Space Weather Highlights **SWPC PRF 2178**
22 May - 28 May 2017 **29 May 2017**

Solar activity was at very low levels to low levels over the period. Low levels were observed on 28 May due to a C3/Sf flare at 28/1928 UTC and a C1/Sf flare at 28/2313 UTC from Region 2659 (N13, L=041, class/area Dao/220 on 28 May). Other events included an approximate 25 degree filament eruption centered near N04W03 which was observed lifting off in H-alpha imagery beginning at 22/1900 UTC. An associated partial-halo CME was observed with the majority of the ejecta off the western limb in SOHO/LASCO C2 imagery beginning at 23/0512 UTC. WSA-Enlil modelling of the event showed an Earth-directed component with the associated CME.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at high levels from 22-27 May with a peak flux of 26,098 pfu observed at 22/1650 UTC. Electron flux dropped to normal levels on 28 May due to the arrival of the 23 May CME.

Geomagnetic field activity ranged from quiet to G3 (Strong) storm levels over the period. The period began under the declining influence of a negative polarity coronal hole high speed stream (CH HSS). Solar wind speeds declined from approximately 570 km/s to near 300 km/s by 27 May while total field was between 3 nT and 7 nT. Quiet to unsettled levels were observed on 22-23 May with quiet levels from 24 May through most of 27 May. Beginning at 27/1447 UTC, a small shock was observed indicating the arrival of the 23 May CME. Total field increased from 3 nT to 10 nT while the solar wind increased from 303 km/s to 353 km/s. Although solar wind speed remained fairly steady between 350 km/s and 380 km/s, another increase in total field was observed with the transition into the magnetic cloud at 27/2000 UTC. Total field reached a maximum of 23 nT at 27/2230 UTC before it slowly declined to near 13 nT by the end of the period. The Bz component deflected southward to -20 nT beginning at 27/2036 UTC and remained negative until 28/1442 UTC. A geomagnetic sudden impulse was observed at 27/1536 UTC (19 nT at the Boulder magnetometer) indicating the arrival of the CME. The geomagnetic field responded with a period of G2 (Moderate) storm levels late on 27 May followed by G1-G3 (Minor-Strong) storm levels through midday on 28 May. A decrease to quiet to active levels was observed during the second half of 28 May.

Space Weather Outlook
29 May - 24 June 2017

Solar activity is expected to be at very low levels throughout the forecast period with a chance for further isolated C-class flares on 29-30 May due to flare potential from Region 2659.

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 with high levels likely from 29-30 May due to CME influence. High levels are also likely from 16-24 Jun due to CH HSS influence.

Geomagnetic field activity is expected to be at quiet to active levels on 29 May due to waning CME effects. Mostly quiet conditions are expected from 30 May through 09 Jun. From 10-19 Jun, unsettled to active levels are expected with G1 (Minor) geomagnetic storm levels likely on 16 Jun due to recurrent CH HSS effects. Mostly quiet conditions are expected to return from 20-24 Jun.

Daily Solar Data

Date	Radio Flux 10.7cm	Sun spot No.	Sunspot Area (10^{-6} hemi.)	X-ray Background		Flares						
						X-ray			Optical			
				Flux		C	M	X	S	1	2	3	4
22 May	74	55	52	A6.0	0	0	0	0	0	0	0	0
23 May	76	47	50	A7.0	0	0	0	1	0	0	0	0
24 May	78	15	30	A8.0	0	0	0	1	0	0	0	0
25 May	76	19	80	A8.7	0	0	0	0	0	0	0	0
26 May	80	22	170	B1.0	0	0	0	2	0	0	0	0
27 May	82	21	180	B1.3	0	0	0	11	0	0	0	0
28 May	79	20	220	B1.1	2	0	0	6	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
22 May	5.3e+07	1.5e+04	3.5e+03		8.0e+08	
23 May	4.1e+07	1.5e+04	3.6e+03		3.7e+08	
24 May	3.0e+07	1.5e+04	3.6e+03		6.4e+08	
25 May	2.8e+07	1.6e+04	3.6e+03		9.6e+08	
26 May	2.6e+07	1.5e+04	3.6e+03		8.0e+08	
27 May	2.4e+07	1.5e+04	3.5e+03		4.9e+08	
28 May	2.7e+07	1.4e+04	3.2e+03		3.1e+06	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
22 May	9	2-2-1-2-3-2-2-3	17	2-2-3-5-4-3-2-2	10	2-2-2-2-3-2-3-3
23 May	8	2-3-2-1-3-1-2-1	12	3-4-2-3-3-2-1-1	8	2-3-2-1-2-1-2-2
24 May	4	1-2-1-2-2-1-1-0	5	2-1-1-2-3-1-0-0	4	2-2-1-1-1-1-0-1
25 May	4	0-0-0-2-2-2-1-2	2	0-1-0-0-1-1-0-1	4	0-1-0-1-1-1-1-2
26 May	3	1-1-0-1-2-1-1-1	1	1-0-0-2-0-0-0-0	3	1-1-1-1-1-0-1-1
27 May	14	1-0-0-1-2-3-2-6	4	1-0-0-0-1-2-2-3	14	1-1-0-1-1-3-2-6
28 May	32	5-6-5-5-3-2-2-1	84	4-9-6-6-5-4-2-0	94	6-7-6-5-4-2-1-1

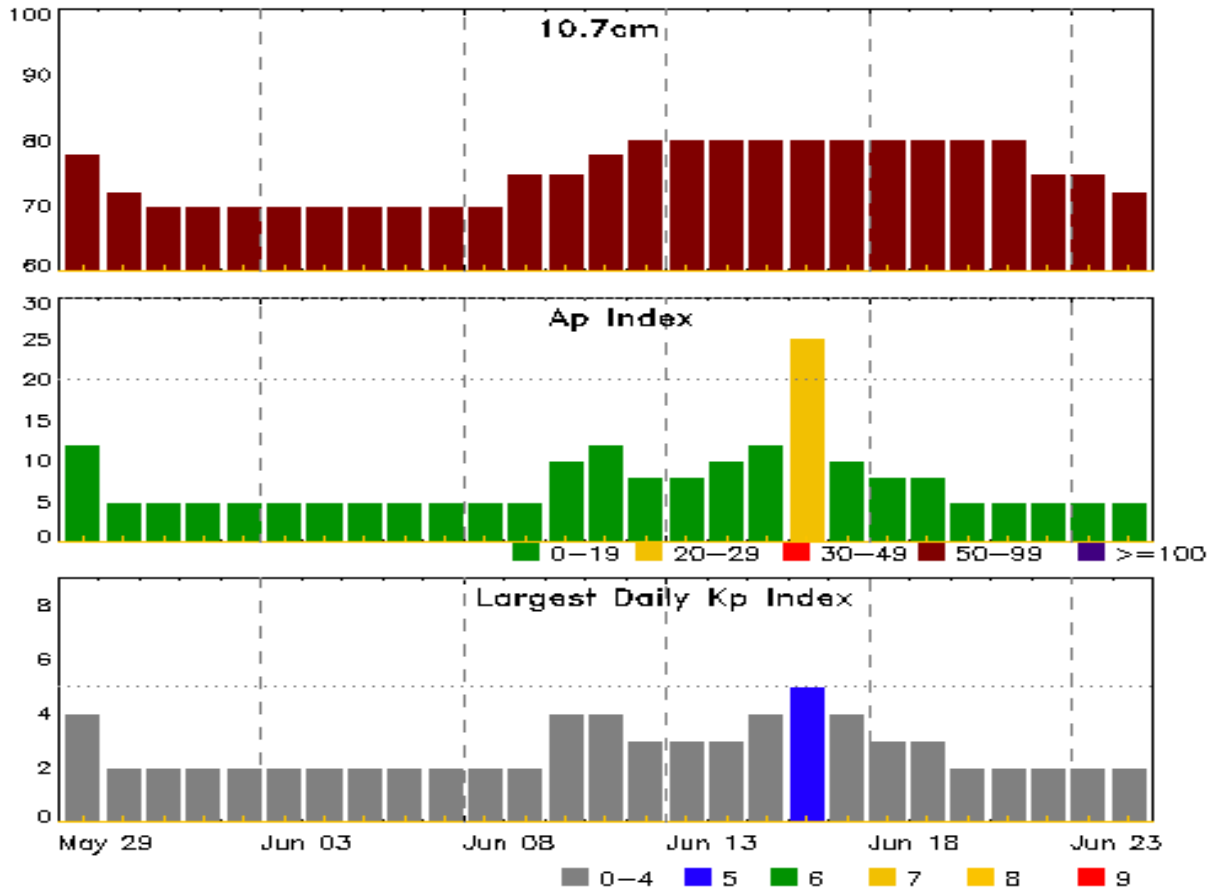
Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
22 May 0500	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	20/1705
23 May 0536	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	20/1705
23 May 0545	WARNING: Geomagnetic K = 4	23/0544 - 1200
24 May 0501	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	20/1705
25 May 0500	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	20/1705
26 May 0500	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	20/1705
27 May 0501	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	20/1705
27 May 1505	WARNING: Geomagnetic Sudden Impulse expected	27/1545 - 1630
27 May 1523	WARNING: Geomagnetic K = 4	27/1530 - 2100
27 May 1546	SUMMARY: Geomagnetic Sudden Impulse	27/1536
27 May 2045	EXTENDED WARNING: Geomagnetic K = 4	27/1530 - 28/0900
27 May 2202	ALERT: Geomagnetic K = 4	27/2202
27 May 2204	WARNING: Geomagnetic K = 5	27/2204 - 28/0600
27 May 2255	ALERT: Geomagnetic K = 5	27/2255
27 May 2320	WARNING: Geomagnetic K = 6	27/2320 - 28/0600
27 May 2323	ALERT: Geomagnetic K = 6	27/2322
28 May 0106	ALERT: Geomagnetic K = 5	28/0105
28 May 0225	ALERT: Geomagnetic K = 6	28/0224
28 May 0330	ALERT: Geomagnetic K = 5	28/0329
28 May 0350	ALERT: Geomagnetic K = 6	28/0349
28 May 0410	EXTENDED WARNING: Geomagnetic K = 5	27/2204 - 28/1500
28 May 0410	EXTENDED WARNING: Geomagnetic K = 6	27/2320 - 28/0900
28 May 0410	WARNING: Geomagnetic K>= 7	28/0409 - 0900
28 May 0420	ALERT: Geomagnetic K = 7	28/0419
28 May 0430	EXTENDED WARNING: Geomagnetic K = 4	27/1530 - 29/0000

Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
28 May 0719	ALERT: Geomagnetic K = 5	28/0718
28 May 0824	ALERT: Geomagnetic K = 6	28/0823
28 May 1026	ALERT: Geomagnetic K = 5	28/1020
28 May 1443	EXTENDED WARNING: Geomagnetic K = 5	27/2204 - 28/2100

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
29 May	78	12	4	12 Jun	80	8	3
30	72	5	2	13	80	8	3
31	70	5	2	14	80	10	3
01 Jun	70	5	2	15	80	12	4
02	70	5	2	16	80	25	5
03	70	5	2	17	80	10	4
04	70	5	2	18	80	8	3
05	70	5	2	19	80	8	3
06	70	5	2	20	80	5	2
07	70	5	2	21	80	5	2
08	70	5	2	22	75	5	2
09	75	5	2	23	75	5	2
10	75	10	4	24	72	5	2
11	78	12	4				

Energetic Events

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

No Events Observed

Flare List

	Time				Optical		
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
22 May	2201	2205	2209	B1.5			2660
23 May	1404	1421	1437	B4.4	SF	S12W21	2660
24 May	0233	0236	0242	B1.2			
24 May	1331	1344	1356	B3.8	SF	S11W35	2660
25 May	1322	1326	1331	B2.2			
25 May	1522	1527	1533	B2.2			
25 May	2110	2117	2127	B5.0			
26 May	0133	0136	0140	B1.8			2659
26 May	0925	0928	0930	B1.2			2659
26 May	1734	1736	1737		SF	N15W41	2659
26 May	2118	2123	2132	B2.9	SF	N14W44	2659
27 May	0531	0531	0534		SF	N11W50	2659
27 May	0848	0851	0857	B2.2	SF	N11W52	2659
27 May	1022	1038	1053	B3.1			2659
27 May	1446	1450	1500		SF	N15W55	2659
27 May	1515	1516	1522		SF	N11W56	2659
27 May	1543	1544	1548		SF	N15W55	2659
27 May	1623	1633	1647		SF	N11W56	2659
27 May	1655	1703	1712		SF	N11W56	2659
27 May	1747	1830	1904	B9.2	SF	N15W55	2659
27 May	1926	1927	1934		SF	N15W55	2659
27 May	2047	2050	2052		SF	N15W53	2659
27 May	2118	2124	2128	B4.4			2659
27 May	2208	2211	2214	B7.2	SF	N15W54	2659
28 May	0055	0100	0103	B3.8			2659
28 May	0634	0639	0651	B6.7	SF	N11W60	2659
28 May	0845	0849	0903	B1.6			
28 May	1046	1051	1054	B8.0	SF	N13W62	2659
28 May	1139	1147	1154	B6.6	SF	N13W62	2659
28 May	1318	1323	1329	B4.0			2659
28 May	1422	1425	1430	B1.6			2659

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
28 May	1542	1552	1557	B3.0			2659
28 May	1855	1859	1904	B2.7	SF	N15W67	2659
28 May	1922	1928	1937	C3.3	SF	N14W68	2659
28 May	2305	2313	2326	C1.0	SF	N14W70	2659

Region Summary

	Location		Sunspot Characteristics					Flares							
		Helio	Area	Extent	Spot	Spot	Mag	X-ray			Optical				
Date	Lat CMD	Lon	10^{-6} hemi.	(helio)	Class	Count	Class	C	M	X	S	1	2	3	4
			Region 2656												
16 May	N12E62	67	30	1	Hrx	1	A								
17 May	N11E50	66	30	2	Cso	3	B								
18 May	N12E36	68	20	2	Hax	1	A								
19 May	N12E22	69	20	2	Hax	1	A								
20 May	N11E08	69	20	2	Hax	1	A								
21 May	N11W06	70	20	2	Hax	1	A								
22 May	N11W16	67	10		Axx	1	A								
23 May	N11W28	66	10		Axx	1	A								
24 May	N11W41	65	plage												
25 May	N11W55	66	plage												
26 May	N11W69	67	plage												
27 May	N11W83	68	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 70

			Region 2657												
16 May	N07E21	109	plage												
17 May	N07E06	111	plage												
18 May	N07W08	112	plage												
19 May	N07W22	113	plage												
20 May	N07W36	113	plage												
21 May	N07W50	114	plage												
22 May	N07W65	116	plage												
23 May	N07W80	118	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 111

Region Summary - continued

	Location		Sunspot Characteristics					Flares							
		Helio	Area	Extent	Spot	Spot	Mag	X-ray			Optical				
Date	Lat CMD	Lon	10^{-6} hemi.	(helio)	Class	Count	Class	C	M	X	S	1	2	3	4
			Region 2658												
18 May	S08E38	66	10	4	Bxo	3	B								
19 May	S08E24	67	10	4	Bxo	3	B								
20 May	S07E09	69	10	1	Hrx	1	A								
21 May	S07W05	69	10	1	Hrx	1	A				1				
22 May	S08W18	69	10	4	Hsx	2	A								
23 May	S07W35	72	10	1	Axx	1	A								
24 May	S07W50	75	plage												
25 May	S07W65	76	plage												
26 May	S07W80	78	plage												
								0	0	0	1	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 69

			Region 2659												
21 May	N14E26	38	40	5	Dao	3	B								
22 May	N14E11	39	20	5	Cro	2	B								
23 May	N13W06	44	20	1	Hrx	2	A								
24 May	N12W18	42	30	6	Cro	5	B								
25 May	N13W32	42	80	6	Dsi	9	B								
26 May	N14W45	43	170	8	Dai	12	B				2				
27 May	N13W57	42	180	8	Dai	11	B				11				
28 May	N13W70	41	220	9	Dao	10	B	2			6				
								2	0	0	19	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 44

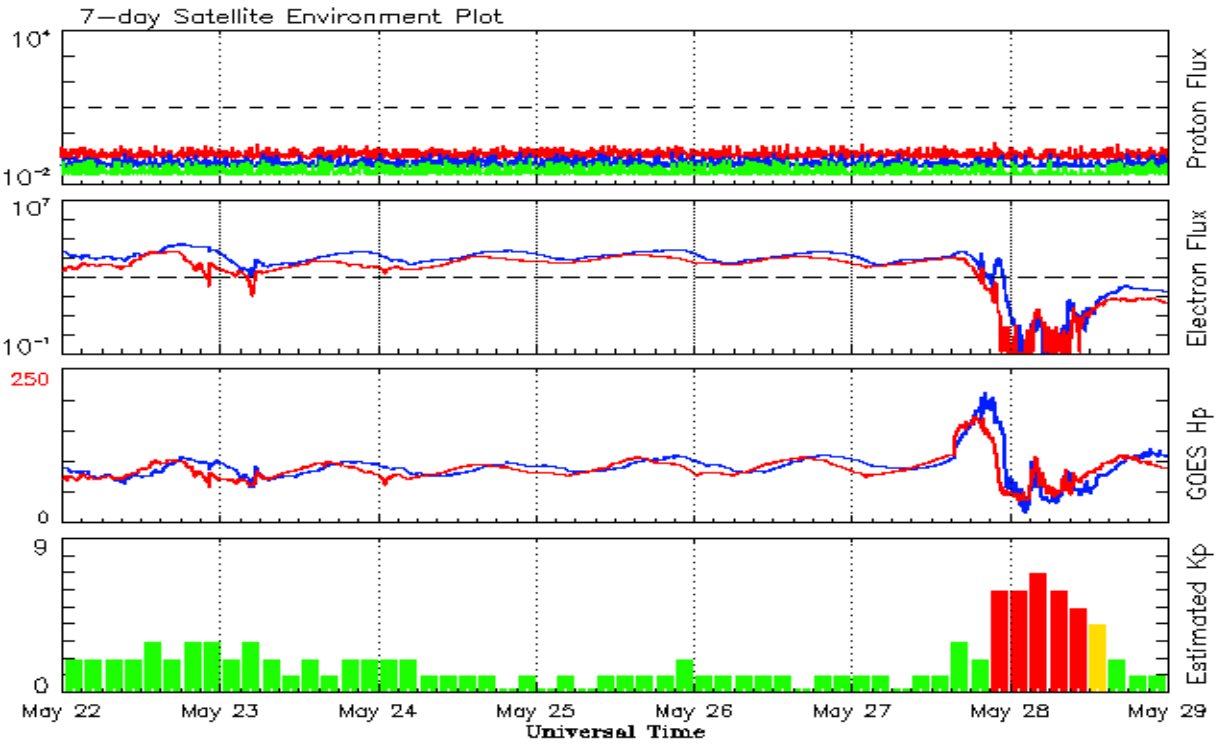
			Region 2660												
22 May	S11W15	66	12	7	Cro	10	B								
23 May	S11W26	64	10	5	Bxo	3	B				1				
24 May	S11W40	65	plage								1				
25 May	S11W54	65	plage												
26 May	S11W68	66	plage												
27 May	S11W82	67	plage												
28 May	S11W96	67	plage												
								0	0	0	2	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 66

Recent Solar Indices (preliminary)
Observed monthly mean values

	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed values		Ratio	Smooth values		Penticton	Smooth	Planetary	Smooth
Month	SEC	RI	RI/SEC	SEC	RI	10.7 cm	Value	Ap	Value
				2015					
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	30.2	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	39.0	24.9	81.9	90.4	9	11.4
July	36.8	19.4	0.53	36.5	23.1	85.9	87.7	10	11.2
August	50.4	30.1	0.60	34.2	21.6	85.0	85.5	10	11.2
September	37.4	26.8	0.72	32.1	19.9	87.8	83.7	16	11.3
October	30.0	20.0	0.67	31.1	18.8	86.1	82.5	16	11.6
November	22.4	12.8	0.57			78.7		10	
December	17.6	11.1	0.64			75.1		10	
				2017					
January	28.1	15.5	0.55			77.4		10	
February	22.0	15.7	0.71			76.9		10	
March	25.4	10.6	0.42			74.6		15	
April	30.4	19.6	0.64			80.9		13	

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 22 May 2017

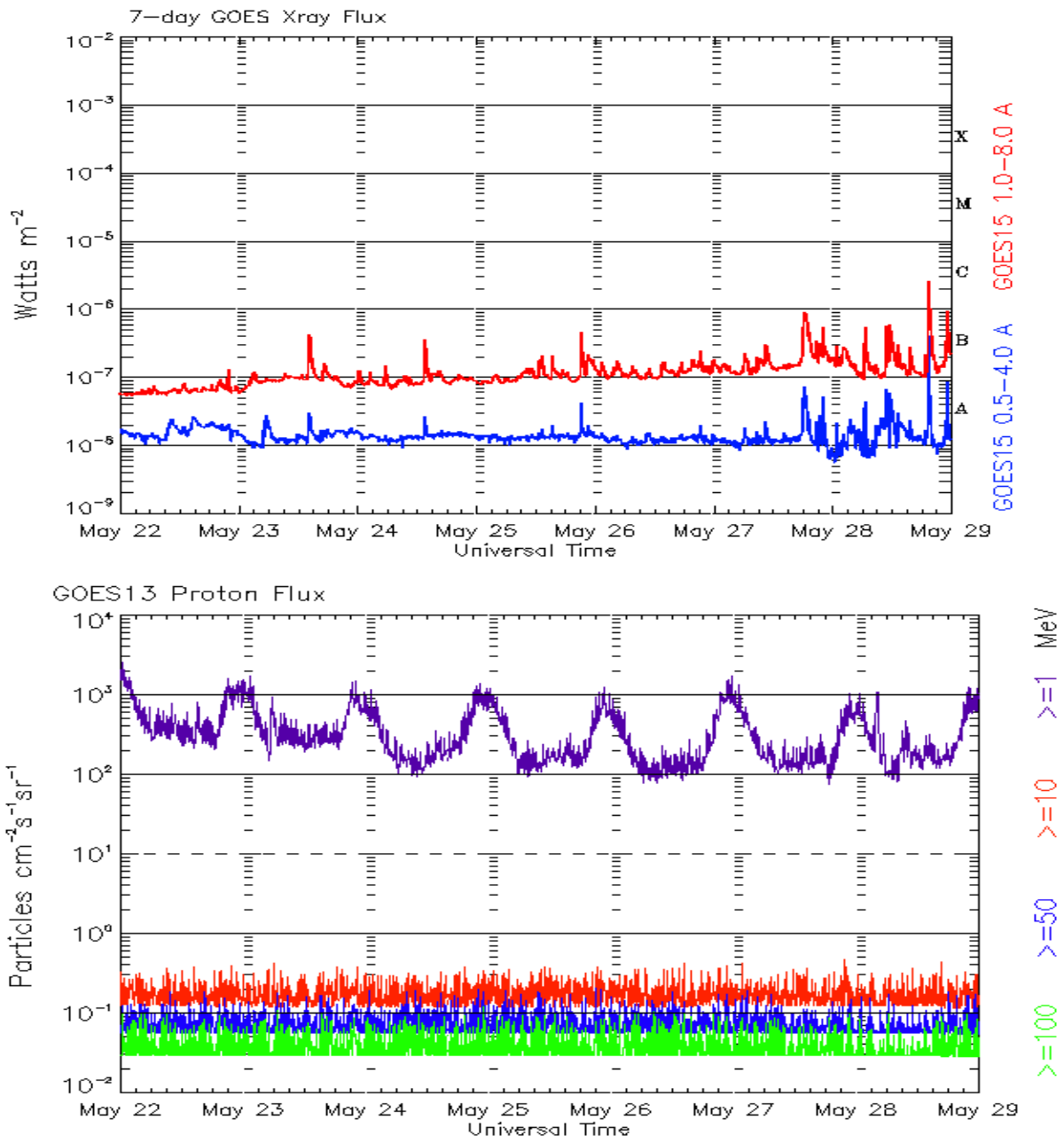
The proton flux plot contains the five-minute averaged integral proton flux (protons/cm^2-sec -sr) as measured by the SWPC Primary GOES satellite, near West 75, for each of three energy thresholds: greater than 10, 50, and 100 MeV.

The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm^2-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 22 May 2017

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)

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 achive 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