

**Space Weather Highlights**  
**14 - 20 February 2005**

**SWO PRF 1538**  
**22 February 2005**

Solar activity ranged from very low to moderate. Low levels occurred on 14 – 18 February followed by moderate levels on the 19th. The summary period ended on the 20th with very low conditions. Most of this period's activity occurred from two regions, Region 732 (N11, L=184, class/area, Eso/090 on 12 February) and Region 734 (S04, L=138, class/area, Cso/080 on 16 February). One day after rotating around the west limb, Region 732 produced the largest event of the period, an M3.3 flare at 19/1101 UTC. Prior to this flare, as Region 732 approached the west limb on 18 February, five minor C-class flares were observed. Region 734 produced a C4.9/1n at 16/2338 UTC with weak radio signatures and a faint, full halo CME. The largest region on the disk, Region 735 (S07, L=121, class/area, Ekc/470 on 16 February), remained fairly quiet, producing two minor C-class flares. All other regions on the disk were magnetically simple and stable.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft during most of the summary period. The period began with the solar wind at near 360 km/s and the IMF Bz at +/- 5 nT. Late on 15 February, a solar sector boundary crossing was observed in the solar wind data at about 2120 UTC. Oscillations in the Bz component of the IMF ranged from -8 to +5 nT and persisted for about 12 hours. Wind speed remained around 400 km/s until early on 18 February when a coronal hole moved into a geoeffective position. Solar wind speed increased to a maximum of near 600 km/s late on 18 February and began a gradual decrease thereafter. During the advent of the coronal hole high speed stream, the IMF Bz reached a maximum value of -20 nT for a short period of time. Thereafter, and through to the end of the summary period, the IMF Bz did not vary much beyond +/- 5 nT. The period ended with the solar wind speed near 450 km/s.

No greater than 10 MeV proton events were observed this period.

The greater than 2 MeV electron flux at geosynchronous orbit was at high levels from 14 – 16 February and 19 – 20 February.

During the summary period, the geomagnetic field ranged from quiet to minor storm levels with some major storming observed at the higher latitudes. The period began with quiet conditions on 14 and 15 February. Quiet to active levels, with minor to major storm periods at high latitudes, were observed on 16 February due to extended periods of southward Bz. By late on 16 February, conditions returned to mostly quiet to unsettled. By 18 February, a recurrent high speed stream (HSS) moved into a geoeffective position. Quiet to minor storm periods, with some major storm periods at the higher latitudes, were observed. These conditions persisted through most of the 19th. Thereafter, and through to the end of the summary period, conditions remained mostly quiet to unsettled with some isolated active periods.

**Space Weather Outlook**  
**23 February - 21 March 2005**

Solar activity is expected to be at very low to low conditions the entire forecast period.

A greater than 10 MeV proton event is not expected.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at high levels on 22 February – 03 March, and 07 – 12 March.

The geomagnetic field is expected to range from quiet to minor storm levels. Coronal hole high speed wind streams are expected to produce unsettled to active levels with occasional minor storm periods on 24 – 28 February, and 07 – 08 March. Quiet to active conditions are possible on 17 March due to a weak high speed wind stream. Otherwise, expect quiet to unsettled conditions.



### 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
14 February	118	115	760	B1.5	2	0	0	3	1	0	0	0
15 February	122	69	690	B1.6	1	0	0	4	0	0	0	0
16 February	113	61	720	B1.4	2	0	0	1	1	0	0	0
17 February	111	51	620	B1.3	1	0	0	0	0	0	0	0
18 February	104	46	590	B2.1	5	0	0	1	0	0	0	0
19 February	99	51	520	B1.6	1	1	0	0	0	0	0	0
20 February	96	60	580	A7.0	0	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
	14 February	1.7E+6	1.3E+4	3.0E+3		4.5E+8
15 February	1.5E+6	1.3E+4	3.1E+3		1.2E+8	
16 February	9.1E+5	1.4E+4	3.0E+3		4.7E+7	
17 February	3.0E+5	1.4E+4	3.0E+3		2.9E+6	
18 February	1.4E+6	1.4E+4	3.0E+3		4.7E+6	
19 February	1.6E+6	1.4E+4	2.8E+3		3.4E+7	
20 February	5.7E+5	1.3E+4	2.8E+3		5.2E+7	

### Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	14 February	4	0-2-1-0-2-1-2-2	4	0-1-1-2-2-0-2-1	5
15 February	1	0-1-1-0-0-0-0-0	2	1-0-1-0-0-0-1-2	5	1-1-2-0-1-1-2-2
16 February	8	3-1-1-2-3-2-2-2	29	2-1-2-5-6-5-4-3	13	2-1-2-4-4-3-3-3
17 February	7	2-2-0-1-1-1-1-4	7	2-1-0-3-3-2-0-2	6	1-2-0-1-2-2-2-3
18 February	14	4-3-3-2-3-3-2-2	37	4-4-5-6-5-5-2-2	25	5-4-4-3-4-4-3-2
19 February	8	1-1-3-3-2-2-2-2	40	3-5-5-6-6-4-3-1	14	1-2-3-4-4-3-3-2
20 February	6	3-2-2-0-1-1-2-2	16	4-3-3-1-3-4-3-2	12	4-3-3-0-2-3-2-2

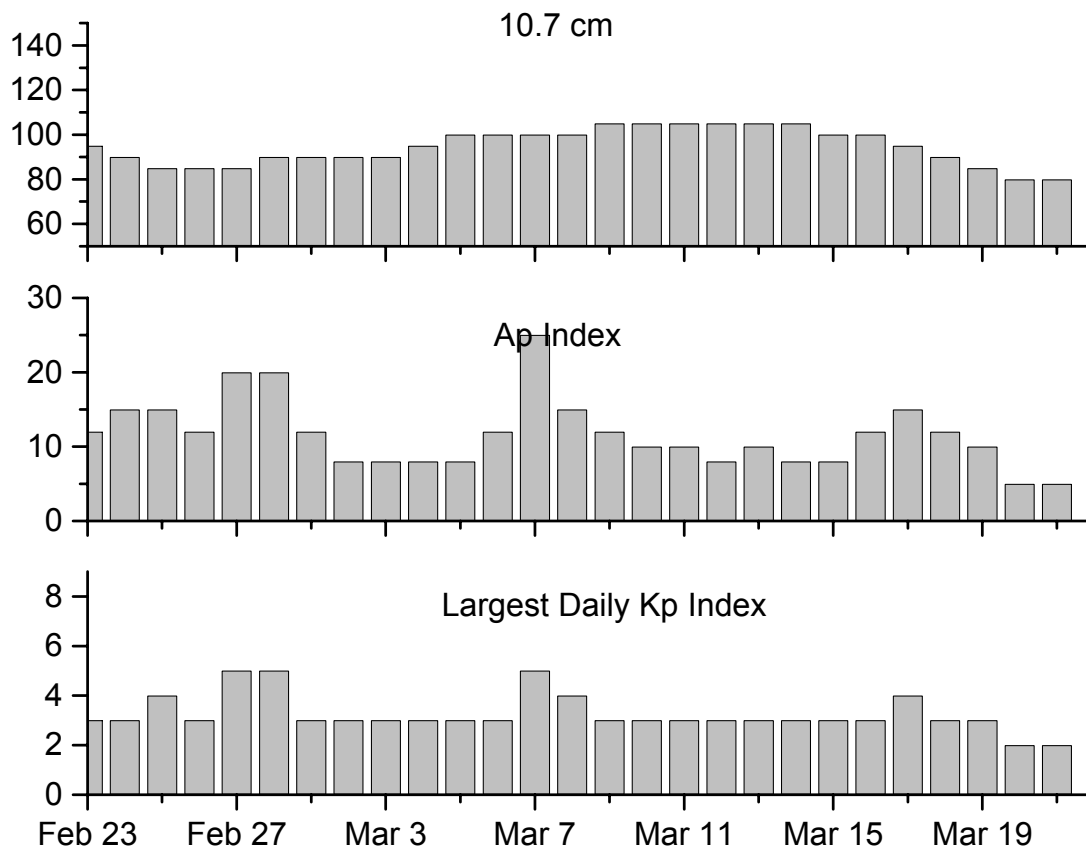


### *Alerts and Warnings Issued*

<u>Date &amp; Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date &amp; Time of Event UTC</u>
14 Feb 0007	3 – 245 MHz Radio Bursts	13 Feb
14 Feb 0007	1 – 245 MHz Radio Noise Storm	13 Feb
14 Feb 0515	ALERT: Electron 2MeV Integral Flux > 1000pfu	14 Feb 0500
14 Feb 1147	ALERT: Type IV Radio Emission	14 Feb 0401
14 Feb 1156	ALERT: Type IV Radio Emission	14 Feb 0606
14 Feb 1220	ALERT: Type IV Radio Emission	14 Feb 1201
14 Feb 1254	ALERT: Type IV Radio Emission	14 Feb 1209
14 Feb 1317	ALERT: Type II Radio Emission	14 Feb 1204
15 Feb 0014	9 – 245 MHz Radio Bursts	14 Feb
15 Feb 0014	1 – 245 MHz Radio Noise Storm	14 Feb
15 Feb 1152	ALERT: Electron 2MeV Integral Flux > 1000pfu	15 Feb 1130
16 Feb 1318	ALERT: Electron 2MeV Integral Flux > 1000pfu	16 Feb 1255
16 Feb 1347	WARNING: Geomagnetic K= 4	16 Feb 1347 -1600
16 Feb 1350	ALERT: Geomagnetic K= 4	16 Feb 1350
16 Feb 1551	EXTENDED WARNING: Geomagnetic K= 4	16 Feb 1347 -2359
17 Feb 0006	1 – 245 MHz Radio Noise Storm	16 Feb
17 Feb 2324	WARNING: Geomagnetic K= 4	17 Feb 2325 -18 Feb 1500
18 Feb 0012	9 – 245 MHz Radio Bursts	17 Feb
18 Feb 0012	1 – 245 MHz Radio Noise Storm	17 Feb
18 Feb 0047	WARNING: Geomagnetic K= 5	18 Feb 0028 - 1500
18 Feb 0052	ALERT: Geomagnetic K= 4	18 Feb 0045
18 Feb 0117	ALERT: Geomagnetic K= 5	18 Feb 0114
18 Feb 1453	EXTENDED WARNING: Geomagnetic K= 4	17 Feb 2325 -18 Feb 2359
19 Feb 1535	ALERT: Electron 2MeV Integral Flux > 1000pfu	19 Feb 1515
20 Feb 0205	ALERT: Geomagnetic K-index of 4	20 Feb 0202
20 Feb 1632	ALERT: Electron 2MeV Integral Flux > 1000pfu	20 Feb 1610



### 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
23 Feb	95	12	3	09 Mar	105	12	3
24	90	15	3	10	105	10	3
25	85	15	4	11	105	10	3
26	85	12	3	12	105	8	3
27	85	20	5	13	105	10	3
28	90	20	5	14	105	8	3
01 Mar	90	12	3	15	100	8	3
02	90	8	3	16	100	12	3
03	90	8	3	17	95	15	4
04	95	8	3	18	90	12	3
05	100	8	3	19	85	10	3
06	100	12	3	20	80	5	2
07	100	25	5	21	80	5	2
08	100	15	4				



***Energetic Events***

Date	Time		X-ray		Optical Information			Peak		Sweep Freq		
	Begin	Max	Max	Class	Flux	Imp/ Brtns	Location Lat CMD	Rgn #	Radio Flux		Intensity	
									245	2695	II	IV
19 Feb	1036	1101	1113	M3.3	.035							

***Flare List***

Date	Begin	Time		X-ray Class.	Imp / Brtns	Optical Location Lat CMD	Rgn	
		Max	End					
14 February	B0402	0408	0423	C1.9	Sf	S02E13	734	
		1152	1158	C1.5			733	
		1526	1529	B2.8			732	
		1947	1954	B3.6			735	
		B2109	2109	2128	Sf	S08E25		
		B2208	2208	2214	1f	S09E25		
		B2305	2342	2343	Sf	S09E24		
15 February	B0039	0040	0050		Sf	S09E24		
		0113	0121	0122	B4.5	S07E16	735	
		0215	0221	0227	B6.3	S09E17	735	
		0411	0418	0500	B5.7		734	
		0656	0659	0708	B5.2	Sf	S10E20	735
		0931	0935	0940	B3.3			
		1333	1341	1347	B4.3		735	
		1535	1539	1543	B2.6		735	
		1617	1626	1635	B8.7		735	
		1928	1948	2005	C1.1		734	
16 February	2156	2200	2205	B2.3				
	0224	0229	0243	B2.7			733	
	0619	0624	0632	B5.8			732	
	0815	0819	0823	B2.9			735	
	1334	1338	1344	B3.0			735	
	1611	1614	1616	B2.1			735	
	1633	1637	1640	C1.9			735	
	2315	2315	2323	B4.7	Sf	S11W02	735	
2333	2336	0018	C4.9	1n	S03W23	734		
17 February	0618	0622	0625	B2.2			735	
	0704	0710	0717	B2.3				
	2056	2103	2111	B8.0			732	
	2216	2223	2228	B5.4			734	
	2317	2321	2325	B6.2			732	
	2328	2332	2337	B8.2			732	
	2339	2344	2348	C2.3			732	
	2358	0002	0004	B8.4			732	



*Flare List - continued.*

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
18 February	0100	0105	0110	C1.0			732
	0117	0121	0124	C1.4			732
	0302	0309	0312	B5.2			732
	0400	0403	0405	B2.3			
	0436	0437	0446	C1.2	Sf	S09W22	735
	0536	0540	0544	B3.9			732
	0707	0713	0717	B3.4			
	0754	0759	0810	B4.0			732
	0824	0828	0831	B7.5			732
	0902	0921	0927	B6.8			732
	1152	1155	1204	B3.4			732
	1209	1217	1232	B4.3			732
	1252	1322	1328	C2.0			732
	1427	1439	1446	B3.9			732
	1505	1545	1558	C1.4			732
	1640	1643	1645	B3.7			732
	1704	1708	1712	B3.0			732
	2032	2036	2038	B3.5			
	2140	2156	2202	B8.5			735
	2230	2235	2243	B9.0			732
19 February	0033	0041	0048	B4.4			732
	0214	0220	0222	B3.7			
	0317	0321	0332	B3.2			732
	0423	0432	0456	B7.7			732
	0603	0609	0615	C1.2			732
	0909	0915	0921	B3.8			
	1036	1101	1113	M3.3			732
	2053	2056	2059	B1.8			
2142	2146	2150	B2.0				
2257	2300	2304	B1.6				
20 February	0418	0422	0425	B1.4			
	0445	0448	0451	B1.7			
	0643	0649	0659	B1.6			
	1201	1205	1207	B1.0			735
	1532	1628	1752	B3.8			



### 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 730

04 Feb	S20E73	200	0060	02	Hsx	001	A										
05 Feb	S20E60	200	0030	01	Hsx	001	A										
06 Feb	S20E46	200	0050	02	Hax	001	A										
07 Feb	S20E33	200	0060	07	Cso	003	B										
08 Feb	S20E20	200	0070	06	Dso	009	B										
09 Feb	S21E09	198	0090	06	Cao	006	B										
10 Feb	S20W05	199	0050	02	Hax	002	A										
11 Feb	S20W19	199	0050	02	Hax	002	A										
12 Feb	S20W32	199	0010	02	Axx	004	A										
13 Feb	S19W44	198	0010	01	Axx	003	A										
14 Feb	S19W57	198	0010	02	Bxo	003	B										
15 Feb	S19W70	198															
16 Feb	S19W83	198															
																	0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 199

#### Region 732

06 Feb	N09E70	176	0040	08	Dao	003	B										
07 Feb	N09E57	176	0090	08	Dso	005	Bg										
08 Feb	N12E37	183	0050	16	Fso	010	Bg	1									
09 Feb	N14E28	179	0060	10	Fai	010	Bg										
10 Feb	N17E17	177	0040	08	Dro	006	B										
11 Feb	N11W04	184	0040	10	Dro	014	Bg										
12 Feb	N11W17	184	0090	11	Eso	014	Bg										
13 Feb	N12W30	184	0030	06	Dso	009	B										
14 Feb	N12W43	184	0010	06	Bxo	007	B										
15 Feb	N08W60	188	0020	10	Bxo	004	B										
16 Feb	N08W73	188															
17 Feb	N08W86	188															1 2 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 184



**Region Summary – continued.**

Date	Location		Sunspot Characteristics				Flares															
	Helio		Area (10 <sup>-6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical											
	( ° Lat ° CMD)	Lon						C	M	X	S	1	2	3	4							
<i>Region 733</i>																						
07 Feb	S09E78	155	0180	02	Hax	001	A	4														
08 Feb	S08E67	153	0240	03	Hkx	004	A	1														
09 Feb	S08E54	153	0280	04	Hsx	003	A															
10 Feb	S08E40	154	0310	03	Cho	003	B															
11 Feb	S08E31	149	0340	05	Hhx	003	A															
12 Feb	S08E14	153	0250	03	Hax	002	A															
13 Feb	S09E01	153	0230	03	Hax	002	A	1														
14 Feb	S09W13	154	0230	05	Cao	022	B	1														
15 Feb	S08W26	154	0180	04	Dao	006	A															
16 Feb	S08W39	154	0170	04	Dso	009	A															
17 Feb	S08W52	153	0130	05	Dso	006	B															
18 Feb	S09W67	155	0090	04	Dso	005	B															
19 Feb	S08W80	155	0070	03	Cso	002	B															
20 Feb	S08W93	155	0070	02	Hsx	001	A															
									7	0	0	0	0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude:153

<i>Region 734</i>																						
09 Feb	S04E71	136	0060	02	Hax	001	A															
10 Feb	S04E57	137	0050	02	Hax	001	A	1														
11 Feb	S04E44	136	0060	02	Hsx	001	A	1														
12 Feb	S05E31	136	0060	02	Hsx	001	A															
13 Feb	S04E17	137	0080	02	Hsx	001	A	1			1											
14 Feb	S05E04	137	0070	05	Cao	007	B	1		1												
15 Feb	S04W10	138	0070	04	Cso	004	B	1														
16 Feb	S04W23	138	0080	04	Cso	005	B	1			1											
17 Feb	S05W34	135	0070	04	Cso	004	B															
18 Feb	S05W50	138	0040	02	Dso	003	B															
19 Feb	S05W63	138	0040	01	Hsx	001	A															
20 Feb	S05W76	138	0040	01	Hsx	001	A															
									6	0	0	2	1	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude:137





***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 735*

10 Feb	S08E74	120	0080	04	Hsx	001	A											
11 Feb	S08E60	120	0410	06	Dho	003	B											
12 Feb	S08E47	120	0380	04	Hhx	001	A					1						
13 Feb	S09E34	120	0370	07	Dho	008	B											
14 Feb	S08E20	121	0440	07	Dko	026	B											
15 Feb	S08E06	122	0420	11	Cko	015	Bg						3					
16 Feb	S07W06	121	0470	11	Ekc	017	Bgd	1				1						
17 Feb	S10W18	119	0420	08	Dkc	011	Bgd											
18 Feb	S09W32	120	0460	06	Dko	008	B	1				1						
19 Feb	S09W45	120	0410	06	Dki	018	Bg											
20 Feb	S09W58	120	0440	06	Dko	012	Bg											
								2	0	0	0	6	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude:122

*Region 736*

20 Feb	N13W50	112	0030	05	Dao	006	B											
								0	0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude:112

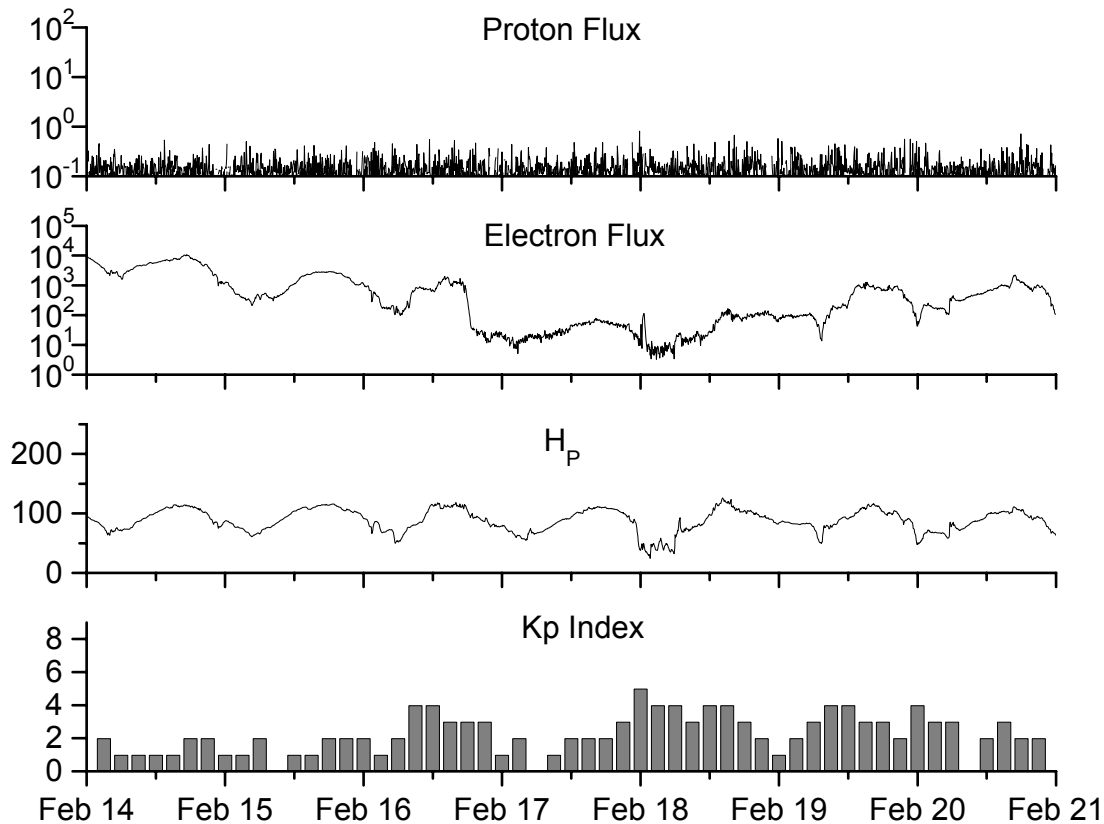


**Recent Solar Indices (preliminary)  
of the observed monthly mean values**

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
<b>2003</b>									
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	128.1	74.2	132.2	139.5	21	19.4
April	119.7	60.0	0.50	121.5	70.3	126.3	135.0	20	20.1
May	89.6	55.2	0.62	118.3	67.8	129.3	133.1	26	21.0
June	118.4	77.4	0.65	113.6	65.2	129.4	130.2	24	21.5
July	132.8	85.0	0.64	106.9	62.0	127.8	127.2	19	22.0
August	114.3	72.7	0.64	102.8	60.3	122.1	125.2	23	22.2
September	82.6	48.8	0.59	100.7	59.8	112.3	123.7	18	21.8
October	118.9	65.5	0.55	96.6	58.4	153.1	121.8	35	21.1
November	118.9	67.3	0.57	93.6	57.0	153.1	120.1	28	20.0
December	75.4	46.5	0.62	91.4	55.0	115.1	118.0	16	18.6
<b>2004</b>									
January	62.3	37.7	0.61	87.9	52.0	114.1	116.3	22	18.1
February	75.6	45.8	0.61	84.2	49.4	107.0	115.5	13	17.7
March	81.0	49.1	0.61	80.9	47.2	112.2	114.6	14	16.9
April	59.3	39.3	0.66	77.9	45.6	101.2	112.3	11	15.5
May	77.3	41.5	0.54	74.1	43.9	99.8	109.2	8	14.3
June	78.9	43.2	0.55	70.4	41.7	97.4	107.2	8	14.0
July	87.8	51.0	0.58	68.3	40.2	118.5	105.9	23	13.8
August	69.5	40.9	0.59			110.1		11	
September	50.0	27.7	0.55			103.1		10	
October	77.9	48.4	0.62			105.7		9	
November	70.5	43.7	0.62			113.2		26	
December	34.7	17.9	0.52			94.6		11	
<b>2005</b>									
January	52.0	31.3	0.60			102.4		22	

**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 14 February 2005*

*Protons* plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-sec-sr) as measured by GOES-11 (W110) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

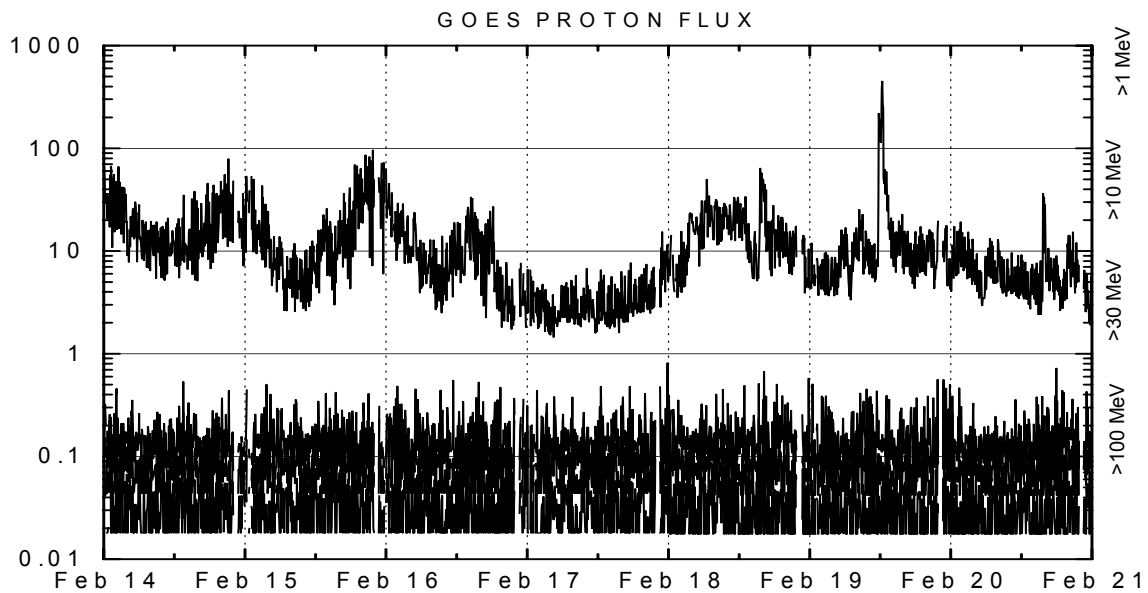
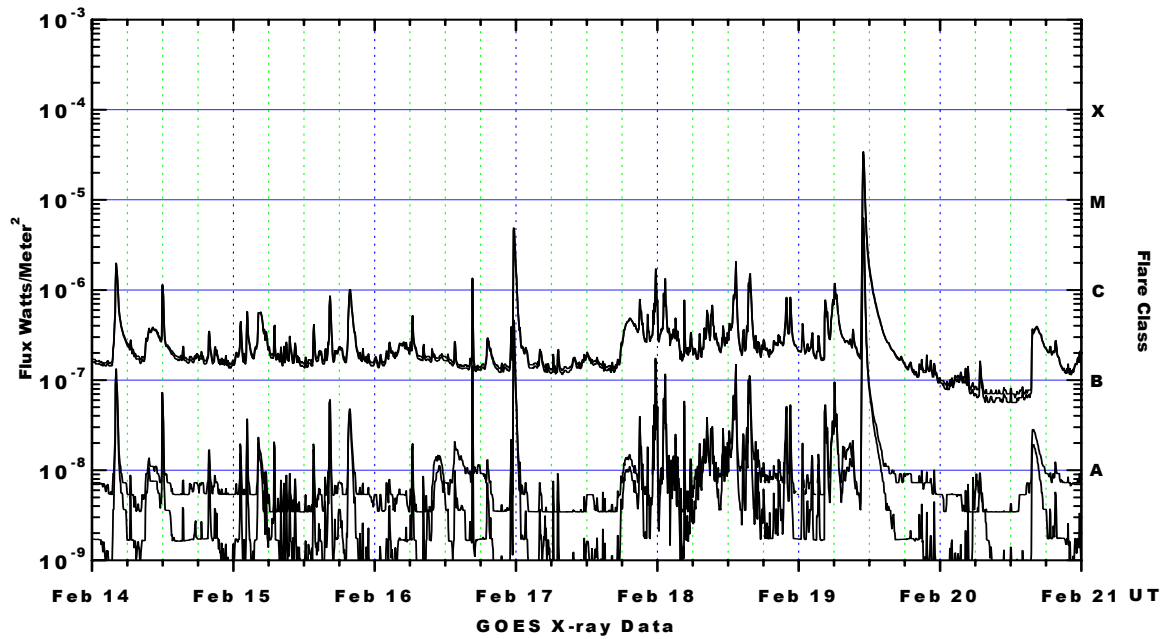
*Electrons* plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec-sr) with energies greater than 2 MeV at GOES-12 (W75).

*H<sub>p</sub>* 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<sub>p</sub>* 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 Hartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC), British Geological Survey (BGS) 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 parallel 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 12 (W76) and GOES 10 (W135) 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-11 (W110) 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.



# Sudden Storm Commencements and Impulses



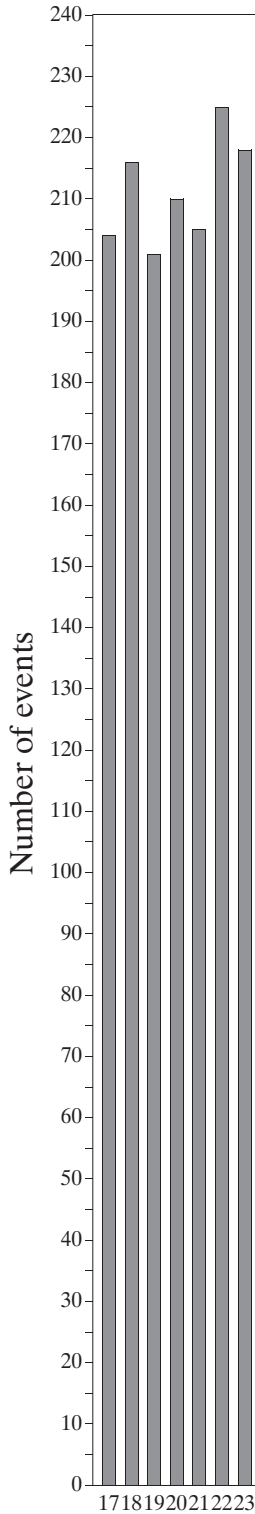
Space Environment Center



January 2005  
(Month 100)

  Preliminary data

Comparison of Cycles at current month in cycle



K. Tegnell

Cycle

