

Space Weather Highlights
15-21 December 1997

Solar activity was very low to low. Isolated C-class subflares occurred beginning 19 December, coincident with the east limb arrival of Region 8124 (S22, L = 347, class/area Eac/220 on 22 December).

Solar wind data were received from the WIND spacecraft a few hours per day. Velocities ranged from 300 - 350 km/sec. Densities were enhanced during 17 - 18 December with peaks to 27 p/cc, but varied from 05 - 15 p/cc during the remainder of the period. Bz was mostly in the plus 05 nT to minus 10 nT (GSM) range with Bz predominantly southward during 15 - 17 December. Solar sector orientation was away (phi angle near 135 degrees) on 15 December, but shifted to toward orientation (phi angle near 315 degrees) during 16 - 19 December. Orientation was not discernible during the rest of the period.

There were no significant proton enhancements observed at geosynchronous altitude.

The greater than 2 MeV electron flux at geosynchronous altitude was at high levels early on 15 December, then declined to moderate to normal levels for the remainder of the period.

The geomagnetic field was mostly quiet at all latitudes.

Space Weather Forecast
24 December 1997 -19 January 1998

Solar activity is expected to range from very low to moderate. C-class flares are expected to occur almost daily. Region 8124 appears capable of isolated M-class flare production. Old Region 8113 is due to return to the visible disk on 23 December and may increase chances for M-class flare activity.

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 levels during most of the period.

The geomagnetic field is expected to be quiet to unsettled.



Daily Solar Data

Date	Radio	Sun	Sunspot	X-ray	X-ray Flux			Flares				
	Flux 10.7 cm	spot No. (10 ⁶ hemi.)	Area	Background	C	M	X	S	Optical			
									1	2	3	4
15 December	89	56	220	B1.6	2	0	0	6	0	0	0	0
16 December	85	43	240	B1.3	0	0	0	1	0	0	0	0
17 December	86	42	200	A7.5	0	0	0	0	0	0	0	0
18 December	86	35	130	A5.7	0	0	0	0	0	0	0	0
19 December	90	16	70	B1.7	1	0	0	1	0	0	0	0
20 December	90	27	110	B2.4	0	0	0	0	0	0	0	0
21 December	92	30	190	B2.2	2	0	0	1	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
15 December	1.6E+5	1.8E+4	4.7E+3		3.9E+7	
16 December	2.8E+5	1.9E+4	4.8E+3		2.1E+7	
17 December	1.7E+5	1.9E+4	4.8E+3		5.0E+6	
18 December	1.9E+5	1.8E+4	4.7E+3		1.8E+6	
19 December	2.0E+5	1.8E+4	4.4E+3		1.3E+6	
20 December	2.3E+5	1.7E+4	4.0E+3		1.3E+6	
21 December	2.4E+5	1.7E+4	4.2E+3		6.7E+5	

Daily Geomagnetic Data

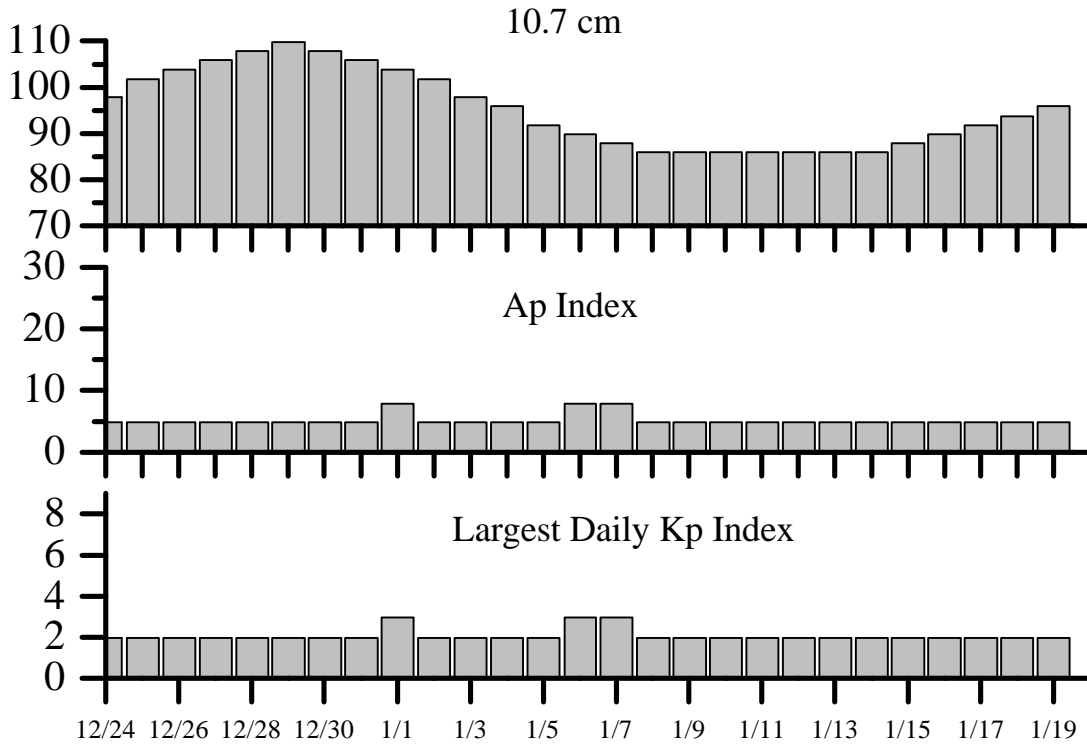
Date	Middle Latitude		High Latitude		Estimated	
	Fredericksburg		College		Planetary	
	A	K-indices	A	K-indices	A	K-indices
15 December	2	1-0-0-1-1-2-1-0	1	0-0-0-2-0-2-0-0	3	0-0-0-1-1-2-1-0
16 December	4	0-1-1-1-1-2-2-2	*	0-0-0-1-4-0-*-0	3	0-0-0-0-2-1-1-2
17 December	4	1-1-2-1-1-1-1-2	1	0-0-2-2-0-0-0-0	3	1-0-1-1-1-1-1-2
18 December	6	2-3-2-2-1-1-1-1	4	0-4-1-0-0-0-1-1	6	1-4-2-0-0-1-1-1
19 December	5	2-1-1-1-2-2-2-1	0	0-0-0-0-0-0-0-0	2	1-0-0-0-0-1-1-0
20 December	3	1-0-1-1-1-1-1-1	2	0-0-1-1-2-0-0-0	2	0-0-1-1-1-1-1-1
21 December	3	2-0-1-0-1-1-1-1	0	0-0-1-1-0-0-0-0	3	2-0-1-1-1-1-1-0

Alerts and Warnings Issued

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
16 Dec 0005	>2MeV Electron Event in Progress	≥1000pfu 15 Dec
18 Dec 0600	K= 4 Observed	18 Dec 03-06
19 Dec 0010	1-245 MHz Burst	18 Dec



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
24 Dec	98	5	2	07 Jan	86	8	3
25	102	5	2	08	86	5	2
26	104	5	2	09	86	5	2
27	106	5	2	10	86	5	2
28	108	5	2	11	86	5	2
29	106	5	2	12	86	5	2
30	104	5	2	13	86	5	2
31	102	5	2	14	86	5	2
01 Jan	98	8	3	15	88	5	2
02	96	5	2	16	90	5	2
03	92	5	2	17	92	5	2
04	90	5	2	18	94	5	2
05	88	5	2	19	96	5	2
06	86	8	3				



Energetic Events

Date	Time (UT)		X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½ Max	Class	Integ Flux	Imp Brtns	Location		Radio Flux		Intensity	
							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	
15 December	0153	0225	0236	B6.2				
	0351	0353	0357		SF	N18E58	8123	
	0527	0531	0535	B2.9				
	0759	0803	0806	B2.5				
	1221	1225	1233	B2.7	SF	N17E53	8123	
	1353	1355	1357	B3.8	SF	N17E53	8123	
	1426	1430	1437	B2.7				
	1842	1844	1900	C1.1	SF	N16E50	8123	
	1936	1937	1941	B4.8	SF	N17E49	8123	
	1946	1946	1953		SF	N17E48	8123	
	2339	2350	0004	C2.4				
16 December	0953	1000	1006	B2.3				
	1016	1025	1030	B1.8				
	1030	1035	1042	B3.3				
	1128	1131	1139		SF	N28W50	8122	
	1408	1431	1452	B2.4				
	2023	2030	2036	B4.6				
17 December	1158	1217	1243	B1.1				
	1439	1442	1444	B1.0				
	1838	1841	1843	B1.4				
	1856	1904	1909	B3.7				
18 December	0214	0225	0255	B3.4				
	1350	1355	1359	B2.3				
	2057	2107	2111	B1.8				
19 December	0534	0554	0630	B5.1				
	0710	0710	0714	B3.9	SF	N18E02	8123	
	1338	1346	1401	B3.7				
	1800	2030	2153	C1.1				
20 December	1743	1749	1756	B3.6				
	2005	2024	2039	B5.6				
	2341	2346	2350	B5.3				
21 December	0145	0153	0157	B5.9				
	0341	0354	0407	C7.0				
	0808	0835	0851	B8.5				
	1029	1035	1041	B8.0				
	1418	1426	1429	B3.4				
	1436	1445	1453	B9.7				



Flare List - continued.

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
21 December	1518	1521	1523	B7.8			
	1634	1645	1724	C2.9			
	1926	1932	1943	B5.6			
	2052	2053	2059	B4.8	SF	S21W63	8124

Region Summary

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

Region 8118

08 Dec	S38E37	189	0020	06	BXO	005	B										
09 Dec	S39E25	188	0070	07	CAO	007	B										
10 Dec	S39E09	191	0070	02	HSX	001	A										
11 Dec	S39W03	189	0040	02	HSX	001	A										
12 Dec	S38W14	187	0050	02	HSX	001	A										
13 Dec	S40W27	187	0050	02	HSX	001	A										
14 Dec	S41W39	186	0040	01	HSX	001	A										
15 Dec	S39W52	186	0030	01	HSX	001	A										
16 Dec	S40W64	184	0020	02	HSX	001	A										
17 Dec	S39W78	185	0020	02	AXX	001	A										
18 Dec	S39W91	185															

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 189

Region 8120

08 Dec	S22E35	191	0030	03	BXO	005	B										
09 Dec	S22E22	191	0050	04	CRO	009	B										
10 Dec	S22E10	190	0040	06	CAO	007	B										
11 Dec	S21W06	192	0000	00	AXX	001	A										
12 Dec	S21W19	192															
13 Dec	S20W31	191	0000	01	AXX	001	A										
14 Dec	S20W44	191															
15 Dec	S20W57	191															
16 Dec	S20W70	191															
17 Dec	S19W83	191															

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 192



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 8122

11 Dec	N31W06	192	0050	05	DRO	018	B										
12 Dec	N31W18	191	0120	08	DSO	014	B					2					
13 Dec	N30W33	193	0120	10	DAO	011	B										
14 Dec	N29W48	195	0110	09	DAO	009	B	1				1					
15 Dec	N31W60	194	0120	11	EAO	007	B										
16 Dec	N30W72	192	0070	14	ESO	002	B					1					
17 Dec	N32W85	192	0050	01	HSX	001	A										
										1	0	0	4	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 192

Region 8123

14 Dec	N19E61	086	0010	04	BXO	003	B										
15 Dec	N18E46	088	0060	06	DSO	007	B	1				6					
16 Dec	N18E32	088	0150	07	DSO	010	B										
17 Dec	N18E20	087	0130	08	DSO	010	B										
18 Dec	N19E06	088	0100	09	DSO	014	B										
19 Dec	N18W08	089	0070	10	CSO	006	B					1					
20 Dec	N18W20	088	0070	10	DSO	006	B										
21 Dec	N18W36	091	0040	07	CSO	003	B										
										1	0	0	7	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 88

Region 8124

20 Dec	S22E78	350	0040	02	HSX	001	A										
21 Dec	S22E66	349	0150	12	EAO	007	B					1					
										0	0	0	1	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 349



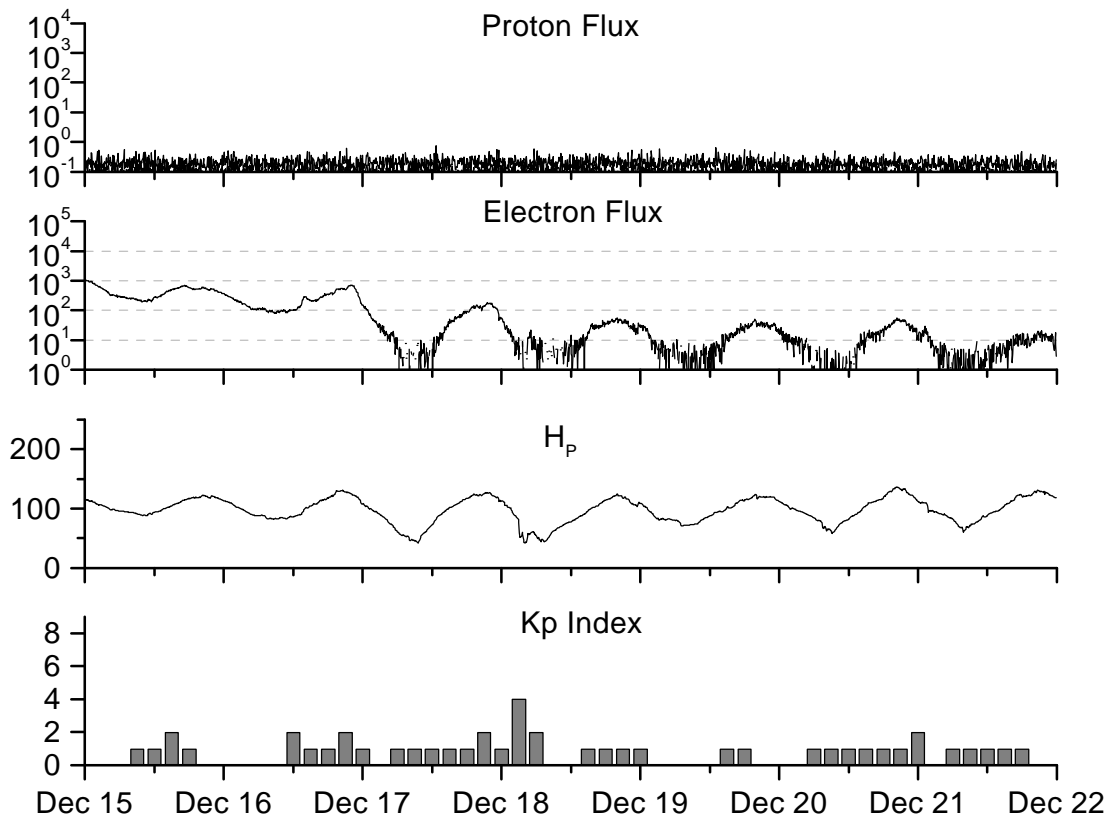
**Recent Solar Indices (preliminary)
of the observed monthly mean values**

Month	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed values		Ratio	Smooth values		Penticton	Smooth	Planetary	Smooth
	SWO	RI	RI/SWO	SWO	RI	10.7 cm	Value	Ap	Value
1995									
December	16.2	10.0	0.62	17.6	10.8	72.6	72.8	09	10.0
1996									
January	17.6	11.5	0.65	16.8	10.4	74.5	72.4	09	09.8
February	09.1	04.4	0.48	16.2	10.1	71.5	72.2	10	09.8
March	12.1	09.2	0.76	15.4	09.7	72.7	72.1	11	09.9
April	08.5	04.8	0.56	13.6	08.5	69.3	71.6	11	09.7
May	11.8	05.5	0.47	12.9	08.0	72.1	71.4	07	09.5
June	18.8	11.8	0.63	13.5	08.5	69.6	71.8	05	09.4
July	13.2	08.2	0.62	13.4	08.4	71.2	72.0	07	09.3
August	20.5	14.4	0.70	13.1	08.3	72.4	72.1	09	09.4
September	02.9	01.6	0.55	13.3	08.4	69.4	72.3	15	09.3
October	02.3	00.9	0.39	14.0	08.8	69.2	72.6	13	09.1
November	26.7	17.9	0.67	15.4	09.8	78.7	73.0	08	09.1
December	21.1	13.3	0.63	16.2	10.4	77.8	73.3	07	09.3
1997									
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	09.0*
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	18.4*	74.6	78.4*	08	08.6*
June	22.1	12.7	0.57			71.7		07	
July	17.0	10.5*	0.62*			71.1		06*	
August	36.7	24.7*	0.67*			79.0		08*	
September	52.8	51.3*	0.88*			96.2*		10*	
October	33.6	23.3*	0.69*			85.0*		10*	
November	53.5	39.3*	0.73*			99.5*		10*	

*Preliminary estimates.

The lowest smoothed sunspot number for Cycle 22, RI = 8.0, occurred May 1996. The highest smoothed sunspot number for Cycle 22, RI=158.5, occurred July 1989. October 1996 has been selected as the start of Solar Cycle 23. 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 15 December 1997

Protons plot contains the five-minute averaged integral proton flux (protons/ cm^2 -sec-sr) as measured by GOES-9 (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/ cm^2 -sec-sr) with energies greater than 2 MeV at GOES-9.

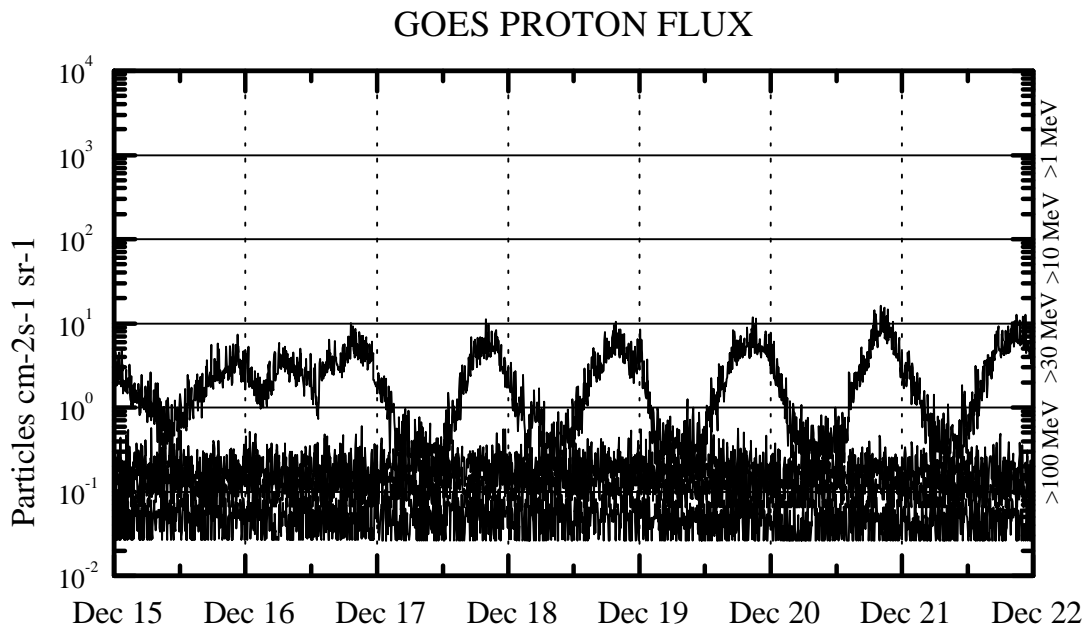
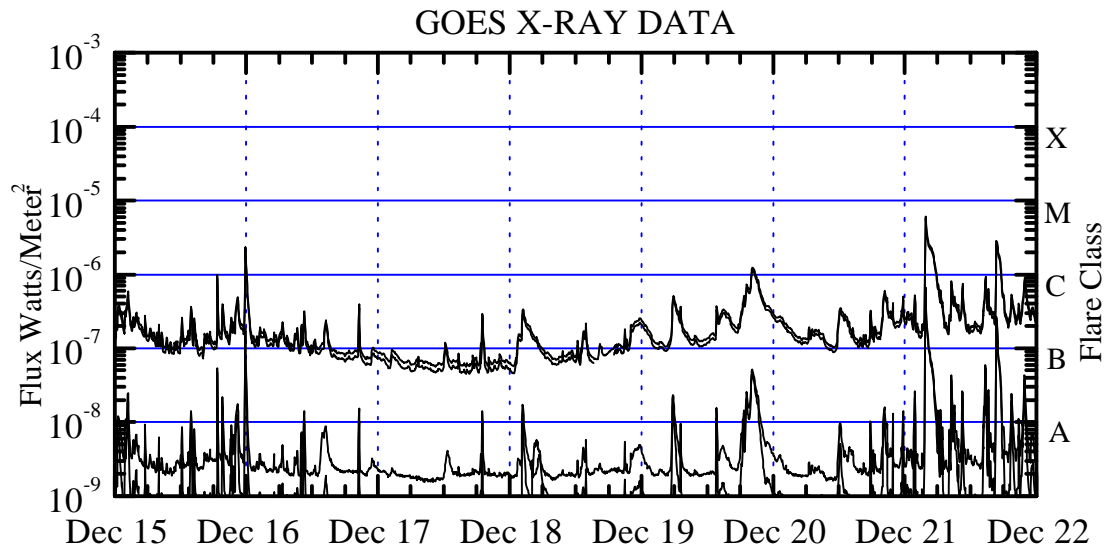
H_p plot contains the five minute averaged magnetic field H component in nanoteslas (nT) as measured by GOES-9. The H component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

K_p plot contains the estimated planetary 3-hour K-index (derived by the USAF 55th 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_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 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

Proton plot contains the five minute averaged integral proton flux (protons/cm²-sec-sr) as measured by GOES-9 (W135) 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.

X-ray plot contains five minute averaged x-ray flux (watts/m²) as measured by GOES 8 and 9 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.

