

Space Weather Highlights
29 December - 04 January 2009

SWO PRF 1740
06 January 2009

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

No proton events were observed at geosynchronous orbit.

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

Geomagnetic field activity was at quiet levels at all latitudes on 29-30 December. By 31 December, field activity increased to quiet to unsettled, with periods of active to minor storm levels observed at high latitudes on 31 December and 01 January. This activity was due to a co-rotating interaction region, followed by a recurrent coronal hole high-speed stream. These conditions persisted through midday on 01 January when the field returned to quiet levels. By early on 03 January, the field returned to mostly unsettled levels with an isolated major storm period observed at high latitudes midday on the 3rd. This activity was due to a secondary increase in wind speed from the same coronal hole. By late on the 3rd, the field returned to quiet levels and remained so for the balance of the summary period. ACE solar wind measurements began the period with a speed of about 310 km/s, reached a preliminary high of 559 km/s at 31/1141 UTC, with a secondary high of 555 km/s at 03/1442 UTC, and ended the summary period at about 435 km/s. The Bz component of the IMF ranged between -16 nT (31/0131 UTC) and +14 nT (31/0004UTC).

Space Weather Outlook
07 January - 02 February 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 be at normal background levels the entire forecast period.

The geomagnetic field is expected to be at quiet levels during 07 - 17 January. Field activity is expected to increase to quiet to unsettled levels, with isolated active periods at high latitudes during 18 - 19 January due to a recurrent coronal hole high speed stream (CH HSS). Activity is expected to decrease to quiet levels during 20 - 26 January. Activity is expected to increase to quiet to unsettled levels, with isolated active levels at high latitudes during 27 - 30 January due to another recurrent CH HSS. Activity is expected to decrease to quiet levels during 31 January - 02 February.



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
29 December	70	0	0	<A1.0	0	0	0	0	0	0	0	0
30 December	69	0	0	<A1.0	0	0	0	0	0	0	0	0
31 December	69	0	0	<A1.0	0	0	0	0	0	0	0	0
01 January	69	0	0	<A1.0	0	0	0	0	0	0	0	0
02 January	70	0	0	<A1.0	0	0	0	0	0	0	0	0
03 January	70	0	0	<A1.0	0	0	0	0	0	0	0	0
04 January	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
29 December	7.8E+5	1.9E+4	4.4E+3		2.9E+6	
30 December	1.8E+6	2.0E+4	4.7E+3		4.6E+6	
31 December	1.5E+6	1.8E+4	3.9E+3		5.4E+5	
01 January	7.5E+5	1.8E+4	4.1E+3		8.3E+5	
02 January	1.0E+6	1.8E+4	4.0E+3		2.9E+6	
03 January	1.6E+6	1.8E+4	4.0E+3		8.1E+6	
04 January	6.2E+5	1.9E+4	4.0E+3		1.6E+7	

Daily Geomagnetic Data

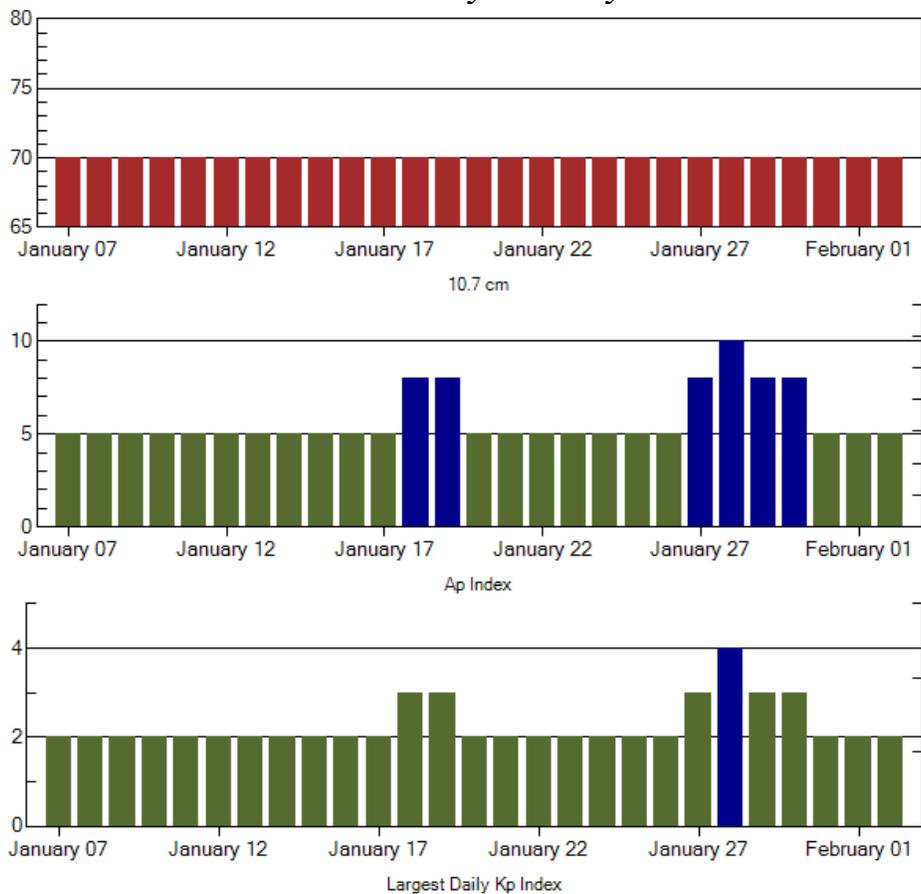
Date	Middle Latitude		High Latitude		Estimated	
	Fredericksburg		College		Planetary	
	A	K-indices	A	K-indices	A	K-indices
29 December	1	0-0-0-0-0-1-1-0	0	0-0-0-1-0-0-0-0	0	0-0-0-0-0-0-0-0
30 December	1	0-0-0-0-0-1-0-1	0	0-0-0-0-0-0-0-0	1	0-0-0-0-0-0-0-2
31 December	8	3-2-3-2-2-2-1-1	13	1-3-3-5-2-2-1-2	10	3-3-3-3-2-1-2-2
01 January	5	1-2-2-2-1-1-1-1	12	1-1-4-4-4-2-0-0	6	1-2-3-3-2-1-0-1
02 January	3	0-1-0-0-1-2-2-2	2	0-0-0-0-1-1-1-2	3	0-1-0-0-1-1-2-2
03 January	8	3-3-2-3-2-1-0-1	15	1-1-2-6-2-3-1-1	9	3-3-2-4-2-2-0-1
04 January	5	2-1-0-2-1-1-1-3	3	1-0-0-2-1-2-1-0	4	2-1-0-1-1-2-1-0

Alerts and Warnings Issued

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
31 Dec 0636	WARNING: Geomagnetic K=4	31 Dec 0640 - 1600
31 Dec 0642	ALERT: Geomagnetic K=4	31 Dec 0642
03 Jan 0931	ALERT: Geomagnetic K=4	03 Jan 0926



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
07 Jan	70	5	2	21 Jan	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	5	2	27	70	8	3
14	70	5	2	28	70	10	4
15	70	5	2	29	70	8	3
16	70	5	2	30	70	8	3
17	70	5	2	31	70	5	2
18	70	8	3	01 Feb	70	5	2
19	70	8	3	02 Feb	70	5	2
20	70	5	2				



Energetic Events

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

No Events Observed

Flare List

Date	Time			X-ray	Imp /	Location	Rgn
	Begin	Max	End	Class.	Brtns	Lat	CMD
29 Dec	<i>No Flares Observed</i>						
30 Dec	<i>No Flares Observed</i>						
31 Dec	<i>No Flares Observed</i>						
01 Jan	<i>No Flares Observed</i>						
02 Jan	<i>No Flares Observed</i>						
03 Jan	<i>No Flares Observed</i>						
04 Jan	<i>No Flares Observed</i>						

Region Summary

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

No active regions.



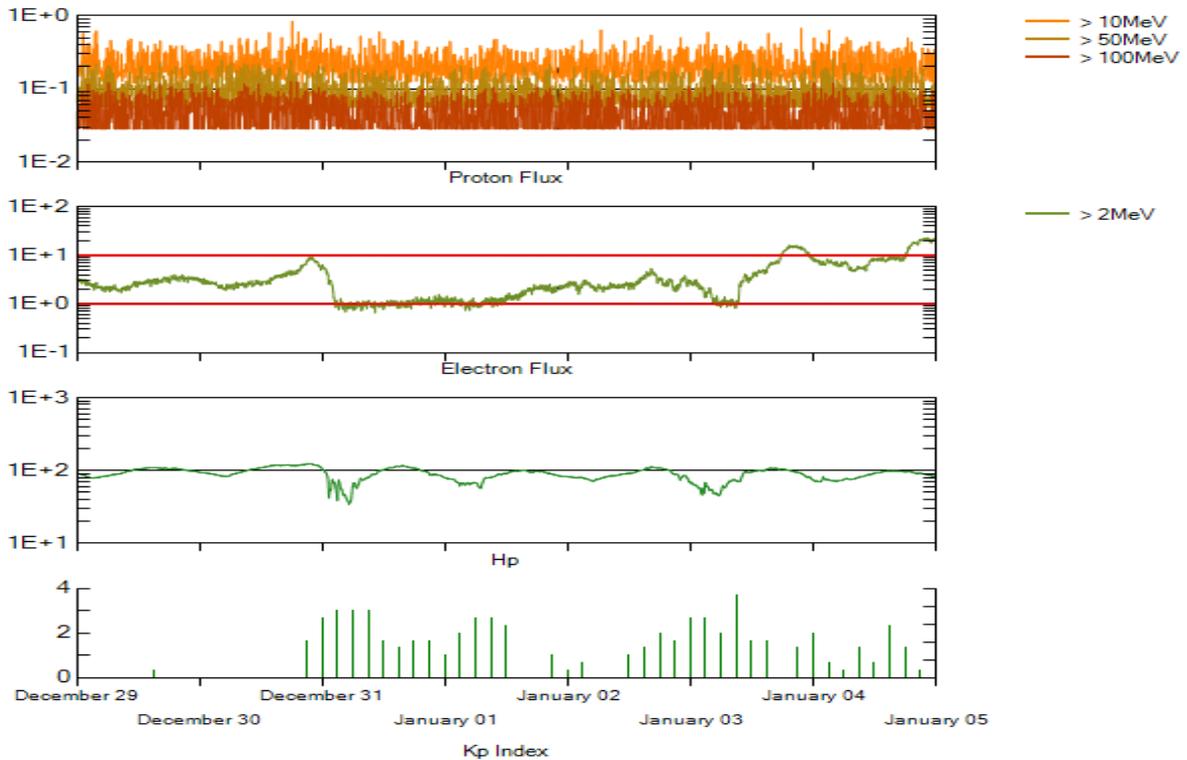
Recent Solar Indices (preliminary)
Of the observed monthly mean values

Month	Sunspot Numbers			Radio Flux		Geomagnetic			
	Observed values SEC	Ratio RI	Ratio RI/SEC	Smooth values SEC	Smooth values RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth 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 29 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/cm²-sec -sr) as measured by GOES-11 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

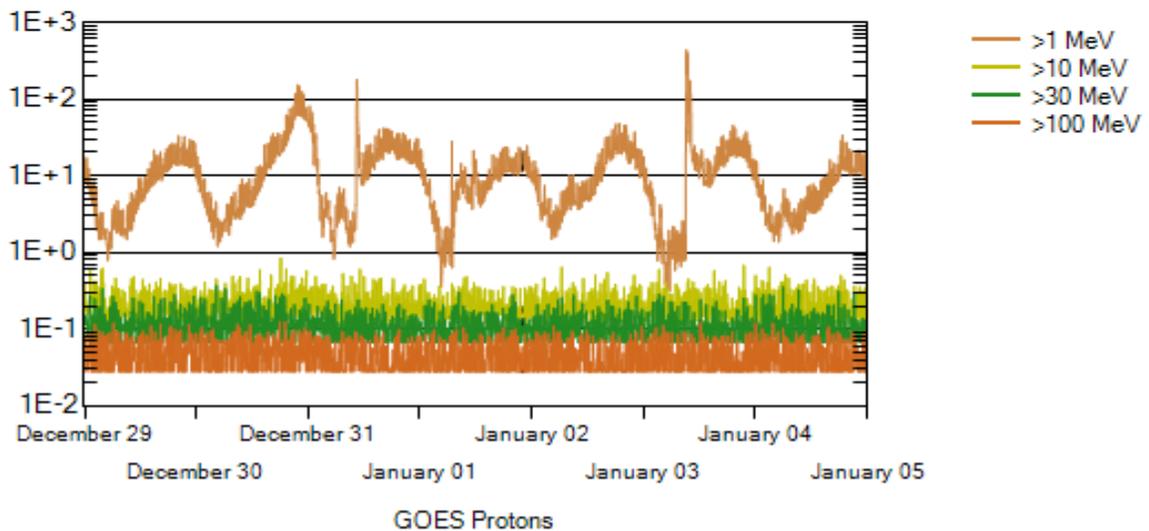
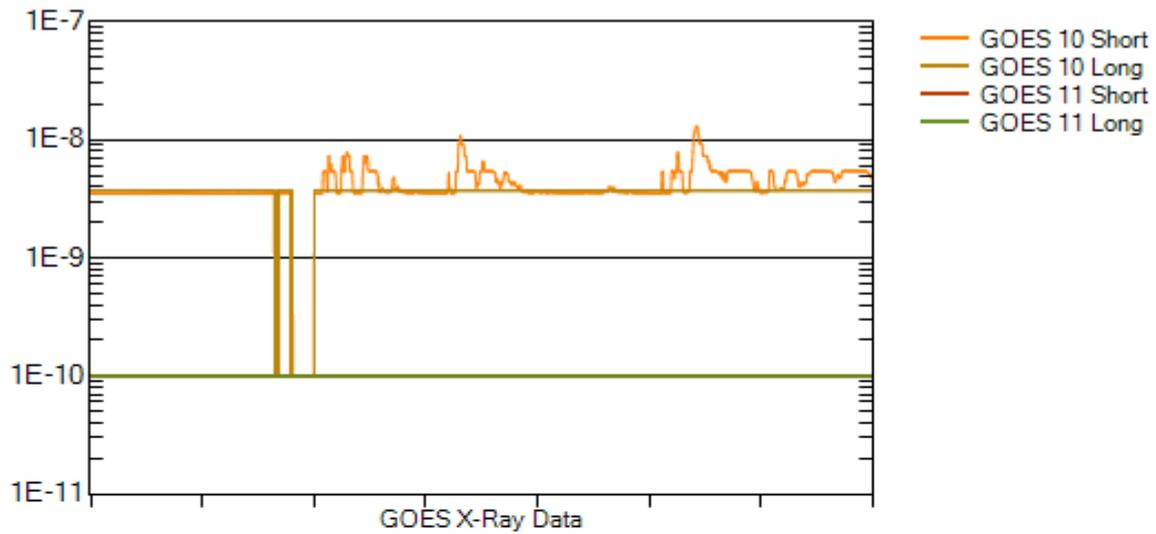
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-11 (W135).

Hp plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-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 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

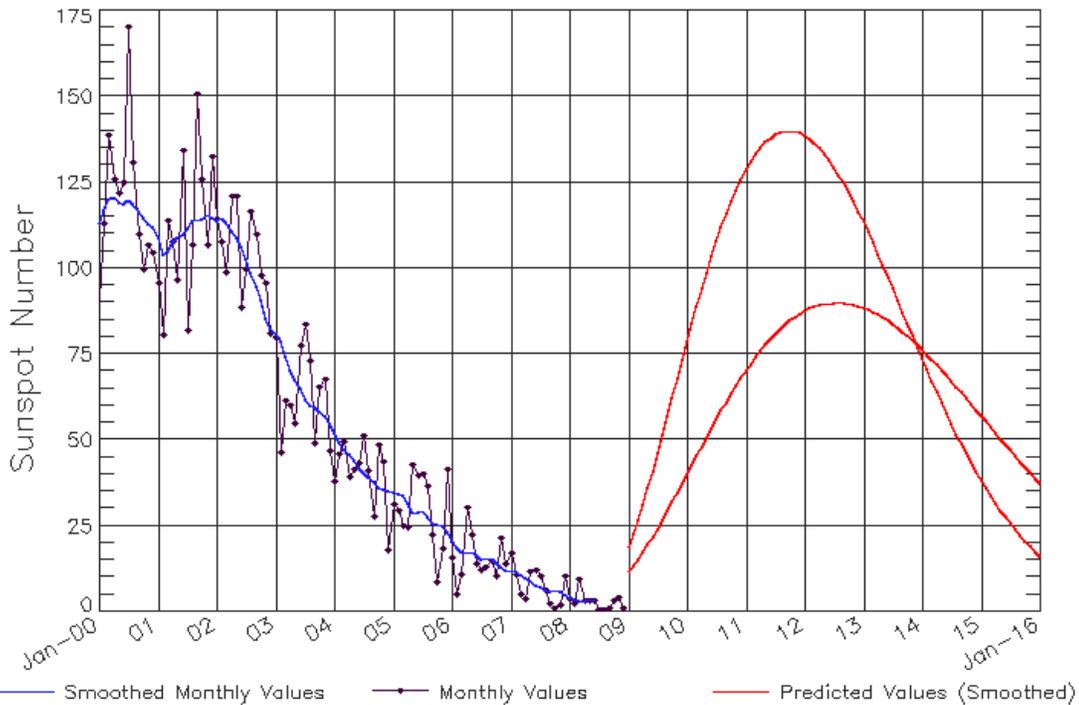
X-ray plot contains five-minute averaged x-ray flux (watts/m^2) as measured by GOES 10 (W060) and GOES 11 (W135) in two wavelength bands, .05 - .4 and .1 - .8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 - .8 nm band.

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



ISES Solar Cycle Sunspot Number Progression

Data Through 31 Dec 08



Updated 2009 Jan 3

NOAA/SWPC Boulder, CO USA

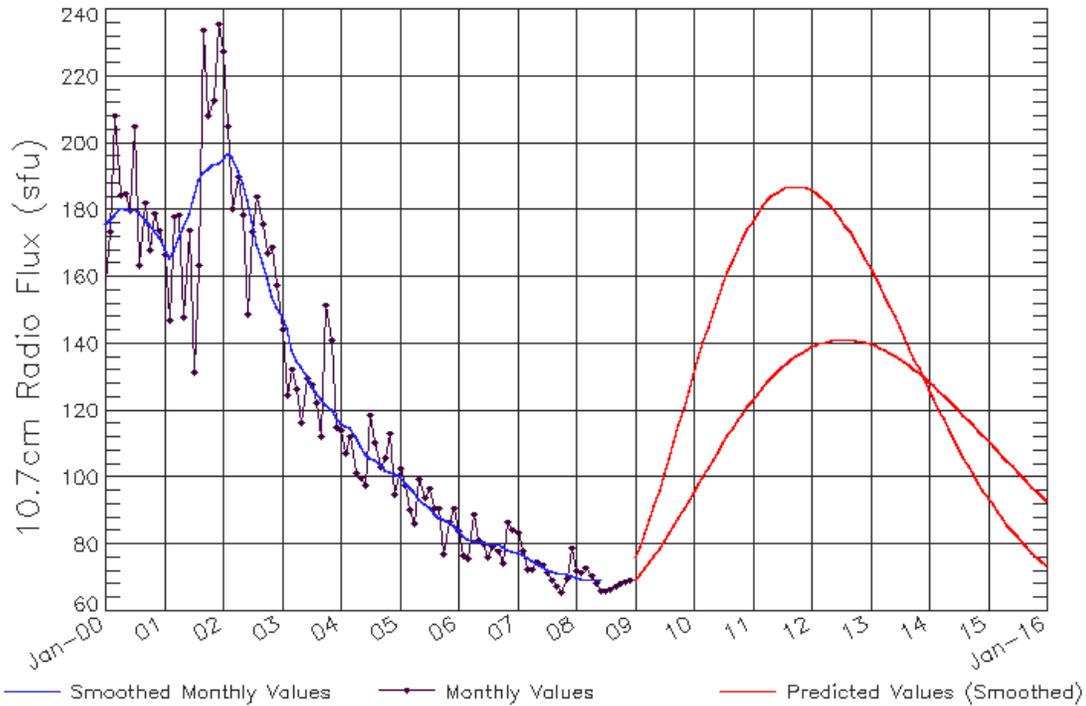
SEC Prediction of Smoothed Sunspot Number

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	3/3	5/4	7/5	8/5	11/7	14/8
	(***)	(***)	(***)	(***)	(***)	(***)	(1)	(3)	(5)	(7)	(8)	(9)
2009	17/10	21/12	26/14	31/17	36/19	42/22	46/24	52/27	57/29	62/32	68/35	73/37
	(10)	(11)	(12)	(13)	(14)	(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

ISES Solar Cycle F10.7cm Radio Flux Progression
Data Through 31 Dec 08



Updated 2009 Jan 3

NOAA/SWPC Boulder, CO USA

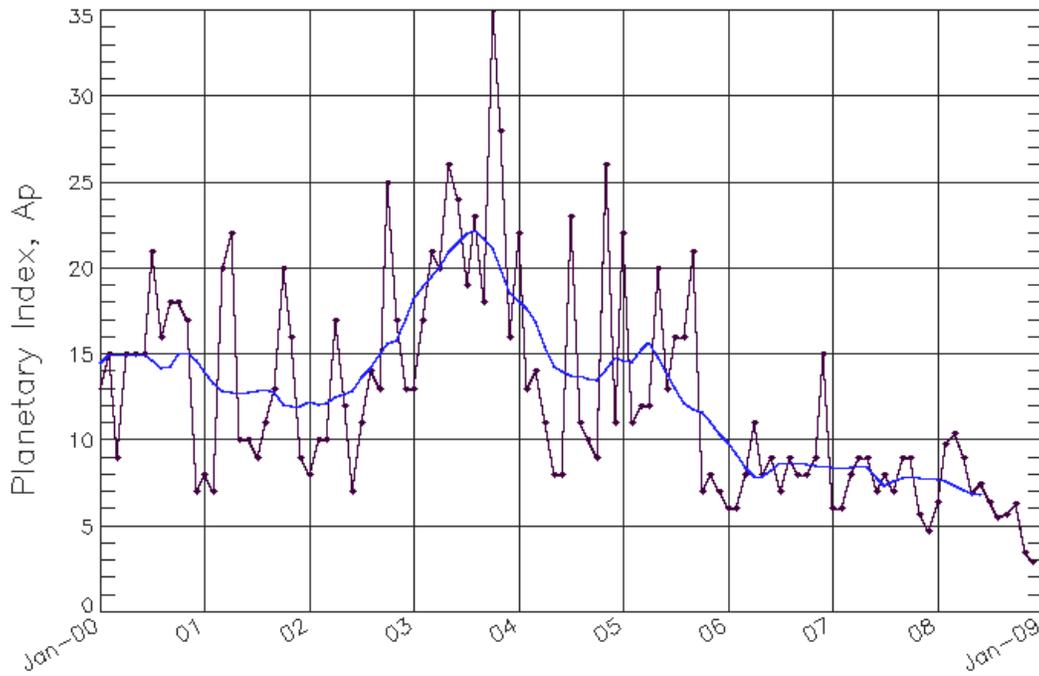
SEC Prediction of Smoothed F10.7cm Radio Flux

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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 (1)	69/63 (1)	70/63 (3)	70/63 (5)	71/63 (7)	73/64 (9)	75/64 (11)
2009	78/66 (13)	81/67 (15)	85/68 (17)	89/70 (19)	93/72 (21)	97/76 (22)	101/81 (23)	106/83 (23)	111/86 (23)	116/88 (23)	121/90 (23)	126/93 (23)
2010	131/95 (23)	136/98 (23)	140/100 (23)	145/103 (23)	149/105 (23)	154/108 (23)	158/110 (23)	161/112 (23)	165/115 (23)	168/117 (23)	171/119 (23)	174/121 (23)
2011	177/123 (23)	179/125 (23)	181/127 (23)	183/128 (23)	184/130 (23)	185/132 (23)	186/133 (23)	187/134 (23)	187/135 (23)	187/136 (23)	187/137 (23)	187/138 (23)
2012	186/139 (23)	185/140 (23)	184/140 (23)	183/141 (23)	181/141 (23)	179/141 (23)	177/141 (23)	175/141 (23)	173/141 (23)	171/141 (23)	168/141 (23)	166/140 (23)
2013	163/140 (23)	160/139 (23)	157/139 (23)	154/138 (23)	151/137 (23)	148/136 (23)	145/136 (23)	142/135 (23)	139/134 (23)	136/132 (23)	133/131 (23)	129/130 (23)
2014	126/129 (23)	123/127 (23)	120/126 (23)	117/125 (23)	115/123 (23)	112/122 (23)	109/120 (23)	106/119 (23)	104/117 (23)	101/116 (23)	99/114 (23)	96/113 (23)
2015	94/111 (23)	92/110 (23)	90/108 (23)	88/106 (23)	86/105 (23)	84/103 (23)	82/102 (23)	81/100 (23)	79/99 (23)	78/97 (23)	76/96 (23)	75/94 (23)



ISES Solar Cycle Ap Progression

Data Through 31 Dec 08



— Smoothed Monthly Values —●— Monthly Values

Updated 2009 Jan 3

NOAA/SWPC Boulder, CO USA





Space
Environment
Center

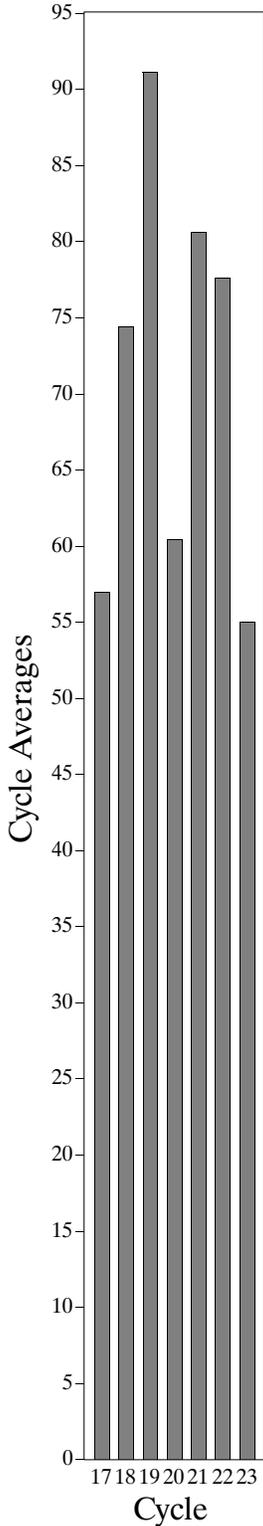
Sunspot Number (RI)

December 2008
(Month 147)

Preliminary data



Comparison of Cycles
at current month in cycle



N.Cohen

