

Space Weather Highlights
26 October – 01 November 2009

SWO PRF 1783
03 November 2009

Solar activity was very low to low. The week began with Region 1029 (N17, L=213, class/area Eko/380 on 29 October) as the only spotted region on the disk. The group kept activity at low levels as it produced numerous B-flares and occasional C-flares during 26-28 October. Activity levels decreased to very low levels for 29-30 October with a few B-flares, then returned to low levels with a single C-flare on the 31st, and once again declined to very low levels with a single B-flare on 1 November. Region 1029 rotated around the west limb early on 1 November, leaving behind a spotless disk. In addition to the above activity, a slow coronal mass ejection was observed to enter the LASCO C3 field of view off the southwest limb at 0501 UTC on 31 October which had an estimated plane-of-sky speed of 380 km/s. Disk imagery showed the formation of an arcade of coronal loops in the southwest in association with this CME.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was predominantly at normal levels for most of the period with the exception of brief periods of moderate levels on 27, 28, and 29 October.

The geomagnetic field was quiet from the beginning of the summary period through most of 29 October. An increase to unsettled levels was observed late on 29 October and intensified to unsettled to active with some minor storm periods at high latitudes from 0000-1200 UTC on 30 October. Activity levels returned to quiet for the remainder of the interval. Solar wind observations from the ACE spacecraft indicated a sector transition from positive orientation (away) to negative orientation (towards) between 0553 UTC on 29 October through early on 01 November. During the transition of this solar sector boundary the interplanetary magnetic field (IMF) showed an enhancement of total field up to about 11 nT and the Z-component (in GSM coordinates), Bz, rotated from positive 10 nT (at 1059 UTC on 29 October) through -7 nT (at 2300 UTC on 30 October). The interval of enhanced negative Bz was well associated with the increase in geomagnetic activity seen late on the 29th through midday on the 30th.

Space Weather Outlook

04 November 2009 – 30 November 2009

Solar activity is expected to be very low to low. There may be a small increase in background levels from 15-27 November due to the return of Region 1029.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at normal levels through the period.

The geomagnetic field is expected to be quiet for 04 November but is expected to increase to mostly unsettled on 05 November due to possible effects from the CME that occurred on 31 October (as described above). Quiet conditions should return on 3 November, followed by a small increase to quiet to unsettled levels on 7 November due to a recurrent high speed stream. Activity levels should return to predominantly quiet levels for 8- 25 November. A small increase



to unsettled levels is possible due to recurrence on 26 November. Activity is expected to return to mostly quiet levels for 27-30 November.

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
26 October	81	29	190	A6.2	3	0	0	4	0	0	0	0
27 October	82	29	260	A4.2	5	0	0	3	0	0	0	0
28 October	80	26	340	A4.4	1	0	0	1	0	0	0	0
29 October	77	19	380	A2.7	0	0	0	0	0	0	0	0
30 October	75	13	320	A2.8	0	0	0	0	0	0	0	0
31 October	75	0	0	A7.5	1	0	0	0	0	0	0	0
01 November	72	0	0	A1.4	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
	26 October	3.6e+05	1.9e+04	4.2e+03		3.5e+06
27 October	3.0e+05	2.0e+04	4.5e+03		3.9e+06	
28 October	3.4e+05	1.9e+04	4.4e+03		4.1e+06	
29 October	1.6e+06	2.0e+04	4.2e+03		5.5e+06	
30 October	9.2e+05	2.0e+04	4.2e+03		1.1e+06	
31 October	8.8e+05	2.0e+04	4.4e+03		1.4e+06	
01 November	8.5e+05	1.9e+04	4.4e+03		2.0e+06	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	26 October	3	1-0-1-1-0-2-2-1	3	0-0-2-2-0-0-1-1	3
27 October	2	1-0-1-0-1-1-2-0	2	0-0-2-0-2-0-0-0	3	1-0-1-0-1-1-1-1
28 October	3	2-1-1-2-1-1-0-0	*	*-*-*-*-*-*-*	2	1-0-1-2-0-0-0-1
29 October	5	1-1-1-0-2-1-3-1	1	0-0-0-0-0-0-2-0	7	0-2-1-2-2-3-2-2
30 October	8	3-3-3-3-1-0-0-0	15	1-3-5-5-1-1-0-0	11	3-4-4-3-1-1-0-2
31 October	1	0-0-0-0-0-0-1-1	1	0-0-0-1-1-0-0-1	1	0-0-0-0-1-0-0-1
01 November	2	0-2-1-0-0-0-1-0	0	0-0-0-1-0-0-0-0	2	0-1-0-0-0-1-0-0

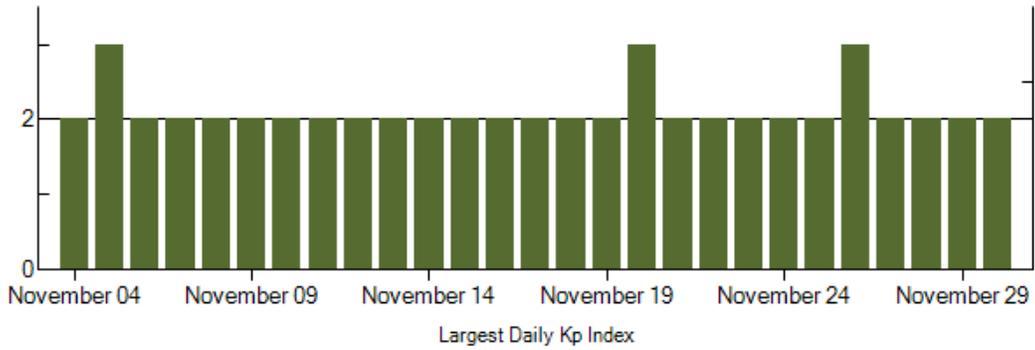
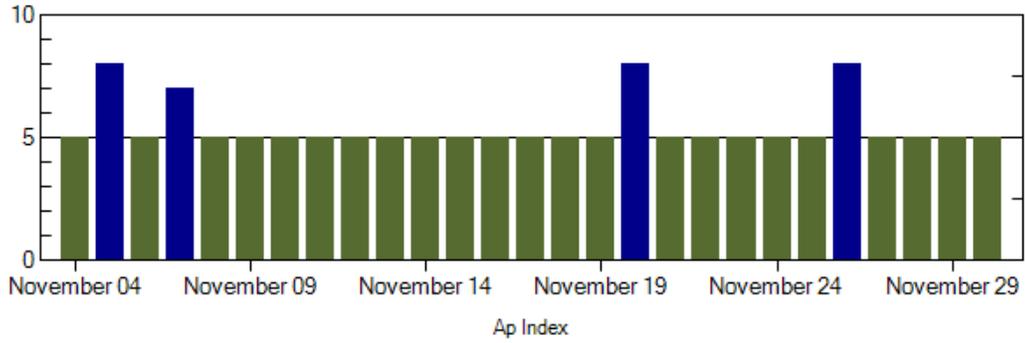
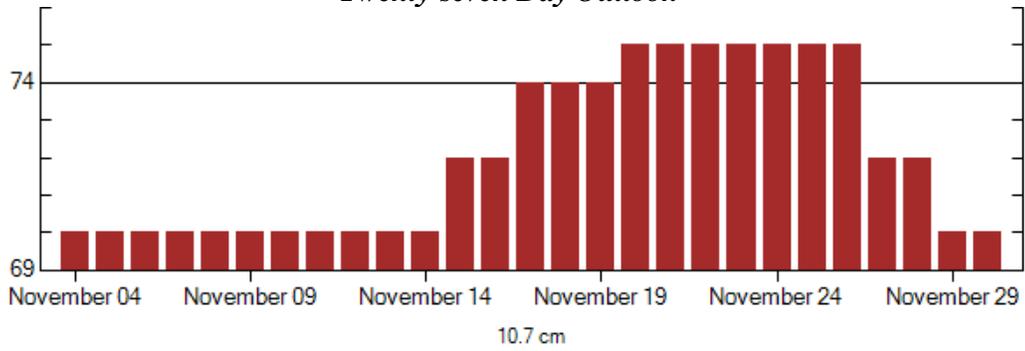


Alerts and Warnings Issued

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
30 Oct 0437	ALERT: Geomagnetic K = 4	30 Oct 0437
30 Oct 0708	WARNING: Geomagnetic K = 4	30 Oct 0708 - 1600
30 Oct 0714	ALERT: Geomagnetic K = 4	30 Oct 0713



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 Nov	70	5	2	18 Nov	74	5	2
05 Nov	70	8	3	19 Nov	74	5	2
06 Nov	70	5	2	20 Nov	75	8	3
07 Nov	70	7	2	21 Nov	75	5	2
08 Nov	70	5	2	22 Nov	75	5	2
09 Nov	70	5	2	23 Nov	75	5	2
10 Nov	70	5	2	24 Nov	75	5	2
11 Nov	70	5	2	25 Nov	75	5	2
12 Nov	70	5	2	26 Nov	75	8	3
13 Nov	70	5	2	27 Nov	72	5	2
14 Nov	70	5	2	28 Nov	72	5	2
15 Nov	72	5	2	29 Nov	70	5	2
16 Nov	72	5	2	30 Nov	70	5	2
17 Nov	74	5	2				



Energetic Events

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

No Events Observed

Flare List

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn
	Begin	Max	End			Location	Lat CMD	
26 October	0544	0608	0617	B2.0				
	0625	0630	0636	B1.7				
	0656	0700	0703	B1.8				
	0750	0753	0759	B1.0				
	0824	0827	0833	B1.0				
	0836	0839	0842	B1.0				
	0856	0901	0911	B1.5				
	1144	1152	1209	B1.7				
	1314	1326	1338	B4.1				
	1438	1448	1456	B1.7				
	1522	1526	1532	B1.7				
	1644	1647	1650	B2.4				
	1705	1715	1719	B4.6				
	1811	1818	1825	B3.8				
	1842	1903	1943	C1.2	SF	N16W29		1029
	1952	1955	1959	B2.9	SF	N16W30		1029
	2023	2030	2035	B4.2				
	2052	2057	2107	B3.0				
	2134	2151	2157	B5.9				
	2241	2250	2300	C1.3	SF	N16W30		1029
2321	2325	2328	B4.4					
2332	2333	2339	C1.0	SF	N15W28		1029	
2338	2345	2349	B4.1					
2351	2354	2358	B4.5					
27 October	0008	0013	0020	B6.0				
	0039	0043	0047	B4.1				
	0149	0153	0157	B8.4				
	0259	0306	0318	B3.6				
	0429	0435	0439	B4.0				
	0449	0500	0510	C1.2				
	0723	0725	0729	C1.2	SF	N15W34		1029
	0805	0827	0835	B4.8				
	0857	0924	0934	C1.7				
	0955	0959	1004	B6.8				
	1012	1021	1034	C1.4				
1055	1100	1107	C1.1					
1140	1146	1151	B5.0					



	1152	1155	1200	B5.3			
	1307	1311	1315	B8.3			
	1500	1503	1507	B1.3			
	1538	1550	1554	B5.2			
	1725	1726	1730	B8.2	SF	N14W40	1029
	1905	1906	1909	B1.7	SF	N18W45	1029
	1935	1938	1947	B6.4			
	2015	2023	2027	B6.9			
	2212	2217	2223	B1.0			
	2339	2348	2352	B3.5			
28 October	0050	0052	0059	C2.2	SF	N19W47	1029
	0245	0249	0252	B1.7			
	0303	0313	0318	B5.1			
	1014	1022	1034	B2.2			
	1831	1841	1848	B1.8			
	1935	1940	1942	B2.7			
	2032	2042	2050	B1.3			
	2147	2151	2156	B1.0			
29 October	0230	0243	0248	B1.1			
	2233	2240	2249	B2.0			
30 October	0009	0026	0042	B2.5			
	2043	2048	2050	B1.7			
31 October	0923	0935	0943	C1.0			
	1512	1524	1554	B3.0			
01 November	0108	0139	0227	B4.1			



Region Summary

Date	Location		Sunspot Characteristics				Flares											
	° Lat ° CMD)	Helio	Area (10 ⁻⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
		Lon						C	M	X	S	1	2	3	4			
<i>Region 1028</i>																		
20 Oct	N26E51	211	10	1	AXX	1	A											
21 Oct	N26E38	211																
22 Oct	N26E25	211																
23 Oct	N27E16	206	10	1	AXX	1	A											
24 Oct	N27E03	206																
25 Oct	N27W10	206																
26 Oct	N27W23	206																
27 Oct	N27W36	206																
28 Oct	N27W49	206																
29 Oct	N27W62	206																
30 Oct	N27W75	206																
31 Oct	N27W88	206																
								0	0	0	0	0	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 206

<i>Region 1029</i>																		
23 Oct	N14E14	208	50	5	DSI	9	B											
24 Oct	N14W02	211	120	7	CAI	11	B											
25 Oct	N15W15	211	130	9	DSI	18	BG	1										
26 Oct	N16W30	212	190	9	DAI	19	BG	3		4								
27 Oct	N15W45	213	260	8	DAI	19	BG	1		3								
28 Oct	N16W59	215	340	9	DSC	16	BG	1		1								
29 Oct	N17W71	213	380	11	EKO	9	B											
30 Oct	N16W84	213	320	9	DSO	3	B											
31 Oct	N16W97	213						1										
								7	0	0	8	0	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 211



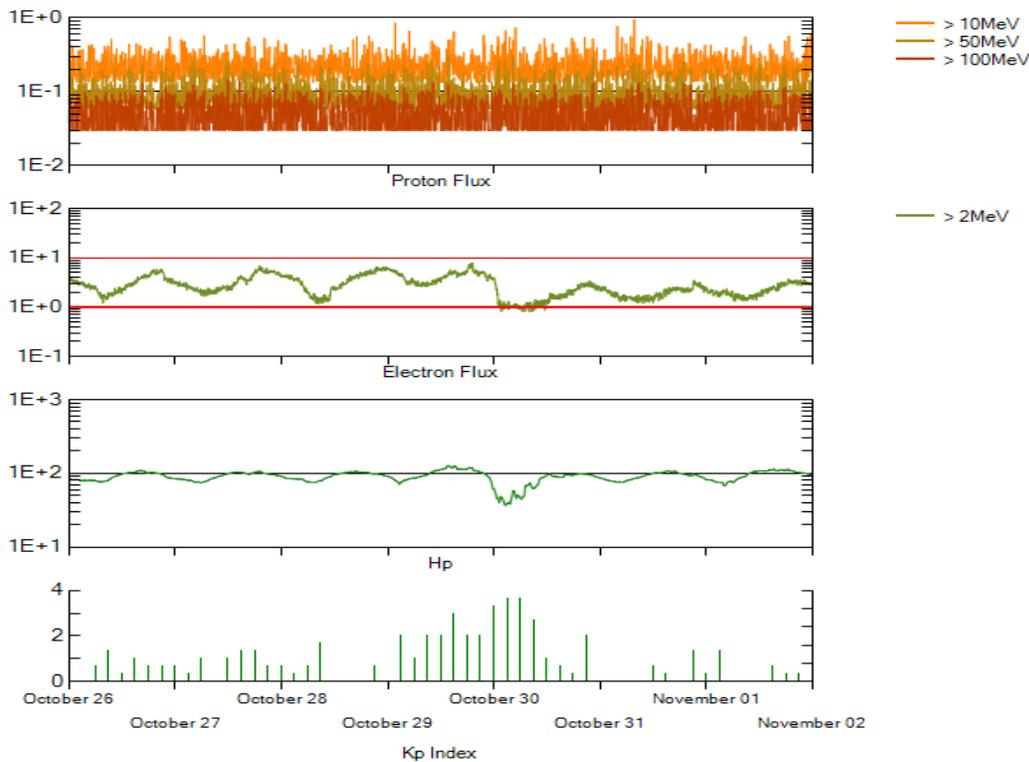
Recent Solar Indices (preliminary)
Of the observed monthly mean values

Month	Sunspot Numbers			Smooth values		Radio Flux		Geomagnetic	
	Observed SEC	values RI	Ratio RI/SEC	SEC	RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
November	2.5	1.7	0.68	9.4	5.7	69.6	71.4	7	7.8
December	16.2	10.1	0.62	8.1	4.9	78.5	70.8	6	7.8
2008									
January	5.1	3.3	0.65	6.9	4.2	74.3	70.3	8	7.8
February	3.8	2.1	0.55	5.9	3.6	71.1	69.9	11	7.6
March	15.9	9.3	0.58	5.3	3.3	72.9	69.8	11	7.5
April	4.9	2.9	0.59	5.3	3.4	70.2	69.8	9	7.3
May	5.7	3.2	0.56	5.7	3.5	68.4	69.8	6	7.2
June	4.2	3.4	0.81	5.2	3.3	65.9	69.4	7	7.0
July	1.0	0.8	0.80	4.5	2.8	65.7	68.8	5	6.8
August	0.0	0.5	**	4.4	2.7	66.3	68.6	5	6.3
September	1.5	1.1	0.73	3.7	2.3	67.1	68.4	6	5.8
October	5.2	2.9	0.56	2.9	1.9	68.3	68.2	7	5.4
November	6.8	4.1	0.60	2.7	1.8	68.6	68.3	4	5.1
December	1.3	0.8	0.62	2.7	1.7	69.2	68.5	4	4.9
2009									
January	2.8	1.3	0.46	3.0	1.8	69.8	68.7	4	4.7
February	2.5	1.4	0.56	3.1	1.9	70.0	68.8	5	4.7
March	0.7	0.7	1.00	3.4	2.0	69.2	69.0	5	4.6
April	1.2	1.2	1.00			69.7		4	
May	3.9	2.9	0.74			70.5		4	
June	6.6	2.6	0.39			68.6		4	
July	5.0	3.5	0.70			68.2		4	
August	0.3	0.0	0.00			67.4		5	
September	6.6	4.2	0.64			70.5		4	
October	7.0	4.6	0.66			72.4		3	

NOTE: Values are final except for the most recent 6 months which are considered preliminary. Cycle 23 started in May 1996 with an RI=8.0. Cycle 23 maximum was April 2000 with an RI=120.8.

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





*Weekly Geosynchronous Satellite Environment Summary
Week Beginning 26 October 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/cm²-sec-sr) as measured by GOES-11 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

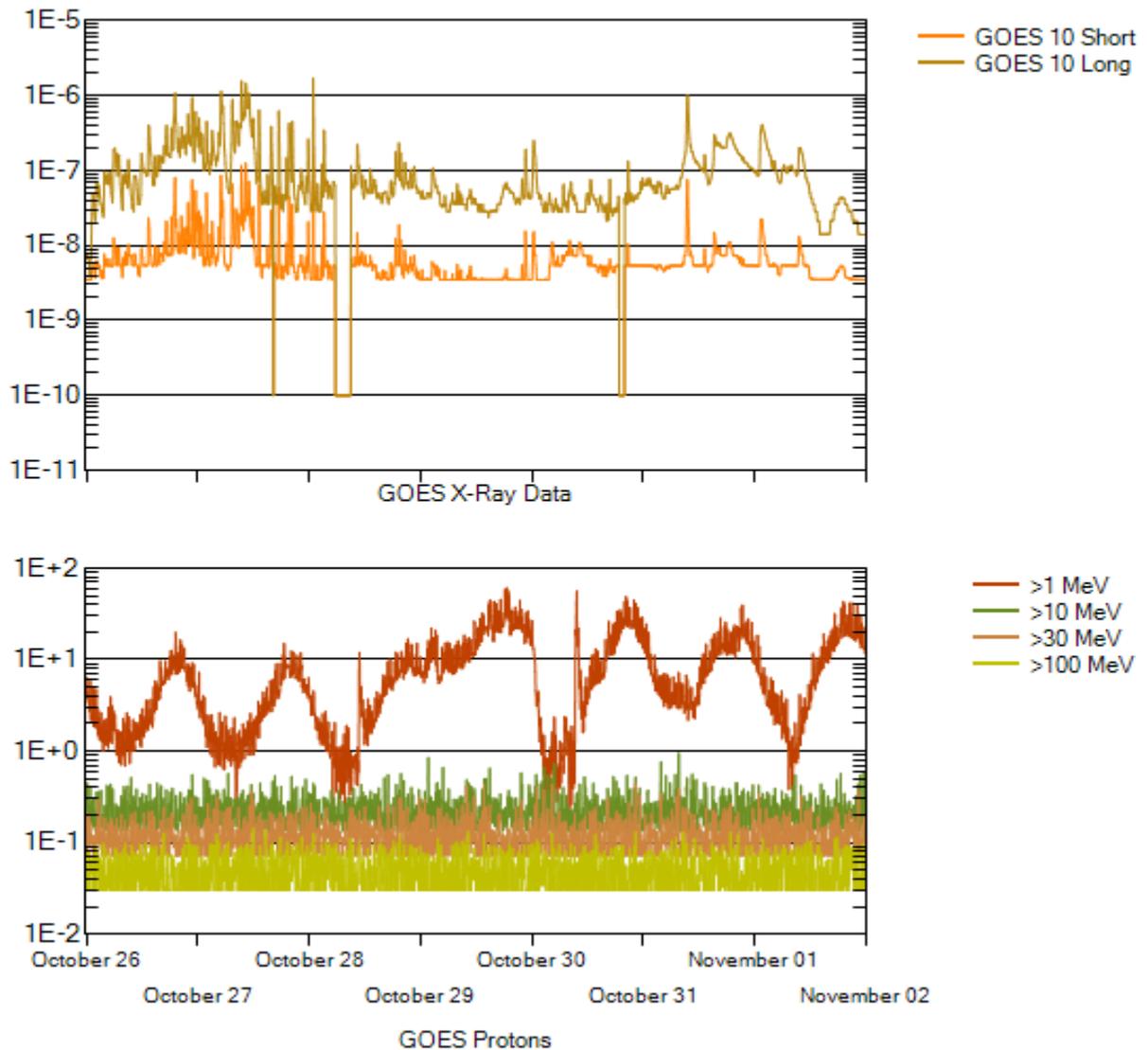
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec-sr) with energies greater than 2 MeV at GOES-11.

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

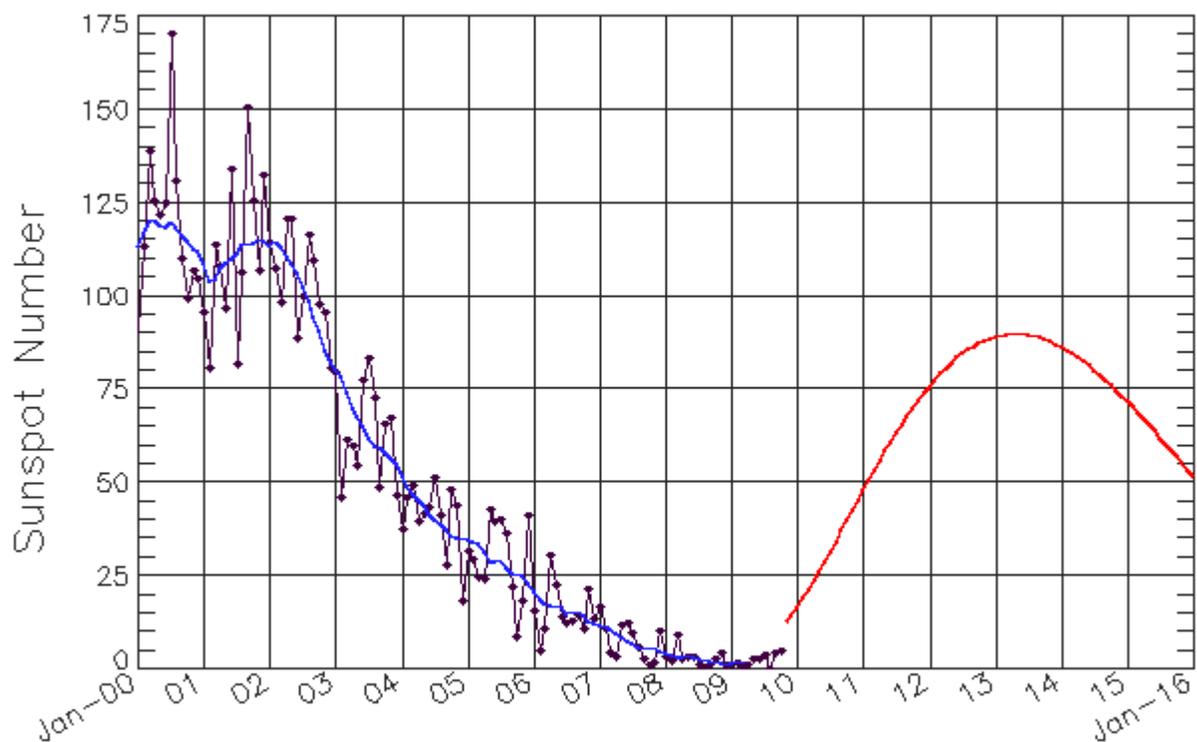
X-ray plot contains five-minute averaged x-ray flux (watts/m^2) as measured by GOES 10 (W060) and GOES 11 (W135) in two wavelength bands, .05 - .4 and .1 - .8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 - .8 nm band.

Proton plot contains the five-minute averaged integral proton flux ($\text{protons/cm}^2\text{-sec-sr}$) as measured by GOES-11 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 Oct 09



— Smoothed Monthly Values
 —●— Monthly Values
 — Predicted Values (Smoothed)

Updated 2009 Nov 2

NOAA/SWPC Boulder, CO USA

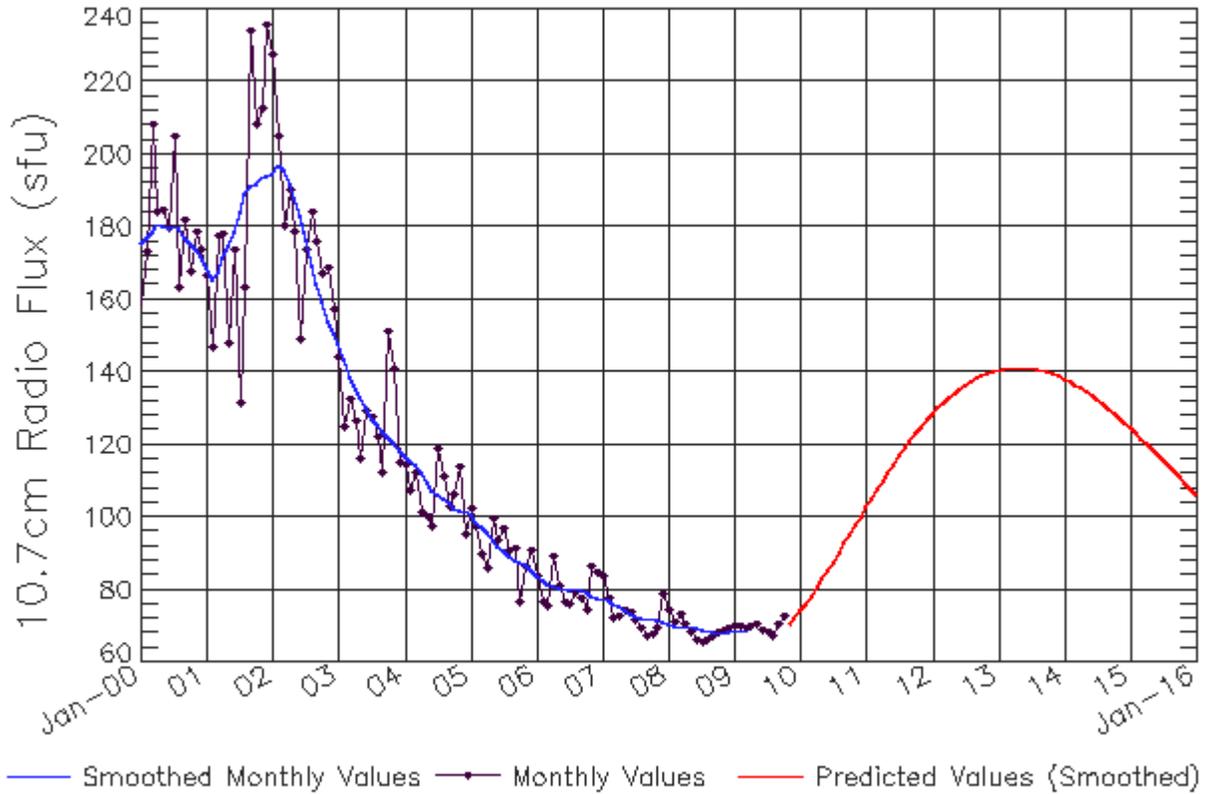
Smoothed Sunspot Number Prediction

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	4 (***)	4 (***)	3 (***)	3 (***)	4 (***)	3 (***)	3 (***)	3 (***)	2 (***)	2 (***)	2 (***)	2 (***)
2009	2 (***)	2 (***)	2 (***)	2 (1)	3 (2)	4 (3)	5 (5)	6 (5)	8 (6)	10 (7)	12 (7)	14 (8)
2010	16 (9)	18 (9)	21 (10)	24 (10)	26 (10)	29 (10)	32 (10)	34 (10)	37 (10)	40 (10)	43 (10)	45 (10)
2011	48 (10)	51 (10)	53 (10)	56 (10)	59 (10)	61 (10)	63 (10)	66 (10)	68 (10)	70 (10)	72 (10)	74 (10)
2012	76 (10)	78 (10)	79 (10)	81 (10)	82 (10)	84 (10)	85 (10)	86 (10)	87 (10)	88 (10)	88 (10)	89 (10)
2013	89 (10)	90 (10)	90 (10)	90 (10)	90 (10)	90 (10)	90 (10)	89 (10)	89 (10)	89 (10)	88 (10)	87 (10)
2014	86 (10)	86 (10)	85 (10)	84 (10)	83 (10)	81 (10)	80 (10)	79 (10)	78 (10)	76 (10)	75 (10)	73 (10)
2015	72 (10)	70 (10)	69 (10)	67 (10)	65 (10)	64 (10)	62 (10)	60 (10)	59 (10)	57 (10)	55 (10)	54 (10)



ISES Solar Cycle F10.7cm Radio Flux Progression

Data Through Oct 09



Updated 2009 Nov 2

NOAA/SWPC Boulder, CO USA

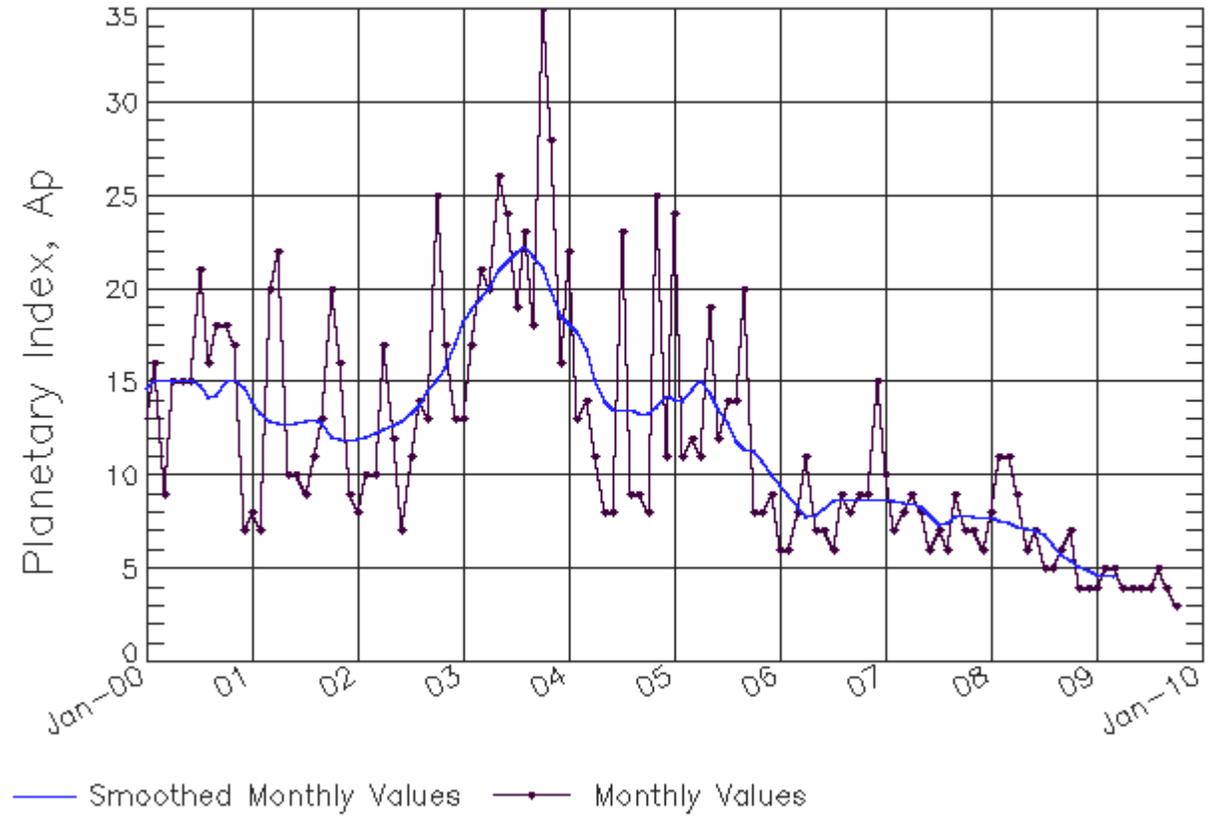
Smoothed F10.7cm Radio Flux Prediction

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	70 (***)	70 (***)	70 (***)	70 (***)	70 (***)	69 (***)	69 (***)	69 (***)	68 (***)	68 (***)	68 (***)	69 (***)
2009	69 (***)	69 (***)	69 (***)	69 (1)	70 (1)	70 (2)	70 (3)	71 (4)	71 (4)	72 (5)	73 (6)	74 (7)
2010	76 (8)	77 (8)	79 (9)	81 (9)	83 (9)	85 (9)	88 (9)	90 (9)	93 (9)	95 (9)	98 (9)	100 (9)
2011	103 (9)	105 (9)	108 (9)	110 (9)	112 (9)	115 (9)	117 (9)	119 (9)	121 (9)	123 (9)	125 (9)	127 (9)
2012	128 (9)	130 (9)	132 (9)	133 (9)	134 (9)	135 (9)	136 (9)	137 (9)	138 (9)	139 (9)	140 (9)	140 (9)
2013	141 (9)	140 (9)	140 (9)	139 (9)	139 (9)							
2014	138 (9)	137 (9)	136 (9)	136 (9)	135 (9)	134 (9)	132 (9)	131 (9)	130 (9)	129 (9)	127 (9)	126 (9)
2015	125 (9)	123 (9)	122 (9)	120 (9)	119 (9)	117 (9)	116 (9)	114 (9)	113 (9)	111 (9)	110 (9)	108 (9)



ISES Solar Cycle Ap Progression

Data Through Oct 09



Updated 2009 Nov 2

NOAA/SWPC Boulder, CO USA





Active Regions



October 2009
(Month 157)

Comparison of Cycles at current month in cycle

