

**Space Weather Highlights**  
**16 November – 22 November 2009**

**SWO PRF 1786**  
**24 November 2009**

Solar activity was very low throughout the summary period. There was only one flare, a B1 at 1259 UTC on 17 November from a spotless plage region that later emerged as Region 1033 (N21, L=191, class/area Bxo/010 on 18 November). The week began with one spotted group, Region 1031 (N30, L=257, class/area Bxo/010 on 15 November) which decayed to plage on 17 November. Two new sunspot groups emerged on 18 November: Region 1032 (N17, L=218, class/area Bxo/010 on 18 November) and Region 1033. Region 1032 decayed back to plage on 21 November and Region 1033 had decayed to plage by the end of the day on 22 November. A coronal mass ejection was observed to enter the LASCO C2 field of view off the East limb at 0755 UTC on 21 November. The associated disk signature was observed along a filament channel in the southeast portion of the solar disk.

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 period.

The geomagnetic field was predominantly quiet during the summary period. There was a small increase to quiet to unsettled levels on 21 November. Solar wind observations from the ACE spacecraft showed a sector boundary change from towards (negative) to away (positive) early on 18 November, followed by a change back to towards (negative) on 19 November. A co-rotating interaction region was observed around 1600 UTC on 19 November (peak density ~16 p/cc) which was followed by a gradual increase in solar wind velocity from 340 km/s up to 575 km/s between 0200 UTC on 20 November through 1900 UTC on 21 November. Solar wind velocity slowly declined through the remainder of 21-22 November.

**Space Weather Outlook**  
**25 November 2009 – 21 December 2009**

Solar activity is expected to be predominantly very low with just a slight chance for brief periods of low.

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 through the period.

The geomagnetic field is expected to be quiet for 25 November. An increase to quiet to unsettled levels is expected on 26 November due to recurrence. Activity levels are expected to be predominantly quiet for the remainder of the outlook period from 26 November through 21 December.



### *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
16 November	76	12	10	<A1.0	0	0	0	0	0	0	0	0
17 November	77	0	0	<A1.0	0	0	0	0	0	0	0	0
18 November	76	29	20	<A1.0	0	0	0	0	0	0	0	0
19 November	77	30	20	<A1.0	0	0	0	0	0	0	0	0
20 November	76	31	20	<A1.0	0	0	0	0	0	0	0	0
21 November	76	14	10	<A1.0	0	0	0	0	0	0	0	0
22 November	76	13	10	<A1.0	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)		
	>1 MeV	>10 MeV	>100 MeV	>.6 MeV	>2MeV	>4 MeV
	16 November	3.5e+05	2.0e+04	4.3e+03		4.8e+04
17 November	3.5e+05	2.0e+04	4.4e+03		5.4e+04	
18 November	4.5e+05	2.0e+04	4.8e+03		4.7e+04	
19 November	6.5e+05	1.9e+04	4.4e+03		6.8e+04	
20 November	4.4e+05	1.9e+04	4.3e+03		5.3e+04	
21 November	4.7e+05	1.9e+04	4.1e+03		4.0e+04	
22 November	5.6e+05	2.0e+04	4.3e+03		4.9e+04	

### *Daily Geomagnetic Data*

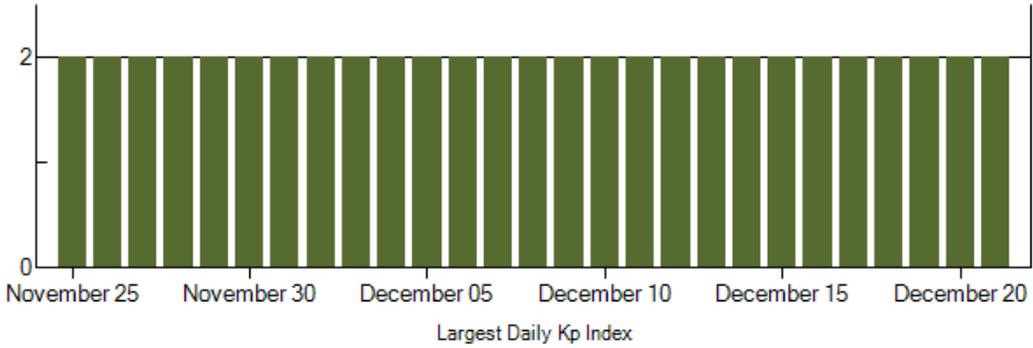
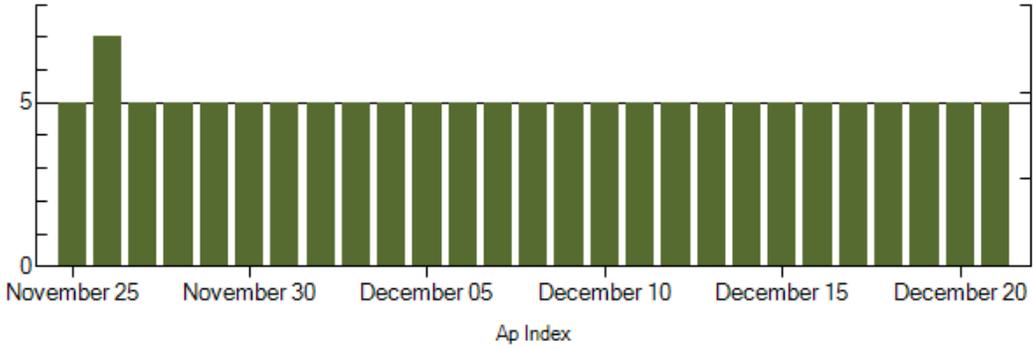
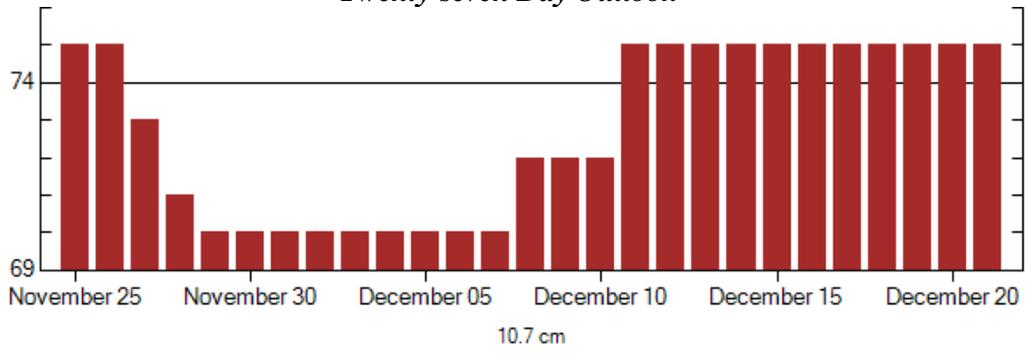
Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	16 November	0	0-0-0-0-0-0-0-0	0	0-0-0-0-0-0-0-0	1
17 November	0	0-0-0-0-0-0-0-0	0	0-0-0-0-0-0-0-0	1	0-0-0-0-0-1-0-0
18 November	2	0-0-1-1-1-0-0-1	2	0-0-2-2-0-0-0-0	2	0-0-1-1-0-0-0-1
19 November	0	0-0-0-0-0-0-0-1	0	0-0-0-0-0-0-0-0	2	0-1-0-0-0-0-0-2
20 November	2	1-0-0-0-1-1-1-1	0	0-0-0-0-0-0-1-0	1	1-0-0-0-0-0-0-1
21 November	6	3-2-1-1-1-1-2-1	6	1-1-3-3-2-0-1-1	8	3-1-2-2-1-0-3-2
22 November	2	2-0-1-0-1-1-0-0	3	2-1-2-0-1-2-0-0	4	2-0-1-0-1-1-0-0

### *Alerts and Warnings Issued*

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
<i>No Alerts Issued</i>		



### 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
25 Nov	75	5	2	09 Dec	72	5	2
26	75	7	2	10	72	5	2
27	73	5	2	11	75	5	2
28	71	5	2	12	75	5	2
29	70	5	2	13	75	5	2
30	70	5	2	14	75	5	2
01 Dec	70	5	2	15	75	5	2
02	70	5	2	16	75	5	2
03	70	5	2	17	75	5	2
04	70	5	2	18	75	5	2
05	70	5	2	19	75	5	2
06	70	5	2	20	75	5	2
07	70	5	2	21	75	5	2
08	72	5	2				



***Energetic Events***

Date	Time		X-ray	Optical Information			Peak		Sweep Freq	
	$\frac{1}{2}$		Integ	Imp/	Location	Rgn	Radio Flux		Intensity	
	Begin	Max	Class	Flux	Brtns	Lat CMD	#	245	2695	II
<i>No Events Observed</i>										

***Flare List***

Date	Time			X-ray	Imp /	Optical	Rgn
	Begin	Max	End	Class.	Brtns	Location Lat CMD	
16 November	No Flares Observed						
17 November	1256	1259	1302	B1.5			
18 November	No Flares Observed						
19 November	No Flares Observed						
20 November	No Flares Observed						
21 November	No Flares Observed						
22 November	No Flares Observed						

***Region Summary***

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 1031</i>																						
15 Nov	N30E20	258	10	1	AXX	1	A															
16 Nov	N30E08	257	10	3	BXO	2	B															
17 Nov	N30W05	257																				
18 Nov	N30W18	257																				
19 Nov	N30W31	257																				
20 Nov	N30W44	257																				
21 Nov	N30W57	257																				
22 Nov	N30W70	257																				
													0	0	0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 257



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**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	4	
<i>Region 1032</i>																
18 Nov	N17E20	218	10	2	BXO	4	B									
19 Nov	N15E07	218	10	2	BXO	3	B									
20 Nov	N16W03	218	10	2	BXO	2	B									
21 Nov	N16W10	209														
22 Nov	N16W23	209														

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 218

<i>Region 1033</i>																
18 Nov	N21E47	191	10	3	BXO	5	B									
19 Nov	N19E34	191	10	5	BXO	7	B									
20 Nov	N21E23	189	10	1	BXO	9	B									
21 Nov	N18E07	192	10	4	BXO	4	B									
22 Nov	N18W05	191	10	6	BXO	3	B									

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 191

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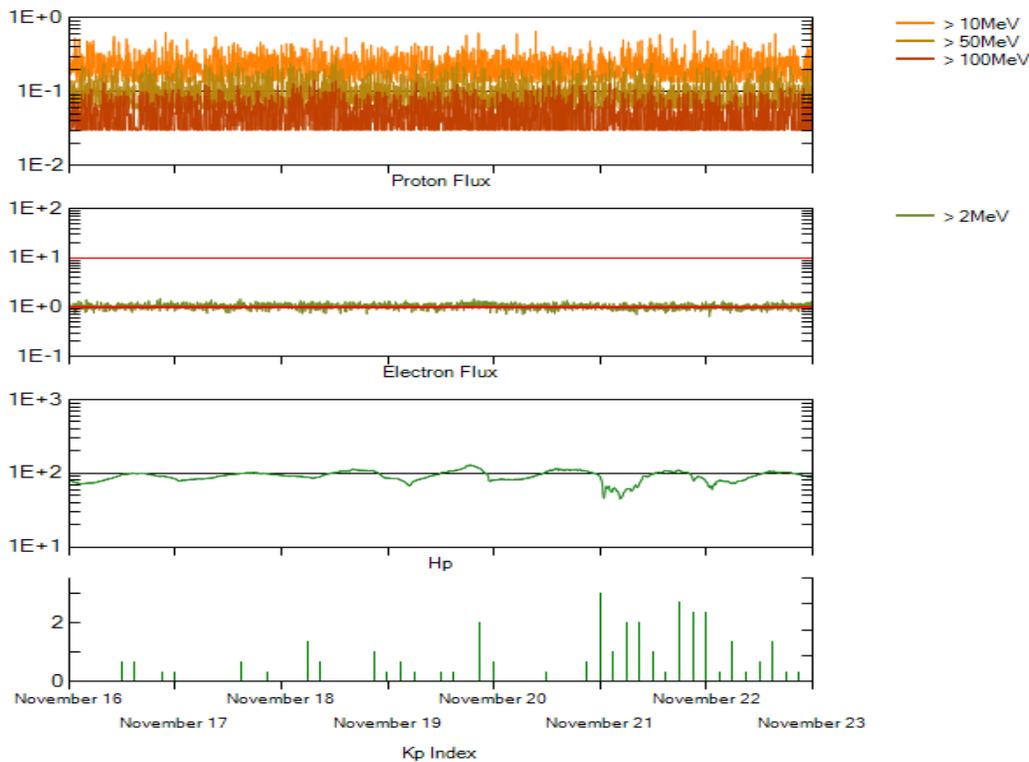
**Recent Solar Indices (preliminary)**  
**Of the observed monthly mean values**

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
<b>2008</b>									
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
<b>2009</b>									
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 zero, so a ratio could not be computed.





*Weekly Geosynchronous Satellite Environment Summary  
Week Beginning 16 November 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<sup>2</sup>-sec -sr) as measured by GOES-11 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

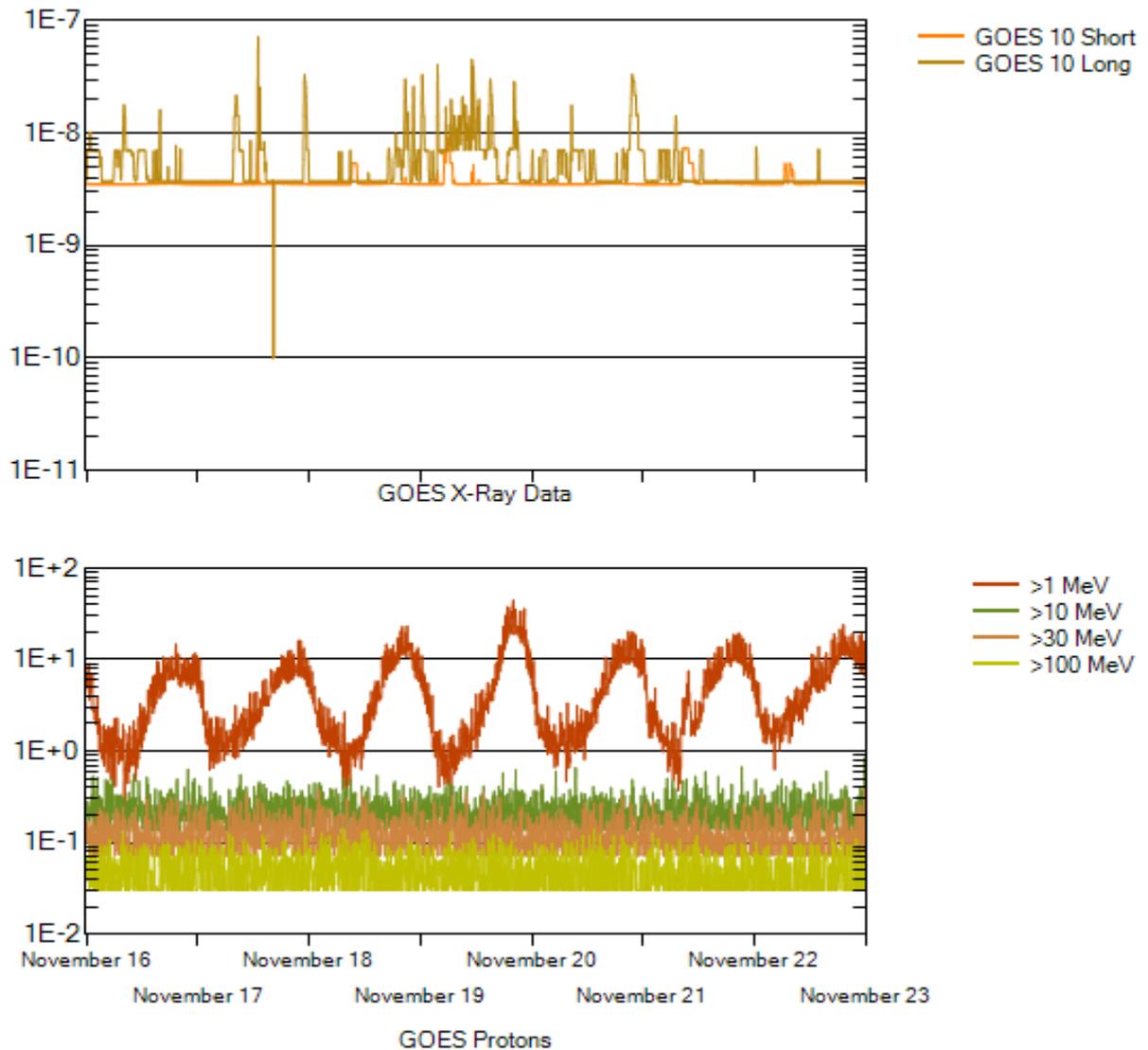
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV at GOES-11.

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<sup>2</sup>) as measured by GOES 10 (W060) in two wavelength bands, 0.05 - 0.4 and 0.1 - 0.8 nm. The letters A, B, C, M and X refer to x-ray event levels for the 0.1 - 0.8 nm band.

Proton plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-sec-sr) as measured by GOES-11 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.

