

**Space Weather Highlights**  
**09 - 15 April 2001**

**SWO PRF 1337**  
**17 April 2001**

Solar activity reached high levels for the fourth consecutive week. Region 9415 (S22, L = 001, class/area Eko/880 on 07 April) produced major flares on April 9, 10, 12, and 15 (please refer to the Energetic Event Summary for flare specifics). Region 9415 was large and magnetically complex, by virtue of a strong magnetic delta configuration within the leader portion of the region. Region 9415 began to gradually decay on 09 April, but the strong delta persisted through 13 April. The delta appeared to dissipate on 14 April as the Region 9415, then classed (magnetically) as a beta-gamma, continued to slowly decay. As its decay phase continued, Region 9415 produced the largest flare of the period; an X14/2b which peaked at 15/1350 UTC, making it the second largest flare observed during Cycle 23. This flare was associated with a 48000 SFU Tenflare, Type II and IV radio sweeps, solar proton events at greater than 100 MeV and 10 MeV, and a ground level event (GLE). Region was crossing the west limb as the period ended.

Data were available from the Advanced Composition Explorer (ACE) spacecraft for most of the period. However, SWEPAM data were unreliable during 15/1436 - 16/0300 UTC, due to effects from the X14 Flare. Coronal mass ejection (CME) passages occurred on 11 and 13 April. Two CME shock fronts reached ACE on 11 April. The first shock reached ACE at about 11/1310 UTC, followed by a second stronger shock at 11/1520 UTC. Solar wind velocities increased to about 780 km/sec following the shocks, then gradually declined. IMF Bz showed strong north/south variations following the second shock with a range of plus 29 to minus 27 nT (GSM) before turning northward at approximately 11/2300 UTC. The 13 April passage began as a shock reached ACE at 13/0707 UTC accompanied by increased velocities (peak around 850 km/sec during 13/0900 - 1100 UTC), minor increases in density and total IMF field intensity; along with variable, but generally northward, IMF Bz.

A greater than 10 MeV event began on 10 April following a X2/3b flare at 10/0526 UTC. The event began at 10/0850 UTC, reached a maximum of 355 PFU at 11/2055 UTC, and ended at 13/1055 UTC. A polar cap absorption event was associated with this proton event. A >100 MeV proton event began at 12/1305 UTC following a X2 flare at 12/1028 UTC. This event reached a maximum of 1.4 PFU at 12/1725 UTC, then ended at 12/1950 UTC. Proton events at greater than 100 MeV and greater than 10 MeV, and a ground level event followed the X14 flare on 15 April (this GLE was only the third seen during Cycle 23). The greater than 100 MeV event began at 15/1405 UTC, reached a maximum of 146 PFU at 15/1525 UTC, and was in progress as the period ended. The >10 MeV event began at 15/1410 UTC, reached a maximum of 951 PFU at 15/1920 UTC, and was in progress as the period ended. A polar cap absorption event was associated with this proton event.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels during 14 - 15 April.

The geomagnetic field was intermittently disturbed during the period due to the CME passages mentioned above. A major geomagnetic storm began on 11 April with a sudden storm commencement (SSC) at 11/1343 UTC (07 nT, Boulder USGS magnetometer). The SSC was followed by minor to severe storm levels at all latitudes. The storm subsided on 12 April. Another disturbance began on 13 April with a sudden impulse (SI) at 13/0735 UTC (19 nT, Boulder USGS magnetometer). The SI was followed by active to major storm levels at all latitudes with severe storm levels detected at high latitudes. This disturbance subsided on 14 April.



## **Space Weather Outlook**

### **18 April - 14 May 2001**

Solar activity is expected to range from moderate to high levels during the period. Isolated major flares will be possible during the period due to the expected return on 18 April of active longitudes associated with old Region 9393 (N16, L = 151, class/area Fkc/2440 on 29 March). (Old) Region 9415 is expected to return to the visible disk on 29 April.

The solar proton event at greater than 100 MeV and greater than 10 MeV that began on 15 April were in progress as the period ended. These events are expected to end by 18 April. Proton events will be possible during the period with expected return of old Regions 9393 and 9415.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at normal to moderate levels during most of the period.

Geomagnetic field activity is expected to be at unsettled to minor geomagnetic storm levels during 18 - 19 April. Mostly unsettled levels are expected during the rest of the period, barring Earth-directed CME occurrences.



### Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10 <sup>6</sup> hemi.)	X-ray Background	Flares							
					X-ray Flux			Optical				
					C	M	X	S	1	2	3	4
09 April	165	185	1420	C1.0	4	1	0	7	0	1	0	0
10 April	170	170	930	B4.7	5	0	1	4	0	0	1	0
11 April	160	178	1050	B7.9	8	2	0	6	1	1	0	0
12 April	149	159	1030	B8.1	2	1	1	2	1	0	0	0
13 April	137	138	870	B3.3	0	0	0	0	0	0	0	0
14 April	139	149	850	B5.1	5	1	0	7	0	0	0	0
15 April	134	100	730	B5.5	7	0	1	3	0	1	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	>4Me
09 April	9.0E+6	1.5E+5	1.1E+4		7.4E+6	
10 April	2.8E+7	3.7E+6	2.4E+4		9.5E+7	
11 April	3.6E+8	1.2E+7	1.2E+4		1.3E+8	
12 April	1.0E+8	4.3E+6	4.2E+4		5.6E+6	
13 April	4.8E+7	1.1E+6	1.0E+4		3.1E+6	
14 April	4.1E+6	1.7E+5	1.9E+3		6.5E+7	
15 April	3.9E+7	2.1E+7	2.2E+6		2.4E+8	

### Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	09 April	17	2-4-4-3-3-4-3-2	*	*-*-*-5-3-2	19
10 April	7	3-0-1-2-3-1-1-2	*	2-2-*-3-4-3-2-4	9	3-1-2-2-3-3-2-2
11 April	50	2-2-2-1-3-7-6-7	100	2-3-4-5-6-8-7-8	60	3-3-3-2-4-8-6-7
12 April	29	6-6-4-3-3-2-1-2	34	6-4-5-6-4-2-1-1	38	7-6-5-5-3-3-1-2
13 April	31	1-1-3-6-5-4-5-4	*	*-*-*-6-5-3	36	1-1-3-7-6-4-5-4
14 April	13	4-3-3-2-3-2-2-2	29	3-4-4-5-5-5-3-1	15	3-3-4-3-3-3-3-2
15 April	9	3-3-2-1-3-2-1-2	21	2-3-5-4-5-3-1-2	13	3-4-3-2-4-3-2-3



### *Alerts and Warnings Issued*

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UT
09 Apr 0035	3 – 245 MHz Radio Bursts	08 Apr
09 Apr 0427	10cm Radio Burst 350 F.U.	09 Apr 0142
09 Apr 0453	Type IV Radio Emission	09 Apr 0122 UT
09 Apr 1144	EXTENDED A $\geq$ 30 Warning	08/2050 – 09/1200 Apr
09 Apr 1419	EXTENDED K= 4 Warning	07/1710 - 09/1500 Apr
09 Apr 1518	ENDED A $\geq$ 30 Observed	08 Apr 2102
09 Apr 1618	X-Ray event M7.9/2B	09 Apr 1534
09 Apr 1640	Proton Event $>10\text{MeV}$ $\geq 10\text{pfu}$ Warning	09/1800 - 10/0000 Apr
09 Apr 1646	Type II Radio Emission	09 Apr 1527
09 Apr 1648	10cm Radio Burst 1600 F.U.	09 Apr 1523
09 Apr 1855	Type IV Radio Emission	09 Apr 1558
09 Apr 2152	A $\geq$ 30 Watch	11 Apr
09 Apr 2156	A $\geq$ 20 Watch	12 Apr
10 Apr 0001	ENDED A $\geq$ 20 Observed	08 Apr 0900
10 Apr 0050	4 – 245 MHz Radio Bursts	09 Apr
10 Apr 0050	245 Radio Noise Storm	09 Apr
10 Apr 0533	Type II Radio Emission	10 Apr 0513
10 Apr 0536	Type IV Radio Emission	10 Apr 0515
10 Apr 0553	X-Ray event X2.3/3B	10 Apr 0526
10 Apr 0816	10cm Radio Burst 4800 F.U.	10 Apr 0523
10 Apr 0846	Proton Event $>10\text{MeV}$ $\geq 10\text{pfu}$ Warning	10/0844 – 11/0000 Apr
10 Apr 0907	Protons Event $>10\text{ MeV}$ $\geq 10\text{pfu}$	10 Apr 0850
10 Apr 1433	Electron Event $>2\text{MeV}$ $\geq 1000\text{pfu}$	10 Apr 1415
10 Apr 1448	K= 4 Warning	10/1450 - 13/0000 Apr
10 Apr 1800	K= 4 Observed	10 Apr 1500 - 1800
10 Apr 2136	A $\geq 50$ Watch	11 Apr
10 Apr 2137	A $\geq 50$ Watch	12 Apr
10 Apr 2138	A $\geq 20$ Watch	13 Apr
10 Apr 2347	CONTINUED Proton Event $>10\text{MeV}$ $\geq 10\text{pfu}$ Warning	10/0844 - 11/0000 Apr
11 Apr 0100	CONTINUED Protons Event $>10\text{ MeV}$ $\geq 10\text{pfu}$	10 Apr 0850
11 Apr 0100	CONTINUED Electron Event $>2\text{MeV}$ $\geq 1000\text{pfu}$	10 Apr 1415
11 Apr 1158	CONTINUED Proton Event $>10\text{MeV}$ $\geq 10\text{pfu}$ Warning	10/0844 -11/0000 Apr
11 Apr 1326	K= 5 Warning	11/1330 - 12/1500 Apr
11 Apr 1430	Sudden Impulse observed at Boulder	11 Apr
11 Apr 1439	Type II Radio Emission	11 Apr 1317
11 Apr 1450	10cm Radio Burst 540 F.U.	11 Apr 1300
11 Apr 1606	K $\geq 6$ Warning	11/1606 - 12/1500 Apr
11 Apr 1632	A $\geq 30$ Warning	11/1645 - 12/2359 Apr
11 Apr 1759	K $\geq 7$ Observed	11 Apr 1500 - 1800
11 Apr 1803	A $\geq 30$ Observed	11 Apr 1800
11 Apr 2142	Type IV Radio Emission	11 Apr 1306
11 Apr 2203	A $\geq 50$ Warning	11/2210 - 12/1200 Apr
12 Apr 0000	A $\geq 50$ Observed	12 Apr 0000
12 Apr 0100	CONTINUED Electron Event $>2\text{MeV}$ $\geq 1000\text{pfu}$	10 Apr 1415



*Alerts and Warnings Issued – continued.*

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UT
12 Apr 0100	CONTINUED Protons Event >10 MeV >=10pfu	10 Apr 0850
12 Apr 0104	1 – 245 MHz Radio Burst	11 Apr
12 Apr 0104	245 MHz Radio Noise Storm	11 Apr
12 Apr 0309	K >= 7 Observed	12 Apr 0000 - 0300
12 Apr 1052	X-Ray event X2.0	12 Apr 1028
12 Apr 1103	Type II Radio Emission	12 Apr 1018
12 Apr 1114	10cm Radio Burst 1200 F.U.	12 Apr 1014
12 Apr 1147	CONTINUED A >=50 Warning	11/2210 -12/2100 Apr
12 Apr 1149	Type IV Radio Emission	12 Apr 1032
12 Apr 1207	Proton event >100 MeV >1pfu Warning	12/1210 - 13/0000 Apr
12 Apr 1320	Proton event >100 MeV >1pfu	12 Apr 1305
12 Apr 1401	CONTINUED Proton Event >10MeV >=10pfu Warning	10/0844 - 11/0000 Apr
12 Apr 2107	ENDED A-Index >=50 Observed	12 Apr 0000
12 Apr 2204	A >=30 Watch	13 Apr
12 Apr 2210	A >=50 Watch	14 Apr
12 Apr 2219	A >=20 Watch	15 Apr
12 Apr 2251	ENDED Proton event >100 MeV >1pfu	12 Apr 1305
13 Apr 0100	CONTINUED Protons Event >10 MeV >=10pfu	10 Apr 0850
13 Apr 0111	1 – 245 MHz Radio Burst	12 Apr
13 Apr 0111	245 MHz Radio Noise Storm	12 Apr
13 Apr 0301	ENDED A >=30 Observed	11 Apr 1800
13 Apr 0753	Sudden Impulse observed at Boulder	13 Apr 0735
13 Apr 1004	K= 4 Warning	13 Apr 1010 -1800
13 Apr 1059	K= 5 Warning	13 Apr 1100 - 1800
13 Apr 1200	K=6 Observed	13 Apr 0900 - 1200
13 Apr 1513	A >=20 Observed	13 Apr 1500
13 Apr 1820	ENDED Protons Event >10 MeV >=10pfu	10 Apr 0850
13 Apr 2146	K= 4 Observed	13 Apr 1800 - 2100
14 Apr 0600	K= 4 Observed	14 Apr 0300 - 0600
14 Apr 0601	A >=30 Observed	14 Apr 0600
14 Apr 0740	K= 4 Warning	14 Apr 0745 - 1200
14 Apr 1158	ENDED A >=30 Observed	14 Apr 0600
14 Apr 1450	Electron Event >2MeV >=1000pfu	14 Apr 1415
14 Apr 1751	10cm Radio Burst 150 F.U.	14 Apr 1734
14 Apr 1804	ENDED A >=20 Observed	13 Apr 1500
14 Apr 2036	Type II Radio Emission	14 Apr 1750
14 Apr 2145	A >=30 Watch	15 Apr
15 Apr 0224	CONTINUED Electron Event >2MeV >=1000pfu	14 Apr 1415
15 Apr 0531	K= 4 Warning	15 Apr 0535 - 1500
15 Apr 0559	K= 4 Observed	15 Apr 0300 - 0600
15 Apr 1358	X-Ray event X14/2N/S20W85	15 Apr 1350
15 Apr 1407	Proton event >100 MeV >1pfu Warning	15/1406 - 16/1500 Apr
15 Apr 1408	Proton Event >10MeV >=10pfu Warning	15/1408 - 16/1500 Apr
15 Apr 1417	Type II Radio Emission	15 Apr 1348

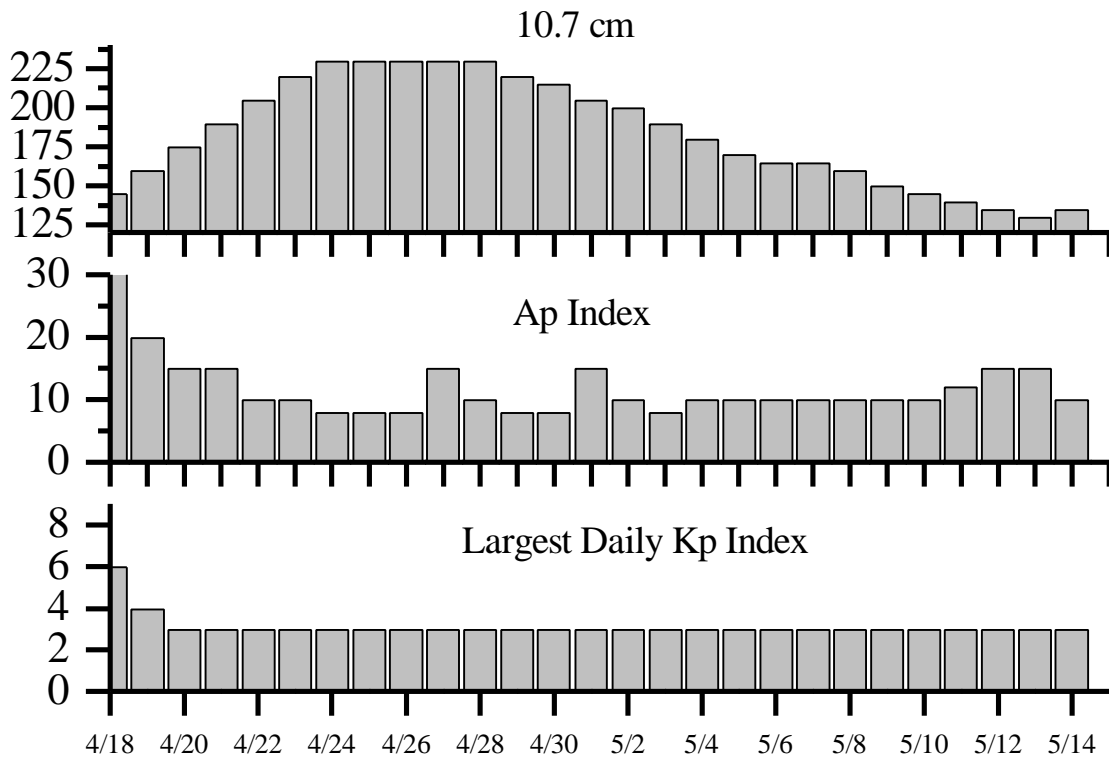


*Alerts and Warnings Issued – continued.*

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UT
15 Apr 1420	Type IV Radio Emission	15 Apr 1353
15 Apr 1421	Proton event >100 MeV >1pfu	15 Apr 1405
15 Apr 1425	Protons Event >10 MeV >=10pfu	15 Apr 1410
15 Apr 1433	A >=20 Watch	16 Apr
15 Apr 1455	EXTENDED K= 4 Warning	15 /0535 - 16/1500
15 Apr 1608	CANCELLED A >= 20 Watch	16 Apr
15 Apr 1616	A >= 20 Watch	18 Apr
15 Apr 1624	10cm Radio Burst 48000 F.U.	15 Apr 1333
15 Apr 2008	Type II Radio Emission	15 Apr 1348



## 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
18 Apr	145	35	6	02 May	200	10	3
19	160	20	4	03	190	8	3
20	175	15	3	04	180	10	3
21	190	15	3	05	170	10	3
22	205	10	3	06	165	10	3
23	220	10	3	07	165	10	3
24	230	8	3	08	160	10	3
25	230	8	3	09	150	10	3
26	230	8	3	10	145	10	3
27	230	15	3	11	140	12	3
28	230	10	3	12	135	15	3
29	220	8	3	13	130	15	3
30	215	8	3	14	135	10	3
01 May	205	15	3				



### *Energetic Events*

Date	Time			X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	½	Class	Integ Flux	Imp/ Brtns	Location		Rgn #	Radio Flux		Intensity	
			Max				Lat	CMD		245	2695	II	IV
09 Apr	1520	1534	1600	M7.9	.130	2B	S21W04		9415	6700	1600	3	1
10 Apr	0506	0526	0542	X2.3	.300	3B	S23W09		9415	10000	4000	3	2
11 Apr	0024	0031	0035	M1.0	.004					52			
11 Apr	1256	1326	1349	M2.3	.048	1F	S22W27		9415	3100	540	2	2
12 Apr	0256	0304	0329	M1.3	.017	1N	S22W38		9415				
12 Apr	0939	1028	1049	X2.0	.300	SF	S19W43		9415	8200	1200	2	1
14 Apr	1715	1811	1828	M1.0	.029	SF	S16W71		9415	210	31		
15 Apr	1319	1350	1355	X14.0	.610	2B	S20W85		9415	61000	48000	3	3

### *Flare List*

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn
	Begin	Max	End			Location	Lat	
09 April	0158	0202	0342	C6.4	SF	S22E06		9415
	0655	0655	0703	C3.0	SF	S20E00		9415
	0923	0926	0951	C6.1	SF	S21W02		9415
	1127	U1127	A1139		SF	S16W02		9415
	1359	1359	1404		SF	S18W04		9415
	1524	1534	1703	M7.9	2B	S21W04		9415
	1709	1713	1748		SF	S17W09		9415
	1827	1827	1839	C2.1	SF	S22W10		9415
10 April	0139	0140	0143	B8.1	SF	N07W74		9419
	0412	0416	0419	B7.3				
	0459	0520	0810	X2.3	3B	S23W09		9415
	1440	1448	1519	C6.5	SF	S07W35		9417
	1542	1542	1547		SF	S05W35		9417
	1827	1832	1909	C2.7	SF	S18W19		9415
	1854	1907	1952	C2.9				
	2101	2105	2109	C2.4				
11 April	2220	2301	2329	C3.3				
	0024	0031	0035	M1.0				
	0144	0148	0153	C1.4				
	0254	0257	0320	C1.5	SF	S05W42		9417
	0538	0543	0549	C1.4				
	0625	0628	0630	C1.1				
	B0758	U0758	A0813		SF	S11E30		9422
	B0816	U0816	0828		SF	S13E34		9422
	1146	1216	1226	C2.2				
	1309	1321	1423	M2.3	1F	S22W27		9415
	1555	1556	1603		SF	S20W29		9415
1725	1726	1728		SF	S21W27		9415	
1853	1854	1900	C1.6	SF	S16W03		9424	
1925	1929	1932	C1.2					
2359	0004	0054	C7.7	2F	S27W33		9415	





*Flare List – continued.*

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
12 April	0229	0230	0239	B7.2	SF	S18W37	9415
	0300	0302	0359	M1.3	1N	S22W38	9415
	B1112	U1113	A1206	X2.0	SF	S19W43	9415
	1454	1458	1504	C1.1			
	1628	1629	1631	C1.0			
	1656	1701	1705	B9.4			
13 April	0825	0830	0836	B5.8			
	1155	1158	1200	B5.8			
	1200	1203	1207	B7.3			
	1710	1714	1717	B7.5			
	1727	1731	1736	B5.8			
	2017	2024	2026	B9.5			
	2140	2143	2146	B7.4			
	2239	2242	2245	B7.3			
	2318	2323	2326	B9.1			
	14 April	0008	0008	0011	C1.6	SF	S19W61
0159		0159	0202	B7.1	SF	S22W64	9415
0459		0506	0514	C1.7			
0634		0638	0640	B6.9			
0716		0719	0726	C1.1	SF	S21W62	9415
0827		0836	0856	C2.4	SF	S18W67	9415
1725		1738	1841	M1.0	SF	S16W71	9415
1810		1812	1815		SF	N25W53	9418
1926		1930	1933	C1.2			
2323		2323	2328	B7.9	SF	S20W71	9415
15 April	0404	0408	0412	C2.2			
	0427	0432	0435	C1.0			
	0607	0612	0621	C3.6	SF	S22W81	9415
	0750	0801	0815	C6.7			
	0826	0831	0835	C7.7	SF	S24W82	9415
	0839	0844	0907		SF	S10W07	9426
	1056	1104	1111	C5.3			
	1336	1349	1535	X14.4	2B	S20W85	9415
	2159	2207	2222	C5.1			



### 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

#### Region 9406

28 Mar	N25E67	084	0150	04	HAX	001	A											
29 Mar	N26E52	085	0160	02	HSX	001	A											
30 Mar	N26E41	083	0170	03	HAX	001	A											
31 Mar	N25E28	083	0150	03	HAX	002	A											
01 Apr	N25E16	082	0160	03	HAX	003	A											
02 Apr	N27E04	081	0200	03	HAX	002	A											
03 Apr	N26W09	080	0160	03	HSX	002	A											
04 Apr	N27W22	080	0190	03	HAX	002	A											
05 Apr	N29W35	080	0140	04	CAO	003	B											
06 Apr	N28W50	082	0160	07	CSO	004	B											
07 Apr	N27W60	079	0150	03	HAX	001	A											
08 Apr	N27W73	079	0120	02	HAX	002	A											
09 Apr	N27W86	078	0080	04	HSX	001	A											

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 081

#### Region 9407

28 Mar	N11E64	087	0080	02	HSX	001	A											
29 Mar	N13E54	083	0110	06	CSO	002	B											
30 Mar	N11E41	083	0100	09	CSO	005	B											
31 Mar	N11E26	085	0100	07	CSO	003	B											
01 Apr	N11E13	085	0110	07	CSO	007	B											
02 Apr	N12W01	086	0080	02	HSX	002	A											
03 Apr	N13W15	086	0100	04	CSO	004	B											
04 Apr	N11W28	086	0060	02	HSX	001	A											
05 Apr	N11W41	086	0090	06	CSO	002	B											
06 Apr	N11W54	086	0050	07	CSO	003	B											
07 Apr	N11W68	087	0100	02	HSX	001	A											
08 Apr	N11W81	087	0070	02	HSX	001	A											
09 Apr	N11W94	086	0060	02	HSX	001	A											

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 086



***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 9410*

30 Mar	S36E38	086	0010	01	AXX	002	A											
31 Mar	S36E26	085	0000	00	AXX	001	A											
01 Apr	S36E18	080	0000	00	AXX	001	A											
02 Apr	S36E05	080																
03 Apr	S36W08	080																
04 Apr	S36W21	080																
05 Apr	S36W34	080																
06 Apr	S36W47	080																
07 Apr	S36W60	080																
08 Apr	S36W73	080																
09 Apr	S36W86	080																

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 080

*Region 9411*

30 Mar	N07E49	075	0020	02	AXX	002	A											
31 Mar	N08E35	076	0000	00	AXX	001	A											
01 Apr	N08E21	077	0000	02	BXO	002	B											
02 Apr	N08E08	077																
03 Apr	N08W05	077																
04 Apr	N08W18	077																
05 Apr	N08W31	077																
06 Apr	N08W44	077																
07 Apr	N08W57	077																
08 Apr	N08W70	077																
09 Apr	N08W83	077																

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 077



**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 9412*

30 Mar	S14E79	045	0030	02	BXO	002	B												
31 Mar	S14E65	046	0050	02	HSX	002	A												
01 Apr	S14E51	047	0040	02	DSO	003	B												
02 Apr	S13E38	047	0040	01	HAX	002	A												
03 Apr	S15E25	046	0010	01	AXX	002	A												
04 Apr	S14E12	046	0010	00	AXX	001	A												
05 Apr	S14W01	046	0000	00	AXX	001	A												
06 Apr	S16W13	045	0010	03	BXO	002	B												
07 Apr	S16W26	045																	
08 Apr	S16W39	045																	
09 Apr	S16W52	045																	
10 Apr	S16W65	045																	
11 Apr	S16W78	045																	

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 046

*Region 9414*

02 Apr	S21E58	027	0020	01	HSX	001	A												
03 Apr	S23E44	027	0010	01	AXX	001	A												
04 Apr	S22E31	027	0010	00	AXX	001	A												
05 Apr	S23E20	025	0000	00	AXX	001	A												
06 Apr	S23E07	025																	
07 Apr	S23W06	025																	
08 Apr	S23W19	025																	
09 Apr	S23W32	025																	
10 Apr	S23W45	025																	
11 Apr	S23W58	025																	
12 Apr	S23W71	025																	
13 Apr	S23W84	025																	

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 025



**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 9415</i>																							
03 Apr	S22E72	359	0470	10	DKO	005	B					1	2	1									
04 Apr	S21E60	358	0680	10	DKO	009	B	1	1			5	1										
05 Apr	S21E47	358	0710	10	DKI	019	BG		1			2		1									
06 Apr	S21E33	359	0860	10	DKO	011	BG	2			1	4											
07 Apr	S21E21	358	0880	11	EKO	023	BG	1				1											
08 Apr	S21E05	358	0790	12	EKO	034	BGD																
09 Apr	S22W07	359	0760	13	EKI	032	BGD	4	1			7			1								
10 Apr	S23W19	358	0490	12	EKI	040	BGD	1		1	1									1			
11 Apr	S22W31	357	0550	13	EKI	023	BGD	1	1			2	1	1									
12 Apr	S22W46	359	0520	10	DKI	022	BGD		1	1	2	1											
13 Apr	S22W59	359	0390	09	DKI	018	BGD																
14 Apr	S22W72	358	0360	07	DKO	009	BG	3	1			6											
15 Apr	S21W87	360	0350	10	DKO	004	B	2			1	2		1									
										15	6	5	34	4	4	1	0						

Still on Disk.

Absolute heliographic longitude: 358

*Region 9417*

03 Apr	S10E43	028	0000	00	AXX	001	A														
04 Apr	S09E33	025	0000	00	AXX	001	A														
05 Apr	S08E27	018	0050	06	DSO	013	B		1			1									
06 Apr	S08E14	018	0180	07	DAO	013	B	1				1									
07 Apr	S08E01	018	0160	09	DAO	020	B	1				1									
08 Apr	S09W12	018	0140	09	DAO	021	B					1									
09 Apr	S08W27	019	0120	09	DAO	010	B														
10 Apr	S08W39	018	0090	10	DAO	013	B	1				2									
11 Apr	S07W53	019	0110	08	DAO	014	B	1				1									
12 Apr	S06W66	019	0120	08	DAO	008	B														
13 Apr	S07W81	021	0120	09	DAO	007	B														
14 Apr	S05W92	018	0090	06	DAO	004	BG														
										4	1	0	7	0	0	0	0	0			

Crossed West Limb.

Absolute heliographic longitude: 018



**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 9418</i>																	
04 Apr	N23E69	349	0130	02	HSX	001	A										
05 Apr	N27E58	347	0230	11	EAO	008	B		1			3					
06 Apr	N27E45	347	0200	10	DAO	008	B										
07 Apr	N26E32	347	0210	11	EAO	011	B										
08 Apr	N27E19	347	0230	12	EAO	019	B										
09 Apr	N27E07	345	0210	12	EAO	017	B										
10 Apr	N26W07	346	0190	10	DAO	013	B										
11 Apr	N27W20	346	0160	12	ESO	007	B										
12 Apr	N27W33	346	0110	12	ESO	004	B										
13 Apr	N26W46	346	0120	12	ESO	005	B										
14 Apr	N26W59	345	0200	11	EAO	007	BG		1			1					
15 Apr	N26W72	345	0170	12	EAO	004	B										
								0	2	0	4	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 345

<i>Region 9419</i>																	
04 Apr	N08W08	066	0010	04	CSO	005	B										
05 Apr	N10W33	078	0000	00	AXX	001	A										
06 Apr	N10W46	078															
07 Apr	N08W51	070	0010	01	AXX	002	A										
08 Apr	N08W64	070															
09 Apr	N08W77	070															
10 Apr	N08W88	067	0000	01	AXX	001	A					1					
								0	0	0	1	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 066



**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 9420*

05 Apr	S08E76	329	0040	03	HSX	001	A											
06 Apr	S06E62	330	0070	02	HSX	002	A											
07 Apr	S07E49	330	0070	01	HSX	002	A											
08 Apr	S06E36	330	0080	02	HSX	001	A											
09 Apr	S07E22	330	0040	01	HSX	001	A											
10 Apr	S07E10	329	0050	04	CSO	003	B											
11 Apr	S07W05	331	0050	03	CSO	004	B											
12 Apr	S07W18	331	0040	02	HSX	001	A											
13 Apr	S08W31	331	0040	03	CAO	003	B											
14 Apr	S07W44	330	0010	03	HRX	004	A											
15 Apr	S07W59	332	0020	01	HRX	001	A											
																		0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 331

*Region 9421*

07 Apr	S15W42	061	0010	04	CSO	002	B											
08 Apr	S16W57	063	0020	01	HSX	001	A											
09 Apr	S16W72	064	0030	01	HSX	001	A											
10 Apr	S16W85	064																
																		0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 061

*Region 9422*

07 Apr	S13E78	301	0050	02	HAX	001	A											
08 Apr	S12E64	302	0050	02	HSX	001	A											
09 Apr	S12E51	301	0070	02	HAX	002	A											
10 Apr	S13E37	302	0050	01	HSX	002	A											
11 Apr	S12E23	303	0060	04	DSO	006	B											2
12 Apr	S12E09	304	0070	04	DAO	006	B											
13 Apr	S12W04	304	0050	05	DAO	006	BG											
14 Apr	S12W17	303	0040	05	DAO	008	BG											
15 Apr	S12W30	303	0020	03	CSO	004	B											
																		0 0 0 2 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 304



**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 9423*

08 Apr	N21E03	003	0000	01	BXO	003	B											
09 Apr	N20W10	002	0010	03	BXO	004	B											
10 Apr	N19W24	003	0010	02	HRX	002	A											
11 Apr	N20W38	004	0010	02	BXO	002	B											
12 Apr	N20W52	005	0010	02	BXO	003	B											
13 Apr	N20W65	005																
14 Apr	N20W78	005																
								0	0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 003

*Region 9424*

08 Apr	S16E34	332	0000	04	BXO	005	B											
09 Apr	S16E22	330	0020	05	CSO	002	B											
10 Apr	S17E08	331	0020	02	HSX	002	A											
11 Apr	S17W06	332	0040	06	DAO	009	B	1				1						
12 Apr	S17W20	333	0060	07	DSO	012	B											
13 Apr	S18W34	334	0030	07	DSO	006	B											
14 Apr	S18W46	332	0010	08	CRO	004	B											
15 Apr	S17W62	335	0020	01	CRO	003	B											
								1	0	0	0	1	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 332

*Region 9425*

09 Apr	S24W26	018	0020	03	BXO	004	B											
10 Apr	S25W39	018	0030	06	CSO	004	B											
11 Apr	S24W51	017	0010	03	BXO	002	B											
12 Apr	S24W64	017																
13 Apr	S24W77	017																
14 Apr	S24W90	017																
								0	0	0	0	0	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 018





**Region Summary - continued.**

Date	Location		Sunspot Characteristics				Flares								
	(° Lat ° CMD)	Lon (10 <sup>-6</sup> heli)	Area	Extent	Spot	Spot	Mag	X-ray			Optical				
				(heli)	Class	Count	Class	C	M	X	S	1	2	3	4

*Region 9426*

11 Apr	S09E40	286	0030	04	CSO	006	B									
12 Apr	S09E25	288	0060	06	DSO	008	B									
13 Apr	S10E13	287	0060	07	DSO	006	B									
14 Apr	S10W02	288	0020	06	CSO	004	B									
15 Apr	S09W16	289	0010	01	HSX	002	A				1					
								0	0	0	1	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 288

*Region 9427*

11 Apr	S06W12	338	0030	03	DAO	005	B									
12 Apr	S08W26	339	0040	05	DSO	005	B									
13 Apr	S08W39	339	0060	05	DAO	007	B									
14 Apr	S08W52	338	0030	04	CRO	005	B									
15 Apr	S08W64	337	0020	02	HSX	001	A									
								0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 338

*Region 9428*

14 Apr	N14W39	325	0010	03	BXO	003	B									
15 Apr	N14W52	325														
								0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 325

*Region 9429*

14 Apr	N09E62	224	0080	02	HSX	001	A									
15 Apr	N08E50	223	0120	02	HSX	001	A									
								0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 223

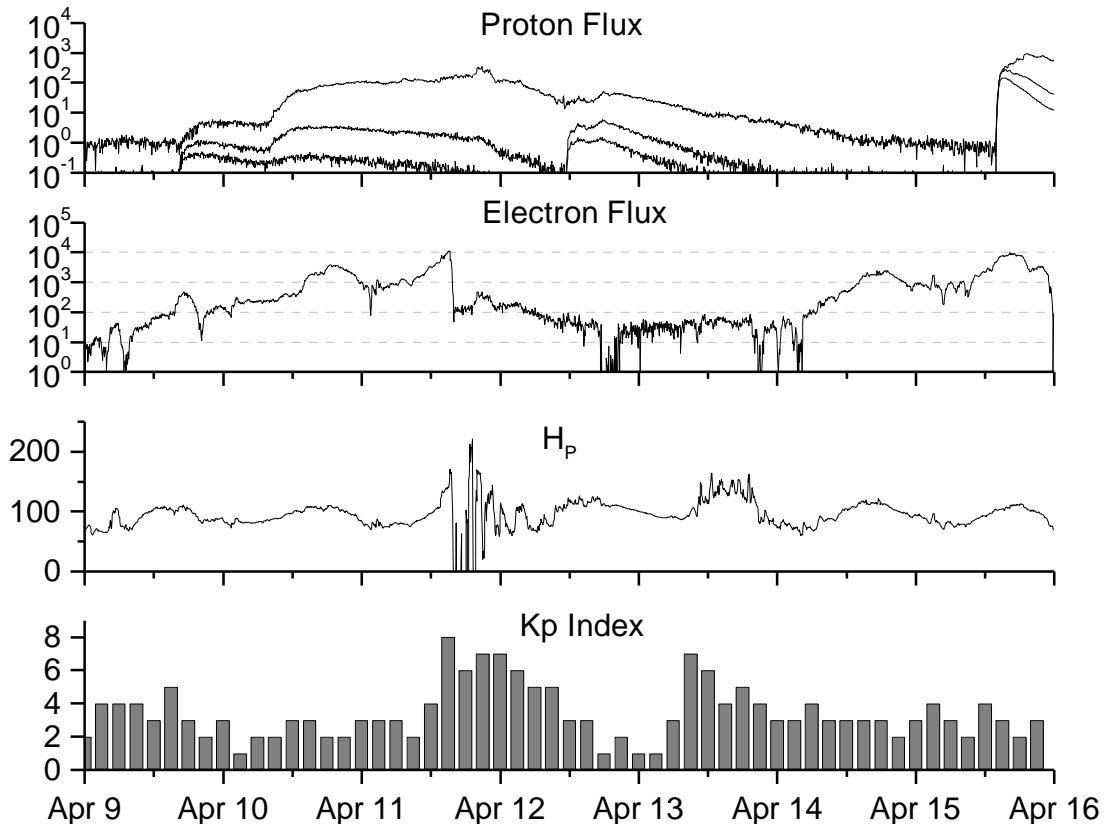


**Recent Solar Indices (preliminary)  
of the observed monthly mean values**

Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	<u>Observed values</u> SWO	<u>Ratio</u> RI	<u>Smooth values</u> RI/SWO	<u>Smooth values</u> SWO	<u>*Penticton</u> 10.7 cm	<u>Smooth</u> Value	<u>Planetary</u> Ap	<u>Smooth</u> Value	
<b>1999</b>									
April	92.9	63.7	0.69	123.8	85.5	117.2	145.8	12	12.2
May	140.5	106.4	0.76	131.7	90.5	148.6	149.9	08	12.4
June	208.3	137.7	0.66	136.0	93.1	169.8	152.9	07	12.4
July	169.2	113.5	0.67	138.0	94.3	165.6	154.4	10	12.6
August	136.1	93.7	0.69	142.8	97.5	170.8	156.3	15	12.9
September	107.4	71.5	0.67	150.0	102.3	135.7	161.0	19	12.8
October	167.7	116.7	0.70	158.5	107.8	164.8	167.2	19	12.7
November	199.3	133.2	0.67	164.7	110.0	191.5	171.5	14	13.1
December	123.5	86.4	0.69	165.9	111.1	169.8	173.4	10	13.8
<b>2000</b>									
January	140.8	90.1	0.64	168.0	112.9	158.1	175.5	13	14.5
February	161.9	112.9	0.70	172.1	116.7	173.2	176.8	15	15.0
March	203.6	138.5	0.68	175.4	119.9	208.2	178.4	09	15.0
April	193.4	125.5	0.65	176.3	120.8	184.2	180.5	15	15.0
May	188.8	121.6	0.64	173.1	119.0	184.5	180.0	15	15.0
June	190.3	124.9	0.66	172.0	118.7	179.8	179.7	15	15.1
July	236.7	169.1	0.71	173.0	119.7	204.7	180.2	21	14.8
August	166.6	130.5	0.78	171.8	118.6	163.1	179.5	16	14.2
September	157.9	109.9	0.70	169.0	116.2	182.1	177.1	18	14.2
October	138.9	100.1	0.72			167.7		18	
November	149.9	106.5	0.71			178.8		17	
December	146.4	104.5	0.71			173.6		08	
<b>2001</b>									
January	142.7	95.1	0.67			166.7		08	
February	131.0	80.1	0.61			147.3		06	
March	166.7	114.2	0.69			177.7		17	

**NOTE:** All smoothed values after December 1999 and monthly values after June 2000 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 22, RI= 158.5, occurred July 1989. \*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 09 April 2001*

*Protons* 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 three energy thresholds: greater than 10, 50, and 100 MeV.

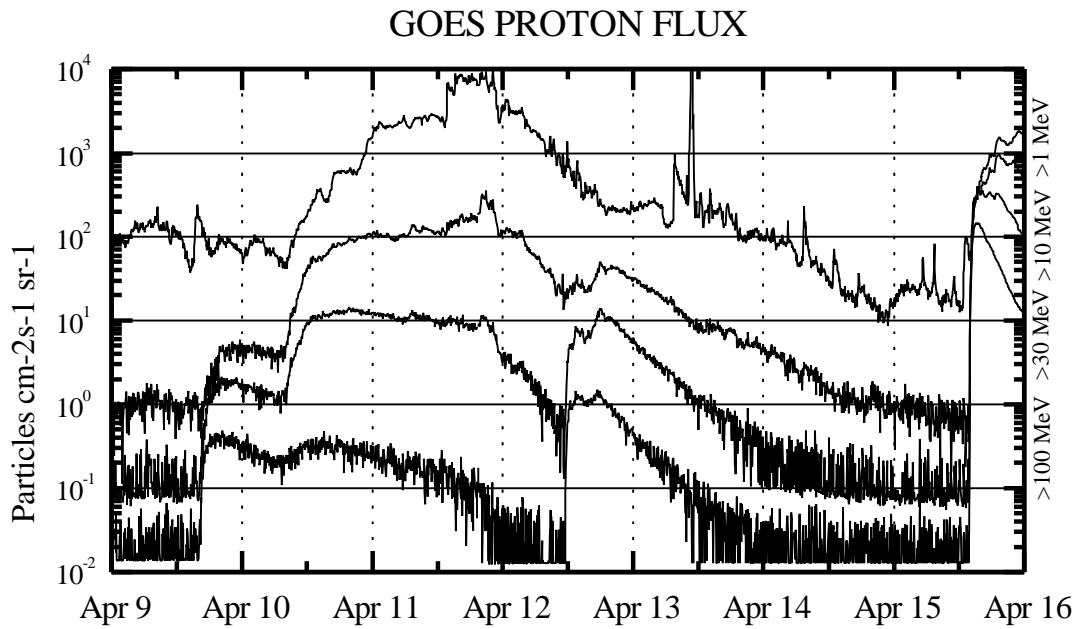
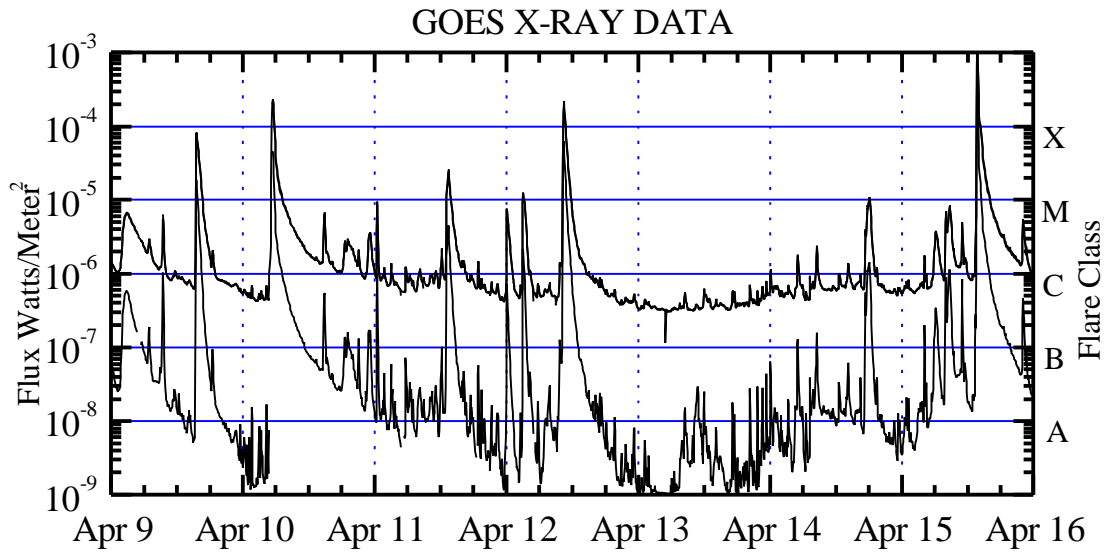
*Electrons* plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV at GOES-8.

*Hp* 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.

*Kp* 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 Kp 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 Kp are “ global ” parameters that are applicable to a first order approximation over large areas. Hparallel 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/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.

