

**Space Weather Highlights  
15-21 September 1997**

Solar activity ranged from low to moderate. Activity rose to moderate levels on 17 September by virtue of an M1/SN flare at 17/1141UT and an M1/SF flare at 17/1750UT. Both flares were produced by Region 8084 (N22, L = 320, class/area Dsi/270 on 10 September). Isolated C-class subflare activity occurred during the remainder of the period. A long duration C2 X-ray flare occurred at 20/1044UT. Space-based solar X-ray imaging suggests the flare emanated from behind the southwest limb.

Solar wind data were received from the WIND spacecraft a few hours per day. Velocities ranged from 270 - 450 km/sec. Particle densities ranged from 03 - 08 p/cc through midday 17 September, then rose sharply to a peak near 40 p/cc late that day. Densities abruptly dropped to a range of 05 - 20 p/cc and remained so for the balance of the period. Bz was weakly southward through 16 September becoming more strongly southward during 17 September - early 18 September, with a maximum deflection of minus 16 nT (GSM). Bz turned northward during 18 September (maximum deflection plus 10 nT) before returning to near zero for the balance of the period. Solar sector orientation was away (phi angle near 135 degrees) at the beginning of the period, gradually shifting to toward orientation (phi angle near 315 degrees) by mid period. Orientation gradually shifted to away during the remainder of the period.

There were no significant proton enhancements observed at satellite altitudes.

The greater than 2 MeV electron flux at geosynchronous altitude reached high levels during 15 - 17 September declining to moderate to normal levels for the rest of the period.

The geomagnetic field was quiet to unsettled until late 17 September. A disturbance began near 17/1800UT and continued until around midday 18 September. The disturbance peaked between 18/0300 - 0600UT with active to minor storm conditions observed at mid latitudes and active to major storm levels noted at high latitudes. Conditions declined to quiet to unsettled levels during the latter half of 18 September and remained so through 21/1800UT. The field became disturbed thereafter with active to minor storm levels observed at all latitudes and isolated major storm periods at high latitudes. Solar wind data suggest both of the above disturbances were associated with coronal transients.

**Space Weather Forecast  
24 September 1997 - 20 October 1997**

Solar activity is expected to range from low to moderate. The best chance for isolated M-class flare activity occurs after 01 October, with the return of previously active regions.

No significant proton enhancements are expected at satellite altitudes.

The greater than 2 MeV electron flux at geosynchronous altitude is expected to be normal to moderate during most of the period. However, high fluxes are expected during 30 September - 04 October.

The geomagnetic field is expected to be predominately quiet to unsettled. However, disturbed conditions are expected during 28 - 30 September due to a polar high speed coronal hole wind stream. Active to minor storm levels are expected at all latitudes during this disturbance with isolated periods of major storming at high latitudes.



### 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
15 September	98	61	770	B4.1	5	0	0	15	0	0	0	0
16 September	95	62	790	B2.6	2	0	0	2	0	0	0	0
17 September	93	52	490	B2.2	6	2	0	3	0	0	0	0
18 September	88	30	200	B3.6	6	0	0	0	0	0	0	0
19 September	88	18	90	B2.7	4	0	0	0	1	0	0	0
20 September	88	15	60	B3.7	1	0	0	1	0	0	0	0
21 September	85	39	90	B2.3	1	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)		
	>1MeV	>10MeV	>100MeV	>.6MeV	>2MeV	>4MeV
15 September	3.1E+5	1.7E+4	4.2E+3		9.1E+7	
16 September	3.9E+5	1.7E+4	4.0E+3		1.8E+8	
17 September	3.6E+5	1.7E+4	4.3E+3		1.6E+8	
18 September	2.1E+5	1.8E+4	4.1E+3		1.2E+7	
19 September	1.4E+5	1.7E+4	4.0E+3		5.1E+6	
20 September	9.8E+4	1.8E+4	4.1E+3		3.6E+6	
21 September	3.7E+5	1.8E+4	4.3E+3		2.9E+6	

### Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
15 September	12	4-3-3-3-2-2-1-2	*	*_*_*_*_*_*_*_*_*	16	3-3-3-4-3-3-2-2
16 September	7	2-3-3-1-1-1-1-1	*	*_*_*_*_*_*_*_*_*	9	2-3-3-1-2-2-2-2
17 September	8	1-2-1-1-2-2-3-3	5	1-0-1-2-3-2-1-2	8	0-1-2-2-2-3-3-3
18 September	14	4-4-3-2-3-2-2-2	16	4-4-3-3-4-2-1-2	17	4-5-4-3-3-3-2-2
19 September	2	1-0-1-1-0-1-1-1	0	0-0-1-0-0-0-1-0	3	1-0-0-1-1-1-2-1
20 September	7	1-1-3-3-2-1-1-1	*	1-0-4-4-1-*_0-0	7	2-2-3-3-2-0-1-1
21 September	12	1-1-3-2-1-2-4-4	10	0-0-3-3-0-4-3-3	15	1-1-3-3-2-3-4-4



### *Alerts and Warnings Issued*

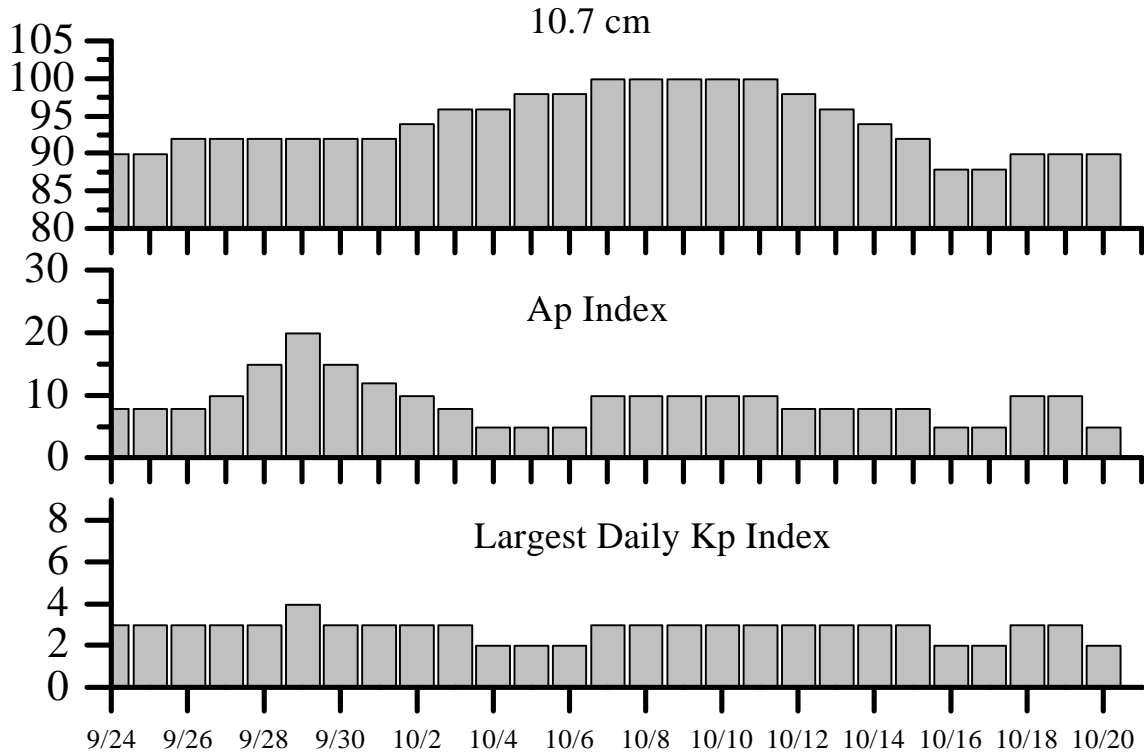
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Date and Time of Issue (UT)	Type of Alert or Warning	Date and Time of Event (UT)
15 Sep 0011	1 - 245MHz Radio Burst	14 Sep 1735
15 Sep 0011	>2MeV Electron Event in Progress $\geq 1000$ pfu	14 Sep
16 Sep 0029	>2MeV Electron Event in Progress $\geq 1000$ pfu	15 Sep
17 Sep 0016	>2MeV Electron Event in Progress $\geq 1000$ pfu	16 Sep
18 Sep 0027	>2MeV Electron Event in Progress $\geq 1000$ pfu	17 Sep
18 Sep 0304	K = 4 observed	18 Sep 00-03
18 Sep 0600	K= 5 observed	18 Sep 03-06
18 Sep 2044	A $\geq 20$ observed	18 Sep 1800
20 Sep 0011	1 - 245MHz Radio Burst	20 Sep 0143

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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
24 Sep	90	8	3	08 Oct	100	10	3
25	90	8	3	09	100	10	3
26	92	8	3	10	100	10	3
27	92	10	3	11	100	10	3
28	92	15	3	12	98	8	3
29	92	20	4	13	96	8	3
30	92	15	3	14	94	8	3
01 Oct	92	12	3	15	92	8	3
02	94	10	3	16	88	5	2
03	96	8	3	17	88	5	2
04	96	5	2	18	90	10	3
05	98	5	2	19	90	10	3
06	98	5	2	20	90	5	2
07	100	10	3				



### *Energetic Event*

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½	Class	Integ	Imp	Location		Rgn	Radio Flux		Intensity	
			Max		Flux		Lat	CMD		#	245	2695	II
17 Sep	1135	1143	1152	M1.7	.009	SN	N21W82		8084				
17 Sep	1745	1803	1827	M1.0	.010	SF	N21W84		8084				

### *Flare List*

Date	Time			X-ray	Imp /	Optical		Rgn
	Begin	Max	End			Class.	Location	
15 September	0032	0033	0050		SF	N28E37		8086
	0206	0213	0224	C4.4	SF	N22W56		8084
	0505	0506	0509		SF	N28E34		8086
	0644	0652	0708	C3.1	SF	N22W59		8084
	0736	0736	0741		SF	N22W59		8084
	0803	0804	0810		SF	N28E33		8086
	1126	1134	1142		SF	N27E35		8086
	1352	1401	1409		SF	N22W62		8084
	1358	1403	1416	C1.5	SN	N28E33		8086
	1637	1637	1644	B9.5	SF	N28E29		8086
	1641	1642	1656		SF	S25W34		8085
	1832	1837	1847	C1.4	SF	N28E28		8086
	2039	2045	2052	B7.7	SF	N28E27		8086
	2040	2123	2145		SF	N19W62		8084
2132	2132	2142	C1.8	SF	N28E28		8086	
16 September	0137	0143	0148	B5.0				
	0200	0205	0211	B8.3				
	0442	0448	0501	B4.5				
	0701	0702	0705	B6.5	SF	N22W71		8084
	1026	1030	1033	B4.3				
	1930	1939	1949	B7.1				
	2010	2030	2041	C1.8				
2112	2115	2118	B4.2					
2214	2215	2247	C3.4	SF	N21W74		8084	
17 September	0105	0136	0139	C5.6				
	0342	0405	0423	C1.7				
	0621	0624	0628	B3.8				
	1050	1054	1056	B8.1				
	B1138	U1141	1210	M1.7	SN	N21W82		8084
	1345	1357	1410	C1.2				
	1658	1702	1707	B4.4				
	1729	1731	1736	C1.2	SF	S26W70		8085
	1749	1750	1810	M1.0	SF	N21W84		8084
	2239	2251	2258	C7.1				
2358	0001	0002	C1.6					



*Flare List – continued.*

Date	Begin	Time		Class.	X-ray Brtns	Optical		Rgn
		Max	End			Imp / Lat CMD	Location #05 September	
18 September		0235	0238	0244	B4.6			
		0553	0558	0601	C1.1			
		0654	0701	0714	B8.0			
		0803	0818	0820	C1.4			
		1208	1213	1222	C2.9			8084
		1604	1608	1611	B5.8			
		1705	1710	1713	C1.5			
		1745	1748	1751	B2.6			
		1816	1819	1821	B5.1			
		1852	1856	1858	B3.6			
		1933	1936	1938	C1.5			
		1947	1953	1956	C1.6			
		2149	2206	2214	B6.1			
		2310	2331	2341	B5.7			
19 September		0001	0013	0027	C1.8			
		0147	0150	0153	C8.6	1F	S17W88	8085
		0515	0521	0525	B6.2			
		0535	0548	0557	C1.5			
		0911	0929	0940	C2.6			
		1435	1445	1507	B9.7			
20 September		1747	1753	1806	B5.4			
		0027	0048	0155	B8.0			
		0834	0834	0837		SF	N28W29	8086
21 September		0949	1044	1220	C2.3			
		0411	0417	0420	C2.6			
		0549	0554	0558	B3.8			
		0750	0754	0759	B2.6			
		0917	0924	0928	B5.7			
	2044	2049	2053	B3.2				
	2301	2304	2308	B2.1				



## Region Summary

Date	Location		Sunspot Characteristics				Flares								
	(° Lat ° CMD)	Helio Lon	Area (10 <sup>6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical				
							C	M	X	S	1	2	3	4	
<i>Region 8083</i>															
03 Sep	S28E55	357	0070	04	CRO	004	B							3	
04 Sep	S27E41	357	0200	05	DSO	007	B							3	
05 Sep	S27E28	357	0300	09	DKO	011	B								
06 Sep	S27E15	357	0300	09	DAO	011	B								
07 Sep	S28E04	355	0360	10	DAI	014	B							1	
08 Sep	S28W09	355	0450	09	DAI	019	B		1					1	
09 Sep	S28W22	355	0540	09	DKO	015	B							3	
10 Sep	S28W35	354	0710	10	DKO	019	B							1	
11 Sep	S28W48	354	0600	10	DKO	011	B								
12 Sep	S27W59	352	0340	11	EKO	012	B								
13 Sep	S28W73	353	0290	08	DAO	007	B								
14 Sep	S27W85	352	0060	02	HSX	001	A	1						1	
								1	1	0	13	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 355

### *Region 8084*

05 Sep	N22E64	321	0010	03	BXO	002	B								
06 Sep	N22E51	321	0010	00	HRX	001	A								
07 Sep	N21E36	323	0010	02	HRX	003	A								
08 Sep	N21E26	320	0070	06	CAO	015	B							3	
09 Sep	N22E13	320	0170	07	DAI	019	B							1	
10 Sep	N22W01	320	0270	09	DSI	022	B							4	
11 Sep	N22W13	319	0240	12	EAI	020	B							3	
12 Sep	N22W26	319	0240	13	EAO	022	BGD	3						8	
13 Sep	N22W39	319	0230	13	EAO	016	BG							2	
14 Sep	N22W53	320	0270	12	ESO	012	BG	1						2	
15 Sep	N21W64	317	0240	09	DAO	010	BG	2						5	
16 Sep	N22W77	317	0270	11	EAO	006	B	1						2	
17 Sep	N22W88	315	0080	06	DRO	006	B		2					2	
								7	2	0	32	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 320



*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 8085</i>																			
06 Sep	S24E75	297	0040	01	HSX	001	A												
07 Sep	S25E64	295	0230	11	EAO	006	B	1				10							
08 Sep	S25E53	293	0460	16	FKI	016	B	3				4							
09 Sep	S25E40	293	0650	16	FKI	023	BG	2				2	2						
10 Sep	S26E27	292	0610	16	FKI	024	BG												
11 Sep	S26E15	291	0600	17	FKI	025	BG					1							
12 Sep	S26E02	291	0470	18	FKI	033	B												
13 Sep	S26W12	292	0380	17	FKI	018	B												
14 Sep	S26W25	292	0380	17	FKI	016	B	1				1	1						
15 Sep	S26W37	290	0330	17	FKO	008	B					1							
16 Sep	S25W55	295	0340	03	HKX	004	A												
17 Sep	S25W72	299	0250	05	HAX	002	A	1				1							
18 Sep	S25W85	299	0080	03	HHX	001	A												
19 Sep	S25W98	299						1					1						
												9	0	0	20	4	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 291

<i>Region 8086</i>																			
11 Sep	N27E76	230	0010	05	BXO	002	B												
12 Sep	N27E63	230	0000	00		000													
13 Sep	N27E50	230	0040	04	CSO	004	B					4							
14 Sep	N28E38	229	0080	06	CSO	005	B	1				2							
15 Sep	N27E27	226	0200	08	DAI	013	B	3				9							
16 Sep	N28E14	226	0180	10	DSO	022	B												
17 Sep	N27E00	227	0160	12	ESO	014	B												
18 Sep	N28W11	225	0120	12	CSO	009	B												
19 Sep	N27W25	226	0090	12	CSO	008	B												
20 Sep	N29W38	226	0060	07	CSO	005	B					1							
21 Sep	N26W54	228	0050	04	CSO	006	B												
												4	0	0	16	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 227





***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</i>	<i>8087</i>																
21 Sep	S22E72	102	0030	02	HSX	001	A											

0 0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 102

*Region 8088*

21 Sep	S28E53	121	0010	02	BXO	002	B											
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0 0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 121



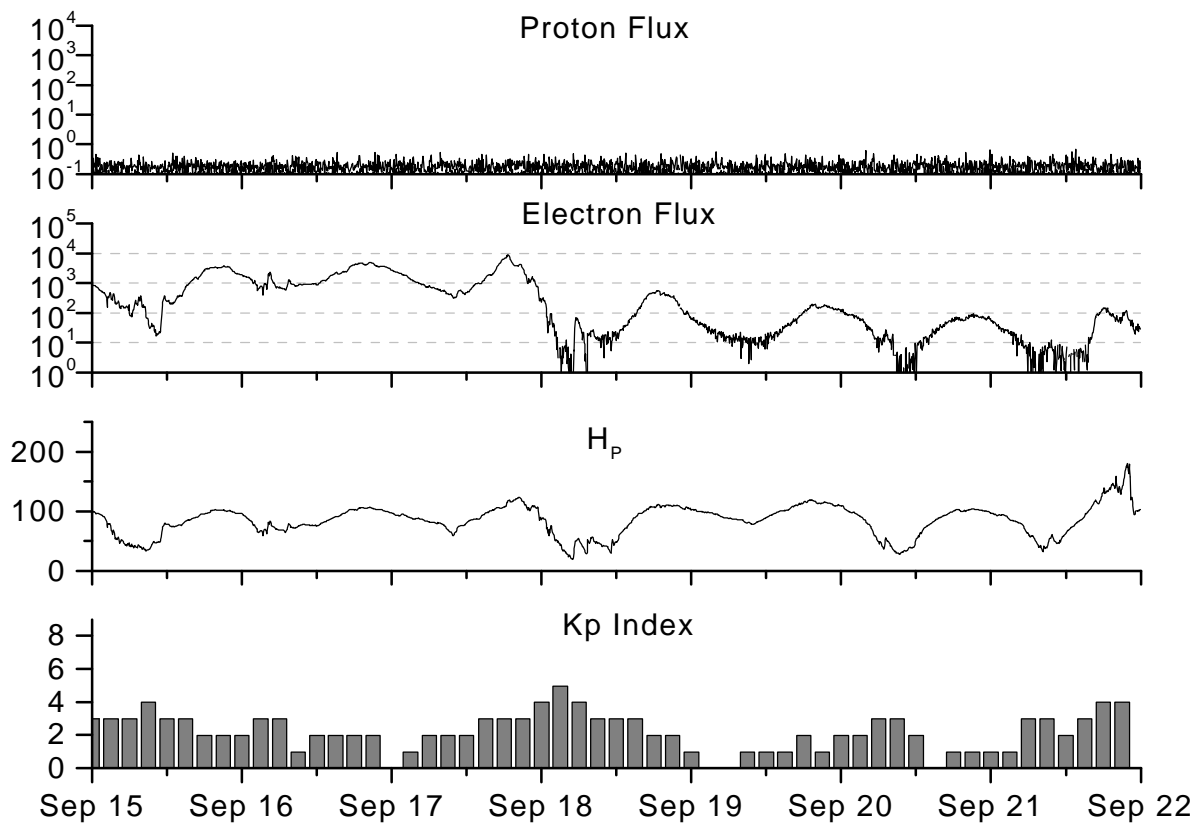
**Recent Solar Indices (preliminary)  
of the observed monthly mean values**

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>									
September	16.5	11.8	0.72	22.0	13.4	72.0	74.8	13	11.8
October	31.6	21.1	0.67	19.7	12.1	77.9	73.8	16	11.4
November	15.7	09.0	0.57	18.5	11.4	74.2	73.2	09	10.7
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	0.55	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	0.60	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	0.67	13.4	08.4*	71.2	72.0	07	09.3
August	20.5	14.4	0.68	13.1	08.3*	72.4	72.1	09	09.4
September	02.9	01.6	0.62	13.3	08.5*	69.4	72.3	15	09.3
October	02.3	00.9	0.78	14.0	08.9*	69.2	72.6	13	09.1
November	26.7	17.9	0.72	15.4	09.9*	78.7	73.0	08	09.1
December	21.1	13.3	0.60	16.2	10.5*	77.8	73.3	07	09.3
<b>1997</b>									
January	09.0	06.5*	0.72*	16.5	10.6*	74.0	73.4*	09	09.3*
February	11.3	07.6*	0.67*	17.4	11.2*	73.8	73.6*	11	09.2*
March	14.4	08.8*	0.61*			73.5		08	
April	24.5	15.8*	0.64*			74.5		10	
May	28.6	18.5*	0.64*			74.6		08	
June	22.1	13.1*	0.59*			71.7		07	
July	17.0	10.5*	0.62*			71.1*		06*	
August	36.7	24.7*	0.67*			76.8*		08*	

\*Preliminary estimates.

The lowest smoothed sunspot indices number for Cycle 21, RI = 12.3, occurred September 1986. 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 15 September 1997*

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

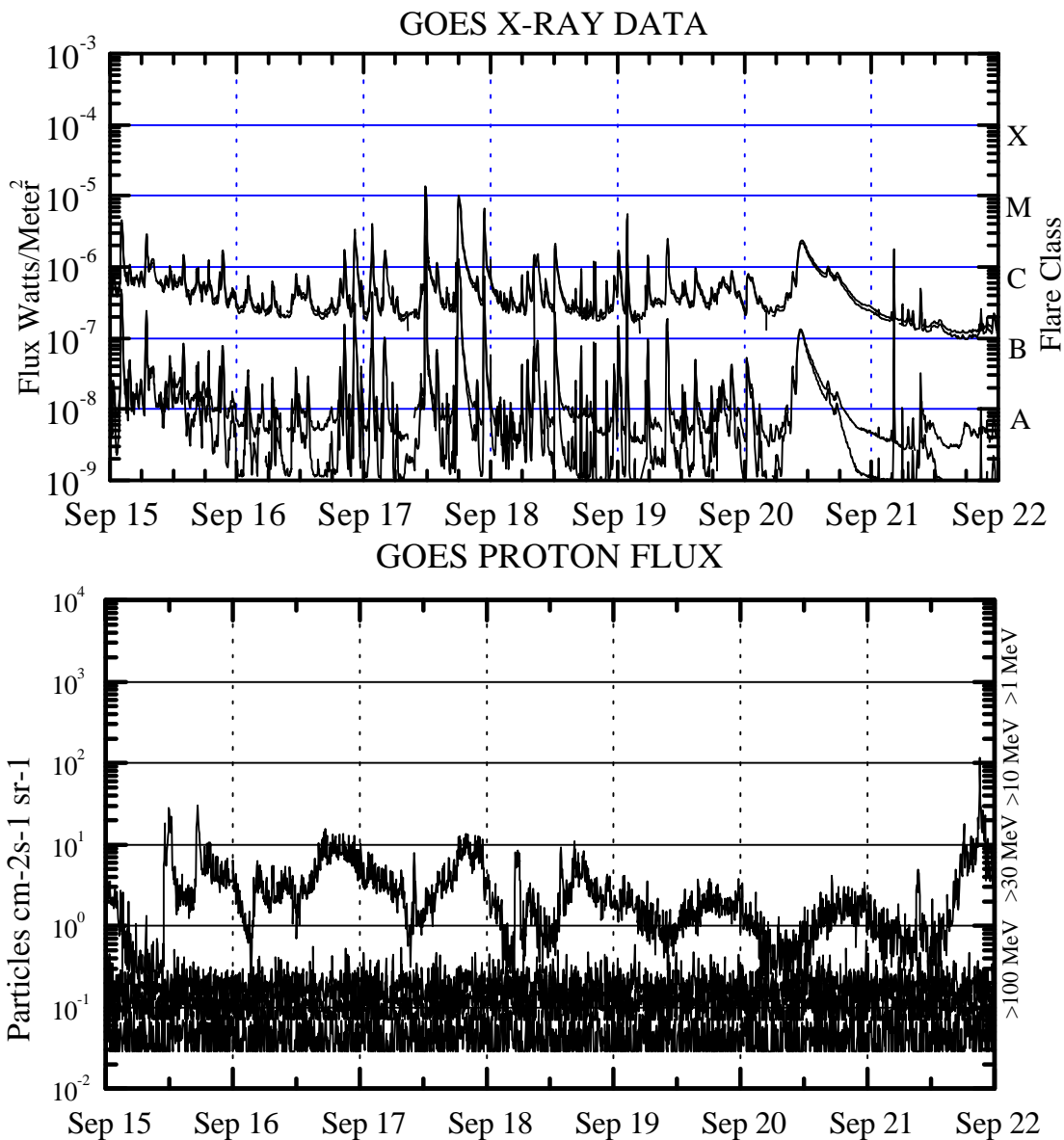
*Electrons* plot contains the five minute averaged integral electron flux (electrons/  $\text{cm}^2$ -sec-sr) with energies greater than 2 MeV at GOES-9.

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





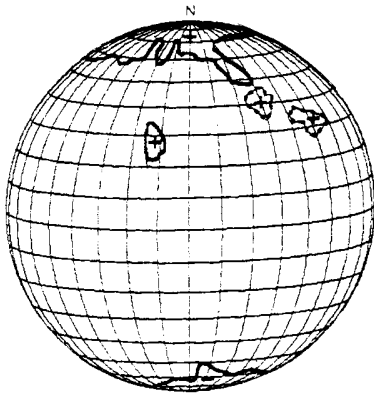
*Weekly GOES Satellite X-ray and Proton Plots*

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.

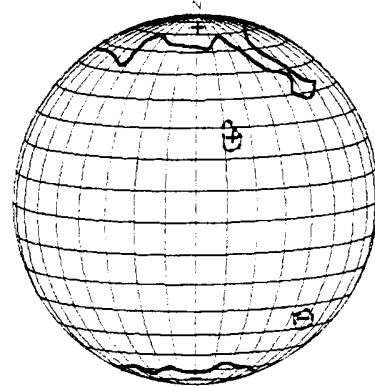
X-ray plot contains five minute averaged x-ray flux (watts/m<sup>2</sup>) as measured by GOES 8 and 9 in two wavelength bands, .05 -.4 and .1 -.8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 -.8 nm band.

**Note: The Proton Plot for 8-14 September (PRF 1150) was inadvertently omitted. The formatted on-line version has now been corrected.**

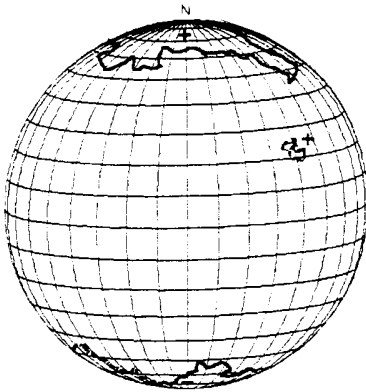




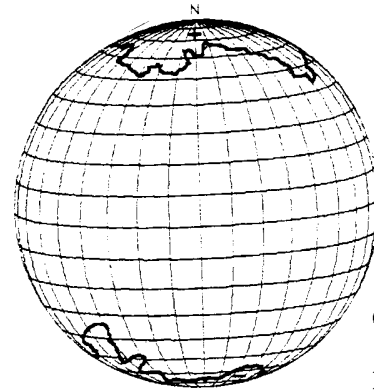
09/08/97  
2008UT  
B=+7°



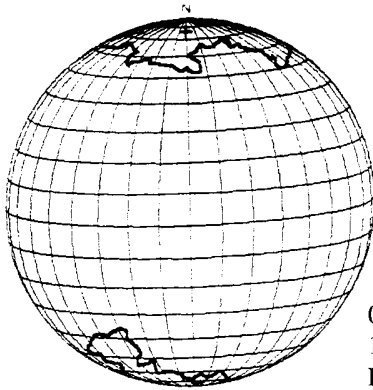
09/10/97  
1803UT  
B=+7°



09/12/97  
1718UT  
B=+7°



09/13/97  
1856UT  
B=+7°



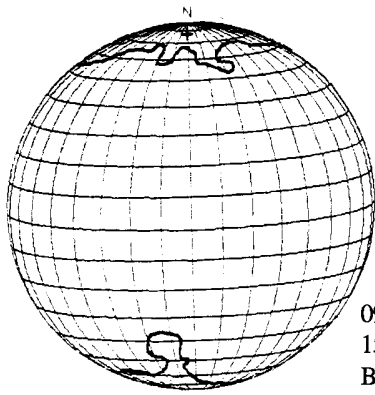
09/14/97  
1900UT  
B=+7°

**No Data**  
09/09/97 &  
09/11/97

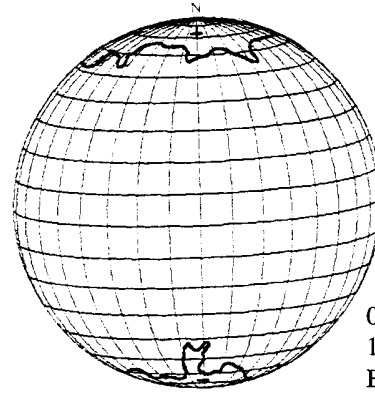
*Coronal hole maps from the National Solar Observatory, Kitt Peak, Arizona*

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.

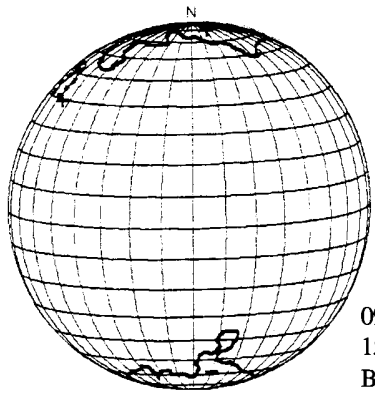




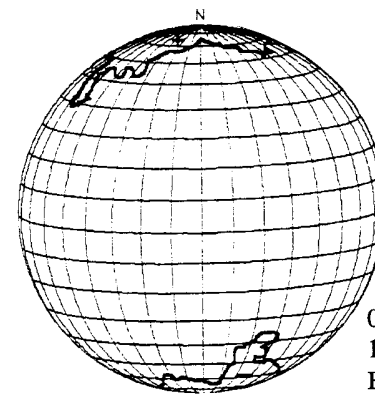
09/16/97  
1541UT  
B=+7°



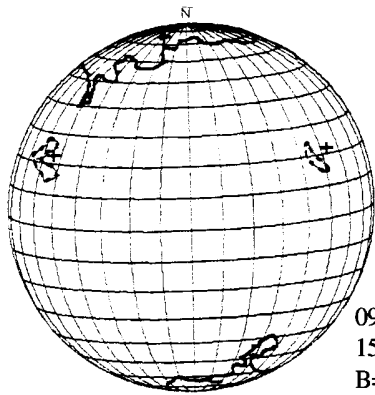
09/17/97  
1518UT  
B=+7°



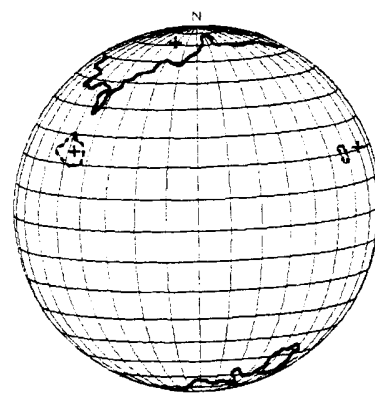
09/18/97  
1537UT  
B=+7°



09/19/97  
1701UT  
B=+7°



09/20/97  
1536UT  
B=+7°



09/21/97  
1726UT  
B=+7°

**No Data**  
09/15/97

*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.

