

Space Weather Highlights
12 December - 18 December 2016

SWPC PRF 2155
19 December 2016

Solar activity was at background levels through the period.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels on 12-17 December and moderate levels on 18 December. A maximum flux of 10,187 pfu was observed at 14/1610 UTC.

Geomagnetic field activity was at quiet to unsettled levels during the period. The period began under the waning influence of a negative polarity CH HSS with unsettled conditions early on 12 December. The remainder of the 12th through late on 17 December saw quiet conditions. During this time, solar wind speeds slowly decreased from about 550 km/s to near 350 km/s. Bt was less than 5 nT while the Bz component varied generally between +5 nT to -4 nT. Phi angle was in a mostly negative orientation.

By midday on 17 December, winds speeds indicated a general increase to about 500 km/s while Bt increased to about 10 nT and Bz showed rotation from +6 nT to -7 nT. Phi angle rotated to a mostly positive orientation. This increase in wind parameters signaled the arrival of a co-rotating interaction region ahead of a weak, positive polarity CH HSS. The geomagnetic field reacted with quiet to unsettled levels.

Space Weather Outlook
19 December - 14 January 2017

Solar activity is expected to be at very low levels with a slight chance for C-class flare activity 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 be at normal to moderate levels on 19 December and moderate to high levels for the remainder of the outlook period (20 Dec - 14 Jan).

Geomagnetic field activity is expected to be at unsettled to active levels on 19-25 December, 03-07 January and again on 14 January, with minor storm (G1-Minor) conditions likely on 21-22 December and 04-05 January; all due to recurrent CH HSSs. Mostly quiet conditions are expected for the remainder of the outlook period.



Daily Solar Data

Date	Radio Flux 10.7cm	Sun spot No.	Sunspot Area (10 ⁻⁶ hemi.)	X-ray Background Flux	Flares							
					X-ray			Optical				
					C	M	X	S	1	2	3	4
12 December	71	13	10	A5.7	0	0	0	0	0	0	0	0
13 December	71	14	70	A5.5	0	0	0	0	0	0	0	0
14 December	72	25	80	A5.4	0	0	0	0	0	0	0	0
15 December	73	12	10	A5.9	0	0	0	1	0	0	0	0
16 December	73	0	0	A6.7	0	0	0	0	0	0	0	0
17 December	72	0	0	A5.6	0	0	0	0	0	0	0	0
18 December	72	13	20	A5.2	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
	12 December		1.3e+06	1.5e+04	3.6e+03	
13 December		8.1e+05	1.5e+04	3.6e+03		4.4e+08
14 December		1.1e+06	1.5e+04	3.8e+03		5.0e+08
15 December		1.1e+06	1.5e+04	4.2e+03		4.7e+08
16 December		1.3e+06	1.5e+04	3.9e+03		4.0e+08
17 December		1.6e+06	1.5e+04	3.8e+03		2.8e+08
18 December		6.2e+05	1.4e+04	3.6e+03		9.0e+06

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	12 December	5	2-2-2-1-1-2-0-1	3	2-2-1-0-0-2-1-0	6
13 December	2	1-1-0-1-1-1-0-1	2	1-1-0-1-1-1-0-0	4	2-1-1-1-1-1-0-1
14 December	2	2-0-0-0-1-0-1-1	1	0-0-0-2-1-0-0-0	4	2-1-0-1-1-0-1-1
15 December	2	0-0-1-1-1-1-1-1	1	0-0-0-1-1-0-0-0	3	1-1-1-1-0-0-1-1
16 December	2	1-1-0-0-1-1-0-1	0	1-0-0-0-0-0-0-0	3	1-1-0-0-0-0-0-1
17 December	3	1-0-0-1-1-1-2-2	3	0-0-0-0-2-1-2-2	6	1-0-1-1-1-1-2-3
18 December	6	2-3-2-1-1-2-1-1	11	2-3-3-1-4-3-1-1	18	3-3-3-2-2-2-1-1

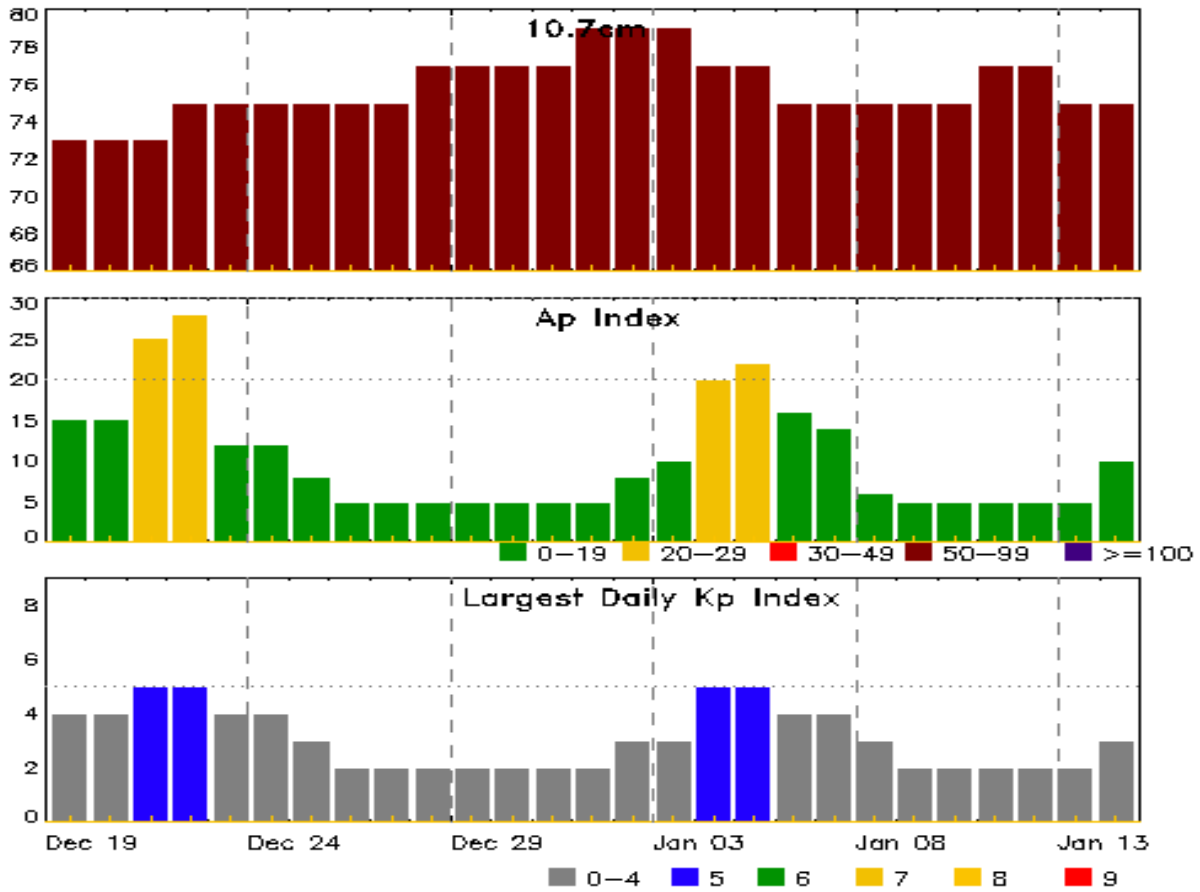


Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
12 Dec 0500	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	09/1150
13 Dec 0501	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	09/1150
14 Dec 0501	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	09/1150
15 Dec 0501	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	09/1150
16 Dec 0500	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	09/1150
17 Dec 0501	CONTINUED ALERT: Electron 2MeV Integral Flux \geq 1000pfu	09/1150
17 Dec 2349	WARNING: Geomagnetic K = 4	17/2348 - 18/1500
18 Dec 2053	WATCH: Geomagnetic Storm Category G1 predicted	



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
19 Dec	73	15	4	02 Jan	79	8	3
20	73	15	4	03	79	10	3
21	73	25	5	04	77	20	5
22	75	28	5	05	77	22	5
23	75	12	4	06	75	16	4
24	75	12	4	07	75	14	4
25	75	8	3	08	75	6	3
26	75	5	2	09	75	5	2
27	75	5	2	10	75	5	2
28	77	5	2	11	77	5	2
29	77	5	2	12	77	5	2
30	77	5	2	13	75	5	2
31	77	5	2	14	75	10	3
01 Jan	79	5	2				



Energetic Events

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

No Events Observed

Flare List

Date	Time			X-ray Class	Optical			Rgn #
	Begin	Max	End		Imp/ Brtns	Location Lat CMD		
15 Dec	0324	0330	0334	B2.5				2617
15 Dec	2051	2056	2059	B1.8				2617
15 Dec	2119	2125	2129	B1.3				2617
15 Dec	2143	2145	2150		SF	N14W82		
16 Dec	0426	0429	0436	B1.1				2617
16 Dec	0938	0943	0953	B2.1				2617



Region Summary

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

Region 2617

11 Dec	N17W44	71	10	3	Bxo	3	B					1					
12 Dec	N16W59	72	10	5	Bxo	3	B										
13 Dec	N16W72	73	70	5	Cao	4	B										
14 Dec	N16W86	74	70	8	Cso	4	B										
								0	0	0	1	0	0	0	0	0	

Crossed West Limb.

Absolute heliographic longitude: 71

Region 2618

14 Dec	N13W35	22	10	1	Bxo	1	B										
15 Dec	N14W48	22	10	2	Axx	2	A										
16 Dec	N14W62	23	plage														
17 Dec	N14W76	24	plage														
18 Dec	N14W90	25	plage														
								0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 22

Region 2619

18 Dec	N04E15	280	20	3	Dso	3	B										
								0	0	0	0	0	0	0	0	0	

Still on Disk.

Absolute heliographic longitude: 280

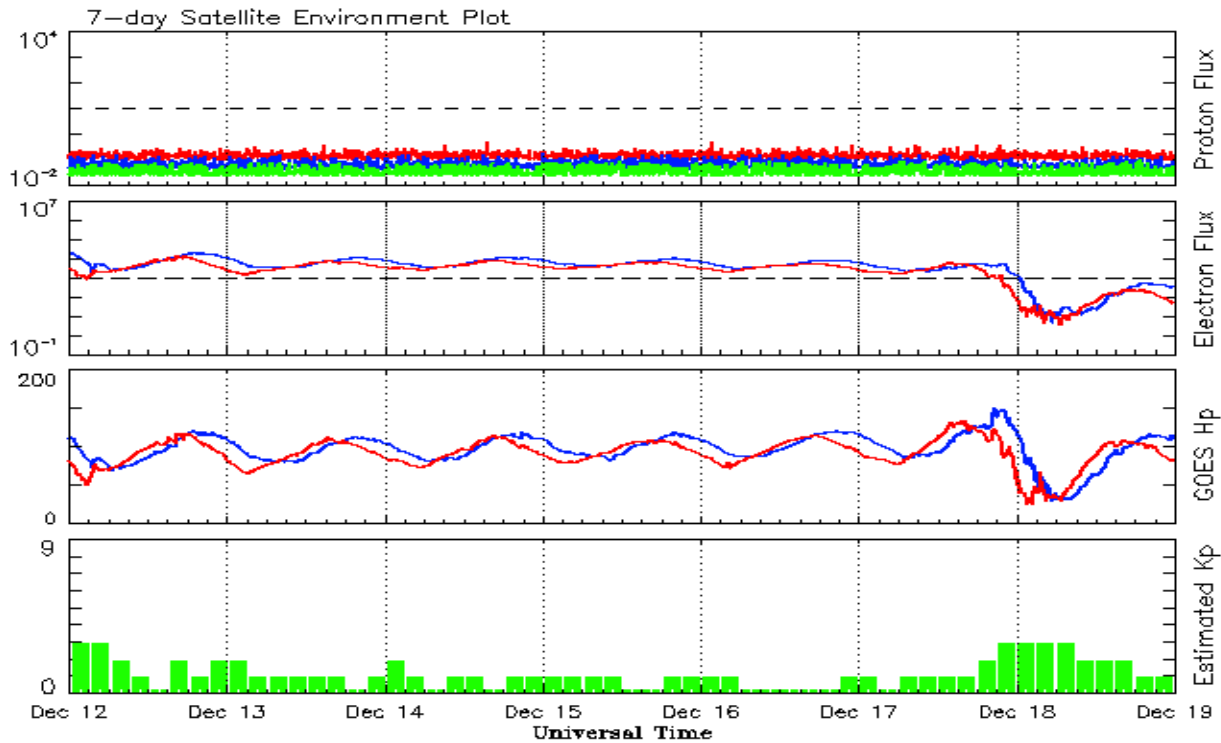


Recent Solar Indices (preliminary)
Observed monthly mean values

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
2014									
December	120.0	67.7	0.65	95.2	55.3	158.7	137.0	12	10.5
2015									
January	101.2	55.8	0.66	92.1	53.6	141.7	135.8	10	11.0
February	70.6	40.0	0.63	88.3	51.7	128.8	133.8	10	11.5
March	61.7	32.7	0.62	84.2	49.3	126.0	131.2	17	12.0
April	72.5	45.2	0.75	80.5	47.3	129.2	127.3	12	12.4
May	83.0	53.3	0.71	77.5	45.7	120.1	123.3	9	12.7
June	77.3	39.9	0.53	73.1	43.3	123.2	119.5	14	13.0
July	68.4	39.5	0.58	68.2	41.0	107.0	116.0	10	13.1
August	61.6	38.6	0.63	65.5	39.8	106.2	113.3	16	13.1
September	72.5	47.2	0.65	64.0	39.5	102.1	110.8	16	12.8
October	59.5	38.2	0.62	61.8	38.6	104.1	107.9	15	12.5
November	61.8	37.3	0.61	59.0	36.7	109.6	105.3	13	12.5
December	54.1	34.8	0.64	55.1	34.7	112.8	102.5	15	12.5
2016									
January	50.4	34.2	0.67	51.4	32.6	103.5	99.9	10	12.3
February	56.0	33.8	0.61	49.6	31.5	103.5	98.1	10	12.0
March	40.9	32.5	0.80	47.7	30.3	91.6	96.6	11	11.8
April	39.2	22.7	0.58	45.0	28.7	93.4	95.3	10	11.8
May	48.9	30.9	0.64	42.1	26.9	93.1	93.2	12	11.7
June	19.3	12.3	0.65			81.9		9	
July	36.8	19.5	0.53			85.9		10	
August	50.4	30.4	0.60			85.0		10	
September	37.4	26.8	0.72			87.8		16	
October	30.0	20.2	0.67			86.1		16	
November	22.4	12.8	0.57			78.7		10	

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 12 December 2016*

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.

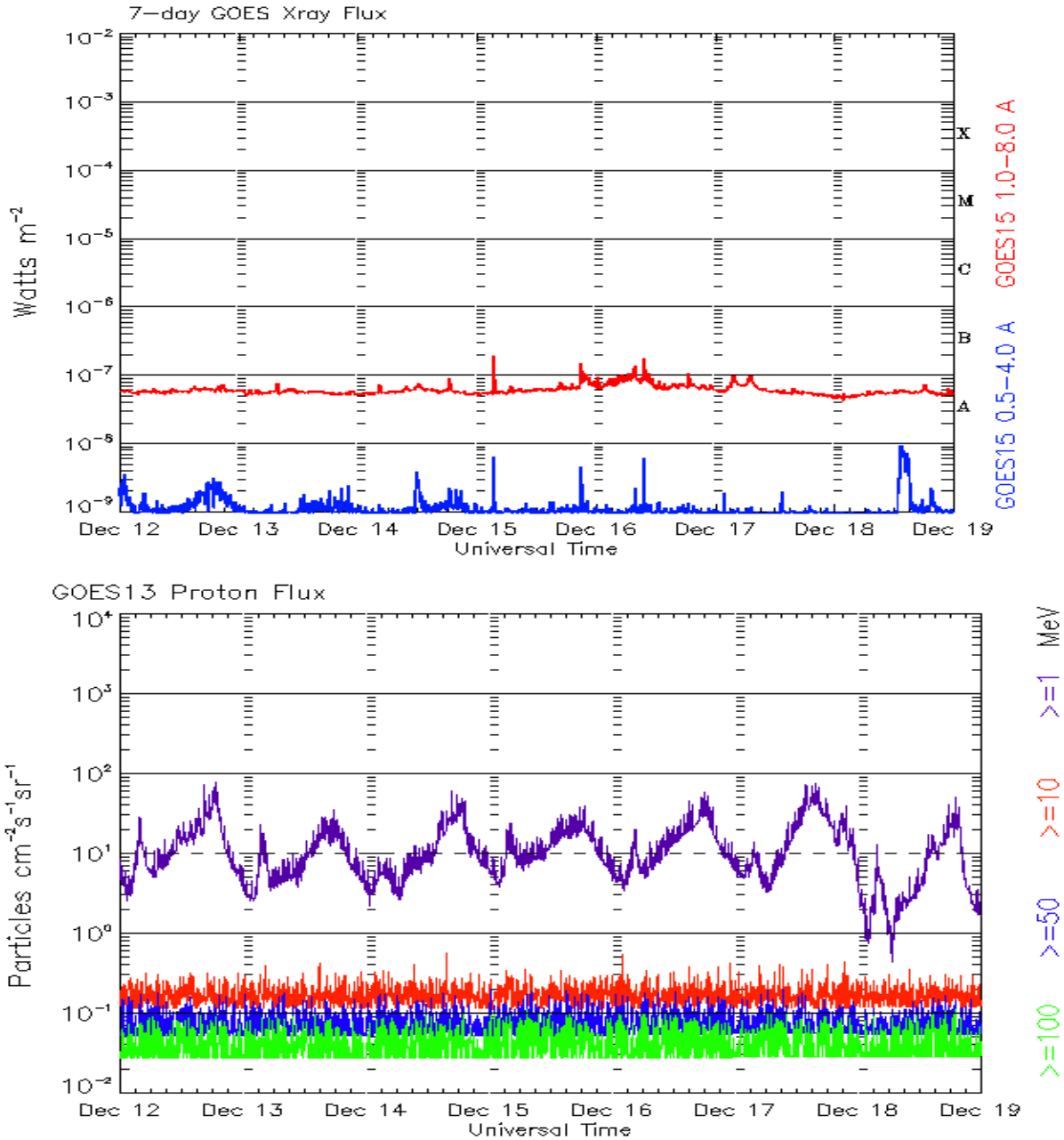
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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 12 December 2016*

The x-ray plots contains five-minute averages x-ray flux (Watt/m²) 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/cm² -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)

Published every Monday by the Space Weather Prediction Center.

U.S. Department of Commerce
NOAA / National Weather Service
Space Weather Prediction Center
325 Broadway, Boulder CO 80305

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.

<http://spaceweather.gov/weekly/> -- Current and previous year

<http://spaceweather.gov/ftpmenu/warehouse.html> -- Online archive from 1997

<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

