								4	0	0	4	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 021

*Region 8432*

05 Jan	N27W35	114	0010	04	BXO	002	B											
06 Jan	N26W50	116	0000	01	AXX	001	A											
07 Jan	N28W64	117	0010	04	BXO	002	B											
08 Jan	N26W78	118	0000	00	AXX	001	A											
																		0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 114





**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			Optical			
		Lon						C	M	X	S	1	2	3

*Region 8433*

07 Jan	S28E10	043	0020	03	CRO	004	B											
08 Jan	S28W04	044	0020	05	BXO	005	B											
09 Jan	S28W18	045	0010	05	BXO	007	B											
10 Jan	S28W32	046	0020	01	HRX	002	A											
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 044

*Region 8434*

07 Jan	S26E46	007	0020	03	BXO	007	B											
08 Jan	S27E35	005	0010	03	BXO	005	B											
09 Jan	S27E22	005	0010	03	BXO	003	B											
10 Jan	S28E09	005	0000	00		000												
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 5

*Region 8435*

07 Jan	N13E18	035	0010	03	BXO	002	B											
08 Jan	N12E03	037	0000	00	AXX	001	A											
09 Jan	N12W10	037																
10 Jan	N12W23	037																
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 037

*Region 8436*

09 Jan	S30E64	323	0010	01	AXX	001	A											
10 Jan	S31E51	323	0010	01	AXX	001	A											
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 323

*Region 8437*

10 Jan	N11E68	306	0090	02	HSX	001	A											
										0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 306



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

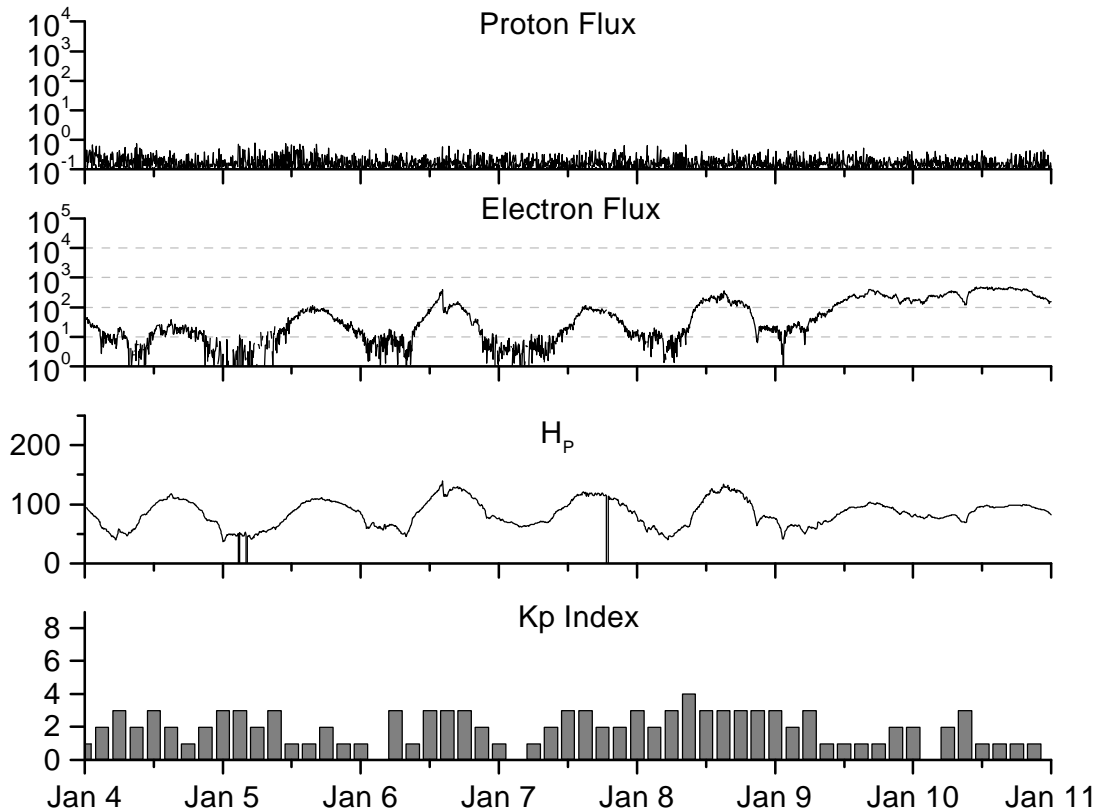
Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	Observed values SWO	Ratio RI	Ratio RI/SWO	Smooth values SWO	Ratio RI	**Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
<b>1997</b>									
January	09.0	05.7	0.63	16.5	10.5	74.0	73.4	09	09.3
February	11.3	07.6	0.67	17.4	11.0	73.8	73.7	11	09.2
March	14.4	08.7	0.60	20.4	13.5	73.5	75.1	08	08.9
April	24.5	15.5	0.63	24.0	16.5	74.5	76.8	10	08.6
May	28.6	18.5	0.65	26.4	18.3	74.6	78.4	08	08.6
June	22.1	12.7	0.57	29.0	20.3	71.7	80.1	07	08.6
July	17.0	10.4	0.61	32.4	22.6	71.1	81.8	06	08.5
August	36.7	24.4	0.66	35.9	25.0	79.0	83.4	07	08.3
September	52.8	51.3	0.88	40.5	28.3	96.2	85.7	10	08.4
October	33.6	22.8	0.68	45.4	31.8	84.9	88.6	11	08.6
November	53.5	39.0	0.73	49.3	35.0	99.5	91.3	11	09.0
December	57.9	41.2	0.71	54.2	39.0*	98.8	94.2*	05	09.5
<b>1998</b>									
January	51.8	31.9	0.62	60.6	43.7*	93.4	97.5*	08	09.9*
February	54.4	40.3	0.74	67.4	48.8*	93.4	101.7*	08	10.5*
March	81.8	54.8	0.67	73.3	53.4*	109.1	105.8*	13	11.2*
April	73.6	53.4	0.73	77.7	56.5*	108.3	109.1*	10	11.4*
May	74.3	56.3	0.76			106.7		18	
June	93.6	70.7*	0.76*			108.4*		10	
July	98.3	66.2*	0.67*			114.0*		11*	
August	118.6	91.7*	0.77*			136.0*		18*	
September	119.0	92.9*	0.78*			138.4*		14*	
October	77.0	55.6*	0.72*			121.9*		13*	
November	99.5	73.6*	0.74*			140.2*		16*	
December	120.8	81.6*	0.68*			150.1*		08*	

\*Preliminary estimates.

The lowest smoothed sunspot indices number for Cycle 22, RI = 8.0, occurred in May 1996. The highest smoothed sunspot number for Cycle 22, RI=158.5 occurred July 1989.

\*\* From June 1991 onward, 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 04 January 1999*

*Protons* plot contains the five-minute averaged integral proton flux (protons/ cm<sup>2</sup>-sec-sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

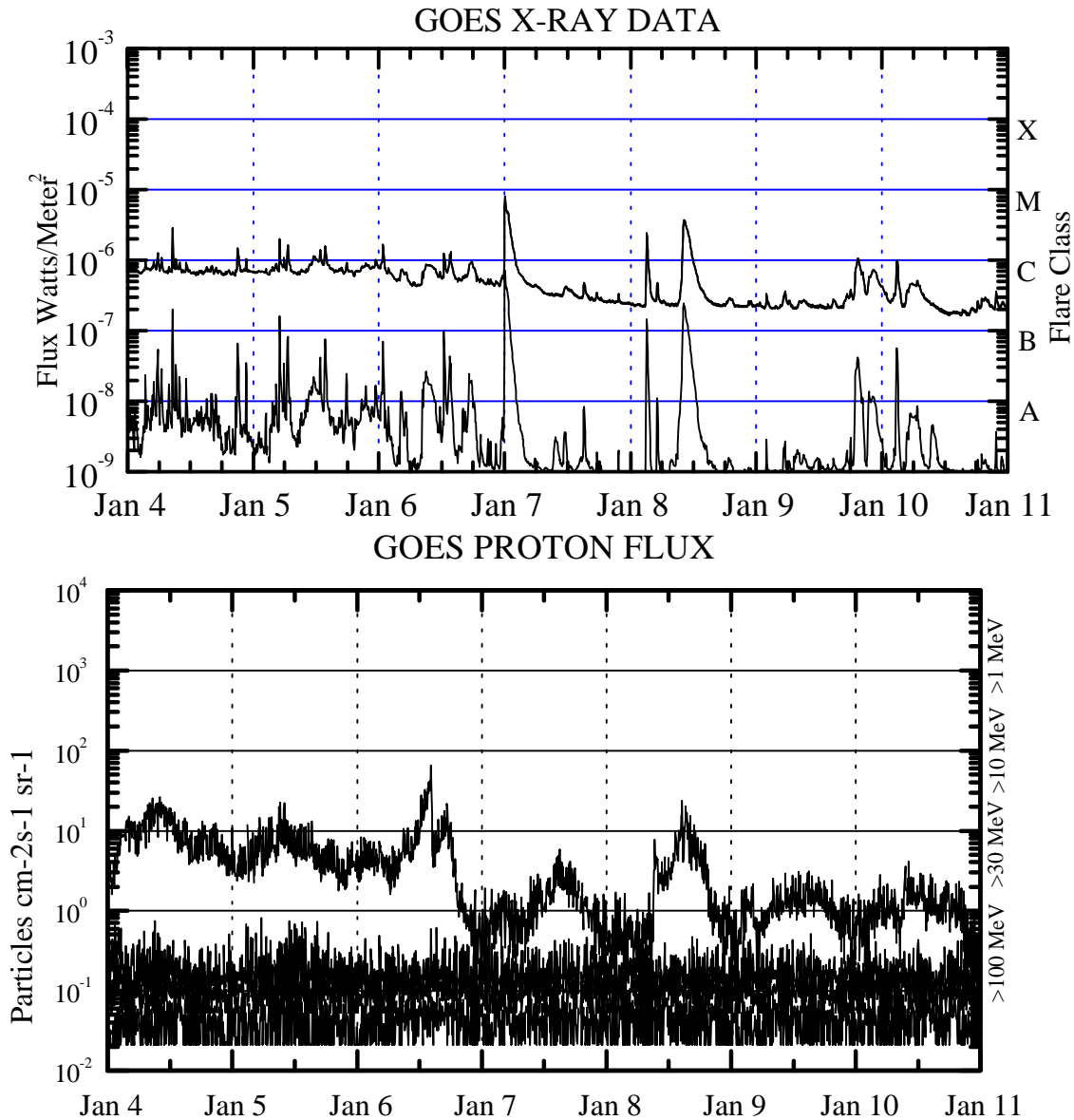
*Electrons* plot contains the five-minute averaged integral electron flux (electrons/ cm<sup>2</sup>-sec-sr) with energies greater than 2 MeV at GOES-8.

*H<sub>p</sub>* plot contains the five minute averaged magnetic field H component in nanoteslas (nT) as measured by GOES-8. The H component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

*K<sub>p</sub>* plot contains the estimated planetary 3-hour K-index (derived by the USAF 55<sup>th</sup> Space Weather Squadron) 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 Heartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC) and the US Geological Survey. These may differ from the final K<sub>p</sub> 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<sub>p</sub> are "global" parameters that are applicable to a first order approximation over large areas. H<sub>p</sub>parallel is subject to a 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<sup>2</sup>) as measured by GOES 8 and 10 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/cm<sup>2</sup>-sec-sr) as measured by GOES-8 (W75) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu (protons/cm<sup>2</sup>-sec-sr) at greater than 10 MeV.

