

Space Weather Highlights
15 - 21 September 2003

SWO PRF 1464
23 September 2003

Solar activity ranged from low to moderate levels. The period began on 15 September with low level activity. Region 456 (S07, L=221, class/area Dai/240 on 13 September) produced an M1 flare at 2244 UTC on 16 September from just beyond the west limb. Activity for the remainder of the period (17 – 21 September) was at low levels. Region 461 (N13, L=159, class/area Dao/250 on 18 September) developed on 16 September and grew quickly in the over the next three days. This region produced some minor C-class flares before it rotated beyond the west limb on 20 September. Region 464 (N03, L=353, class/area Eko/460 on 21 September) rotated onto the visible disk on 20 September and activity from this region consisted of minor C-class flares.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft for most of the summary period. Early on 16 September a slow transient was observed passing the ACE spacecraft. Total IMF measurements (Bt) reached 12 nT and Bz values were –5 to –10 nT. By late on 16 September, a large coronal hole high speed stream rotated into a geoeffective position with solar wind speeds increasing from 450 to over 800 km/s by 17 September. The Bz component of the IMF reached –10 to –15nT at the onset of the coronal hole and from 18 – 21 September Bz was oscillating between +/- 7nT. Solar wind speed was near 800 km/s on 18 September before beginning a slow decline. By the close of the period solar wind speed was down to 550 km/s.

There were no greater than 10 MeV proton events at geosynchronous orbit during the

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels on 15 September and again on 17 – 21 September.

Geomagnetic activity ranged from quiet to severe storm levels. The period began with quiet to unsettled conditions on 15 September. The slow transient observed on 16 September produced active to major storm levels. The coronal hole high speed stream produced severe storm levels on 17 September and major storm levels on 18 September. Active to minor storm levels were observed from 19 – 21 September during the decline phase of the high speed stream.

Space Weather Outlook
24 September - 20 October 2003

Solar activity is expected to range from very low to low levels with a chance of isolated

No greater than 10 MeV proton events at geosynchronous orbit are expected during the period.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach high levels on 19 – 23 September, 02 – 05 October, 07 – 09 October, and 16 – 20 October.

The geomagnetic field is expected to range from quiet to major storm levels during the period. Residual effects from the coronal hole high speed stream are possible early in the period with possible isolated minor storm levels. Another coronal hole is due to return on 01 – 03 October and is expected to produce mostly active conditions with possible isolated minor storm levels. A returning coronal hole on 05 – 08 October is expected to produce active to isolated minor storm levels. The large coronal hole that just departed the disk is due to return on 14 – 20 October and is expected to produce major storm M-class events. Region 464 has the potential for isolated M-class activity early in the period before it rotates beyond the west limb on 02 October. From 02 October until Region 464 returns on 15 October, activity is expected to be at low levels.



Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10 ⁻⁶ hemi.)	X-ray Background	Flares								
					X-ray Flux			Optical					
					C	M	X	S	1	2	3	4	
15 September	97	68	200	B3.1	6	0	0	0	1	0	0	0	0
16 September	99	89	160	B4.0	4	1	0	0	0	0	0	0	0
17 September	106	83	350	B3.0	2	0	0	1	0	0	0	0	0
18 September	109	92	470	B2.7	2	0	0	0	0	0	0	0	0
19 September	111	71	420	B4.1	1	0	0	0	0	0	0	0	0
20 September	112	72	590	B5.4	7	0	0	0	0	0	0	0	0
21 September	120	64	620	B4.2	4	0	0	0	0	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 September	1.0E+6	1.2E+4	2.6E+3		2.6E+8
16 September	2.0E+6	1.1E+4	2.6E+3		1.6E+6	
17 September	6.2E+6	1.3E+4	2.5E+3		5.5E+7	
18 September	1.2E+7	1.2E+4	2.5E+3		3.5E+8	
19 September	6.8E+6	1.3E+4	2.5E+3		6.5E+8	
20 September	7.1E+6	1.2E+4	2.8E+3		1.3E+9	
21 September	1.5E+6	1.1E+4	2.7E+3		8.7E+8	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	15 September	3	0-1-0-0-1-1-2-2	2	1-0-0-0-0-1-1-2	6
16 September	15	4-2-2-3-4-3-3-2	69	4-4-6-7-7-6-5-2	37	4-3-5-5-6-5-4-2
17 September	35	5-4-4-4-5-4-4-5	80	4-4-6-7-8-5-5-4	61	5-5-5-7-7-4-4-5
18 September	29	5-6-2-4-3-3-3-4	75	4-5-7-8-5-5-4-4	40	4-6-5-6-4-4-4-5
19 September	26	4-4-5-4-4-4-3-3	68	7-3-7-6-6-5-4-3	32	4-4-5-5-5-4-4-3
20 September	34	5-6-5-4-4-4-3-2	*	3-4-*-6-5-2-2	25	4-4-5-4-4-4-3-2
21 September	19	4-3-4-3-4-4-2-2	57	3-2-6-5-7-7-3-2	21	4-3-4-4-5-4-3-3

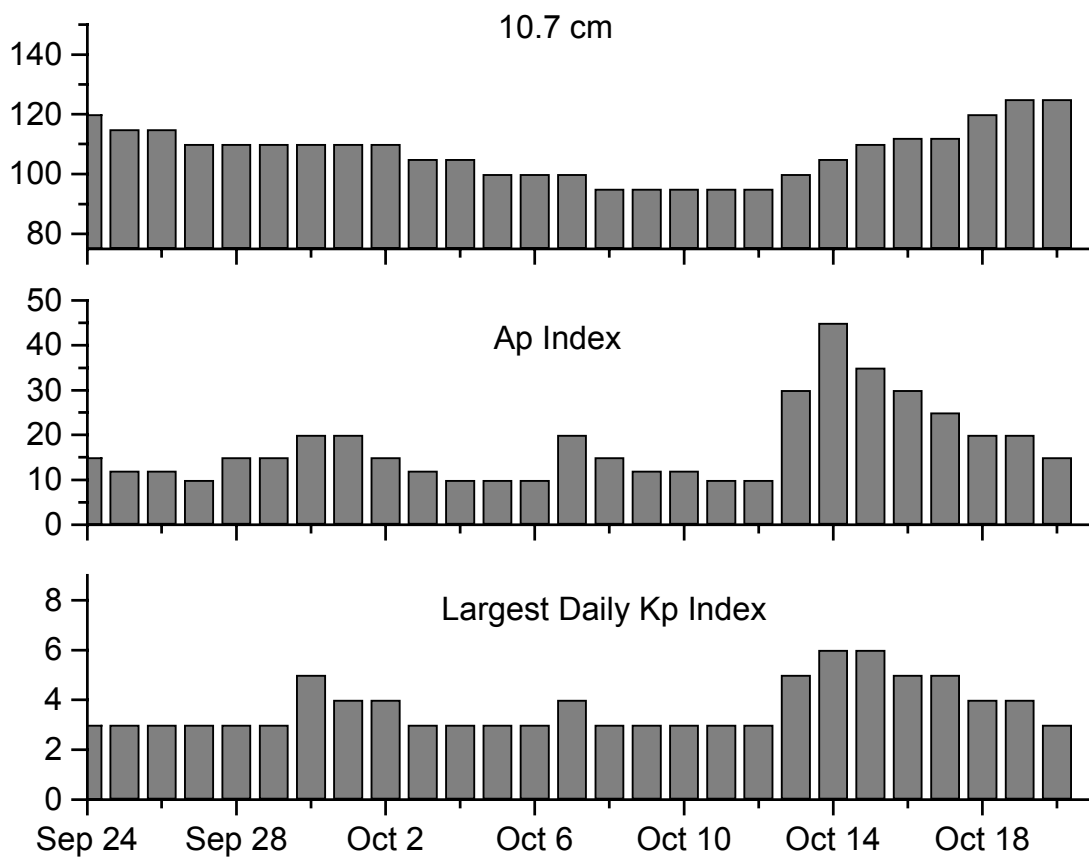


Alerts and Warnings Issued

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UT
15 Sep 517	ALERT: Electron 2MeV Integral Flux > 1000pfu	15 Sep 0500
16 Sep 144	ALERT: Geomagnetic K= 4	16 Sep 0144
16 Sep 223	WARNING: Geomagnetic K= 5	16 Sep 0225 - 1500
16 Sep 226	ALERT: Geomagnetic K= 5	16 Sep 0227
16 Sep 1442	EXTENDED WARNING: Geomagnetic K= 5	16 Sep 0225 -17 Sep 1500
16 Sep 1706	WATCH: Geomagnetic A \geq 20	18 Sep
16 Sep 1707	WATCH: Geomagnetic A \geq 20	19 Sep
17 Sep 1449	EXTENDED WARNING: Geomagnetic K= 5	16 Sep 0225 -18 Sep 1500
17 Sep 1508	ALERT: Electron 2MeV Integral Flux > 1000pfu	17 Sep 1440
18 Sep 526	ALERT: Electron 2MeV Integral Flux > 1000pfu	18 Sep 0505
18 Sep 1444	EXTENDED WARNING: Geomagnetic K= 5	16 Sep 0225 -19 Sep 1500
19 Sep 909	ALERT: Electron 2MeV Integral Flux > 1000pfu	19 Sep 0855
19 Sep 1436	EXTENDED WARNING: Geomagnetic K= 5	16 Sep 0225 -19 Sep 2359
19 Sep 2006	WATCH: Geomagnetic A \geq 20	20 Sep
19 Sep 2008	WATCH: Geomagnetic A \geq 20	21 Sep
20 Sep 033	WARNING: Geomagnetic K= 4	20 Sep 0035 - 1500
20 Sep 300	ALERT: Geomagnetic K-index of 5	20 Sep 0257
20 Sep 306	WARNING: Geomagnetic K= 5	20 Sep 0310 - 1500
20 Sep 450	ALERT: Geomagnetic K= 6	20 Sep 0447
20 Sep 533	ALERT: Electron 2MeV Integral Flux > 1000pfu	20 Sep 0500
20 Sep 1457	EXTENDED WARNING: Geomagnetic K= 4	20 Sep 0035 - 2359
20 Sep 2357	EXTENDED WARNING: Geomagnetic K= 4	20 Sep 0035 -21 Sep 1500
21 Sep 504	ALERT: Electron 2MeV Integral Flux > 1000pfu	21 Sep 0500
21 Sep 1453	EXTENDED WARNING: Geomagnetic K= 4	20 Sep 0035 -21 Sep 2359



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	120	15		08 Oct	95	15	
25	115	12		09	95	12	
26	115	12		10	95	12	
27	110	10		11	95	10	
28	110	15		12	95	10	
29	110	15		13	100	30	
30	110	20		14	105	45	
01 Oct	110	20		15	110	35	
02	110	15		16	112	30	
03	105	12		17	112	25	
04	105	10		18	120	20	
05	100	10		19	125	20	
06	100	10		20	125	15	
07	100	20					



Energetic Events

Date	Time		½ Max	X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max		Class	Flux	Imp/ Brtns	Location		Rgn #	Radio Flux		Intensity
			Lat				CMD	245		2695	II	IV
16 Sep	2130	2224	2331	M1.3	.069							

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical Location Lat CMD	Rgn	
	Begin	Max	End					
15 September	0058	0103	0117	C1.9	1f	S07W77	456	
	0456	0501	0514	C1.0				
	0628	0631	0634	B7.4				
	0650	0653	0656	B4.9				
	0704	0715	0728	B5.5				
	0736	0743	0753	B9.1				
	1047	1052	1058	B5.8				
	1143	1151	1157	B6.2				
	1209	1220	1236	B6.0				
	1427	1450	1458	C2.9				
	1636	1640	1644	C1.5				
	1704	1709	1712	B8.4				
	2200	2214	2220	C1.0				
	2232	2241	2245	B9.9				
16 September	0043	0048	0053	B8.3				
	0112	0116	0152	B9.0				
	0211	0218	0221	C2.5				
	0447	0453	0504	B9.1				
	0518	0525	0531	C1.4				
	0657	0701	0713	B8.1				
	0756	0800	0812	B5.9				
	0852	0858	0912	C1.8				
	1251	1258	1308	B7.3				
	1606	1620	1627	B8.3				
	1850	1901	1918	C1.1				
	2130	2224	2331	M1.3				
	17 September	0120	0142	0200	C1.9			
		0345	0406	0539	C2.4			
0503		0515	0532		Sf	S12E09	459	
18 September	0033	0036	0038	B2.9				
	0651	0801	0938	C1.0				
	1447	1450	1452	B4.4				
	2145	2151	2157	C2.9				



Flare List

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
19 September	1023	1031	1037	B8.0			
	1812	1820	1828	C1.6			
	2025	2030	2041	B5.6			
20 September	0438	0448	0452	C1.1			
	0503	0512	0515	C3.0			
	0630	0645	0705	C1.7			
	1034	1145	1216	C1.3			
	1524	1536	1557	C3.6			
	1952	1955	1959	B9.3			
	2129	2136	2143	C2.0			
	2257	2310	2319	C2.3			464
21 September	0003	0008	0013	C1.4			464
	0025	0028	0031	C1.1			464
	0226	0230	0232	C1.8			464
	0404	0407	0412	C1.0			
	2054	2058	2102	B8.5			

Region Summary

Date	Location		Sunspot Characteristics				Flares								
	Helio		Area (10 ⁻⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical				
	(° Lat ° CMD)	Lon						C	M	X	S	1	2	3	4

Region 455

06 Sep	S16E32	222	0010	01	Hsx	001	A										
07 Sep	S20E24	217	0020	02	Cso	002	B										
08 Sep	S20E11	217	0020	04	Dro	006	B										
09 Sep	S20W02	217															
10 Sep	S20W15	217															
11 Sep	S20W28	217															
12 Sep	S20W41	217															
13 Sep	S20W54	217															
14 Sep	S20W67	217															
15 Sep	S20W80	217															
16 Sep	S20W93	217															

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 217



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	4			
<i>Region 456</i>																		
08 Sep	S09E08	220	0030	07	Dso	010	B											
09 Sep	S09W05	220	0050	07	Dao	015	B											
10 Sep	S09W19	220	0150	07	Dai	017	Bg					1						
11 Sep	S08W32	220	0180	08	Dai	029	B											
12 Sep	S07W45	220	0190	10	Dai	032	B					1						
13 Sep	S07W59	221	0240	10	Dai	020	Bgd	1				2						
14 Sep	S08W73	222	0170	12	Eai	019	B	2				2						
15 Sep	S08W88	223	0110	09	Cso	010	B	1							1			
								4	0	0	0	6	1	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 220

<i>Region 457</i>																		
09 Sep	S11E08	207	0010	04	Bxo	008	B											
10 Sep	S11W06	207	0010	03	Bxo	005	B											
11 Sep	S11W17	205	0030	06	Cso	006	B											
12 Sep	S11W27	202	0040	06	Cro	006	B											
13 Sep	S12W38	200	0010	01	Hsx	001	A											
14 Sep	S12W51	200	0000	00		000												
15 Sep	S12W69	204	0020	01	Hrx	001	A											
16 Sep	S12W83	205	0000	00	Axx	001	A											
								0	0	0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 207

<i>Region 458</i>																		
13 Sep	S08W32	194	0020	04	Cso	006	B											
14 Sep	S09W46	195	0030	04	Cro	006	B											
15 Sep	S08W60	195	0010	01	Axx	002	A											
16 Sep	S10W73	195	0020	02	Hsx	001	A											
17 Sep	S10W86	195																
								0	0	0	0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 194



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 463

17 Sep	N09E74	035	0090	02	Hax	001	A										
18 Sep	N09E59	036	0080	02	Hsx	001	A										
19 Sep	N09E46	036	0070	02	Hsx	001	A										
20 Sep	N08E33	035	0070	02	Hsx	001	A										
21 Sep	N09E18	037	0070	02	Hsx	001	A										
									0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 037

Region 464

20 Sep	N05E77	351	0360	12	Eko	006	B	1									
21 Sep	N03E62	353	0460	12	Eko	010	B	3									
								4	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 353

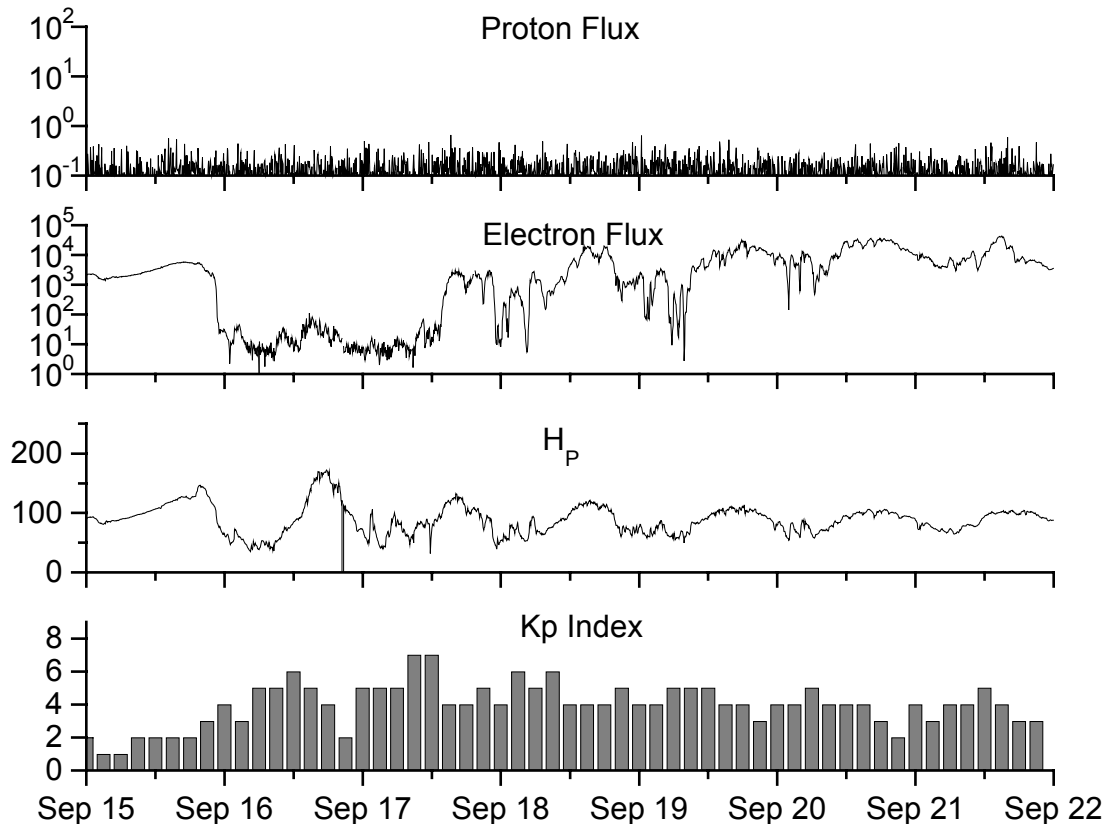


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	Observed values SWO	Ratio RI	Ratio RI/SWO	Smooth values SWO	Smooth values RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
2001									
September	229.1	150.7	0.66	178.8	114.1	233.8	191.3	13	12.8
October	197.3	125.5	0.64	179.5	114.0	208.1	191.9	20	12.0
November	178.6	106.5	0.60	183.7	115.5	212.7	193.7	16	12.0
December	217.5	132.2	0.61	184.5	114.6	235.6	193.9	09	12.2
2002									
January	189.0	114.1	0.60	184.8	113.5	227.3	194.6	08	12.3
February	194.5	107.4	0.55	188.6	114.7	205.0	197.2	10	12.8
March	153.1	98.4	0.64	188.9	113.3	180.3	195.7	10	12.9
April	194.9	120.7	0.62	186.2	110.5	189.8	191.5	15	13.2
May	204.1	120.8	0.59	183.6	108.9	178.4	188.0	15	13.3
June	146.0	88.3	0.60	179.9	106.3	148.7	183.0	11	13.5
July	183.5	99.6	0.54	175.4	102.7	173.5	176.3	11	13.7
August	191.0	116.4	0.61	169.2	98.7	183.9	169.5	16	14.2
September	206.4	109.6	0.53	163.4	94.6	175.8	164.1	14	15.0
October	153.9	97.5	0.63	158.8	90.5	167.0	159.4	23	15.6
November	159.8	95.5	0.60	150.9	85.2	168.7	154.8	16	16.3
December	147.9	80.8	0.55	144.6	82.1	158.6	150.9	13	17.0
2003									
January	149.3	79.7	0.53	141.7	81.0	144.0	149.2	13	18.2
February	87.0	46.0	0.53	136.4	78.5	124.5	144.7	17	18.9
March	119.7	61.1	0.51			132.2		21	
April	119.7	60.0	0.50			126.3		20	
May	89.6	55.2	0.62			129.3		26	
June	118.4	77.4	0.65			129.4		24	
July	132.8	85.0	0.64			127.8		20	
August	114.3	72.7	0.64			122.1		23	

NOTE: All smoothed values after September 2002 and monthly values after March 2003 are preliminary estimates. The lowest smoothed sunspot index number for Cycle 22, RI = 8.0, occurred in May 1996. The highest smoothed sunspot number for Cycle 23, RI = 120.8, occurred April 2000. *After June 1991, 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 2003

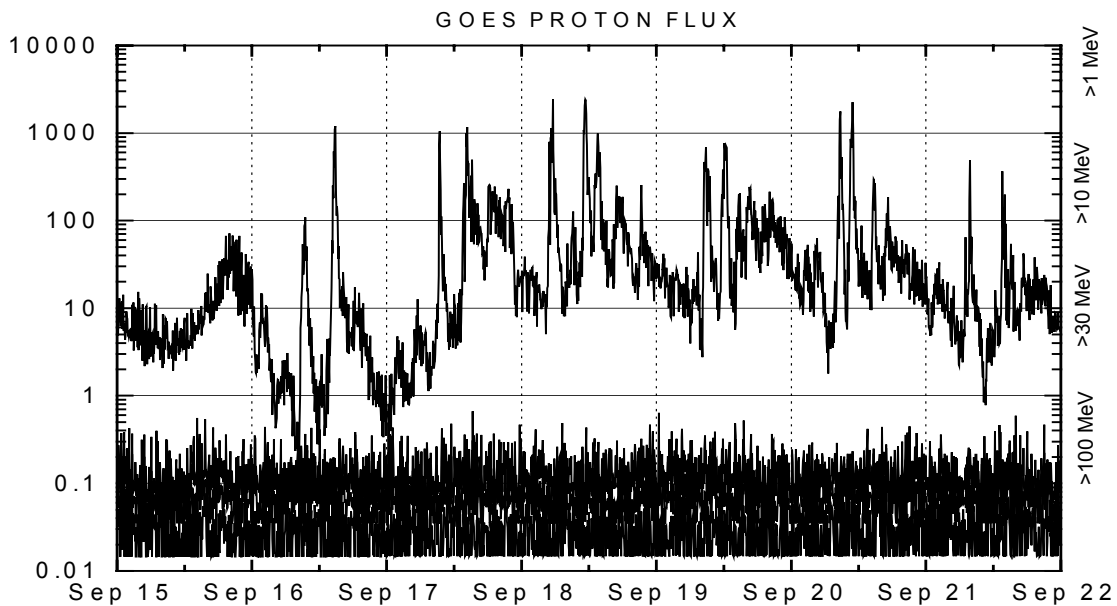
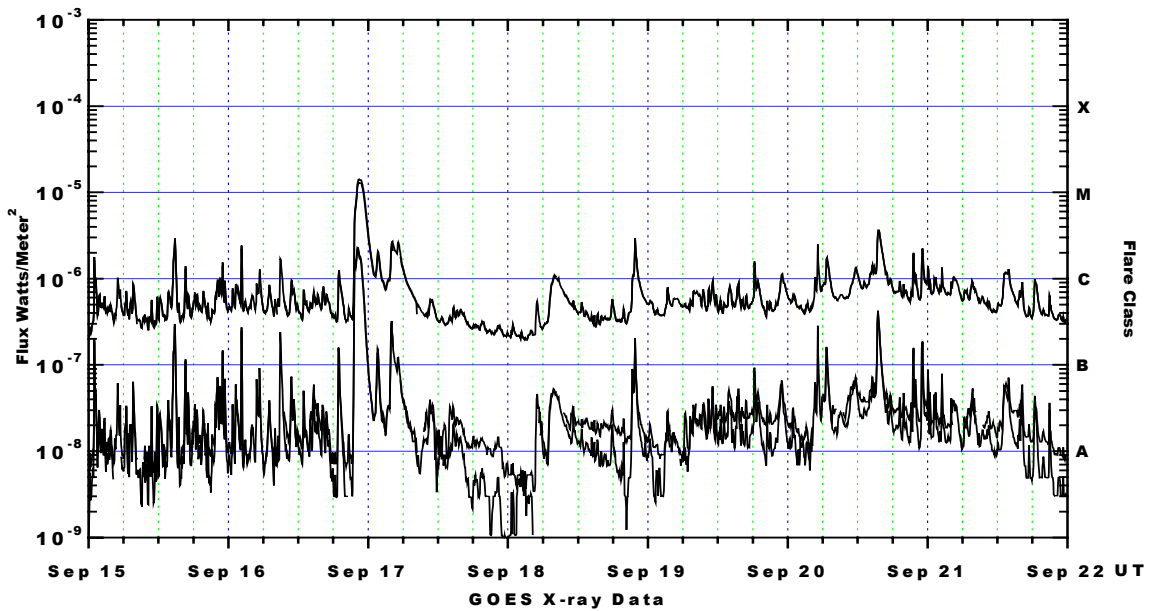
Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by GOES-11 (W113) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-12.

H_p plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-12. 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 Air Force Weather Agency) 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 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/m²) as measured by GOES 12 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/cm²-sec-sr) as measured by GOES-11 (W113) 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.

