

Space Weather Highlights
23 December - 29 December 2019

SWPC PRF 2313
30 December 2019

Solar activity was very low. New Region 2753 (S29, L=122, class/area Bxo/010 on 25 Dec) developed on the visible disk on late on 23 December while Region 2754 (N25, L=191, class/area Axx/010 on 25 Dec) developed on 24 Dec. Both regions were inactive and decayed to plage on 26 Dec. No Earth-directed CMEs were observed during the period.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal levels on 27-29 Dec and reached moderate levels on 23-26 Dec. The maximum flux of the period was 462 pfu observed at 25/1810 UTC.

Geomagnetic field activity ranged from quiet to unsettled levels. A slight enhancement in solar wind parameters occurred beginning late on 25 Dec as a weak negative polarity coronal hole high speed stream (CH HSS) became geoeffective. Total field increased to a maximum of 9 nT at 25/1920 UTC while solar wind speed reached a maximum of 415 km/s at 26/1435 UTC. The geomagnetic field responded with an isolated unsettled period early on 26 Dec.

Space Weather Outlook
30 December - 25 January 2020

Solar activity is expected to continue 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 levels on 06-14 and 23-25 Jan while moderate levels are expected on 30 Dec-05 Jan and 15-22 Jan.

Geomagnetic field activity is expected to reach unsettled levels on 30 Dec-01 Jan due to weak CH HSS activity. Unsettled to active levels are expected on 14-15 Jan due to recurrent CH HSS activity.



Daily Solar Data

Date	Radio	Sun	Sunspot	X-ray		Flares							
	Flux	spot	Area	Background		X-ray			Optical				
	10.7cm	No.	(10 ⁻⁶ hemi.)	Flux		C	M	X	S	1	2	3	4
23 December	73	0	0	A8.4	0	0	0	0	0	0	0	0	0
24 December	73	24	20	A8.5	0	0	0	0	0	0	0	0	0
25 December	72	23	20	A8.5	0	0	0	0	0	0	0	0	0
26 December	72	11	10	A8.4	0	0	0	0	0	0	0	0	0
27 December	72	0	0	A8.3	0	0	0	0	0	0	0	0	0
28 December	72	0	0	A8.3	0	0	0	0	0	0	0	0	0
29 December	72	0	0	A8.2	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	>0.6 MeV	>2MeV	>4 MeV
23 December		3.2e+05	2.2e+04	3.8e+03		1.4e+07
24 December		4.4e+05	2.2e+04	4.1e+03		1.3e+07
25 December		1.0e+06	2.2e+04	3.8e+03		1.7e+07
26 December		7.1e+05	2.2e+04	3.9e+03		6.3e+06
27 December		5.6e+05	2.1e+04	3.8e+03		2.8e+06
28 December		6.4e+05	2.1e+04	4.0e+03		3.0e+06
29 December		7.2e+05	2.1e+04	3.9e+03		3.3e+06

Daily Geomagnetic Data

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

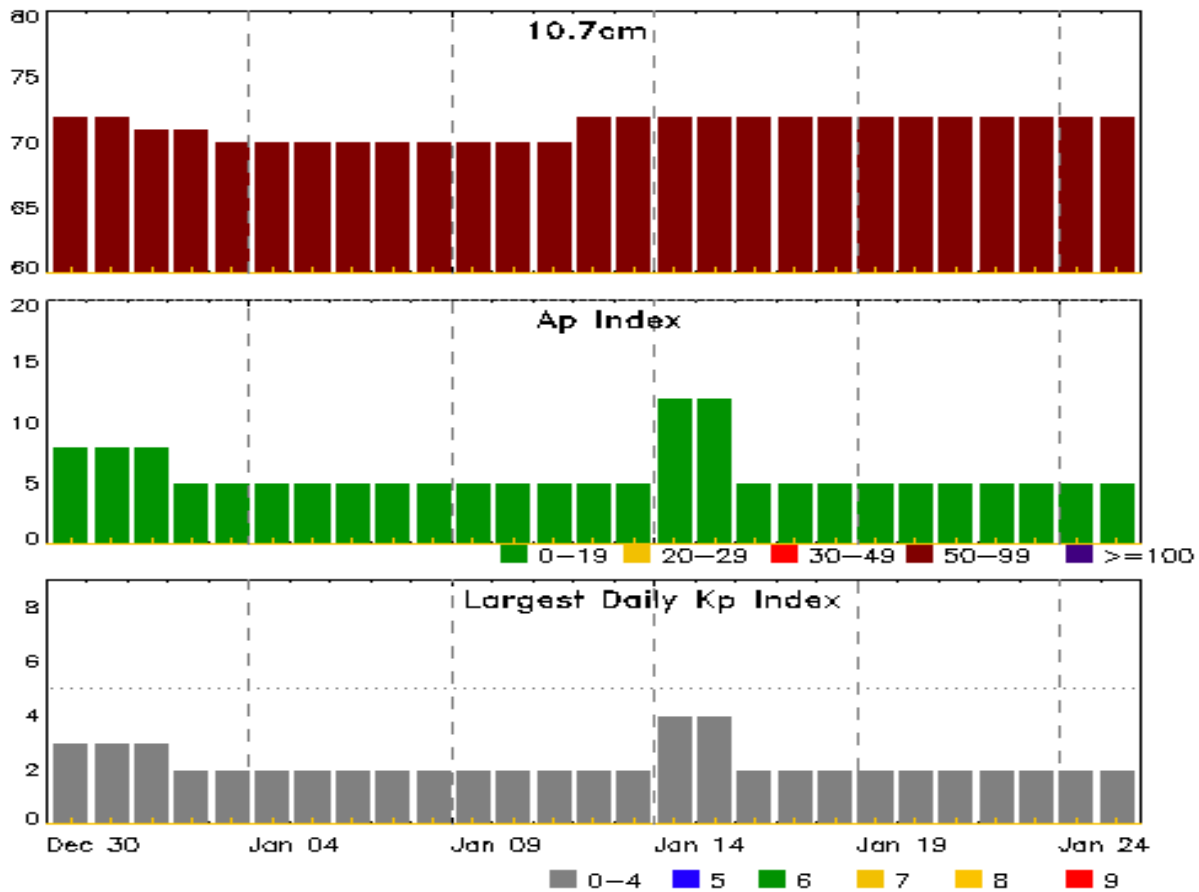


Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
No Alerts or Warnings Issued		



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
30 Dec	72	8	3	13 Jan	72	5	2
31	72	8	3	14	72	12	4
01 Jan	71	8	3	15	72	12	4
02	71	5	2	16	72	5	2
03	70	5	2	17	72	5	2
04	70	5	2	18	72	5	2
05	70	5	2	19	72	5	2
06	70	5	2	20	72	5	2
07	70	5	2	21	72	5	2
08	70	5	2	22	72	5	2
09	70	5	2	23	72	5	2
10	70	5	2	24	72	5	2
11	70	5	2	25	72	5	2
12	72	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			Optical			
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
27 Dec	1450	1451	1452	A1.1			



Region Summary

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

Region 2753

24 Dec	S29E44	119	10	3	Bxo	2	B								
25 Dec	S29E28	122	10	6	Bxo	2	B								
26 Dec	S29E17	120	10	1	Axx	1	A								
27 Dec	S29E03	120	plage												
28 Dec	S29W11	121	plage												
29 Dec	S29W24	121	plage												
								0	0	0	0	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 120

Region 2754

24 Dec	N24W05	168	10	3	Bxo	2	B								
25 Dec	N25W41	191	10	2	Axx	1	A								
26 Dec	N25W55	192	plage												
27 Dec	N25W69	192	plage												
28 Dec	N25W82	192	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 168

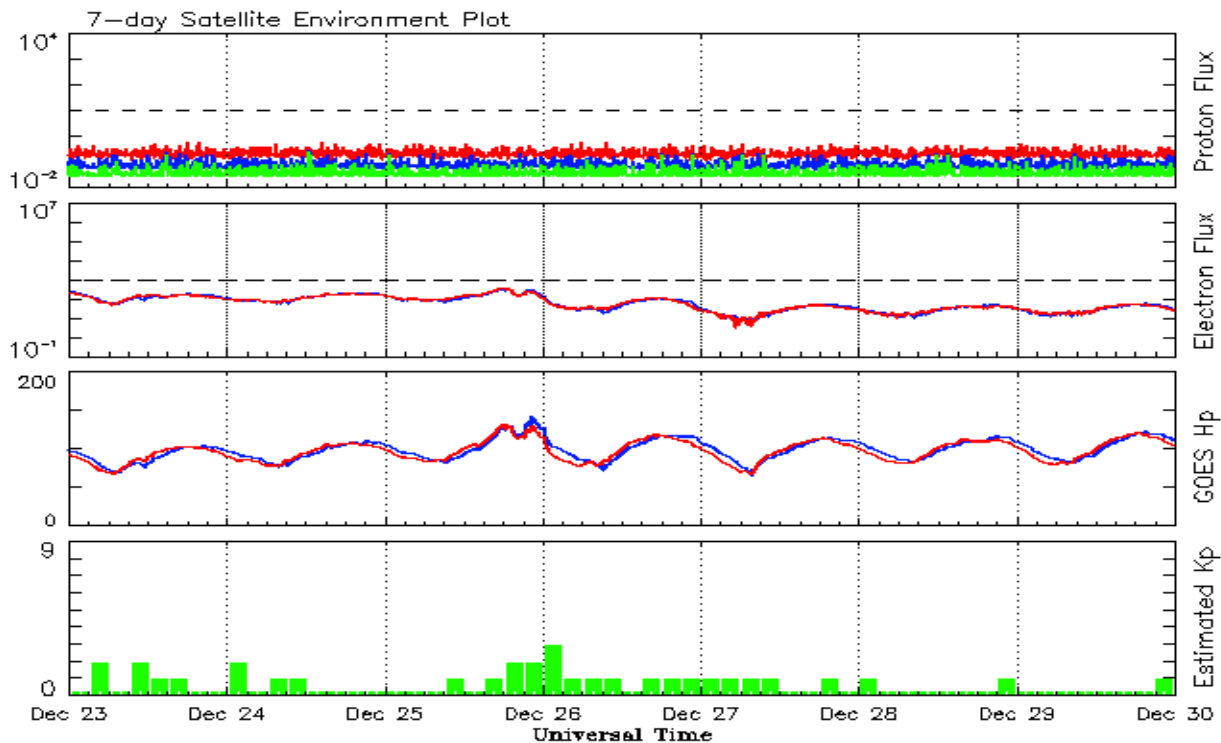


Recent Solar Indices (preliminary)
Observed monthly mean values

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
2017									
December		7.6	4.9	0.64	15.7	9.1	71.5	74.4	8 9.4
2018									
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
2019									
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 23 December 2019*

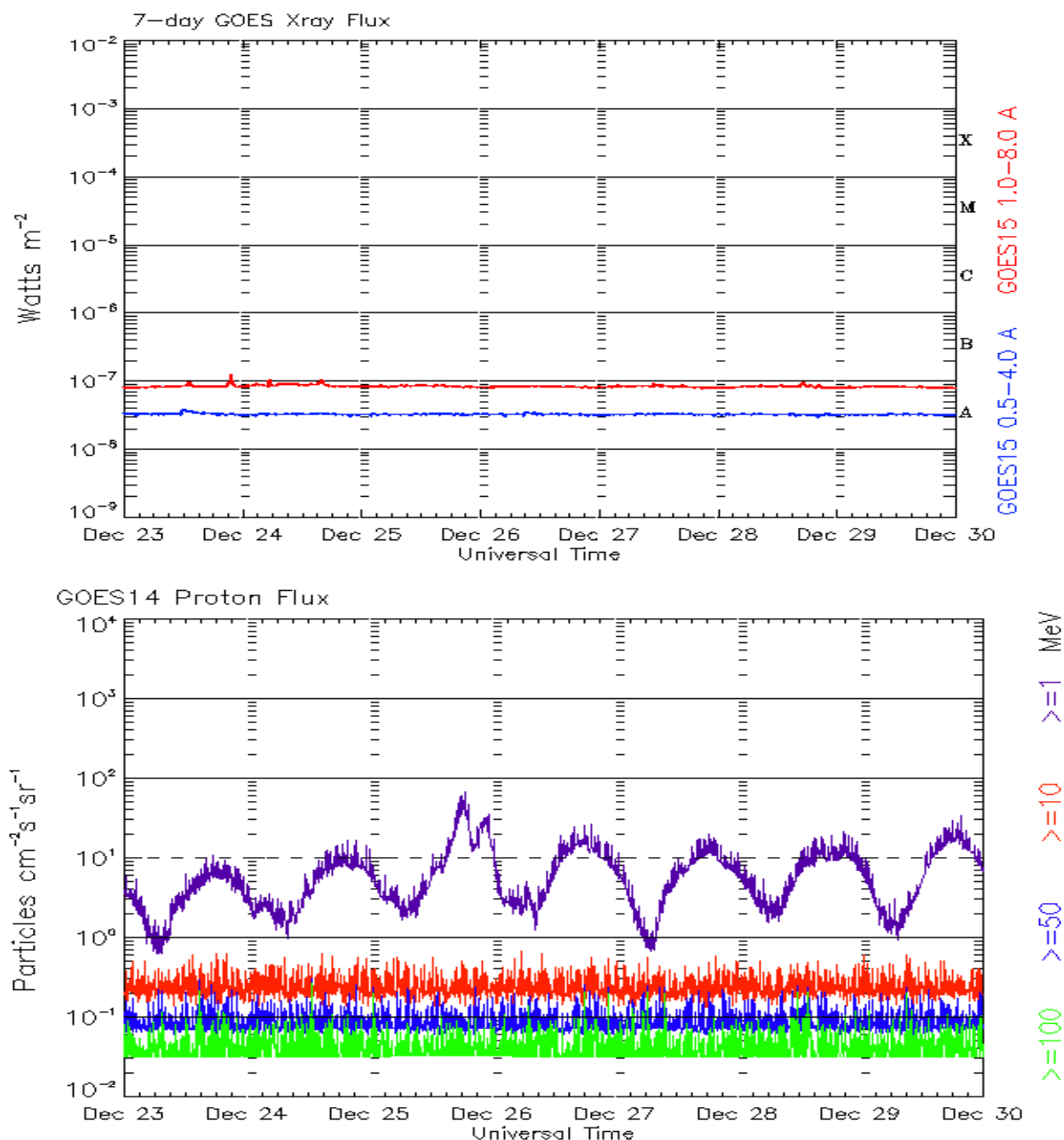
The proton flux plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by the SWPC Primary GOES satellite, near West 75, for each of three energy thresholds: greater than 10, 50, and 100 MeV.

The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm²-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 23 December 2019*

The x-ray plots contains five-minute averages x-ray flux (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 intergral flux units (pfu = protons/ 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

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