

Space Weather Highlights
02 December - 08 December 2019

SWPC PRF 2310
09 December 2019

Solar activity was very low throughout the period. No active regions with sunspots were observed and no earth-directed CMEs were detected in satellite imagery.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal and normal to moderate levels throughout the week.

Geomagnetic field activity was quiet throughout the week under a nominal solar wind regime.

Space Weather Outlook
09 December - 04 January 2020

Solar activity is expected to be very low 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 reach high levels on 13-14 and 21-25 Dec. Normal and normal to moderate flux levels are expected for the remainder of the outlook period.

Geomagnetic field activity is expected to reach active levels on 18-19 Dec due to the influence of a recurrent, positive polarity CH HSS. Generally quiet and quiet to unsettled conditions are expected to prevail 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 ⁻⁶ hemi.)	Flux	C	M	X	S	1	2	3	4
02 December	70	0	0	A7.8	0	0	0	0	0	0	0	0
03 December	71	0	0	A7.8	0	0	0	0	0	0	0	0
04 December	70	0	0	A7.8	0	0	0	0	0	0	0	0
05 December	71	0	0	A7.8	0	0	0	0	0	0	0	0
06 December	70	0	0	A7.8	0	0	0	0	0	0	0	0
07 December	70	0	0	A7.8	0	0	0	0	0	0	0	0
08 December	72	0	0	A7.8	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
02 December		6.4e+05	2.1e+04	3.7e+03		1.3e+07
03 December		6.3e+05	2.1e+04	3.8e+03		1.3e+07
04 December		7.6e+05	2.2e+04	3.6e+03		8.3e+06
05 December		6.7e+05	2.2e+04	3.8e+03		4.9e+06
06 December		4.9e+05	2.3e+04	3.9e+03		5.7e+06
07 December		4.3e+05	2.3e+04	4.0e+03		5.3e+06
08 December		5.3e+05	2.2e+04	4.0e+03		6.8e+06

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
02 December	2	0-1-2-0-0-1-0-0	0	0-0-0-0-0-0-0-0	2	0-1-1-0-0-0-0-0
03 December	1	0-0-0-0-0-1-0-1	0	0-0-0-1-0-0-0-0	2	0-0-0-0-0-0-0-1
04 December	2	1-2-1-0-1-0-0-0	1	0-0-0-2-1-0-0-0	3	1-2-1-1-1-0-1-0
05 December	1	0-0-0-1-1-1-0-0	2	0-0-0-2-2-0-0-0	3	0-0-0-1-1-1-1-0
06 December	2	0-1-1-1-1-1-0-0	1	0-0-0-1-1-0-0-0	4	0-2-1-1-1-1-1-1
07 December	1	0-0-0-0-0-1-1-0	0	0-0-0-1-0-0-0-0	2	1-0-0-1-0-0-1-1
08 December	2	0-0-0-1-1-1-1-1	0	0-0-0-0-0-0-0-0	2	0-0-0-0-1-1-1-1

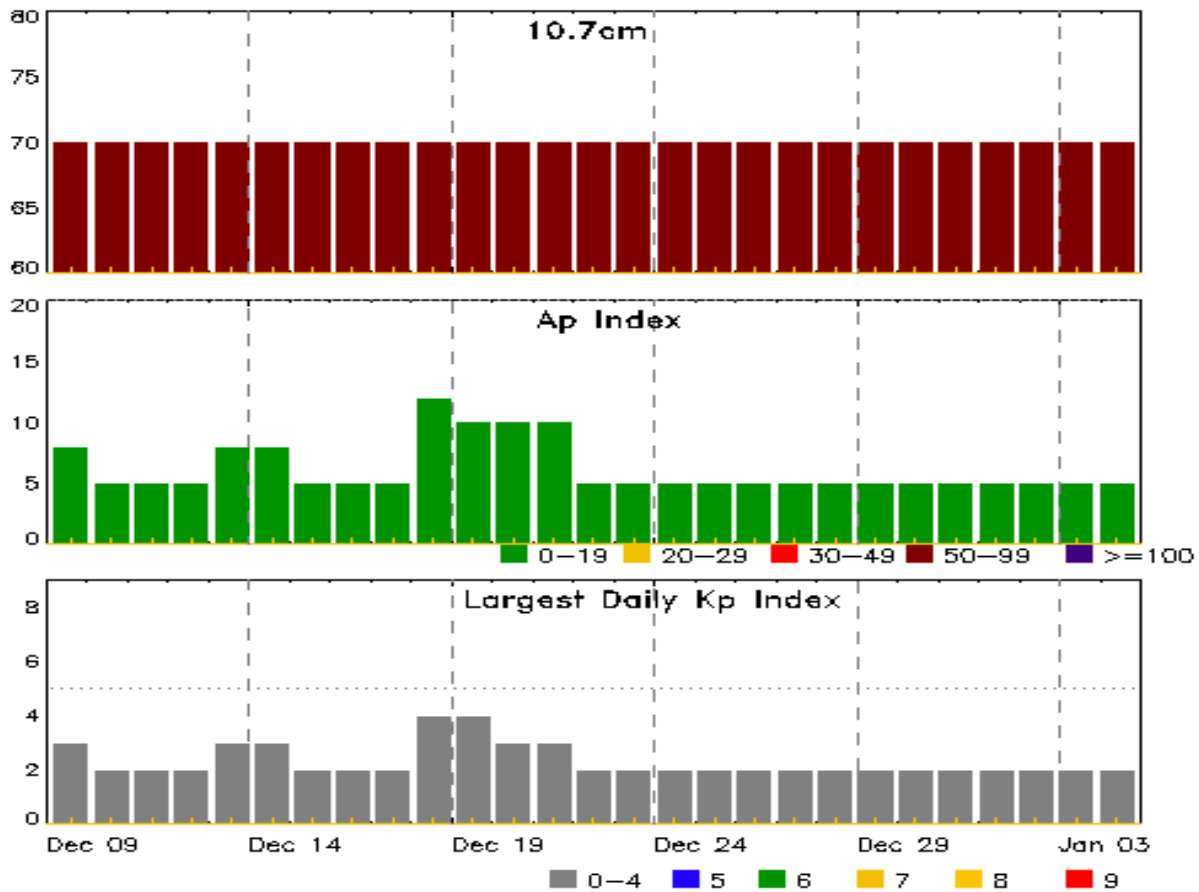


Alerts and Warnings Issued

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
09 Dec	70	8	3	23 Dec	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	8	3	27	70	5	2
14	70	8	3	28	70	5	2
15	70	5	2	29	70	5	2
16	70	5	2	30	70	5	2
17	70	5	2	31	70	5	2
18	70	12	4	01 Jan	70	5	2
19	70	10	4	02	70	5	2
20	70	10	3	03	70	5	2
21	70	10	3	04	70	5	2
22	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	#
02 Dec	1115	1116	1117	A1.1			



Region Summary

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	4		

No Active Regions

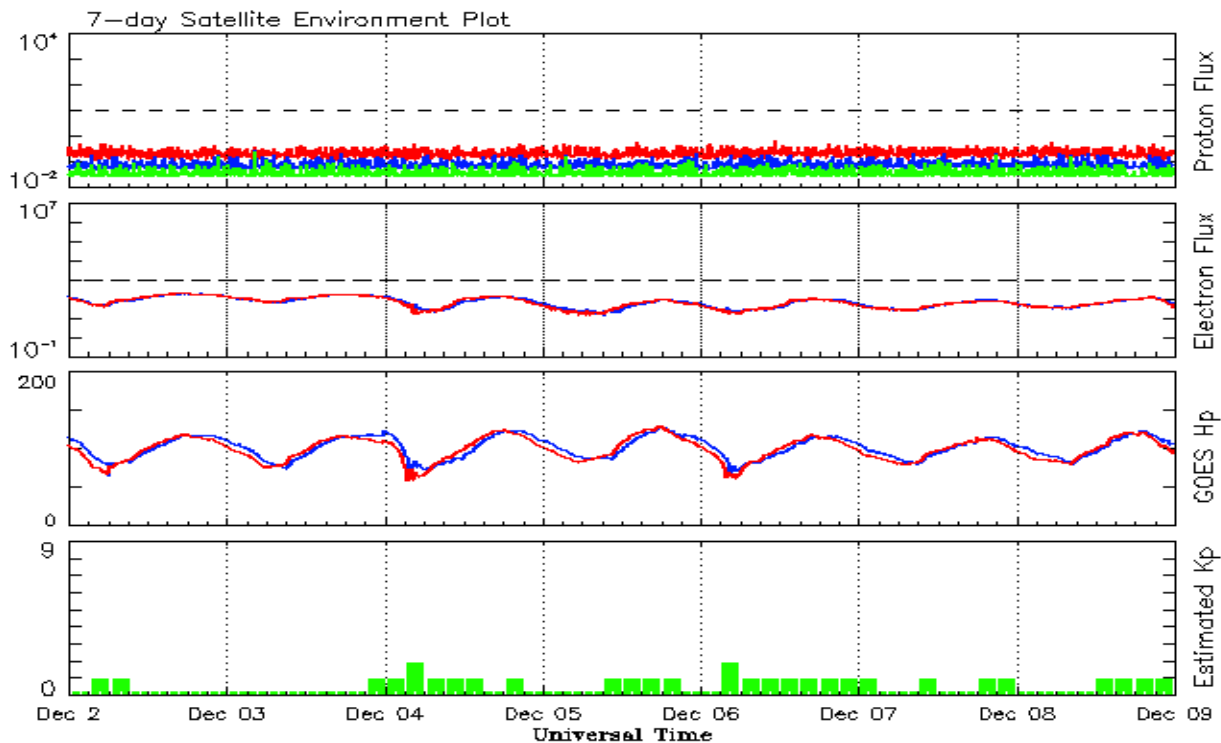


Recent Solar Indices (preliminary)
Observed monthly mean values

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 02 December 2019*

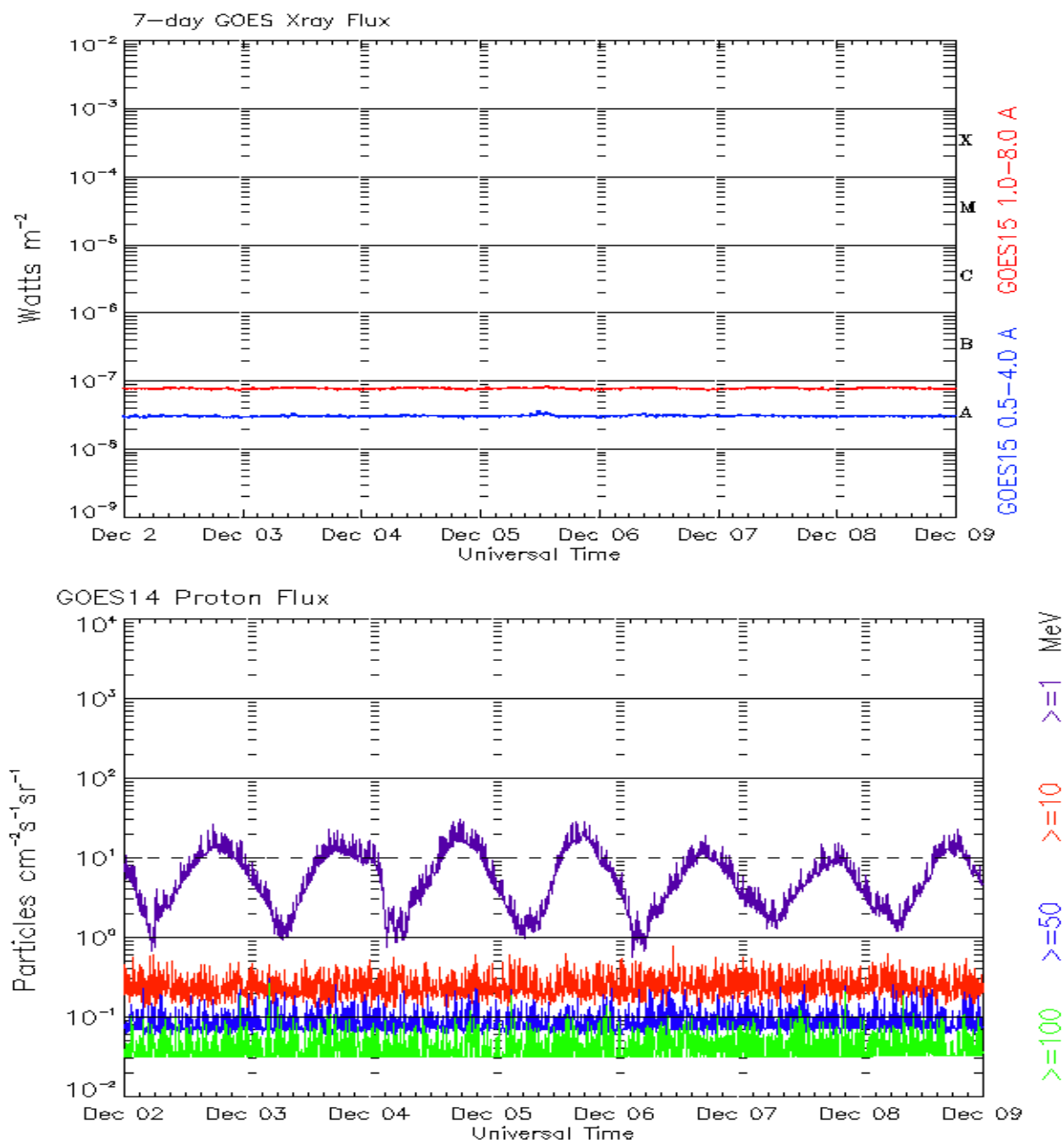
The proton flux plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by the SWPC Primary GOES satellite, near West 75, for each of three energy thresholds: greater than 10, 50, and 100 MeV.

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 02 December 2019*

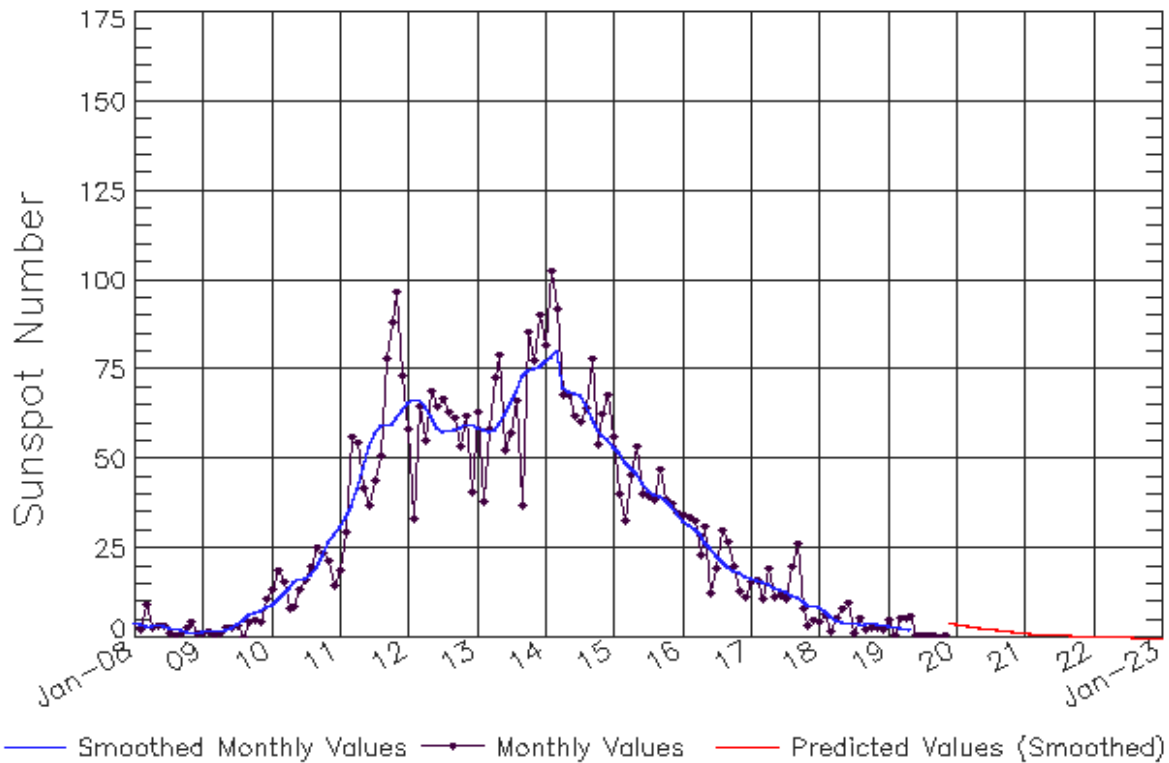
The x-ray plots contains five-minute averages x-ray flux (Watt/m^2) as measure by the SWPC primary GOES X-ray satellite, usually at West 105 longitude, in two wavelength bands, 0.05 - 0.4 and 0.1 - 0.8 nm. The letters A, B, C, M and X refer to x-ray event levels for the 0.1 - 0.8 nm band.

The proton plot contains the five-minute averaged integral flux units ($\text{pfu} = \text{protons/cm}^2\text{-sec -sr}$) 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.



ISES Solar Cycle Sunspot Number Progression

Observed data through Nov 2019



Updated 2019 Dec 9

NOAA/SWPC Boulder, CO USA

Smoothed Sunspot Number Prediction

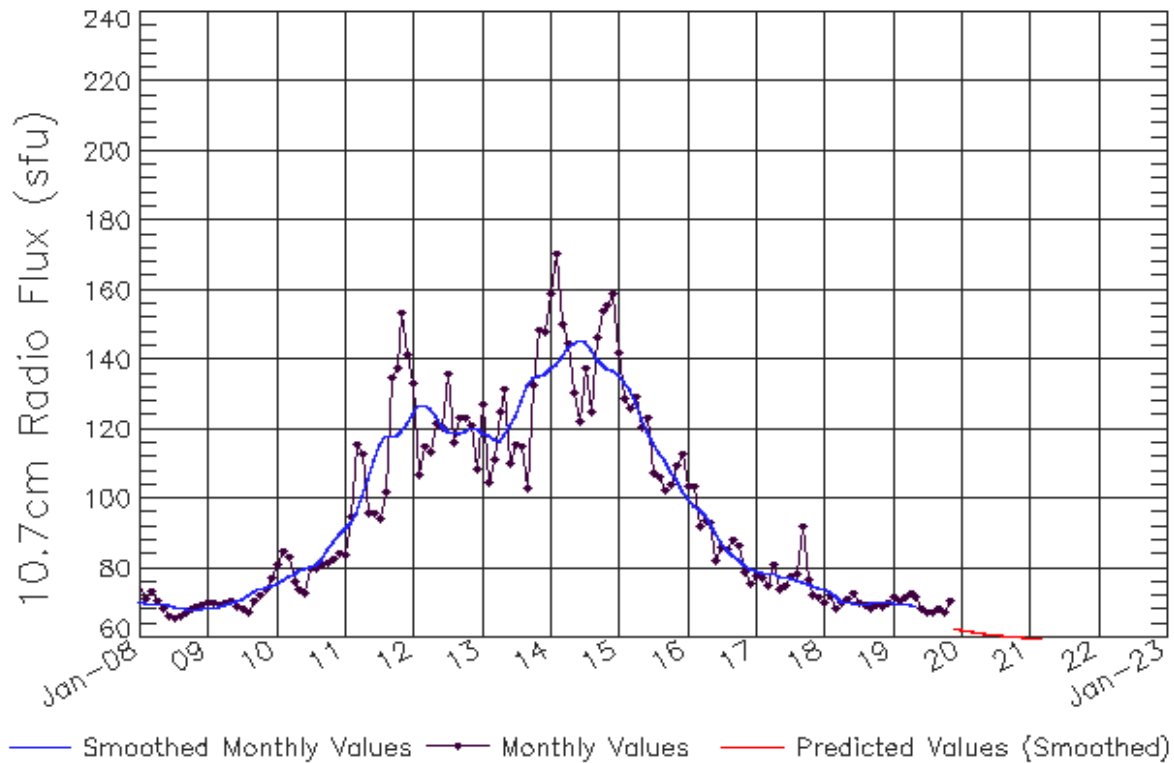
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	7	9	11	13	14	16	17	17	20	23	27	29
	(1)	(2)	(3)	(5)	(5)	(6)	(7)	(7)	(8)	(9)	(9)	(10)
2011	19	30	56	54	42	37	44	51	78	88	97	73
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2012	58	33	64	55	69	65	67	63	61	53	62	41
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2013	63	38	58	72	79	53	57	66	37	86	78	90
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2014	82	102	92	68	68	62	60	64	78	54	62	68
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2015	56	40	33	45	53	40	40	39	47	38	37	35
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2016	34	34	33	23	31	12	19	30	27	20	13	11
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2017	16	16	11	19	11	12	11	20	26	8	3	5
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2018	4	6	2	5	8	9	1	5	2	3	3	2
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2019	5	1	6	6	6	1	1	0	1	0	0	4
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2020	4	4	3	3	3	3	2	2	2	2	2	2
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2021	2	1	1	1	1	1	1	1	1	1	1	1
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2022	1	0	0	0	0	0	0	0	0	0	0	0
	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)

SWPC PRF 2310 09 December 2019



ISES Solar Cycle F10.7cm Radio Flux Progression

Observed data through Nov 2019



Updated 2019 Dec 9

NOAA/SWPC Boulder, CO USA

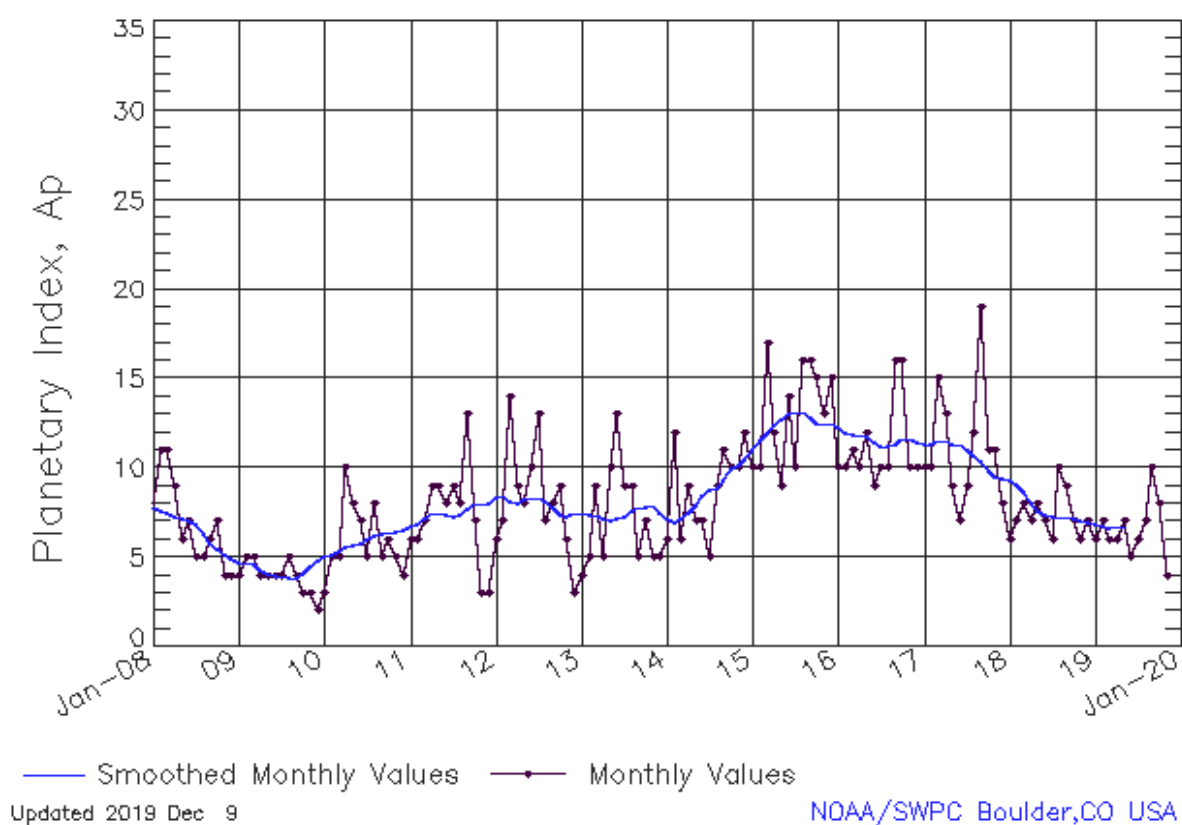
Smoothed F10.7cm Radio Flux Prediction

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	76 (***)	77 (***)	78 (***)	78 (***)	79 (***)	80 (***)	80 (***)	81 (***)	82 (***)	85 (***)	88 (***)	90 (***)
2011	91 (***)	93 (***)	96 (***)	100 (***)	106 (***)	111 (***)	115 (***)	118 (***)	118 (***)	118 (***)	120 (***)	122 (***)
2012	124 (***)	127 (***)	127 (***)	126 (***)	124 (***)	121 (***)	120 (***)	119 (***)	119 (***)	119 (***)	120 (***)	120 (***)
2013	119 (***)	118 (***)	117 (***)	117 (***)	118 (***)	121 (***)	124 (***)	128 (***)	132 (***)	135 (***)	135 (***)	136 (***)
2014	137 (***)	139 (***)	141 (***)	144 (***)	145 (***)	146 (***)	145 (***)	143 (***)	140 (***)	138 (***)	137 (***)	137 (***)
2015	136 (***)	134 (***)	131 (***)	127 (***)	123 (***)	120 (***)	116 (***)	113 (***)	111 (***)	108 (***)	105 (***)	103 (***)
2016	100 (***)	98 (***)	97 (***)	95 (***)	93 (***)	90 (***)	88 (***)	86 (***)	84 (***)	83 (***)	81 (***)	80 (***)
2017	79 (***)	79 (***)	79 (***)	78 (***)	78 (***)	77 (***)	77 (***)	76 (***)	76 (***)	75 (***)	75 (***)	74 (***)
2018	74 (***)	73 (***)	72 (***)	71 (***)	70 (***)	70 (***)	70 (***)	70 (***)	70 (***)	70 (***)	70 (***)	70 (***)
2019	70 (***)	70 (***)	70 (***)	70 (***)	70 (***)	69 (1)	69 (1)	68 (2)	67 (3)	66 (4)	65 (4)	65 (5)
2020	64 (6)	64 (7)	63 (8)	62 (8)	62 (9)	61 (9)	61 (9)	61 (9)	61 (9)	60 (9)	60 (9)	60 (9)
2021	60 (9)	60 (9)	60 (9)	60 (9)	60 (9)	60 (9)	60 (9)	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)
2022	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)	59 (9)



ISES Solar Cycle Ap Progression

Observed data through Nov 2019



Solar Cycle Comparison charts are temporarily unavailable.

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

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

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<http://spaceweather.gov/ftpmenu/> -- Some content as ascii text

<http://spaceweather.gov/SolarCycle/> -- Solar Cycle Progression web site

<http://spaceweather.gov/contacts.html> -- Contact and Copyright information

http://spaceweather.gov/weekly/Usr_guide.pdf -- User Guide

