

**Space Weather Highlights**  
**25 November - 01 December 2019**

**SWPC PRF 2309**  
**02 December 2019**

Solar activity was very low. No sunspots were observed on the visible disk. No Earth-directed CMEs were observed in available coronagraph imagery.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels on 25-28 Nov and decreased to moderate levels on 29 Nov - 01 Dec.

Geomagnetic field activity was mostly quiet. A single isolated period of unsettled was observed late on 29 Nov in response to a prolonged period of southward Bz.

**Space Weather Outlook**  
**02 December - 28 December 2019**

Solar activity is expected to be at very low levels throughout the outlook period.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to range from moderate to high levels. High levels are expected to be reached on 20-25 Dec in response to CH HSS influence; moderate levels are expected for the remainder of the outlook period.

Geomagnetic field activity is expected to be at quiet to active levels. Active levels are expected on 18-19 Dec due to interaction with a positive polarity CH HSS; unsettled levels are expected on 03 Dec and 20-21 Dec; quiet levels are expected for the remainder of the outlook period.



### ***Daily Solar Data***

Date	Radio	Sun	Sunspot	X-ray			Flares							
	Flux	spot	Area	Background			X-ray			Optical				
	10.7cm	No.	(10 <sup>-6</sup> hemi.)	Flux			C	M	X	S	1	2	3	4
25 November	70	0	0	A8.2	0	0	0	0	0	0	0	0	0	0
26 November	70	0	0	A8.0	0	0	0	0	0	0	0	0	0	0
27 November	72	0	0	A7.1	0	0	0	0	0	0	0	0	0	0
28 November	70	0	0	A7.8	0	0	0	0	0	0	0	0	0	0
29 November	70	0	0	A7.8	0	0	0	0	0	0	0	0	0	0
30 November	70	0	0	A7.9	0	0	0	0	0	0	0	0	0	0
01 December	71	0	0	A7.8	0	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	>0.6 MeV	>2MeV	>4 MeV
25 November		3.0e+05	2.1e+04	3.9e+03		8.8e+07
26 November		5.4e+05	2.1e+04	3.9e+03		1.1e+08
27 November		5.6e+05	2.2e+04	3.8e+03		8.6e+07
28 November		7.3e+05	2.2e+04	4.0e+03		4.1e+07
29 November		5.5e+05	2.2e+04	3.9e+03		2.3e+07
30 November		1.3e+06	2.1e+04	3.8e+03		1.5e+07
01 December		6.0e+05	2.0e+04	3.6e+03		9.9e+06

### ***Daily Geomagnetic Data***

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
25 November	5	2-1-2-2-1-1-1-1	5	0-0-3-3-1-1-0-0	5	2-1-2-2-1-1-1-2
26 November	3	1-2-0-0-1-2-0-0	0	0-0-0-0-0-0-1-0	3	2-2-0-0-0-1-1-1
27 November	2	0-1-0-1-1-2-1-0	2	0-0-1-1-1-1-0-0	4	1-1-1-1-1-2-2-1
28 November	2	1-0-0-0-1-1-2-0	1	0-0-0-0-1-0-1-0	4	2-0-1-0-1-1-2-1
29 November	3	1-1-0-1-1-0-1-2	1	0-0-0-1-0-0-1-1	5	1-1-0-1-1-1-2-3
30 November	2	1-1-1-0-1-0-1-1	4	1-0-0-0-1-2-3-1	4	2-1-1-0-1-1-2-2
01 December	2	1-0-1-0-1-1-1-1	2	1-1-0-0-1-0-1-0	5	1-1-0-0-1-1-2-2

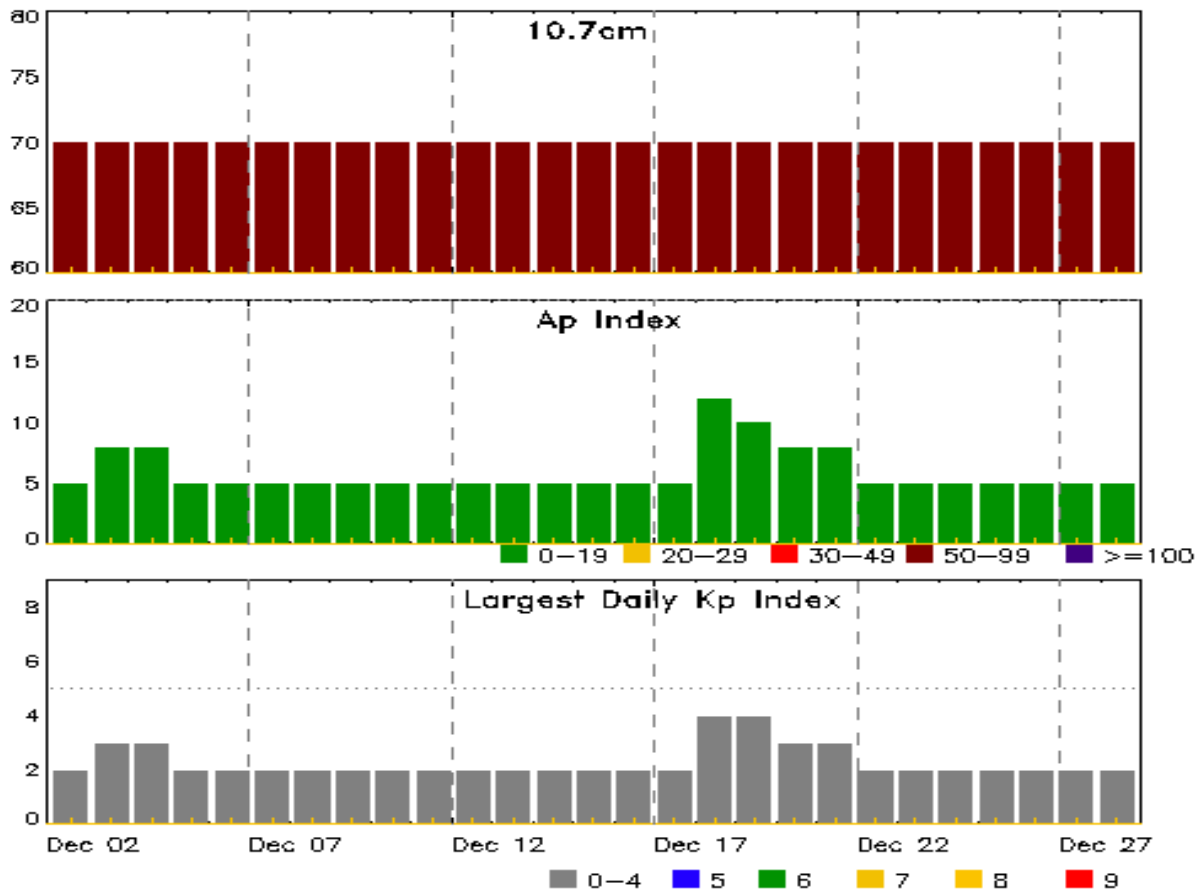


### *Alerts and Warnings Issued*

<b>Date &amp; Time of Issue UTC</b>	<b>Type of Alert or Warning</b>	<b>Date &amp; Time of Event UTC</b>
25 Nov 1241	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	24/1515
26 Nov 1206	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	24/1515
27 Nov 1216	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	24/1515
28 Nov 1505	CONTINUED ALERT: Electron 2MeV Integral Flux $\geq$ 1000pfu	24/1515



## Twenty-seven Day Outlook



Date	Radio Flux 10.7cm	Planetary A Index	Largest Kp Index	Date	Radio Flux 10.7cm	Planetary A Index	Largest Kp Index
02 Dec	70	5	2	16 Dec	70	5	2
03	70	8	3	17	70	5	2
04	70	8	3	18	70	12	4
05	70	5	2	19	70	10	4
06	70	5	2	20	70	8	3
07	70	5	2	21	70	8	3
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	5	2
14	70	5	2	28	70	5	2
15	70	5	2				

### ***Energetic Events***

Date	Time			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	Half	Class	Flux	Imp/	Location	Rgn	Radio Flux		Intensity	
			Max			Brtns			245	2695	II	IV

**No Events Observed**

### ***Flare List***

Date	Time			X-ray	Optical		
	Begin	Max	End		Imp/	Location	Rgn
				Class	Brtns	Lat CMD	#
25 Nov	2318	2322	2323	A8.3			



## ***Region Summary***

Location			Sunspot Characteristics					Flares							
Date	Lat CMD	Helio	Area	Extent	Spot	Spot	Mag	X-ray			Optical				
		Lon	10 <sup>-6</sup> hemi.	(helio)	Class	Count	Class	C	M	X	S	1	2	3	4
Region 2752															
13 Nov	S23E56	286	plage												
14 Nov	S23E42	288	plage												
15 Nov	S23E28	289	plage												
16 Nov	S23E14	290	plage												
17 Nov	S23W00	291	plage												
18 Nov	S23W14	291	plage												
19 Nov	S23W28	292	plage												
20 Nov	S23W42	293	plage												
21 Nov	S23W56	294	plage												
22 Nov	S23W70	295	plage												
23 Nov	S23W84	296	plage												
24 Nov	S23W98	296	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 291

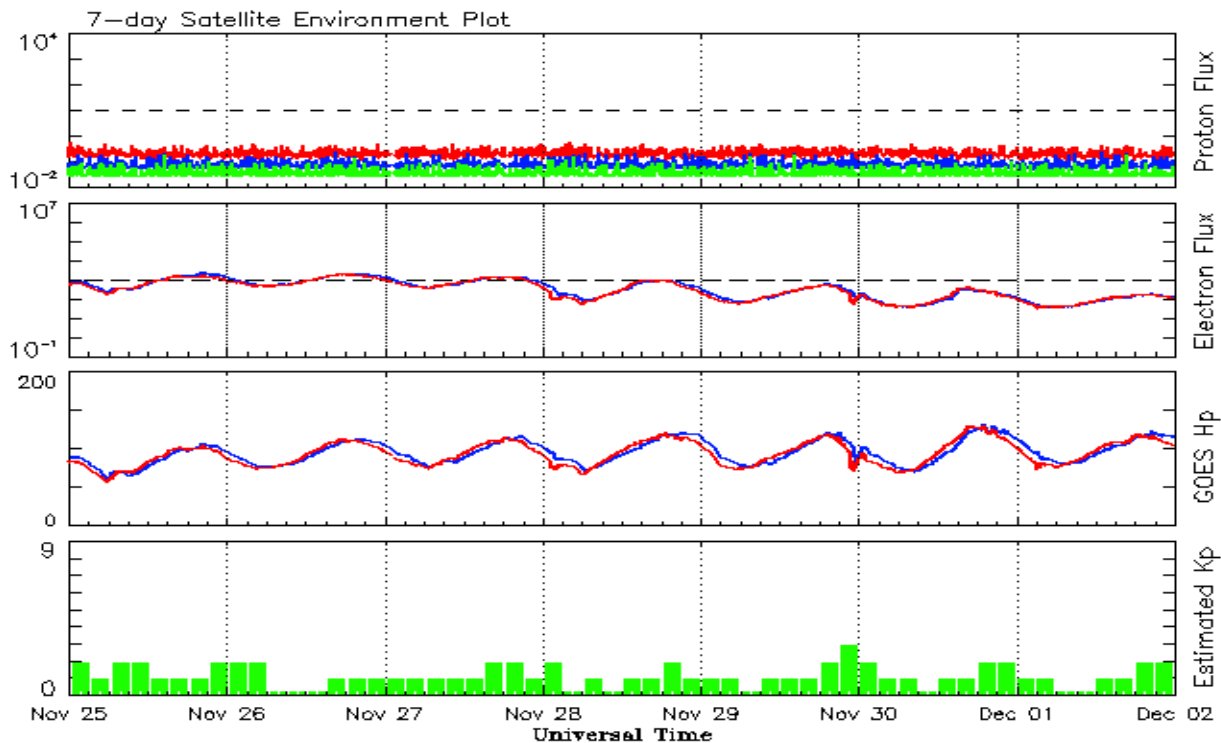


**Recent Solar Indices (preliminary)**  
**Observed monthly mean values**

Month	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed values		Ratio	Smooth values		Penticton	Smooth	Planetary	Smooth
	SEC	RI	RI/SEC	SEC	RI	10.7 cm	Value	Ap	Value
<b>2017</b>									
December		7.6	4.9	0.64	15.7	9.1	71.5	74.4	8 9.4
<b>2018</b>									
January		7.8	4.1	0.51	15.0	8.5	70.0	74.0	6 9.3
February		16.0	6.4	0.40	13.7	7.6	72.0	73.3	7 9.1
March		6.0	1.5	0.25	11.5	5.9	68.4	71.9	8 8.6
April		7.0	5.3	0.76	9.6	4.7	70.0	70.6	7 8.0
May		15.0	7.9	0.53	9.2	4.5	70.9	70.2	8 7.6
June		19.7	9.4	0.48	9.1	4.3	72.5	70.0	7 7.4
July		1.3	1.0	0.77	9.4	4.2	69.7	70.0	6 7.3
August		10.0	5.2	0.53	9.0	4.0	69.1	70.0	10 7.3
September		5.7	2.0	0.35	8.7	3.9	68.3	70.1	9 7.3
October		6.9	2.9	0.42	9.2	4.1	69.5	70.3	7 7.1
November		7.3	2.9	0.48	9.5	4.0	68.9	70.4	6 7.0
December		5.6	1.9	0.34	9.3	3.6	70.0	70.3	7 6.9
<b>2019</b>									
January		16.0	4.6	0.29	9.0	3.2	71.6	70.0	6 6.8
February			0.5		8.7	3.0	70.6	69.8	7 6.7
March		14.8	5.6	0.39	8.3	2.8	71.5	69.7	6 6.6
April		11.5	5.5	0.48	7.9	2.6	72.4	69.6	6 6.7
May		18.1	5.9	0.34	7.4	2.3	71.3	69.6	7 6.7
June		11.6	0.7	0.06			68.1		5
July		1.6	0.5	0.31			67.1		6
August		2.5	0.4	0.16			67.0		7
September		2.6	0.7	0.27			68.1		10
October		1.8	0.2	0.11			67.4		8
November		1.1	0.3	0.27			70.2		4

**Note:** Values are final except for the most recent 6 months which are considered preliminary.  
Cycle 24 started in Dec 2008 with an RI=1.7.





*Weekly Geosynchronous Satellite Environment Summary  
Week Beginning 25 November 2019*

The proton flux plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-sec -sr) as measured by the SWPC Primary GOES satellite, near West 75, for each of three energy thresholds: greater than 10, 50, and 100 MeV.

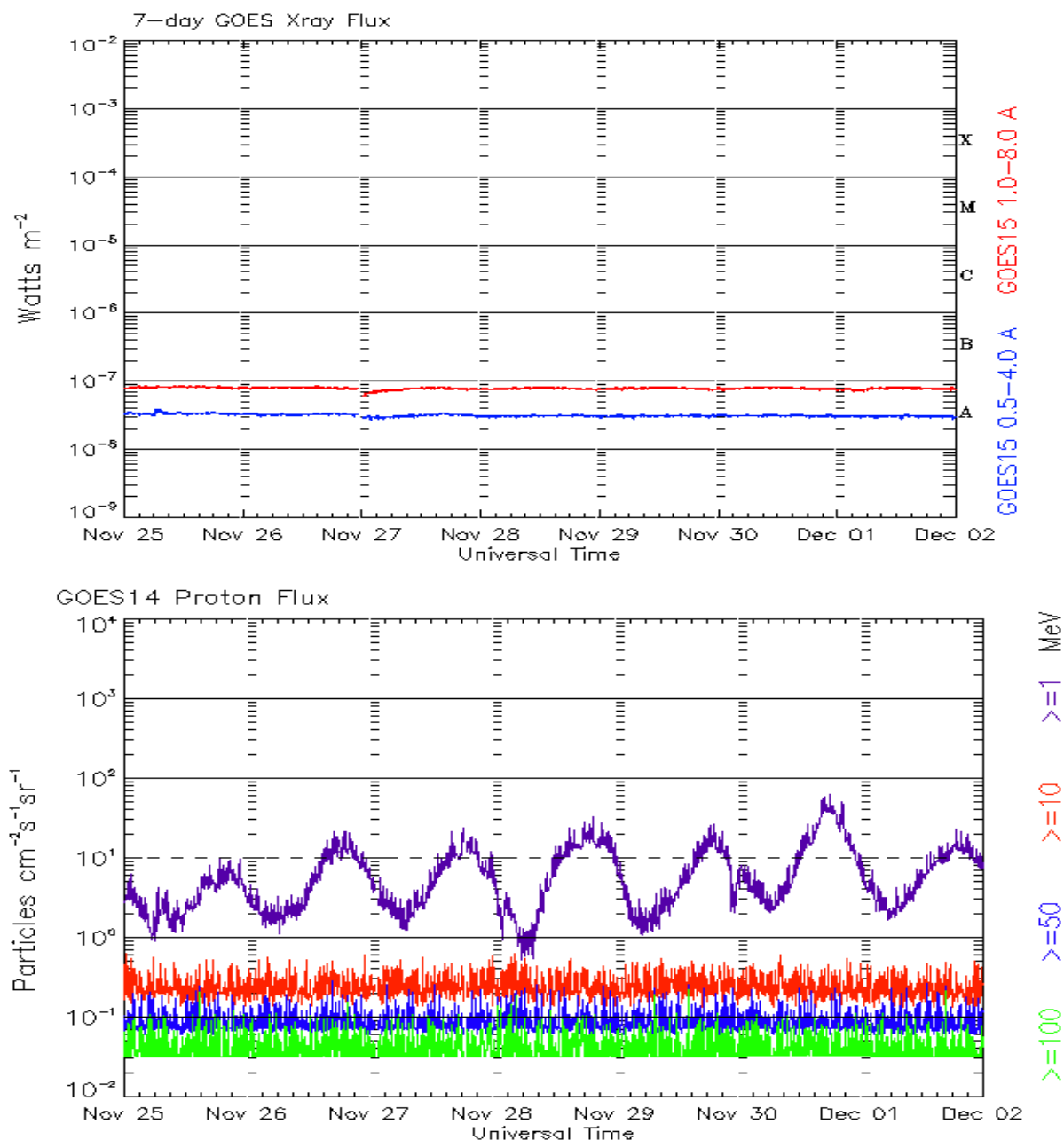
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

The Hp plot contains the five minute averaged Hp magnetic field component in nanoteslas (nT) as by the SWPC Primary GOES satellite. The Hp component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

The Estimated 3-hour Planetary Kp-index is derived at the NOAA Space Weather Prediction Center using data from the following ground-based magnetometers: Boulder, Colorado; Chambon la Foret, France; Fredericksburg, Virginia; Fresno, California; Hartland, UK; Newport, Washington; Sitka, Alaska. These data are made available thanks to the cooperative efforts between SWPC and data providers around the world, which currently includes the U.S. Geological Survey, the British Geological Survey, and the Institut de Physique du Globe de Paris.

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  
Week Beginning 25 November 2019*

The x-ray plots contains five-minute averages x-ray flux ( $\text{Watt/m}^2$ ) as measure by the SWPC primary GOES X-ray satellite, usually at West 105 longitude, 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.

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



## ***Preliminary Report and Forecast of Solar Geophysical Data (The Weekly)***

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**Notice:** The 27-day Outlook, Satellite Environment, X-ray and Proton plots have been redesigned.  
Comments and suggestions are welcome [SWPC.Webmaster@noaa.gov](mailto:SWPC.Webmaster@noaa.gov)

The Weekly has been published continuously since 1951 and is available online since 1997.

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