Space Weather Highlights **SWO PRF 1748**
23 February - 01 March 2009 **03 March 2009**

Solar activity was very low. No flares were observed. New-cycle-polarity Region 1013 (N26, L=146, class/area Cso/020 on 24 February) emerged on 24 February. It gradually decayed to a spotless plage region on 27 February.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal levels during the period.

Geomagnetic field activity was at mostly quiet levels during 23 - 26 February. Activity increased to quiet to unsettled levels on 27 February with minor to major storm periods at high latitudes. Activity decreased to mostly quiet levels during the rest of the period. ACE solar wind data indicated the increased activity of 27 February was due to a recurrent coronal hole high-speed stream (CH HSS). The HSS began on 27 February. Velocities increased to a maximum of 701 km/sec at 27/2000 UTC, then gradually decreased for the rest of the period (minimum 384 km/sec at 01/2340 UTC). Interplanetary magnetic field changes associated with the onset of the CH HSS included increased Bt (peak 11 nT at 27/0940 UTC), and brief, intermittent periods of southward Bz (minimum -7 nT at 27/1006 UTC).

Space Weather Outlook
04 - 30 March 2009

Solar activity is expected to be at very low levels.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to increase to high levels during 14 - 18 March. Normal flux levels are expected during the rest of the period.

Geomagnetic field activity is expected to be at predominantly quiet levels through 12 March. Activity is expected to increase to quiet to active levels during 13 - 14 March with a chance for minor to major storm periods at high latitudes due to a recurrent CH HSS. Activity is expected to decrease to mostly quiet levels during 15 - 30 March.

Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10^{-6} hemi.)	X-ray Background	Flares: X-ray Flux C	M	X	Flares: Optical S	1	2	3	4
23 February	71	0	0	<A1.0	0	0	0	0	0	0	0	0
24 February	71	12	20	<A1.0	0	0	0	0	0	0	0	0
25 February	71	14	10	<A1.0	0	0	0	0	0	0	0	0
26 February	70	12	10	<A1.0	0	0	0	0	0	0	0	0
27 February	69	0	0	<A1.0	0	0	0	0	0	0	0	0
28 February	71	0	0	<A1.0	0	0	0	0	0	0	0	0
01 March	69	0	0	<A1.0	0	0	0	0	0	0	0	0

Daily Particle Data

Date	Proton Fluence (protons/cm^2-day-sr) >1 MeV	>10 MeV	>100 MeV	Electron Fluence (electrons/cm^2-day-sr) >.6 MeV	>2MeV	>4 MeV
23 February	1.1E+6	2.0E+4	4.2E+3		4.2E+6	
24 February	7.3E+5	1.9E+4	4.1E+3		2.6E+6	
25 February	5.5E+5	1.8E+4	4.2E+3		4.7E+6	
26 February	8.1E+5	2.0E+4	4.3E+3		6.8E+6	
27 February	1.3E+6	1.8E+4	4.1E+3		2.0E+6	
28 February	1.7E+6	1.9E+4	3.9E+3		2.9E+5	
01 March	1.7E+6	1.8E+4	3.9E+3		4.4E+5	

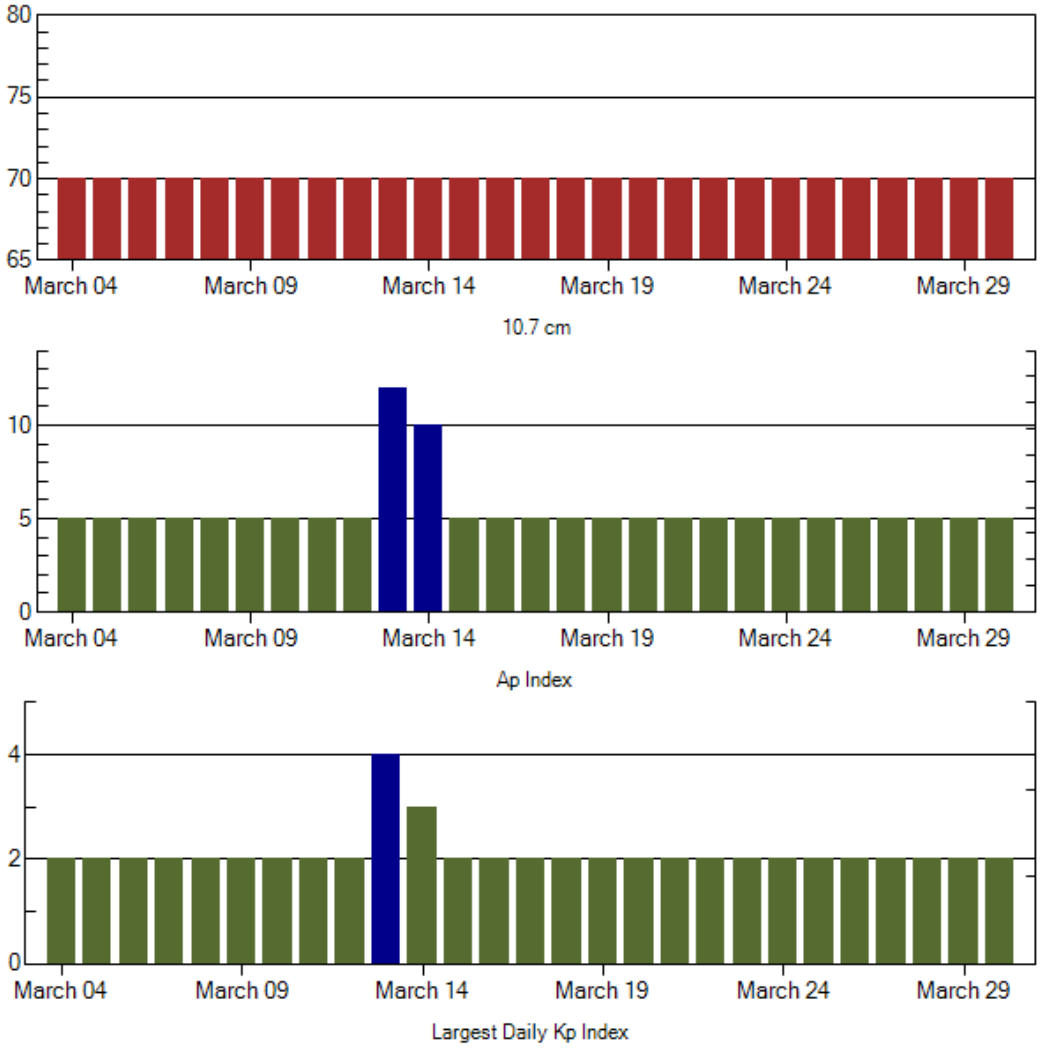
Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg A	K-indices	High Latitude College A	K-indices	Estimated Planetary A	K-indices
23 February	3	1-0-0-0-2-2-1-2	5	0-0-0-2-3-3-1-0	5	1-0-0-0-2-3-2-2
24 February	6	1-3-3-1-1-1-0-1	5	1-1-3-2-2-1-0-0	6	2-3-2-1-1-1-0-1
25 February	2	1-1-1-1-1-0-1-0	2	1-0-0-3-0-0-0-0	3	1-1-0-1-1-1-0-0
26 February	2	1-1-0-0-1-0-0-1	0	0-0-0-0-0-0-0-1	2	1-1-0-0-0-0-1-2
27 February	7	1-1-2-3-3-1-2-1	20	1-0-3-5-6-2-2-1	8	1-1-2-3-3-2-2-2
28 February	4	3-2-2-0-0-0-1-1	3	1-2-2-1-0-0-1-0	5	3-2-2-0-0-0-1-2
01 March	2	2-1-1-0-1-0-0-0	1	0-1-1-0-0-0-0-0	3	1-1-0-0-0-0-1-1

Alerts and Warnings Issued

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
27 Feb 1014	WARNING: Geomagnetic K = 4	27 Feb 1014 - 1600
27 Feb 1018	ALERT: Geomagnetic K = 4	27 Feb 1017

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
04 Mar	70	5	2	18 Mar	70	5	2
05	70	5	2	19	70	5	2
06	70	5	2	20	70	5	2
07	70	5	2	21	70	5	2
08	70	5	2	22	70	5	2
09	70	5	2	23	70	5	2
10	70	5	2	24	70	5	2
11	70	5	2	25	70	5	2
12	70	5	2	26	70	5	2
13	70	12	4	27	70	5	2
14	70	10	3	28	70	5	2
15	70	5	2	29	70	5	2
16	70	5	2	30	70	5	2
17	70	5	2				

Energetic Events

Date	Time Begin	Time Max	Time ½ Max	X-ray Class	X-ray Integ Flux	Optical Information Imp/ Brtns	Optical Information Location Lat CMD	Optical Information Rgn #	Peak Radio Flux 245	Peak Radio Flux 2695	Sweep Freq Intensity II	Sweep Freq Intensity IV

No Events Observed

Flare List

Date	Time Begin	Time Max	Time End	Optical X-ray Class.	Optical Imp / Brtns	Optical Location Lat CMD	Optical Rgn
23 Feb	No Flares Observed						
24 Feb	No Flares Observed						
25 Feb	No Flares Observed						
26 Feb	No Flares Observed						
27 Feb	No Flares Observed						
29 Feb	No Flares Observed						
01 Mar	No Flares Observed						

Region Summary

Date	Location (° Lat ° CMD)	Location Helio Lon	Sunspot Characteristics Area (10^{-6} hemi)	Sunspot Characteristics Extent (helio)	Sunspot Characteristics Spot Class	Sunspot Characteristics Spot Count	Sunspot Characteristics Mag Class	Flares X-ray C	Flares X-ray M	Flares X-ray X	Flares Optical S	Flares Optical 1	Flares Optical 2	Flares Optical 3	Flares Optical 4
					Region 1012										
11 Feb	S06E62	275	0010	01	Axx	001	A								
12 Feb	S05E48	276	0010	01	Axx	001	A								
13 Feb	S06E34	278	0010	01	Axx	001	A								
14 Feb	S06E20	278													
15 Feb	S06E07	278													
16 Feb	S06W06	278													
17 Feb	S06W19	278													
18 Feb	S06W32	278													
19 Feb	S06W45	278													
20 Feb	S06W58	278													
21 Feb	S06W71	278													
22 Feb	S06W84	278													
23 Feb	S06W97	278													
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 278

Region Summary

Date	Location (° Lat ° CMD)	Helio Lon	Sunspot Characteristics: Area (10^{-6} hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	Flares: X-ray C	X-ray M	X-ray X	Optical S	Optical 1	Optical 2	Optical 3	Optical 4
					Region 1013										
24 Feb	N26E20	146	0020	02	Cso	002	B								
25 Feb	N26E07	146	0010	04	Bxo	004	B								
26 Feb	N26W06	146	0010	02	Bxo	002	B								
27 Feb	N26W19	146													
28 Feb	N26W32	146													
01 Mar	N26W45	146													
								0	0	0	0	0	0	0	0

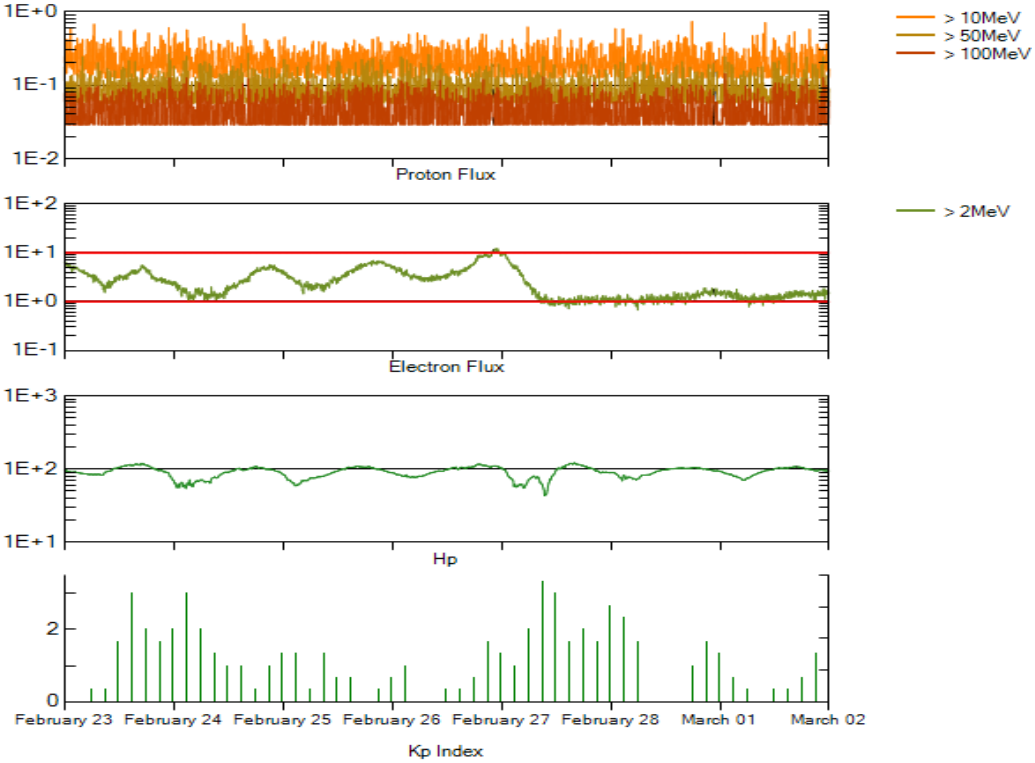
Still on Disk.
Absolute heliographic longitude: 146

Recent Solar Indices (preliminary)
Of the observed monthly mean values

	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed	values	Ratio	Smooth	values	*Penticton	Smooth	Planetary	Smooth
Month	SEC	RI	RI/SEC	SEC	RI	10.7 cm	Value	Ap	Value
				2007					
February	17.2	10.6	0.62	18.9	11.6	77.8	76.9	6	8.4
March	9.7	4.8	0.49	17.5	10.8	72.3	76.0	8	8.4
April	6.9	3.7	0.54	16.0	9.9	72.4	75.2	9	8.5
May	19.4	11.7	0.60	14.2	8.7	74.5	74.2	9	8.4
June	20.0	12.0	0.60	12.8	7.7	73.7	73.2	7	7.8
July	15.6	10.0	0.64	11.6	7.0	71.6	72.5	8	7.4
August	9.9	6.2	0.63	10.2	6.1	69.2	71.8	7	7.6
September	4.8	2.4	0.50	9.9	5.9	67.1	71.5	9	7.8
October	1.3	0.9	0.70	10.0	6.1	65.5	71.5	9	7.9
November	2.5	1.7	0.68	9.4	5.7	69.7	71.1	5	7.8
December	16.2	10.1	0.62	8.1	5.0	78.6	70.5	4	7.8
				2008					
January	5.1	3.4	0.67	6.9	4.2	72.1	70.0	6	7.7
February	3.8	2.1	0.55	5.9	3.6	71.2	69.6	9	7.6
March	15.9	9.3	0.58	5.3	3.3	72.9	69.5	10	7.4
April	4.9	2.9	0.59	5.3	3.3	70.3	69.6	9	7.1
May	5.7	2.9	0.51	5.7	3.5	68.4	69.7	6	6.9
June	4.2	3.1	0.74	5.2	3.2	65.9	69.2	7	6.8
July	1.0	0.5	0.50	4.5	2.7	65.8	68.8	6	6.6
August	0.0	0.5	**			66.4		5	
September	1.5	1.1	0.73			67.1		5	
October	5.2	2.9	0.56			68.3		6	
November	6.8	4.1	0.60			68.6		3	
December	1.3	0.8	0.62			69.2		2	
				2009					
January	2.8	1.5	0.54			69.8		3	

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.

**SEC sunspot number was less than RI value, so a ratio could not be done.



Weekly Geosynchronous Satellite Environment Summary
Week Beginning 23 February 2009

GOES-11 designated Primary Electron Satellite and GOES-10 Secondary: December 1, 2008 the GOES-12 Electron sensor began experiencing periods of noise and sensor is unreliable.

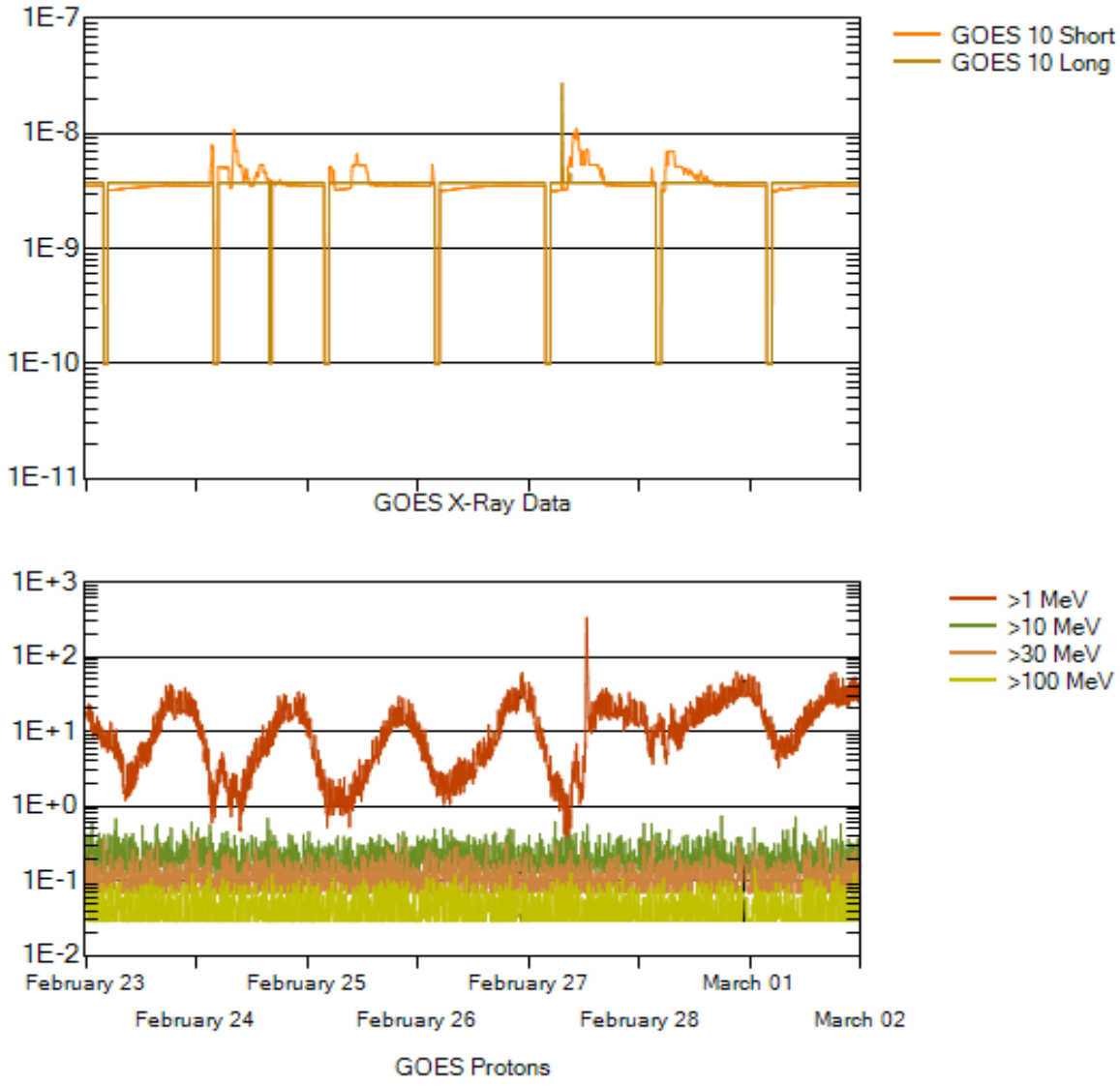
Protons plot contains the five-minute averaged integral proton flux (protons/cm^2 –sec –sr) as measured by GOES-11 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

Electrons plot contains the five-minute averaged integral electron flux (electrons/cm^2 –sec –sr) with energies greater than 2 MeV at GOES-11 (W135).

Hp plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-11. 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 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 Kp values derived from a more extensive network of magnetometers.

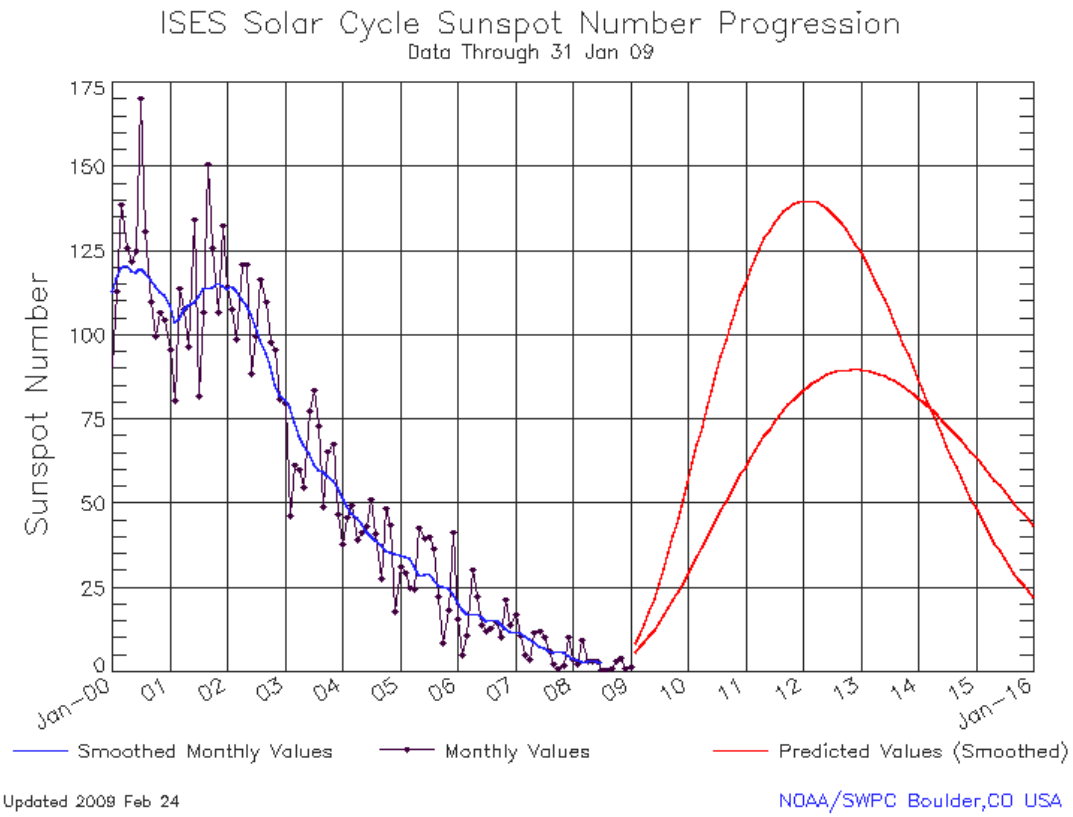
The data included here are those now available in real time at the SWPC and are incomplete in that they do not include the full set of parameters and energy ranges known to cause satellite operating anomalies. The proton and electron fluxes and Kp are "global" parameters that are applicable to a first order approximation over large areas. 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$^{2)}$ as measured by GOES 10 (W060) and GOES 11 (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.

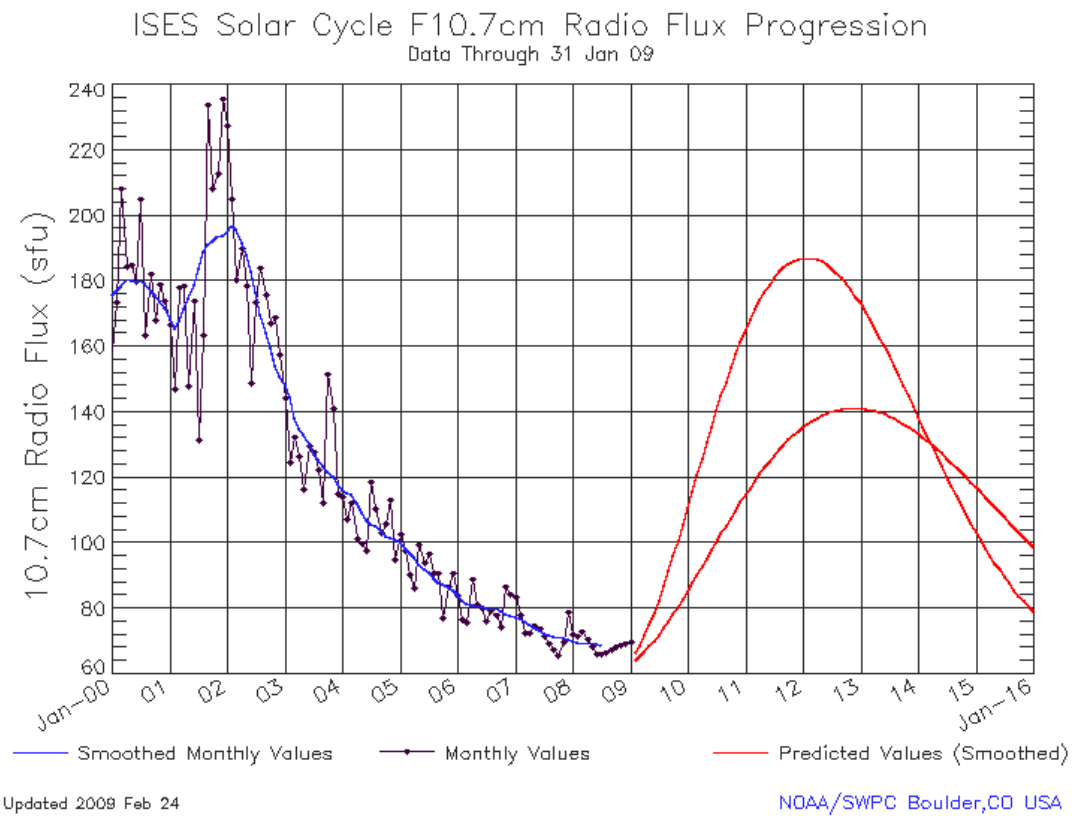
Proton plot contains the five-minute averaged integral proton flux (protons/cm^2 –sec-sr) as measured by GOES-11 (W135) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu (protons/cm^2-sec-sr) at greater than 10 MeV.



SEC Prediction of Smoothed Sunspot Number

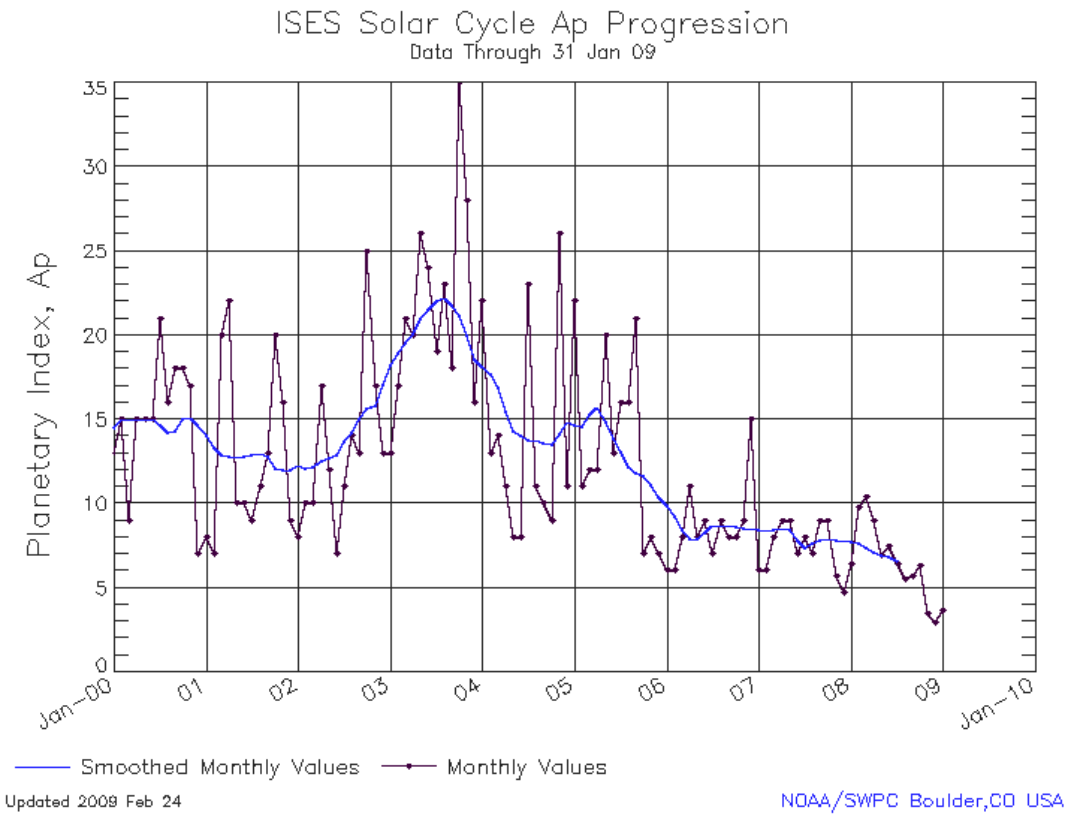
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo
2006	21	19	17	17	17	16	15	16	16	14	13	12
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)
2007	12	12	11	10	9	8	7	6	6	6	6	5
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)
2008	4	4	3	3	4	3	3	**2/2**	**3/2**	**3/2**	**4/3**	**6/4**
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(1)	(3)	(5)	(7)	(8)
2009	**8/5**	**10/6**	**13/7**	**16/9**	**19/11**	**23/12**	**27/15**	**30/16**	**35/19**	**40/21**	**45/23**	**51/26**
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(15)	(15)	(15)	(15)	(15)
2010	**56/29**	**62/31**	**67/34**	**73/37**	**78/39**	**83/42**	**88/45**	**93/48**	**98/50**	**103/53**	**107/55**	**111/58**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2011	**115/60**	**119/63**	**122/65**	**125/67**	**128/70**	**131/72**	**133/74**	**135/75**	**136/77**	**137/79**	**138/80**	**139/82**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2012	**139/3**	**139/84**	**139/85**	**139/86**	**138/87**	**137/88**	**136/88**	**134/89**	**133/89**	**131/89**	**129/89**	**127/90**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2013	**124/89**	**122/89**	**119/89**	**116/89**	**113/88**	**110/87**	**107/87**	**104/86**	**100/85**	**97/84**	**94/83**	**90/82**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2014	**87/81**	**83/80**	**80/78**	**77/77**	**73/76**	**70/74**	**67/73**	**63/71**	**60/70**	**57/68**	**54/67**	**51/65**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2015	**48/63**	**46/62**	**43/60**	**40/58**	**38/57**	**36/55**	**33/53**	**31/51**	**29/50**	**27/48**	**25/46**	**23/45**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)

Note: *Hi is for the larger solar cycle prediction, Lo is for the smaller solar cycle prediction*



SEC Prediction of Smoothed F10.7cm Radio Flux

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Hi/Lo	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**	**Hi/Lo**
2006	84	83	82	81	81	81	80	80	80	79	79	78
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)
2007	78	77	76	75	74	73	73	72	72	72	71	71
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)
2008	70	70	70	70	70	69	69	**68/62**	**68/62**	**68/61**	**68/61**	**69/61**
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(1)	(3)	(5)	(7)	(9)
2009	**70/62**	**71/62**	**73/63**	**75/64**	**78/65**	**81/66**	**84/70**	**86/74**	**91/76**	**95/78**	**100/80**	**105/82**
	(11)	(13)	(15)	(17)	(19)	(21)	(22)	(23)	(23)	(23)	(23)	(23)
2010	**110/85**	**115/87**	**120/90**	**125/92**	**130/95**	**135/97**	**140/100**	**144/102**	**149/105**	**153/107**	**157/110**	**161/112**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2011	**165/114**	**168/116**	**171/119**	**174/121**	**176/123**	**179/124**	**181/126**	**182/128**	**184/130**	**185/131**	**186/132**	**186/134**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2012	**187/135**	**187/136**	**187/137**	**186/138**	**185/139**	**185/139**	**183/140**	**182/140**	**181/140**	**179/141**	**177/141**	**175/171**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2013	**173/141**	**170/141**	**168/140**	**165/140**	**162/139**	**160/139**	**157/138**	**154/138**	**151/137**	**148/136**	**145/135**	**141/134**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2014	**138/133**	**135/132**	**132/131**	**129/129**	**126/128**	**123/127**	**120/126**	**117/124**	**114/123**	**111/121**	**108/120**	**106/118**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2015	**103/117**	**101/115**	**98/114**	**96/112**	**93/111**	**91/109**	**89/107**	**87/106**	**85/104**	**83/103**	**82/101**	**80/100**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)


ISES Solar Cycle Ap Progression
Data Through 31 Jan 09
Planetary Index, Ap
35
30
25
20
15
10
5
0
Jan-00
01
02
03
04
05
06
07
08
09
Jan-10
Smoothed Monthly Values
Monthly Values
Updated 2009 Feb 24
NOAA/SWPC Boulder,CO USA

Solar Radio Flux (10.7 cm)

Space Environment Center

January 2009
(Month 149)