

**Space Weather Highlights**  
**22-28 December 1997**

Solar activity was very low to low. Region 8124 (S22, L = 348, class/area EKC/590 on 23 December) grew at a moderate pace during 22 - 23 December and produced isolated B- and C-class subflares. The region's most notable flare was a brief C2/SF, reaching maximum at 26/0557UT, and accompanied by a partial-halo coronal mass ejection. There were no discrete or sweep frequency bursts detected with this flare.

Solar wind data were received from the WIND spacecraft a few hours per day. Velocities mostly ranged from 270 - 340 km/sec, but briefly increased to 400 km/sec on 23 December. Densities briefly increased to 31 p/cc on 23 December, but were in the 05 - 18 p/cc range for the rest of the period. Bz ranged from plus 05 to minus 05 nT (GSM). Solar sector orientation was mostly toward (phi angle near 315 degrees) during 26 - 27 December, but 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 normal levels.

The geomagnetic field was quiet at all latitudes.

**Space Weather Forecast**  
**31 December 1997 - 26 January 1998**

Solar activity is expected to range from very low to low. Isolated C-class flare activity is expected.

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 Flux	Sun spot	Sunspot Area	X-ray Background	X-ray Flux			Flares				
	10.7 cm	No. (10 <sup>6</sup> hemi.)	(10 <sup>6</sup> hemi.)		C	M	X	S	1	2	3	4
22 December	97	41	260	B1.9	3	0	0	2	0	0	0	0
23 December	104	72	700	B2.4	0	0	0	0	0	0	0	0
24 December	108	67	520	B2.2	0	0	0	2	0	0	0	0
25 December	105	56	470	B1.6	0	0	0	2	0	0	0	0
26 December	105	50	460	B2.1	1	0	0	2	0	0	0	0
27 December	96	56	420	B1.6	1	0	0	0	1	0	0	0
28 December	102	55	410	B1.4	0	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
22 December	2.6E+5	1.8E+4	4.2E+3		5.5E+5	
23 December	2.0E+5	1.7E+4	4.2E+3		2.9E+5	
24 December	2.1E+5	1.7E+4	4.4E+3		4.8E+5	
25 December	2.3E+5	1.8E+4	4.3E+3		6.9E+5	
26 December	1.8E+5	1.8E+4	4.5E+3		7.0E+5	
27 December	2.2E+5	1.8E+4	4.4E+3		7.7E+5	
28 December	3.9E+5	1.8E+4	4.5E+3		8.3E+5	

### Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
22 December	2	0-0-1-1-1-1-1-1	0	0-0-0-2-0-0-0-0	2	0-0-0-1-1-1-1-1
23 December	3	1-1-0-0-1-1-1-2	0	0-0-0-0-0-0-0-0	3	1-0-0-0-1-1-1-2
24 December	4	2-2-1-0-1-1-1-1	1	0-1-1-0-1-0-0-0	3	2-2-1-0-1-1-1-0
25 December	2	1-1-1-0-0-0-1-0	0	0-0-0-0-0-0-0-0	2	1-1-0-0-0-0-1-0
26 December	2	1-0-0-0-1-0-1-1	0	0-0-0-0-0-0-0-0	1	1-0-0-0-0-0-1-0
27 December	0	0-0-0-0-0-0-1-0	0	0-0-0-0-0-0-0-0	2	0-0-0-0-0-0-1-0
28 December	1	0-0-1-0-0-0-1-1	*	0-*-0-0-0-0-0-0	2	0-0-0-0-1-1-1-1



*Alerts and Warnings Issued*

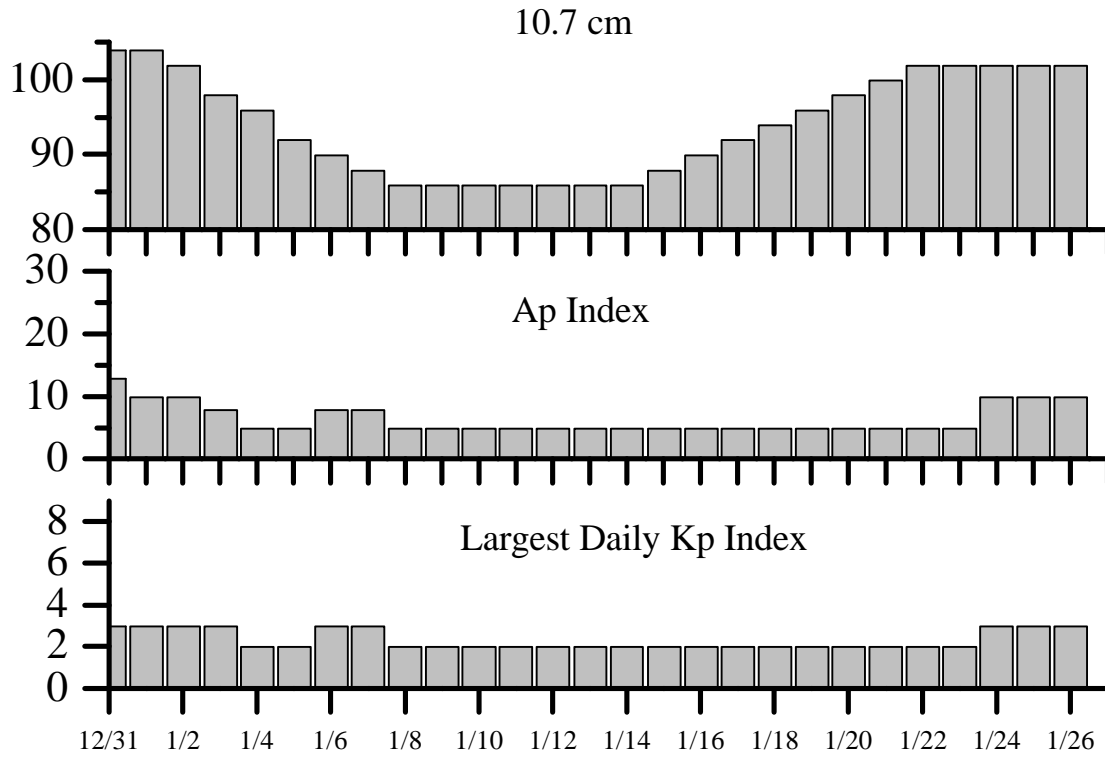
---

Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
22 Dec 1355	Stratwarm Alert exists	Stratwarm Monday
23 Dec 1358	Stratwarm Alert Exists	Stratwarm Tuesday
24 Dec 1330	Stratwarm Alert Exists	Stratwarm Wednesday
25 Dec 1456	Stratwarm Alert Exists	Stratwarm Thursday
26 Dec 1436	Stratwarm Alert Exists	Stratwarm Friday
27 Dec 1358	Stratwarm Alert Exists	Stratwarm Saturday
28 Dec 1323	Stratwarm Alert Exists	Stratwarm Sunday

---



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
31 Dec	104	13	3	14 Jan	86	5	2
01 Jan	104	10	3	15	88	5	2
02	102	10	3	16	90	5	2
03	98	8	3	17	92	5	2
04	96	5	2	18	94	5	2
05	92	5	2	19	96	5	2
06	90	8	3	20	98	5	2
07	88	8	3	21	100	5	2
08	86	5	2	22	102	5	2
09	86	5	2	23	102	5	2
10	86	5	2	24	102	10	3
11	86	5	2	25	102	10	3
12	86	5	2	26	102	10	3
13	86	5	2				



### *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
<i>No Events Observed</i>												

### *Flare List*

Date	Time			X-ray Class.	Imp / Brtns	Optical Location		Rgn #
	Begin	Max	End			Lat	CMD	
22 December	0155	0220	0238	C3.3				
	0622	0627	0636	B3.8				
	0830	0830	0834	C1.4	SF	S24E64	8124	
	1212	1217	1222	B4.0				
	1238	1243	1247	B4.3				
	1524	1536	1546	C6.5	SF	S24E58	8124	
	2102	2108	2112	B4.2				
	2151	2156	2200	B7.1				
	2229	2235	2240	B5.3				
2245	2249	2254	B5.6					
23 December	No Flares Observed							
24 December	0119	0122	0125	B5.2				
	0302	0306	0315	B3.0				
	1545	1550	1601	B4.3				
	1611	1611	1616		SF	S22E25	8124	
	1908	1908	1911	B8.0	SF	N24E72	8126	
25 December	0212	0213	0218	B4.7	SF	S22E23	8124	
	0327	0330	0332	B2.3				
	0955	0956	1000	B3.2	SF	S22E18	8124	
26 December	0409	0410	0418		SF	S24E14	8124	
	0554	0554	0611	C2.0	SF	S22E07	8124	
27 December	1228	1238	1253	B4.9				
	1632	1634	1704	C3.2	1F	S23W06	8124	
28 December	1413	1417	1421	B2.3				
	1751	1752	1756	B5.0	SF	S22W25	8124	



## 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 8123</i>																		
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											
22 Dec	N18W51	092	0020	01	HSX	001	A											
23 Dec	N18W64	092	0000	01	AXX	001	A											
24 Dec	N18W77	092	0000	00	AXX	001	A											
25 Dec	N18W90	092																
								1	0	0	7	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 088

<i>Region 8124</i>																		
20 Dec	S22E78	350	0040	02	HSX	001	A											
21 Dec	S22E66	349	0150	12	EAO	007	B					1						
22 Dec	S22E54	347	0240	14	EAC	020	BG	2				2						
23 Dec	S22E40	348	0590	13	EKC	027	BGD											
24 Dec	S22E27	348	0360	13	EKC	023	BGD					1						
25 Dec	S22E14	348	0310	13	EAI	024	BG					2						
26 Dec	S22E01	348	0260	12	ESI	017	BG	1				2						
27 Dec	S21W12	347	0230	11	ESC	020	BG	1					1					
28 Dec	S20W24	345	0190	12	EAI	015	BG					1						
								4	0	0	9	1	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 348



*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	4		
<i>Region 8125</i>																	
23 Dec	N19E41	347	0010	03	BXO	003	B										
24 Dec	N19E28	347	0000	03	BXO	002	B										
25 Dec	N19E16	346	0000	00	AXX	001	A										
26 Dec	N19E03	346															
27 Dec	N19W10	346															
								0	0	0	0	0	0	0	0	0	0
Died on Disk.																	
Absolute heliographic longitude: 346																	
<i>Region 8126</i>																	
23 Dec	N20E79	309	0100	03	HHX	001	A										
24 Dec	N21E66	309	0160	03	HHX	001	A						1				
25 Dec	N21E54	308	0160	03	HKX	001	A										
26 Dec	N20E41	308	0200	03	CHO	002	B										
27 Dec	N21E28	307	0180	03	HSX	003	A										
28 Dec	N22E16	305	0210	05	CHO	008	B										
								0	0	0	1	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 305																	
<i>Region 8127</i>																	
26 Dec	S17W54	043	0000	00	AXX	001	A										
27 Dec	S17W67	043															
								0	0	0	0	0	0	0	0	0	0
Died on Disk.																	
Absolute heliographic longitude: 043																	
<i>Region 8128</i>																	
27 Dec	N28W54	029	0010	03	BXO	003	B										
28 Dec	N28W68	029	0010	02	BXO	002	B										
								0	0	0	0	0	0	0	0	0	0
Still on Disk.																	
Absolute heliographic longitude: 029																	



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

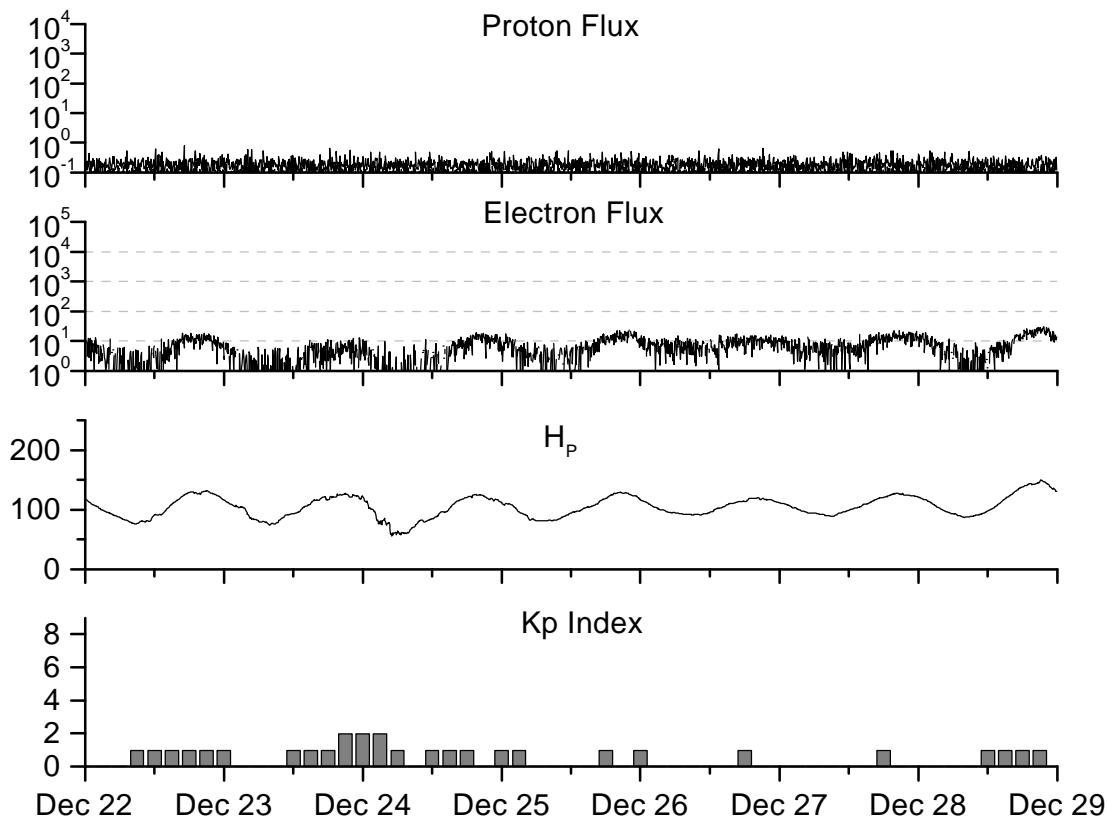
Month	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed values		Ratio	Smooth values		Penticton	Smooth	Planetary	Smooth
	SWO	RI	RI/SWO	SWO	RI	10.7 cm	Value	Ap	Value
<b>1995</b>									
December	16.2	10.0	0.62	17.6	10.8	72.6	72.8	09	10.0
<b>1996</b>									
January	17.6	11.5	0.65	16.8	10.4	74.5	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
<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	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 22 December 1997*

*Protons* plot contains the five-minute averaged integral proton flux (protons/ cm<sup>2</sup>-sec-sr) as measured by GOES-9 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

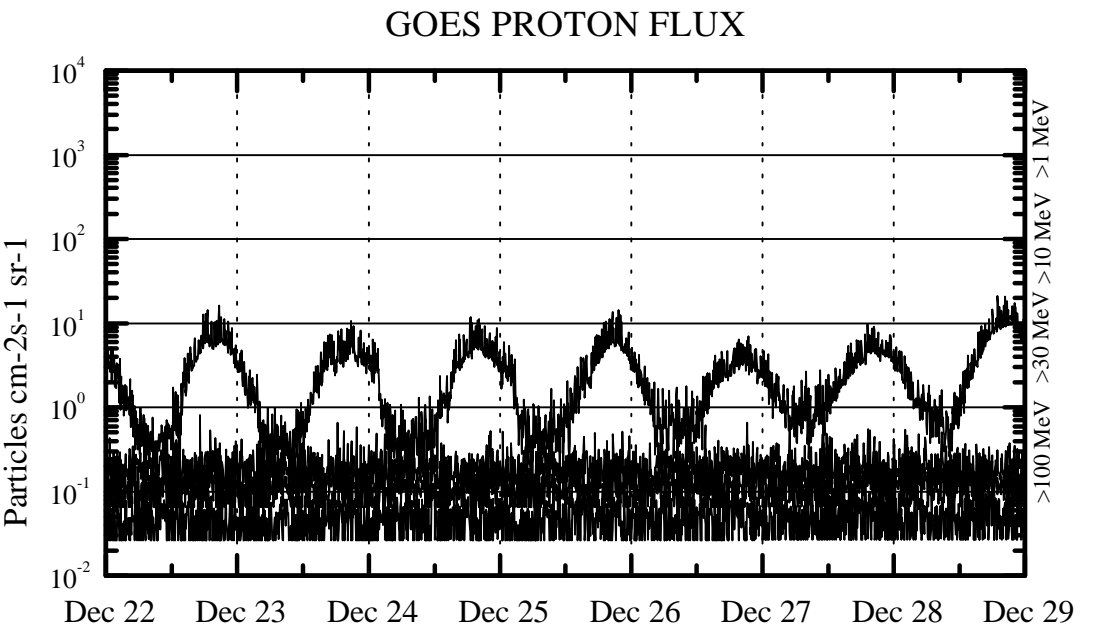
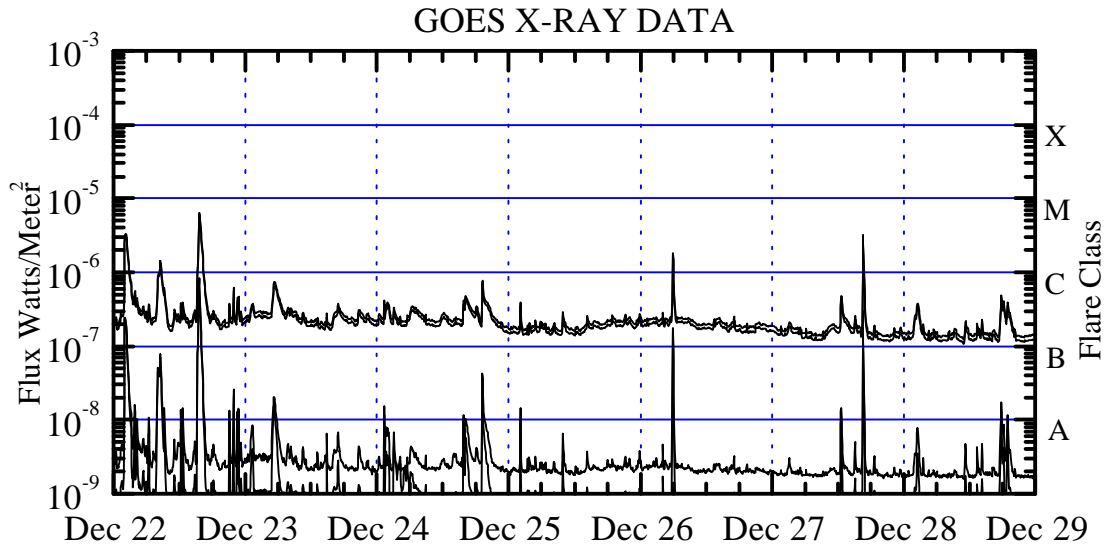
*Electrons* plot contains the five-minute averaged integral electron flux (electrons/ cm<sup>2</sup>-sec-sr) with energies greater than 2 MeV at GOES-9.

*H<sub>p</sub>* 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<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> is subject to a more localized phenomena and the measurements generally are applicable to within a few degrees of longitude of the measuring satellite.



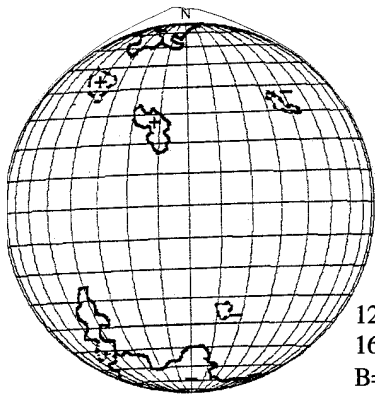


*Weekly GOES Satellite X-ray and Proton Plots*

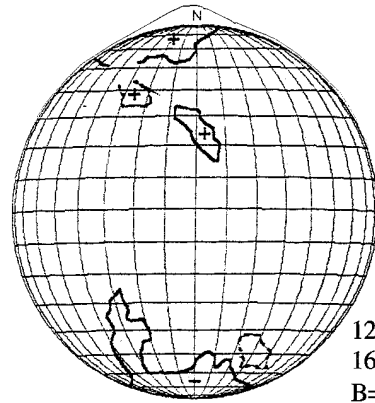
Proton plot contains the five minute averaged integral proton flux (protons/cm<sup>2</sup>-sec-sr) as measured by GOES-9 (W135) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu (protons/cm<sup>2</sup>-sec-sr) at greater than 10 MeV.

X-ray plot contains five minute averaged x-ray flux (watts/m<sup>2</sup>) 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.

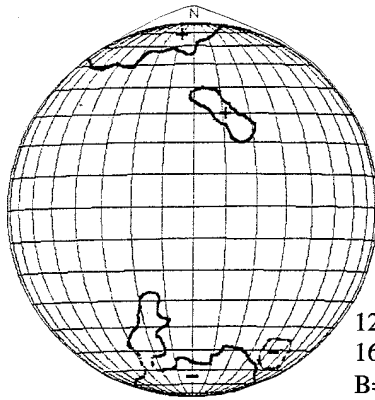




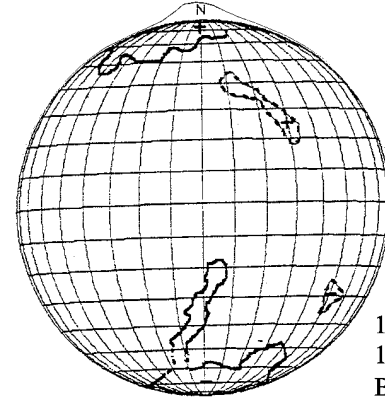
12/15/97  
1656UT  
B=-1°



12/16/97  
1638UT  
B=-1°



12/17/97  
1642UT  
B=-1°



12/18/97  
1811UT  
B=-1°

12/19/97  
No Data

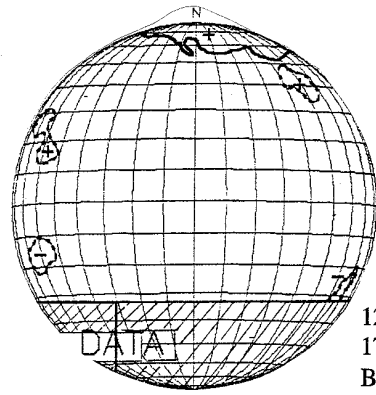
12/20/97  
No Data

12/21/97  
no data

*Coronal hole maps from the National Solar Observatory, Kitt Peak, Arizona*

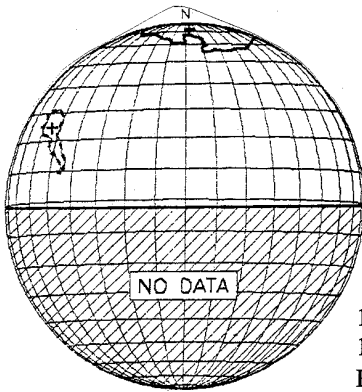
These maps are reproductions of the coronal hole contours as derived from the Kitt Peak 1083 nm raw data images. These are preliminary data, where solid (and dashed) lines are used to indicate more (and less) confidence in an inference and are printed whenever they are available at SWO.





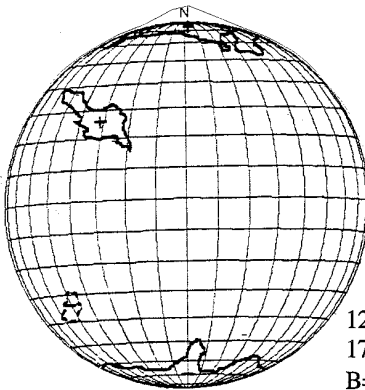
12/23/97  
1701UT  
B=-2°

12/22/97  
no data

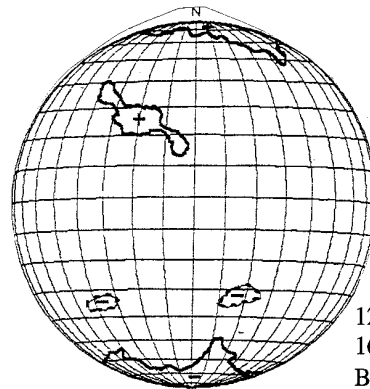


12/24/97  
1632UT  
B=-2°

12/25/97  
No Data



12/26/97  
1747UT  
B=-2°



12/27/97  
1638UT  
B=-2°

*Coronal hole maps from the National Solar Observatory, Kitt Peak, Arizona*

These maps are reproductions of the coronal hole contours as derived from the Kitt Peak 1083 nm raw data images. These are preliminary data, where solid (and dashed) lines are used to indicate more (and less) confidence in an inference and are printed whenever they are available at SWO.

