

**Space Weather Highlights**  
**19 – 25 October 2009**

**SWO PRF 1782**  
**27 October 2009**

Solar activity was very low to low. The week began with a spotless disk void of activity. However, new Region 1029 (N15, L=211, class/area Dsi/130 on 25 October) emerged on the disk on 23 October and produced numerous B-flares on 24-25 October as well as a C-flare at 25/0226 UTC. The group showed steady growth that was continuing at the end of the interval. In addition, Region 1028 (N27, L=206, class/area Axx/10 on 23 October) emerged on 20 October, decayed to plage on 21 October, re-emerged with one spot on 23 October, and then decayed to plage for the remainder of the interval.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal levels for most of the period with the exception of a brief period at moderate levels on 25 October.

The geomagnetic field began the period at quiet levels. Activity levels increased to predominantly unsettled to active on 22 October following a sudden impulse at 22/0019 UTC (11 nT on the Boulder magnetometer), and continued to be elevated through 23/1200 UTC. Isolated minor and major storm periods were observed at high latitudes during this interval. Quiet levels predominated thereafter until late on the 24th when there was a small increase to quiet to unsettled levels which continued through 25/1500 UTC. Activity levels returned to quiet levels thereafter through the remainder of the period. Solar wind observations at the ACE spacecraft showed a weak shock at 21/2309 UTC which was followed by a slow increase in velocity and enhanced interplanetary magnetic field (IMF). The southward component of the IMF ranged typically between +/- 6 nT with peaks around -9 nT following the shock and continuing through 23/0950 UTC. The solar wind velocity jumped from 270 km/s up to 340 km/s at the time of the shock and showed a slow increase through mid-day on the 24th with peak velocity around 420 km/s. Although there was some uncertainty the most likely source for this disturbance was the faint halo CME associated with the EIT wave that occurred around 17/1935 UTC as reported in last week's highlights. A second disturbance in the solar wind was seen beginning at 24/1630 UTC and lasting through mid-day on the 25th; the solar wind signatures were consistent with a co-rotating interaction region followed by a weak high-speed stream associated with a positive polarity coronal hole. Peak Bz values were around -7 nT during the CIR (24/1500 UTC to 25/0000 UTC) and peak velocity reached about 490 km/s at 25/0830 UTC.

**Space Weather Outlook**

**28 October 2009 – 23 November 2009**

Solar activity is expected to be very low to 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 levels through the period.

The geomagnetic field is expected to be predominantly quiet for 28 October through 6 November. An increase to quiet to unsettled is possible on 7 November due to a recurrent high



speed stream. Activity levels should return to predominantly quiet levels for 8 November through 16 November. An increase to unsettled levels with a chance for active periods is expected on 18-21 November due another recurrent high speed stream. Activity is expected to return to mostly quiet levels for 22-23 November.

### 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	
19 October	71	0	0	<A1.0	0	0	0	0	0	0	0	0	0
20 October	71	11	10	<A1.0	0	0	0	0	0	0	0	0	0
21 October	71	0	0	<A1.0	0	0	0	0	0	0	0	0	0
22 October	72	0	0	<A1.0	0	0	0	0	0	0	0	0	0
23 October	73	30	60	<A1.0	0	0	0	0	0	0	0	0	0
24 October	76	21	120	<A1.0	0	0	0	0	0	0	0	0	0
25 October	76	28	130	A1.2	1	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
	19 October	5.4e+05	2.1e+04	4.7e+03		4.7e+04
20 October	4.6e+05	2.2e+04	4.9e+03		3.7e+04	
21 October	5.5e+05	2.1e+04	4.9e+03		4.1e+04	
22 October	7.6e+05	2.0e+04	4.3e+03		3.8e+04	
23 October	7.3e+05	2.1e+04	4.2e+03		4.7e+04	
24 October	1.1e+06	2.1e+04	4.2e+03		2.2e+05	
25 October	3.7e+05	2.0e+04	4.3e+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
	19 October	1	0-0-0-0-2-1-0-0	0	0-0-0-0-0-1-0-0	1
20 October	0	0-0-0-0-0-0-0-0	0	0-0-0-0-0-0-0-0	1	1-0-0-0-0-0-0-0
21 October	1	0-0-0-0-1-0-0-1	0	0-0-0-0-0-0-0-0	1	0-0-0-0-1-1-0-1
22 October	12	3-2-2-4-2-1-3-3	25	1-2-3-6-5-1-2-2	14	3-3-2-4-2-1-4-4
23 October	7	3-2-0-4-2-0-1-0	17	3-2-2-6-2-2-2-1	8	3-2-1-4-1-1-0-1
24 October	5	0-0-1-1-2-2-3-2	5	0-0-1-2-3-1-2-1	8	0-0-1-1-1-2-4-2
25 October	3	3-1-1-1-1-0-0-0	9	2-1-3-3-4-1-0-0	5	3-1-1-1-2-1-1-0

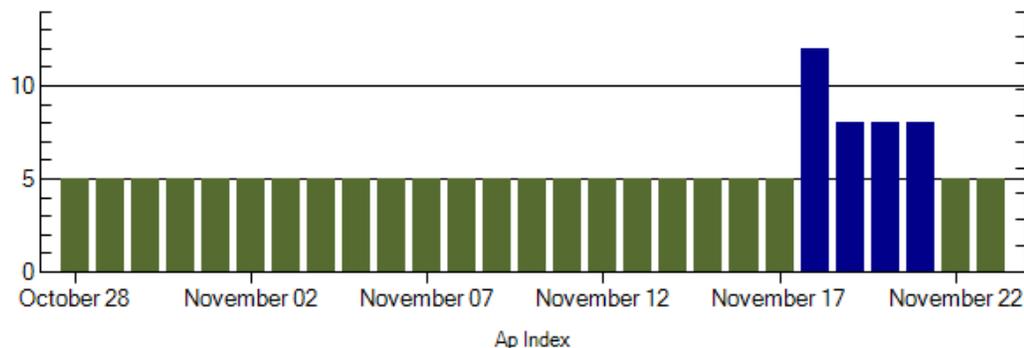
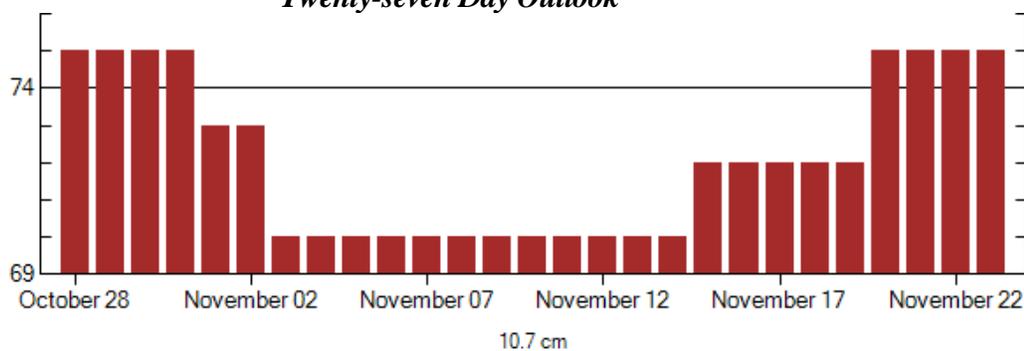


### *Alerts and Warnings Issued*

<u>Date &amp; Time of Issue</u>	<u>Type of Alert or Warning</u>	<u>Date &amp; Time of Event UTC</u>
22 Oct 0031	SUMMARY: Geomagnetic Sudden Impulse	22 Oct 0019
22 Oct 1042	ALERT: Geomagnetic K = 4	22 Oct 1041
22 Oct 1053	WARNING: Geomagnetic K = 5	22 Oct 1053 - 1600
22 Oct 1058	ALERT: Geomagnetic K = 5	22 Oct 1057
23 Oct 0126	WARNING: Geomagnetic K = 4	23 Oct 0126 - 1600
23 Oct 0130	ALERT: Geomagnetic K = 4	23 Oct 0130
24 Oct 0704	SUMMARY: Geomagnetic Sudden Impulse	24 Oct 0702
24 Oct 2016	WARNING: Geomagnetic K = 4	24 Oct 2020 - 2359
24 Oct 2340	EXTENDED WARNING: Geomagnetic K = 4	24 Oct 2020 - 25/1600



### 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
28 Oct	75	5	2	11 Nov	70	5	2
29	75	5	2	12	70	5	2
30	75	5	2	13	70	5	2
31	75	5	2	14	70	5	2
01 Nov	73	5	2	15	72	5	2
02	73	5	2	16	72	5	2
03	70	5	2	17	72	5	2
04	70	5	2	18	72	12	3
05	70	5	2	19	72	8	3
06	70	5	2	20	75	8	3
07	70	5	2	21	75	8	3
08	70	5	2	22	75	5	2
09	70	5	2	23	75	5	2
10	70	5	2				



***Energetic Events***

Date	Time		X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	Max	Class	Flux	Imp/ Brtns	Location Lat CMD	#	Radio Flux		Intensity
									245	2695	II
<i>No Events Observed</i>											

***Flare List***

Date	Time			X-ray Class.	Imp / Brtns	Optical	Rgn
	Begin	Max	End			Location Lat CMD	
19 October	No Flares Observed						
20 October	No Flares Observed						
21 October	No Flares Observed						
22 October	No Flares Observed						
23 October	No Flares Observed						
24 October	1951	1959	2017	B1.6			
	2058	2105	2109	B1.1			
	2110	2114	2118	B4.9			
	2145	2149	2153	B2.0			
25 October	0210	0226	0237	C1.5			
	0505	0508	0512	B1.0			
	0531	0616	0651	B3.2			
	0859	0915	0940	B8.5			
	1248	1253	1302	B2.1			
	1403	1422	1450	B2.2			
	2021	2035	2048	A7.5			



## Region Summary

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

### Region 1028

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															
								0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 206

### Region 1029

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									
								1	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 211



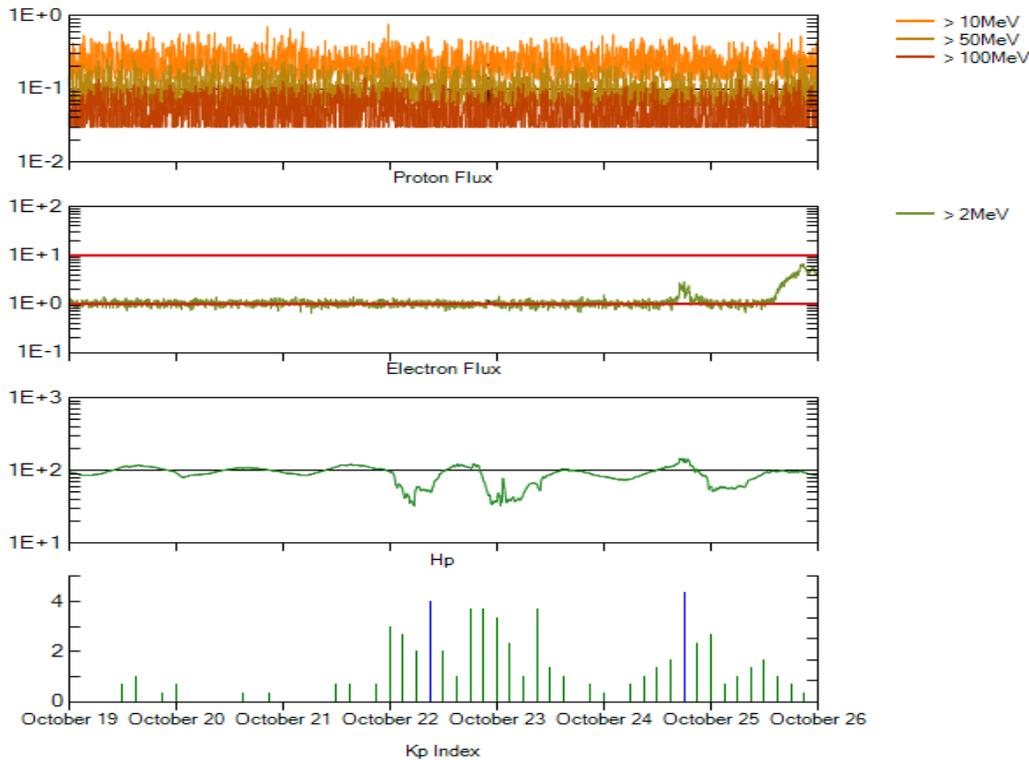
**Recent Solar Indices (preliminary)**  
**Of the observed monthly mean values**

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
<b>2007</b>									
October	1.3	0.9	0.69	10.0	6.0	67.5	71.8	7	7.9
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	68.9	5	4.7
March	0.7	0.7	1.00	3.4	2.0	69.2	69.0	5	4.5
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			70.4		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 19 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/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.

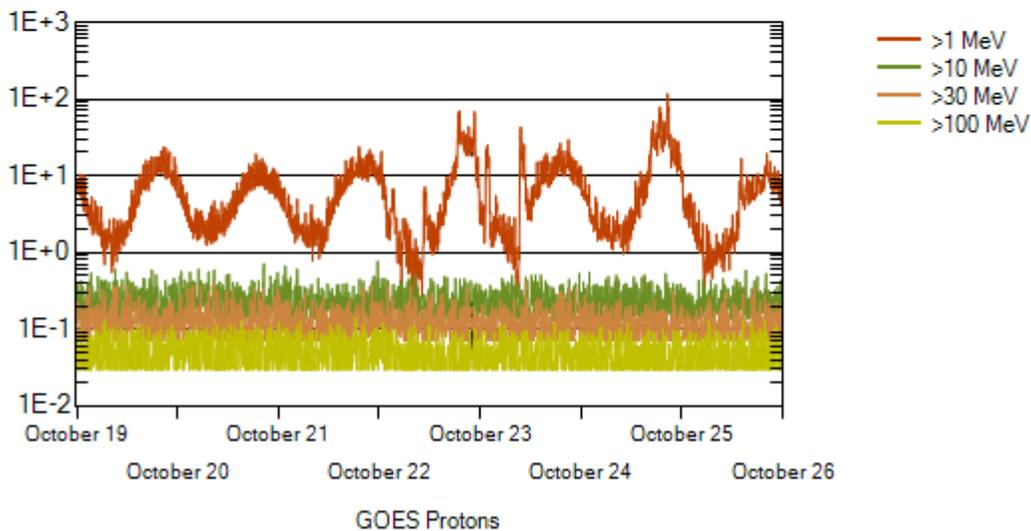
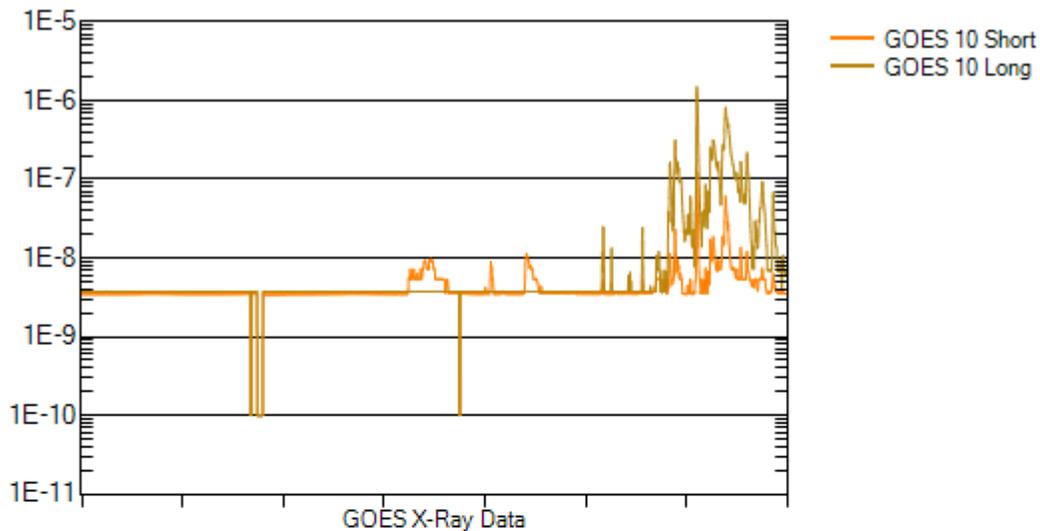
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV at GOES-11.

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 ( $\text{watts/m}^2$ ) 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.

