

**Space Weather Highlights**  
**12-18 October 1998**

Solar activity ranged from low to moderate during the period. Region 8358 (N15, L = 104, class/area Dao/290 on 18 October) grew gradually during the period and produced an M2/1N flare at 18/0145UT associated with minor radio emission. This region stabilized following the M-flare. Isolated B- and C-class flares occurred during the rest of the period. A 27 degree filament, last observed near N19E10, disappeared from the disk on 15 October. An Earth-directed coronal mass ejection (CME) was associated with the filament disappearance.

Real-time solar wind data were available from the Advanced Composition Explorer (ACE) spacecraft during most of the period. An interplanetary shock passage was detected at 18/1902UT associated with the CME described above. Velocities increased from 310 - 400 km/sec, densities increased to 48 p/cc, and Bz became southerly at minus 08 nT immediately following the passage. Note: more extreme Bz and density variations occurred on 19 October associated with the CME passage. They will be described in next week's PRF. In the meantime, users may access our web page at <http://www.sec.noaa.gov> for further details.

There were no significant proton enhancements detected at geosynchronous altitude during the summary period. However, interplanetary shock-accelerated particles caused a >10 MeV proton enhancement on 19 October. The enhancement will be described in next week's PRF.

The greater than 2 MeV electron flux at geosynchronous altitude was at moderate to high levels through 15 October, then declined to normal to moderate levels for the balance of the period. The geomagnetic field was at quiet to unsettled levels throughout the period. Note: a geomagnetic storm occurred on 19 October following the CME mentioned above. The storm will be described in next week's PRF.

**Space Weather Forecast**  
**21 October 1998 -16 November 1998**

Solar activity is expected to be low during most of the period. M-class flare probabilities may increase after 02 November with the return of Region 8358.

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.

The geomagnetic field is expected to be at quiet to unsettled levels during most of the period. However, brief active periods are possible through 24 October due to coronal hole effects.



### *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
12 October	114	76	240	B3.1	2	0	0	2	0	0	0	0
13 October	118	70	240	B3.2	2	0	0	5	0	0	0	0
14 October	119	86	330	B2.2	1	0	0	11	0	0	0	0
15 October	131	113	450	B2.3	2	0	0	2	0	0	0	0
16 October	131	120	570	B4.0	3	0	0	7	0	0	0	0
17 October	135	107	730	B3.2	4	0	0	7	1	0	0	0
18 October	126	136	840	C1.6	1	1	0	1	2	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
12 October	1.4E+5	2.1E+4	7.1E+3		1.6E+8	
13 October	3.4E+5	1.6E+4	3.6E+3		1.0E+8	
14 October	5.2E+5	1.6E+4	3.6E+3		1.0E+8	
15 October	7.9E+5	1.6E+4	3.6E+3		9.2E+7	
16 October	3.7E+5	1.5E+4	3.4E+3		3.1E+7	
17 October	2.9E+5	1.6E+4	3.5E+3		4.7E+6	
18 October	4.5E+5	1.6E+4	3.4E+3		4.0E+6	

### *Daily Geomagnetic Data*

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	12 October	3	2-1-0-1-1-0-1-1	6	0-0-0-2-4-3-0-0	6
13 October	4	1-1-1-2-1-1-2-1	19	4-1-4-6-2-1-1-0	7	1-1-2-4-1-2-1-2
14 October	2	0-2-0-0-0-1-1-0	1	0-0-1-1-0-0-0-0	4	1-2-1-0-0-1-2-2
15 October	2	0-1-0-0-1-1-1-0	6	0-0-2-2-2-1-1-0	6	1-1-2-1-2-3-2-2
16 October	3	1-0-0-1-2-0-2-2	2	1-0-0-0-1-0-1-1	4	1-0-0-1-1-1-2-2
17 October	13	1-1-3-2-2-2-2-0	13	0-1-4-4-4-3-1-0	9	1-2-3-3-3-3-2-2
18 October	*	1-2-2-2-2-1-3-2	*	1-0-3-3-3-3-2-1	10	1-2-3-3-2-2-3-3



*Alerts and Warnings Issued*

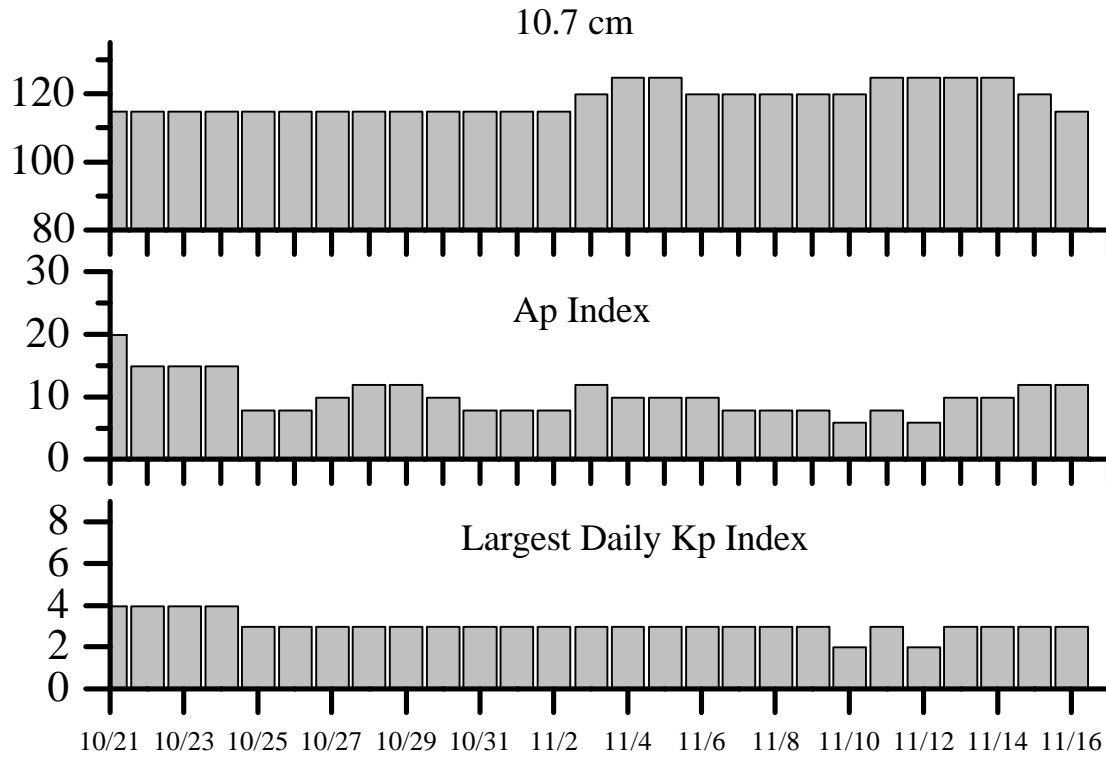
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<u>Date and Time of Issue (UT)</u>	<u>Type of Alert or Warning</u>	<u>Date and Time of Event (UT)</u>
12 Oct 1200	CONTINUED > 2MeV Electron Event $\geq 1000$ pfu	02 Oct 1455
13 Oct 1200	CONTINUED >2 MeV Electron Event $\geq 1000$ pfu	02 Oct 1455
14 Oct 1201	CONTINUED >2 MeV Electron Event $\geq 1000$ pfu	02 Oct 1455
15 Oct 0110	1-245 MHz Radio Burst	14 Oct
15 Oct 0110	245 MHz Radio Noise Storm	14 Oct
15 Oct 1213	CONTINUED >2 MeV Electron Event $\geq 1000$ pfu	02 Oct 1455
16 Oct 0140	1-245 MHz Radio Burst	15 Oct
16 Oct 0140	245 MHz Radio Noise Storm	15 Oct
16 Oct 1201	CONTINUED >2 MeV Electron Event $\geq 1000$ pfu	02 Oct 1455
16 Oct 2106	A $\geq 20$ Watch	19 Oct
17 Oct 0155	1-245 MHz Radio Burst	16 Oct
17 Oct 0155	245 MHz Radio Noise Storm	16 Oct

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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
21 Oct	115	20	4	04 Nov	10	3	
22	115	15	4	05	10	3	
23	115	15	4	06	10	3	
24	115	15	4	07	8	3	
25	115	8	3	08	8	3	
26	115	8	3	09	8	3	
27	115	10	3	10	6	2	
28	115	12	3	11	8	3	
29	115	12	3	12	6	3	
30	115	10	3	13	10	3	
31	115	8	3	14	10	3	
01 Nov	115	8	3	15	12	3	
02	115	8	3	16	12	3	
03	120	12	3				



### *Energetic Events*

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	½	Class	Integ	Imp	Location		Radio Flux		Intensity	
			Max		Flux		Brtns	Lat	CMD	Rgn	#	245
18 Oct 98	0138	0145	0152	M2.4	.010	1N	N16W52				8358	

### *Flare List*

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn #
	Begin	Max	End			Location	Lat CMD	
12 October	1043	1105	1124	C2.2				
	1407	1409	1414	B3.8	SF	S21W63	8354	
	1943	1945	1955	C1.0	SF	S21E03	8355	
13 October	0057	0101	0110	B8.9	SF	N22W54	8356	
	0605	0608	0611	B4.0				
	B1051	U1056	A1115	C1.2	SF	N20W58	8356	
14 October	1153	1157	1201	B7.9				
	1703	1704	1711		SF	N20W67	8350	
	1842	1843	1853	B6.8	SF	N23W44	8359	
	1944	1949	2014	C1.0	SF	N16E03	8358	
	0536	0544	0546		SF	S20W02	8360	
	0611	0611	0621		SF	S20W02	8360	
	0742	0742	0746		SF	S20W03	8360	
	B0756	U0757	0825		SF	S20W02	8360	
	0820	U0827	A0843		SF	N15W03	8358	
	B0918	U0919	A0942		SF	S20W06	8360	
15 October	1123	U1124	A1130		SF	S21W04	8360	
	1407	1420	1439		SF	S21W22	8355	
	1447	1447	1451	B4.2	SF	S19W09	8360	
	1635	1639	1641	B5.8				
	1714	1715	1727	C1.6	SF	S20W09	8360	
	1816	1818	1826	B7.1	SF	S20W10	8360	
	2339	2348	2355	B7.3				
	0044	0048	0059	C2.6	SF	N26W63	8359	
	0320	0326	0332	B7.1				
	1917	1920	1925	B6.3				
2129	2144	A2144	C1.9	SF	S20W23	8360		



*Flare List-continued*

Date	Time			X-ray Class.	Optical		Rgn #
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
16 October	0507	0511	0513	B6.5			
	0519	0520	0535		SF	S19W30	8360
	0519	0519	0526		SF	N15W32	8358
	0539	0542	0546	B5.8			
	0607	0640	0718	C1.0	SF	S19W31	8360
	0709	0711	0723		SF	N16W29	8358
	0822	0846	0926	C1.1			
	1359	1412	1420		SF	N15W35	8358
	1452	1452	1500	B7.2	SF	S19W34	8360
	2126	2131	2150	C2.7	SF	N15W38	8358
	17 October	0317	0325	0333	B5.4		
0622		0627	0630		SF	N16W41	8358
0913		0915	0922		SF	N19E34	
1047		1050	1052	B6.3			
1118		1125	1138		SF	N17W46	8358
1430		1432	1509	B7.9	SF	N16W49	8358
1841		1848	1913	C9.1	1F	N14W51	8358
2137		2141	2151	C1.2	SF	N15W53	8358
2222		2226	2244	C5.1	SF	N14W54	8358
2354		0007	0030	C8.1	SN	N16W51	8358
18 October		0142	0144	0208	M2.4	1N	N16W52
	0537	0537	0548	C2.6	1F	N16W57	8358
	1055	1103	1118	B7.6			
	2327	2332	2338		SF	N13W53	8361



### 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</i>		<i>8350</i>																
01 Oct	N20E78	187	0100	04	HSX	001	A											
02 Oct	N20E66	186	0260	11	ESO	002	B											
03 Oct	N19E54	184	0260	10	DAO	003	B					2						
04 Oct	N20E41	184	0260	10	DSO	011	B					2						
05 Oct	N19E28	183	0240	10	DSO	017	B					1						
06 Oct	N19E14	184	0280	12	EAO	020	B											
07 Oct	N19E02	183	0240	12	EKO	014	B	1				4						
08 Oct	N18W12	184	0150	11	EAI	035	B											
09 Oct	N19W24	183	0120	13	ESO	019	B					1						
10 Oct	N19W38	184	0110	10	CSO	009	B											
11 Oct	N20W53	185	0080	02	HAX	002	A											
12 Oct	N18W69	188	0070	02	HAX	002	A											
13 Oct	N19W83	189	0060	02	HAX	001	A					1						
								1	0	0	0	11	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 183

#### Region 8352

06 Oct	S12E30	168	0000	00	AXX	001	A											
07 Oct	S12E17	168																
08 Oct	S12E04	168																
09 Oct	S12W09	168																
10 Oct	S12W22	168																
11 Oct	S12W35	168																
12 Oct	S12W48	168																
13 Oct	S12W61	168																
14 Oct	S12W74	168																
								0	0	0	0	0	0	0	0	0	0	

Died on Disk.

Absolute heliographic longitude: 168



**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 8353</i>																		
06 Oct	N20E68	130	0030	05	BXO	003	B											
07 Oct	N21E54	131	0020	07	BXO	003	B											
08 Oct	N20E42	130	0010	07	BXO	003	B											
09 Oct	N19E25	134	0010	01	AXX	002	A											
10 Oct	N19E12	134																
11 Oct	N19W01	134																
12 Oct	N19W14	134																
13 Oct	N19W27	134																
14 Oct	N19W40	134																
15 Oct	N19W53	134																
16 Oct	N19W66	134																
17 Oct	N19W79	134																

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 134

*Region 8354*

07 Oct	S18E00	185	0050	05	DAO	008	B											
08 Oct	S18W14	186	0020	06	CRO	008	B											
09 Oct	S18W31	190	0000	01	AXX	001	A											
10 Oct	S18W46	192	0000	00	AXX	001	A											
11 Oct	S18W59	192																
12 Oct	S22W64	183	0010	00	AXX	001	A											
13 Oct	S22W77	183																
14 Oct	S22W90	183																

0 0 0 1 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 185







**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 8358*

13 Oct	N15E02	104	0040	05	CAO	008	B	1			1						
14 Oct	N15W12	105	0110	08	DSO	013	B				1						
15 Oct	N15W26	106	0080	09	DSO	014	B										
16 Oct	N15W41	107	0120	10	CSO	015	B	1			4						
17 Oct	N16W55	108	0170	08	CAO	010	BG	4			6	1					
18 Oct	N15W69	109	0290	09	DAO	010	BG	1	1			2					
								7	1	0	12	3	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 104

*Region 8359*

13 Oct	N23W47	153	0020	03	BXO	005	B				1						
14 Oct	N23W59	152	0030	04	BXO	002	B										
15 Oct	N24W72	152	0010	06	BXO	002	B	1			1						
16 Oct	N25W84	150	0010	00	AXX	001	A										
								1	0	0	2	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 153

*Region 8360*

14 Oct	S19W12	105	0100	05	DSO	010	B	1			9						
15 Oct	S19W25	105	0270	08	DSI	014	B	1			1						
16 Oct	S18W39	105	0340	09	DSO	018	B	1			3						
17 Oct	S19W52	105	0390	10	DKO	008	B										
18 Oct	S19W64	104	0290	10	DHO	005	B										
								3	0	0	13	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 105

*Region 8361*

15 Oct	N14W10	090	0010	04	CRO	003	B										
16 Oct	N14W25	091	0030	05	CSO	006	B										
17 Oct	N14W38	091	0030	07	CSO	009	B										
18 Oct	N15W51	091	0070	08	CSO	009	B				1						
								0	0	0	1	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 090



**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 8362</i>																						
15 Oct	N20E73	007	0040	02	HSX	001	A															
16 Oct	N18E58	008	0030	01	HSX	001	A															
17 Oct	N20E46	007	0030	01	HRX	002	A															
18 Oct	N19E33	007	0010	01	AXX	001	A															
																					0 0 0 0 0 0 0 0	
Still on Disk.																						
Absolute heliographic longitude: 007																						
<i>Region 8363</i>																						
15 Oct	N26E47	033	0020	04	BXO	005	B															
16 Oct	N24E31	035	0040	05	DSO	007	B															
17 Oct	N25E17	036	0100	07	DAO	014	B															
18 Oct	N25E05	035	0110	08	DAO	011	B															
																						0 0 0 0 0 0 0 0
Still on Disk.																						
Absolute heliographic longitude: 35																						
<i>Region 8364</i>																						
17 Oct	N18E24	029	0010	04	BXO	004	B															
18 Oct	N19E13	027	0030	06	CRO	005	B															
																						0 0 0 0 0 0 0 0
Still on Disk.																						
Absolute heliographic longitude: 27																						
<i>Region 8365</i>																						
18 Oct	S28E10	030	0020	04	BXO	003	B															
																						0 0 0 0 0 0 0 0
Still on Disk.																						
Absolute heliographic longitude: 30																						
<i>Region 8366</i>																						
18 Oct	S16E35	005	0000	00	AXX	001	A															
																						0 0 0 0 0 0 0 0
Still on Disk.																						
Absolute heliographic longitude: 5																						



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

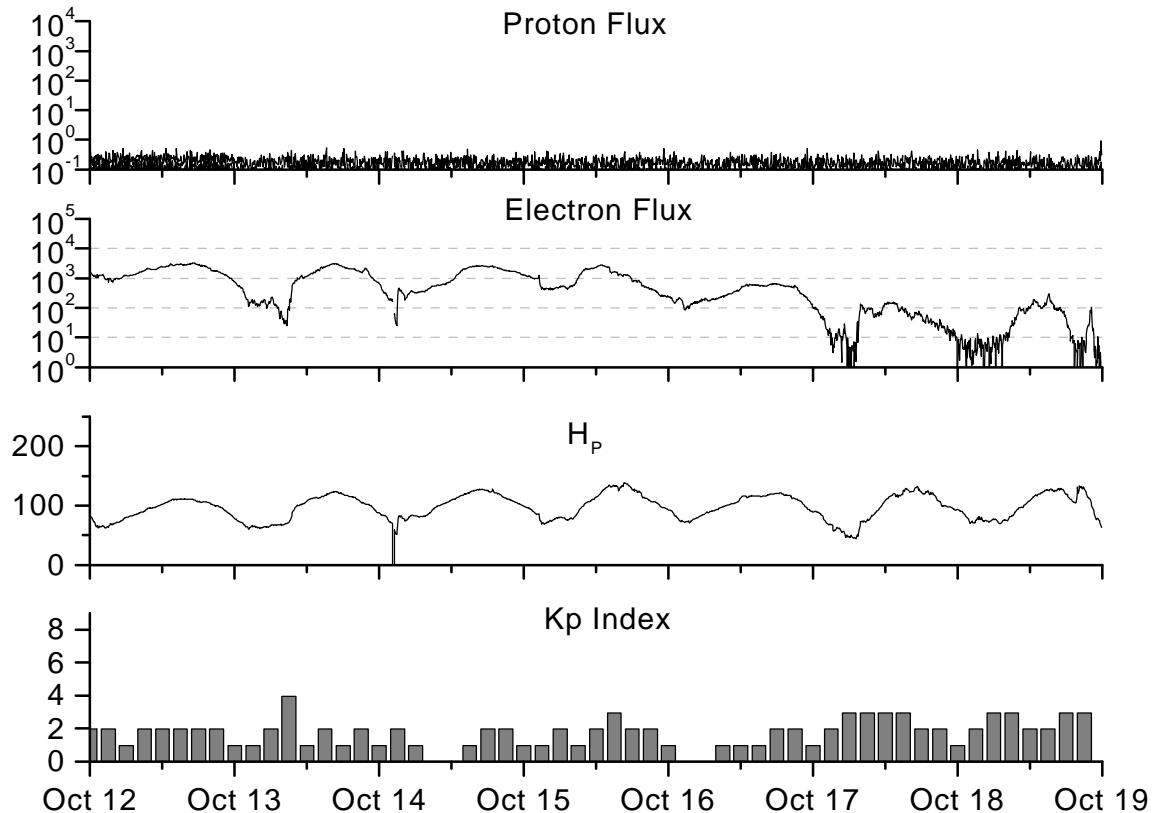
Month	Sunspot Numbers				Radio Flux		Geomagnetic		
	Observed values		Ratio	Smooth values		**Penticton	Smooth	Planetary	Smooth
	SWO	RI	RI/SWO	SWO	RI	10.7 cm	Value	Ap	Value
<b>1996</b>									
October	02.3	00.9	0.39	14.0	08.8	69.2	72.6	13	09.1
November	26.7	17.9	0.67	15.4	09.8	78.7	73.0	08	09.1
December	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	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			108.3		10	
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*	

\*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 12 October 1998*

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

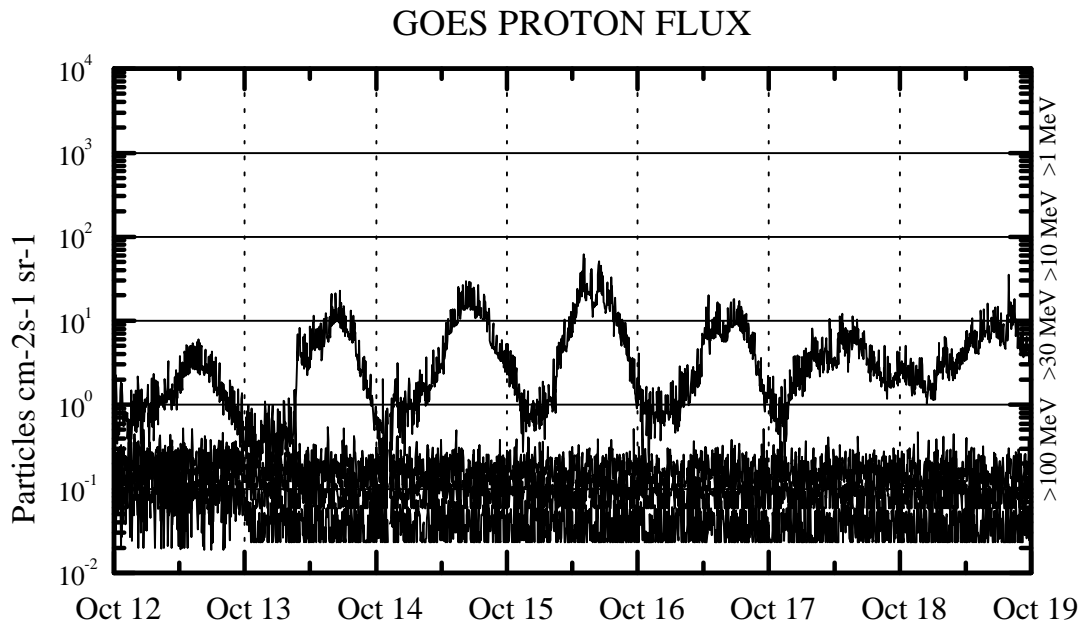
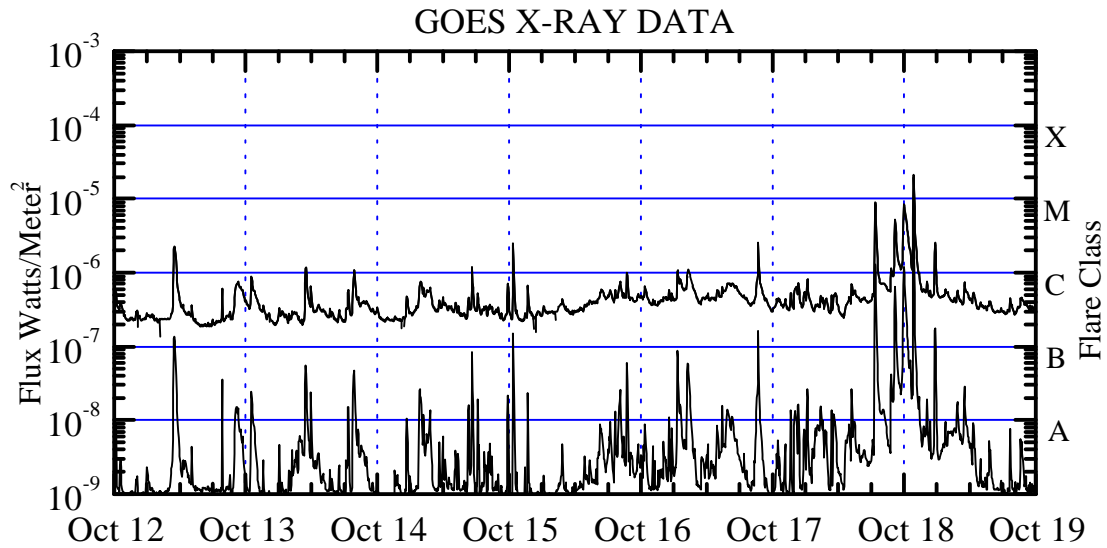
*Electrons* plot contains the five-minute averaged integral electron flux (electrons/  $\text{cm}^2\text{-sec-sr}$ ) with energies greater than 2 MeV at GOES-8.

*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>parallel</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*

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.

