Space Weather Highlights **SWO PRF 1736**
01 - 07 December 2008 **09 December 2008**

Solar activity was very low through the period. No flares were observed. The visible disk was spotless.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal levels on 01 - 05 December and at high levels on 06 - 07 December.

Geomagnetic field activity was at mostly quiet levels on 01 - 03 December. From 04 - 07 December, activity increased to unsettled to active levels, with isolated minor to major storm periods observed at high latitudes. This period of activity was due to a recurrent coronal hole that rotated into a geoeffective position. By midday on 07 December, activity decayed to mostly quiet levels and remained so through the balance of the summary period. The period began with ACE solar wind velocities at about 290 km/s. These velocities persisted through early on 03 December when wind speed gradually increased to about 325 km/s by midday on the 03rd. Velocities continued to increase through the period and reached a maximum of 570 km/s at 07/0748 UTC. During this timeframe, the Bz component of the IMF varied from a high of +8 nT (05/1746 UTC) to a low of -8 nT (05/2128 UTC) with a Bt max of 11 nT (05/2019 UTC), all associated with the coronal hole high speed stream. The summary period ended with solar wind velocity near 500 km/s.

Space Weather Outlook
10 December 2008- 05 January 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 reach high levels during 10 - 12 December and 02 - 05 January. Normal levels are expected during 13 December - 01 January.

Geomagnetic field activity is expected to be at mostly quiet levels on 10 - 12 December. Activity is expected to increase to quiet to unsettled levels on 13 December due to a recurrent coronal hole high speed stream (CH HSS). Activity is expected to decrease to quiet levels during 14 - 21 December. Activity is expected to increase to unsettled levels on 22 - 24 December due to another recurrent CH HSS. Activity is expected to decrease to quiet levels during 25 - 30 December. Activity is expected to increase to unsettled to active levels on 31 December - 02 January due to another recurrent CH HSS. Activity is expected to decrease to quiet levels during 03 - 05 January.

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
01 December	68	0	0	<A1.0	0	0	0	0	0	0	0	0
02 December	69	0	0	<A1.0	0	0	0	0	0	0	0	0
03 December	69	0	0	<A1.0	0	0	0	0	0	0	0	0
04 December	70	0	0	<A1.0	0	0	0	0	0	0	0	0
05 December	69	0	0	<A1.0	0	0	0	0	0	0	0	0
06 December	69	0	0	<A1.0	0	0	0	0	0	0	0	0
07 December	69	0	0	<A1.0	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)		
	>1 MeV	>10 MeV	>100 MeV	>.6 MeV	>2MeV	>4 MeV
01 December	1.0E+6	2.0E+4	4.5E+3		3.7E+6	
02 December	1.7E+6	2.0E+4	4.4E+3		5.4E+6	
03 December	1.5E+6	1.9E+4	4.4E+3		3.3E+6	
04 December	6.7E+5	1.9E+4	4.6E+3		7.5E+4	
05 December	1.9E+6	1.9E+4	4.3E+3		6.5E+5	
06 December	3.9E+6	1.8E+4	4.0E+3		6.3E+7	
07 December	2.0E+6	1.7E+4	3.8E+3		1.3E+8	

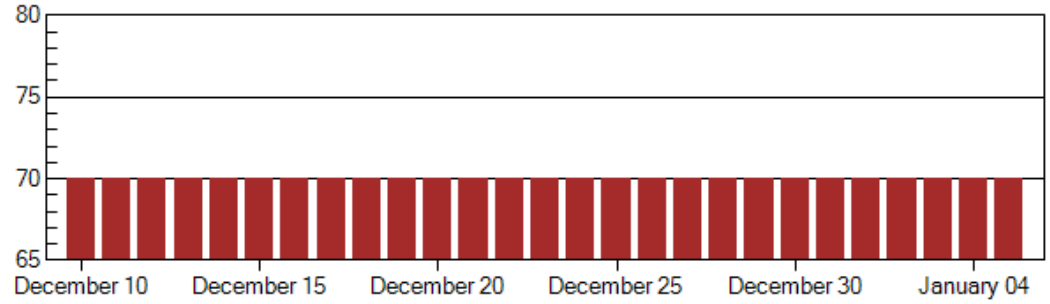
Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
01 December	0	0-0-0-0-0-0-0-0	0	0-0-0-0-0-0-0-0	0	0-0-0-0-0-0-0-0
02 December	0	0-0-0-0-1-0-0-0	0	0-0-0-0-0-0-0-0	0	0-0-0-0-0-0-0-0
03 December	4	1-1-1-1-1-1-1-2	4	0-0-0-0-2-3-1-1	4	0-1-1-0-1-2-1-2
04 December	4	1-2-1-2-2-1-0-0	20	1-3-2-6-5-2-1-0	6	1-3-1-2-2-1-0-1
05 December	7	1-1-1-3-2-2-1-3	24	0-1-5-6-3-4-3-2	10	1-1-2-4-2-3-2-1
06 December	14	4-4-3-2-2-3-2-1	26	3-3-4-6-4-4-3-1	7	2-3-3-3-0-2-1-0
07 December	6	1-2-1-3-2-2-1-0	11	1-2-1-5-3-2-2-0	6	0-2-1-3-2-2-1-1

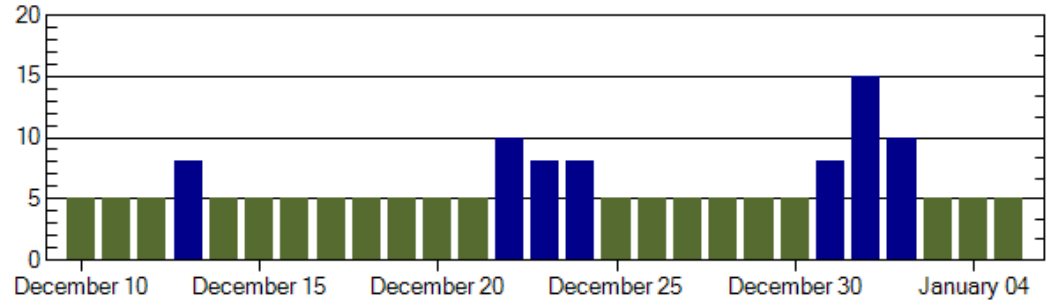
Alerts and Warnings Issued

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
05 Dec 0946	WARNING: Geomagnetic K= 4	05 Dec 0947 - 1600
05 Dec 0955	ALERT: Geomagnetic K= 4	05 Dec 0954
05 Dec 1011	WARNING: Geomagnetic K= 5	05 Dec 1011 - 1600
05 Dec 1119	ALERT: Geomagnetic K= 5	05 Dec 1119
06 Dec 0045	WARNING: Geomagnetic K= 4	06 Dec 0047 - 1600
06 Dec 0206	ALERT: Geomagnetic K= 4	06 Dec 0205
06 Dec 0407	ALERT: Geomagnetic K= 5	06 Dec 0406
06 Dec 1733	ALERT: Geomagnetic K= 4	06 Dec 1733
06 Dec 1806	ALERT: Electron 2MeV Integral Flux > 1000pfu	06 Dec 1750
07 Dec 1130	ALERT: Electron 2MeV Integral Flux > 1000pfu	07 Dec 1115

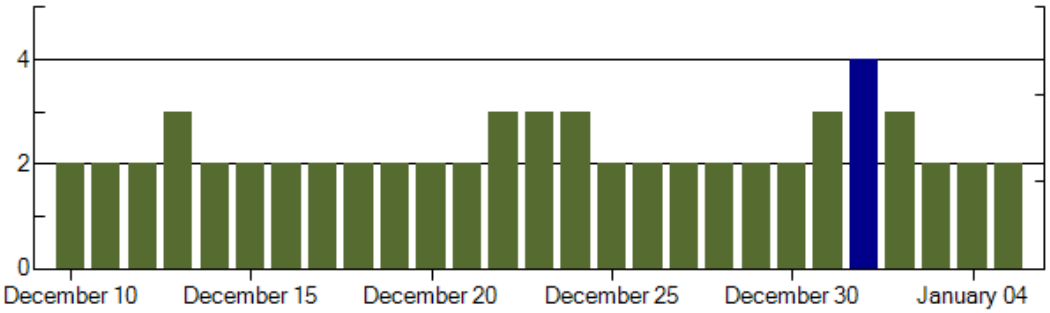
Twenty-seven Day Outlook



10.7 cm



Ap Index



Largest Daily Kp Index

Date	Radio Flux 10.7 cm	Planetary A Index	Largest Kp Index	Date	Radio Flux 10.7 cm	Planetary A Index	Largest Kp Index
10 Dec	70	5	2	24 Dec	70	8	3
11	70	5	2	25	70	5	2
12	70	5	2	26	70	5	2
13	70	8	2	27	70	5	2
14	70	5	2	28	70	5	2
15	70	5	2	29	70	5	2
16	70	5	2	30	70	5	2
17	70	5	2	31	70	8	3
18	70	5	2	01 Jan	70	15	4
19	70	5	2	02	70	10	3
20	70	5	2	03	70	5	2
21	70	5	2	04	70	5	2
22	70	10	3	05	70	5	2
23	70	8	3				

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	Optical Information Location 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
01 December	No Flares Observed						
02 December	No Flares Observed						
03 December	No Flares Observed						
04 December	No Flares Observed						
05 December	No Flares Observed						
06 December	No Flares Observed						
07 December	No Flares Observed						

Region Summary

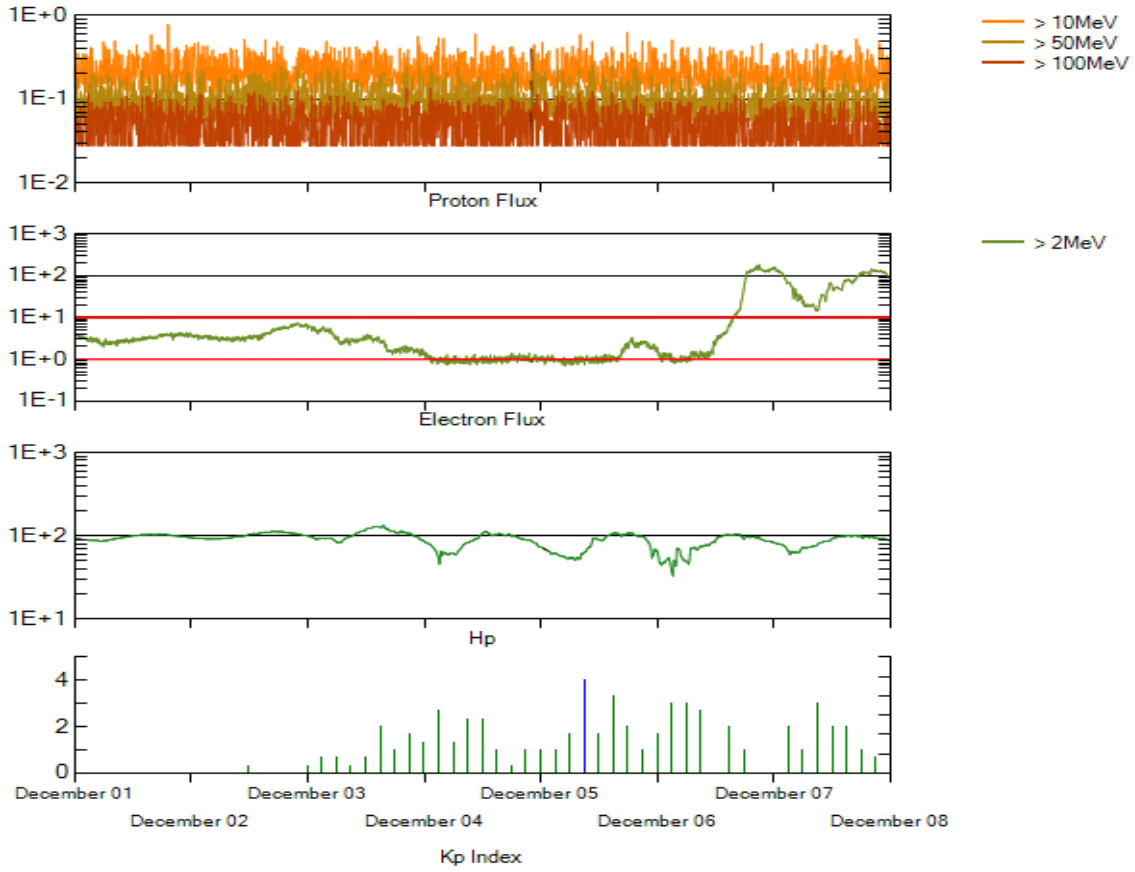
Date	Location (° Lat ° CMD)	Location Helio Lon	Sunspot Characteristics Area (10^{-6} hemi)	Sunspot Characteristics Extent (helio)	Sunspot Characteristics Spot Class	Sunspot Characteristics Spot Count	Sunspot Characteristics Mag Class	Flares X-ray C	Flares X-ray M	Flares X-ray X	Flares Optical S	Flares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

No Regions Reported

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
				2006					
November	31.5	21.5	0.68	22.3	12.7	86.4	78.5	9	8.5
December	22.2	13.6	0.61	20.7	12.1	84.3	77.9	15	8.5
				2007					
January	26.6	16.9	0.64	19.7	12.0	83.5	77.5	6	8.4
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			68.4		6	
June	4.2	3.1	0.74			65.9		7	
July	1.0	0.5	0.50			65.8		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	

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 01 December 2008

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.

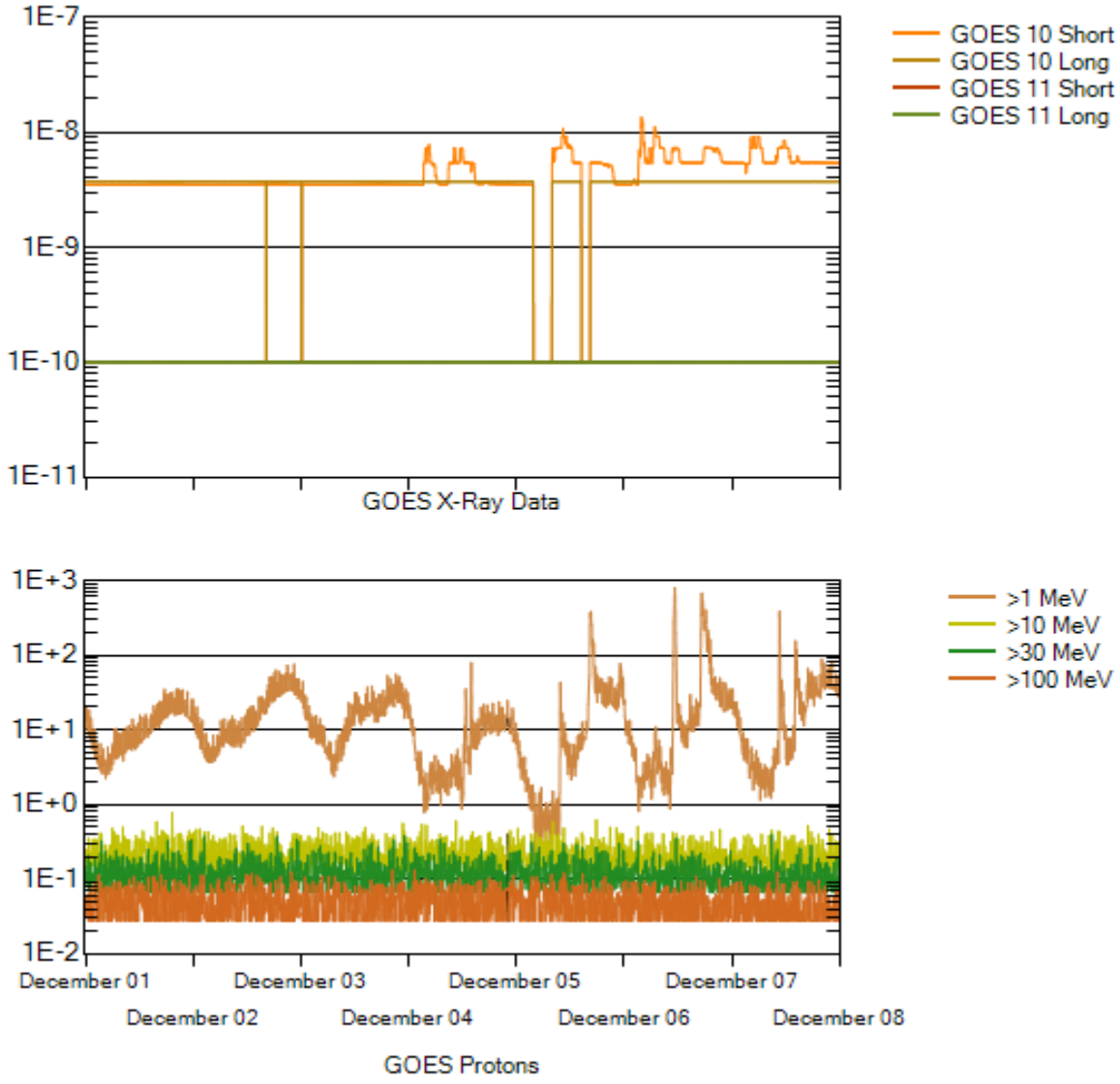
Protons plot contains the five-minute averaged integral proton flux (protons/cm^2 –sec –sr) as measured by GOES-11 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

Electrons plot contains the five-minute averaged integral electron flux (electrons/cm^2 –sec –sr) with energies greater than 2 MeV at GOES-12 (W075).

Hp 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.

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.

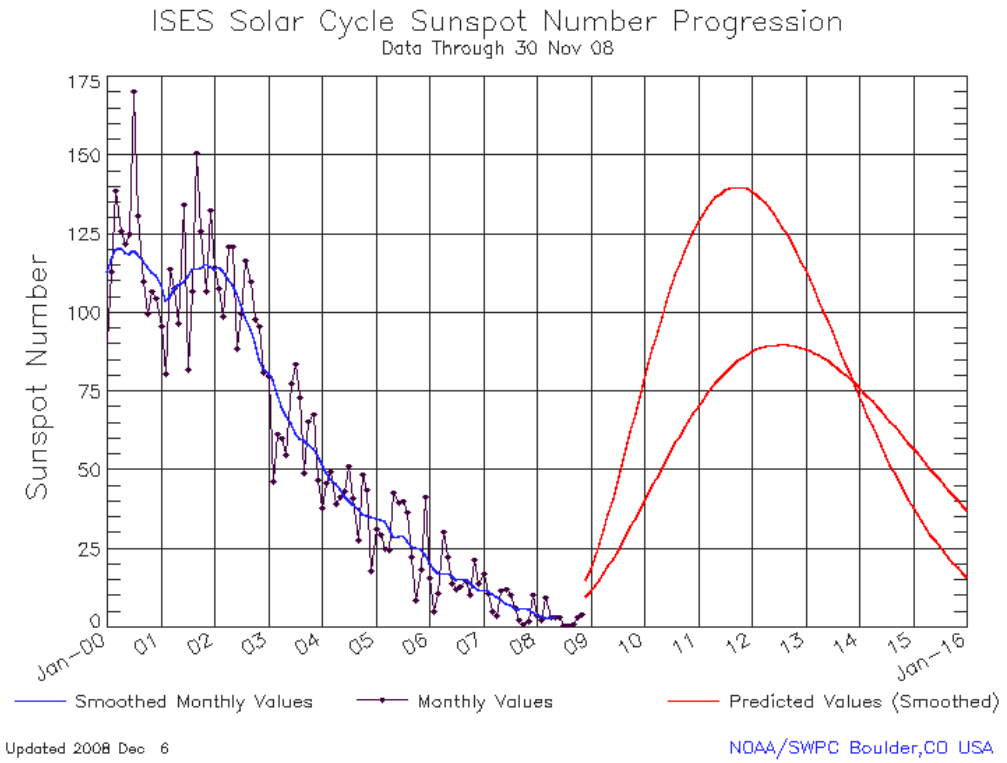
The data included here are those now available in real time at the SEC and are incomplete in that they do not include the full set of parameters and energy ranges known to cause satellite operating anomalies. The proton and electron fluxes and Kp are "global" parameters that are applicable to a first 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.

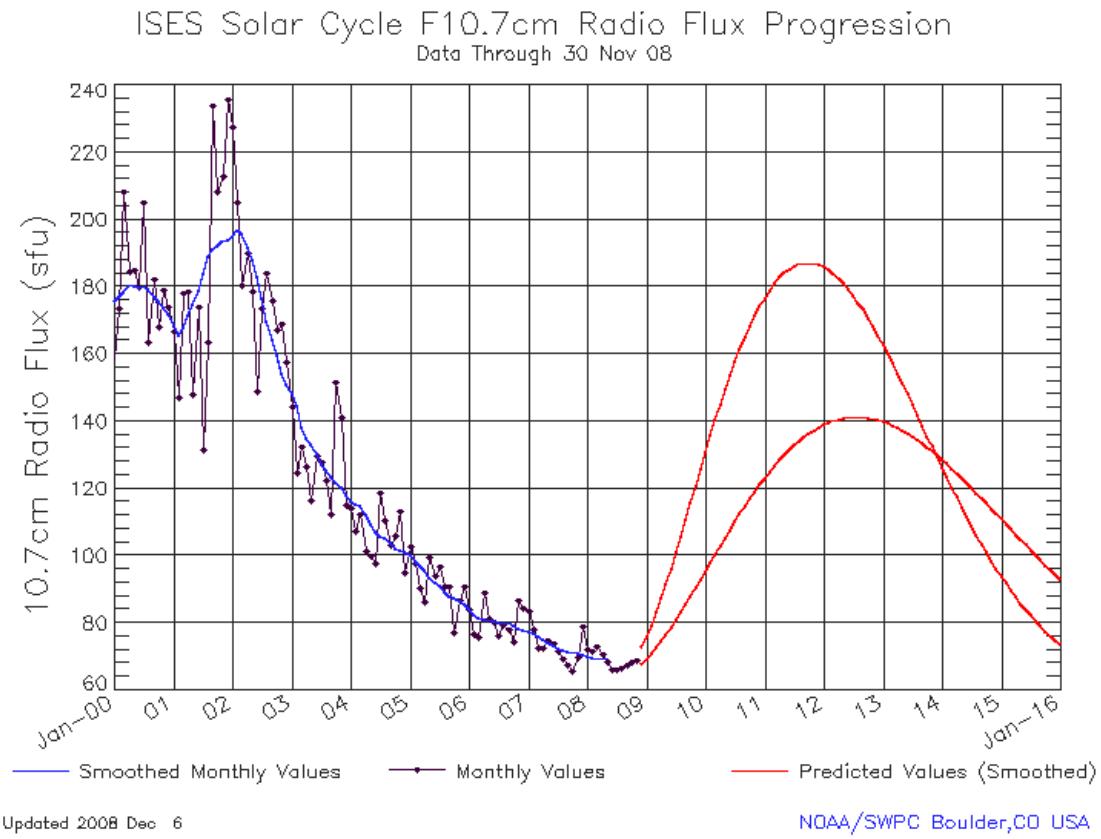
Proton plot contains the five-minute averaged integral proton flux (protons/cm^2 –sec-sr) as measured by GOES-11 (W135) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu (protons/cm^2-sec-sr) at greater than 10 MeV.



SEC Prediction of Smoothed Sunspot Number

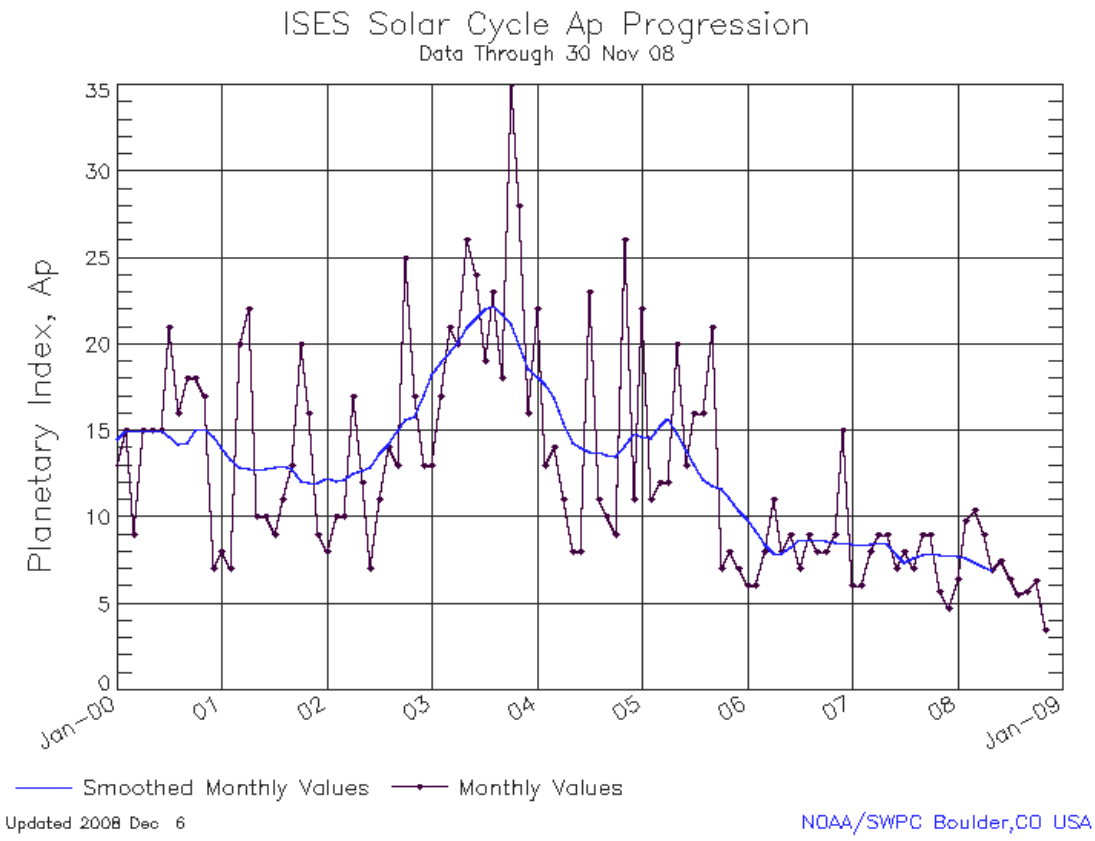
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo	Hi/Lo
2006	21	19	17	17	17	16	15	16	16	14	13	12
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)
2007	12	12	11	10	9	8	7	6	6	6	6	5
	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)	(***)
2008	4	4	3	3	4	**4/3**	**5/4**	**6/4**	**8/5**	**10/6**	**12/7**	**15/9**
	(***)	(***)	(***)	(***)	(***)	(1)	(3)	(5)	(7)	(8)	(9)	(10)
2009	**19/10**	**23/13**	**27/15**	**32/17**	**37/20**	**41/22**	**46/24**	**52/27**	**57/29**	**62/32**	**68/35**	**73/37**
	(11)	(12)	(13)	(14)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2010	**79/40**	**84/43**	**89/45**	**94/48**	**99/51**	**103/53**	**108/56**	**112/59**	**116/61**	**119/63**	**123/66**	**126/68**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2011	**129/70**	**131/72**	**133/74**	**135/76**	**137/78**	**138/79**	**139/81**	**140/82**	**140/84**	**140/85**	**140/86**	**139/87**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2012	**139/88**	**138/88**	**136/89**	**135/89**	**133/90**	**131/90**	**129/90**	**127/90**	**125/90**	**122/90**	**119/89**	**116/89**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2013	**114/89**	**110/88**	**107/87**	**104/86**	**101/86**	**97/85**	**94/84**	**91/83**	**87/81**	**84/80**	**80/79**	**77/78**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2014	**74/76**	**70/75**	**67/73**	**64/72**	**61/70**	**58/69**	**55/67**	**52/65**	**49/64**	**46/62**	**44/60**	**41/59**
	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
2015	**38/57**	**36/55**	**34/54**	**32/52**	**30/50**	**28/49**	**26/47**	**24/45**	**22/44**	**21/42**	**19/40**	**18/39**
	(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	**69/64**	**69/63**	**70/63**	**71/63**	**72/63**	**73/63**	**76/64**
	(***)	(***)	(***)	(***)	(***)	(1)	(3)	(5)	(7)	(9)	(11)	(13)
2009	**78/66**	**82/67**	**85/68**	**89/70**	**93/74**	**96/79**	**101/81**	**106/83**	**111/86**	**116/88**	**121/90**	**126/93**
	(15)	(17)	(19)	(21)	(22)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2010	**131/95**	**136/98**	**140/100**	**145/103**	**149/105**	**154/108**	**158/110**	**161/112**	**165/115**	**168/117**	**171/119**	**174/121**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2011	**177/123**	**179/125**	**181/127**	**183/128**	**184/130**	**185/132**	**186/133**	**187/134**	**187/135**	**187/136**	**187/137**	**187/138**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2012	**186/139**	**185/140**	**184/140**	**183/141**	**181/141**	**179/141**	**177/141**	**175/141**	**173/141**	**171/141**	**168/141**	**166/140**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2013	**163/140**	**160/139**	**157/139**	**154/138**	**151/137**	**148/136**	**145/136**	**142/135**	**139/134**	**136/132**	**133/131**	**129/130**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2014	**126/129**	**123/127**	**120/126**	**117/125**	**115/123**	**112/122**	**109/120**	**106/119**	**104/117**	**101/116**	**99/114**	**96/113**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2015	**94/111**	**92/110**	**90/108**	**88/106**	**86/105**	**84/103**	**82/102**	**81/100**	**79/99**	**78/97**	**76/96**	**75/94**
	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)


ISES Solar Cycle Ap Progression
Data Through 30 Nov 08
Planetary Index, Ap
35
30
25
20
15
10
5
0
Jan-00
01
02
03
04
05
06
07
08
Jan-09
Smoothed Monthly Values
Monthly Values
Updated 2008 Dec 6
NOAA/SWPC Boulder,CO USA