Space Weather Highlights
14 March - 20 March 2022

SWPC PRF 2429
21 March 2022

Solar activity reached moderate levels on 14-15 Mar due to an M2 flare at 14/0840 UTC, an M1/Sn at 15/1239 UTC and an M1/Sf at 15/2246 UTC all originating from Region 2965 (N23, L=266, class/area Fki/620 on 12 Mar). Low levels were observed on 17 and 19-20 Mar while very low levels occurred on 16 and 18 Mar. Two CMEs were of note with possible Earth-directed components. The first was an approximate 10 degree filament eruption beginning at 16/1228 UTC centered near N26E23 which produced a CME first visible in LASCO C2 imagery at 16/1347 UTC off the NE limb. Modelling of the event showed a potential glancing blow late on 19 Mar to early on 20 Mar. The second CME of interest was due to a C4/1f flare at 20/0745 UTC from plage region 2971 (N17, L=180, class/area Bxo/020 on 17 Mar). The eruption produced an EIT darkening in AIA 193 imagery as well as a Type II radio sweep (188 km/s). An associated CME could be seen off the NE limb of LASCO C2 imagery at 20/1100 UTC. Initial modelling shows the potential for a glancing blow late on 23 Mar to early on 24 Mar.

No proton events were observed at geosynchronous orbit.

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

Geomagnetic field activity began under the waning influence of the 10 Mar CME. Total field was initially at 24 nT, but began to diminish after 14/0740 UTC. Solar wind speed declined from approximately 455 km/s to near 425 km/s. The geomagnetic field responded with quiet to G2 (Moderate) storm levels on 14 Mar and quiet to unsettled conditions on 15 Mar. By midday on 16 Mar, solar wind parameters had diminished to nominal levels and maintained those levels through late on 19 Mar. Quiet conditions were observed on 16-19 Mar. By late on 19 Mar, total field slowly increased to 10 nT along with density to near 20 p/cm^3. A solar sector boundary crossing ensued at 20/1617 UTC. The enhancement as well as the sinusoidal like rotation of the Bz component during this time could be attributable to the glancing blow from the 16 Mar CME. Quiet to unsettled levels were observed on 20 Mar.

Space Weather Outlook
21 March - 16 April 2022

Solar activity is expected to be at very low to low levels for the forecast period. There is a chance for M-class (R1-R2, Minor-Moderate) flares on 23 Mar-05 Apr as old Region 2957 (S16, L=038) returns to the visible disk.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach moderate to high levels on 21-22 Mar and 02-06 Apr due to recurrent CH HSS influence.

Geomagnetic field activity is expected to reach unsettled to active levels on 21-22 Mar due to

potential negative polarity CH HSS influence. Unsettled to active levels are also expected on 23-25 Mar due to a possible glancing blow from the 20 Mar CME combined with a positive polarity CH HSS. Unsettled to active levels are expected once again on 31 Mar - 03 Apr with G1 (Minor) geomagnetic storm levels likely on 01 Apr due to recurrent negative polarity CH HSS activity.

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
14 March	115	82	670	B5.1	5	1	0	2	0	0	0	0
15 March	110	71	490	B3.6	5	2	0	10	0	0	0	0
16 March	107	41	290	B2.9	0	0	0	0	0	0	0	0
17 March	103	53	280	B2.7	2	0	0	0	0	0	0	0
18 March	98	27	230	B1.8	0	0	0	0	0	0	0	0
19 March	94	29	190	B2.5	2	0	0	1	0	0	0	0
20 March	95	39	80	B2.7	2	0	0	0	1	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	>2MeV
14 March	9.5e+05	3.8e+04	1.5e+06
15 March	2.7e+05	6.9e+04	1.5e+06
16 March	3.4e+05	5.1e+04	1.7e+06
17 March	1.8e+05	4.4e+04	5.9e+06
18 March	1.2e+05	4.2e+04	7.0e+06
19 March	1.3e+06	4.3e+04	6.0e+06
20 March	1.4e+05	4.3e+04	1.2e+06

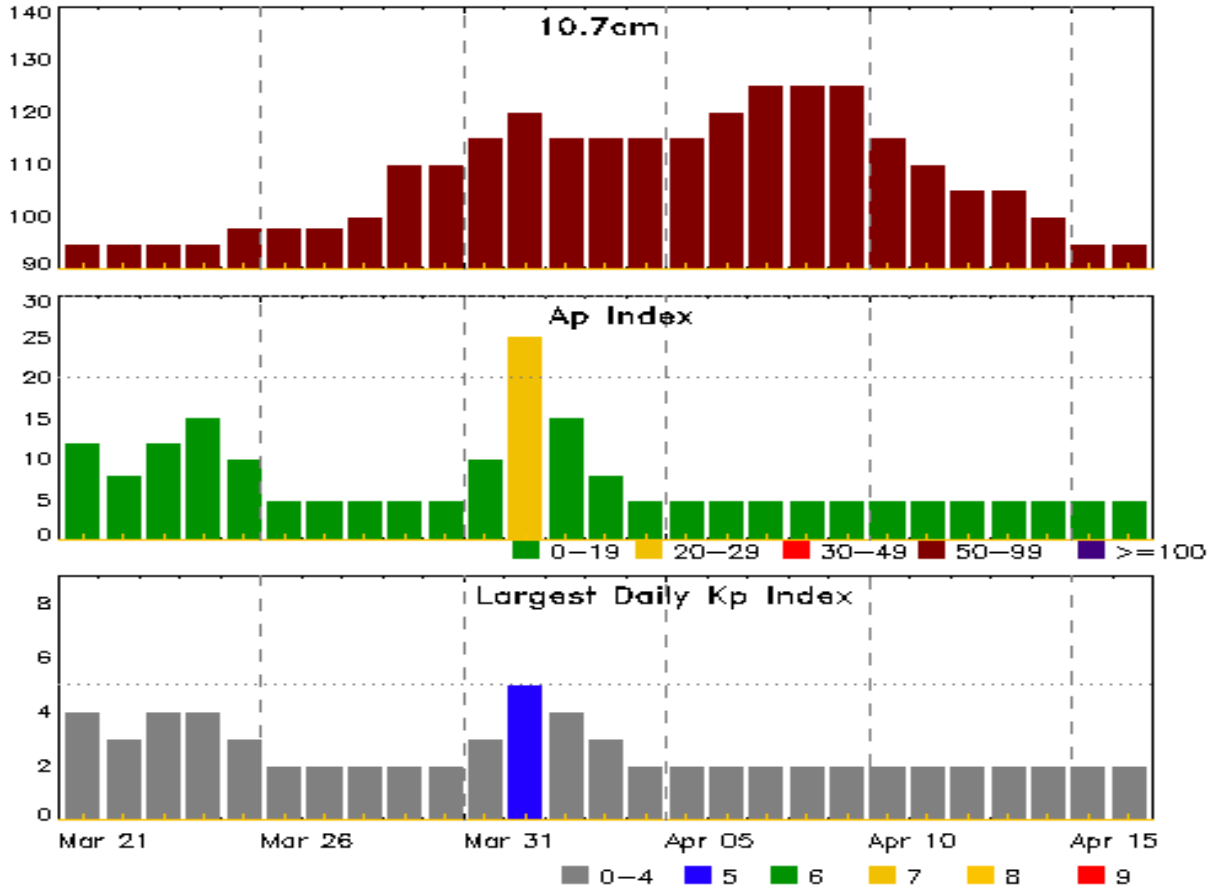
Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
14 March	13	5-3-2-2-3-2-1-1	10	4-2-2-2-1-3-1-2	14	6-3-2-2-2-2-1-1
15 March	5	1-2-1-1-2-2-1-2	3	1-1-0-0-1-2-1-1	7	1-2-1-1-2-2-1-3
16 March	3	1-0-0-1-2-1-1-2	6	0-0-1-3-4-1-0-1	5	1-0-1-2-2-2-2-2
17 March	6	2-2-2-2-2-2-1-0	5	1-2-2-3-2-1-0-0	6	2-2-2-2-1-1-0-1
18 March	3	1-0-0-1-2-2-1-1	1	0-1-0-1-1-0-0-0	4	2-1-0-1-1-1-1-1
19 March	6	1-0-2-2-2-2-2-2	8	0-0-5-3-0-0-1-0	5	1-0-2-2-1-0-1-2
20 March	11	3-3-3-2-2-2-1-3	10	3-4-4-2-0-0-0-1	15	3-3-2-2-1-1-0-3

Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
14 Mar 0000	ALERT: Type II Radio Emission	13/2337
14 Mar 0030	ALERT: Geomagnetic K = 5	14/0029
14 Mar 0136	ALERT: Geomagnetic K = 6	14/0135
14 Mar 0542	EXTENDED WARNING: Geomagnetic K = 5	13/1240 - 14/1200
14 Mar 0543	EXTENDED WARNING: Geomagnetic K = 4	13/1100 - 14/1800
14 Mar 1723	EXTENDED WARNING: Geomagnetic K = 4	13/1100 - 15/0300
14 Mar 1810	ALERT: Type II Radio Emission	14/1720
20 Mar 0351	WARNING: Geomagnetic K = 4	20/0350 - 1800
20 Mar 0741	SUMMARY: 10cm Radio Burst	20/0549 - 0602
20 Mar 0855	ALERT: Type II Radio Emission	20/0743

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
21 Mar	95	12	4	04 Apr	115	5	2
22	95	8	3	05	115	5	2
23	95	12	4	06	120	5	2
24	95	15	4	07	125	5	2
25	98	10	3	08	125	5	2
26	98	5	2	09	125	5	2
27	98	5	2	10	115	5	2
28	100	5	2	11	110	5	2
29	110	5	2	12	105	5	2
30	110	5	2	13	105	5	2
31	115	10	3	14	100	5	2
01 Apr	120	25	5	15	95	5	2
02	115	15	4	16	95	5	2
03	115	8	3				

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
14 Mar	0829	0840	0845	M2.0	0.007				2965			
15 Mar	1233	1239	1244	M1.4	0.005	SN	N24W10		2965			
15 Mar	2239	2246	2252	M1.5	0.006	SF	N24W17		2965			

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
14 Mar	0122	0131	0137	C1.2			2965
14 Mar	0221	0235	0242	C2.1			2965
14 Mar	0438	0448	0457	C1.0			
14 Mar	0638	0644	0651	C1.0			2965
14 Mar	0829	0840	0845	M2.0			2965
14 Mar	B0935	U0936	A0942		SF	N23E04	2965
14 Mar	1459	1508	1516	B7.9			2965
14 Mar	1631	1638	1644	C1.0			2965
14 Mar	1713	1732	1743	B8.5			
14 Mar	2138	2151	2207	C5.3	SF	N24W05	2965
15 Mar	0557	0604	0617	C3.7	SF	N23W06	2965
15 Mar	0805	0817	0824	C3.3	SF	N24W09	2965
15 Mar	1121	1134	1147	C1.6	SF	N27W05	2965
15 Mar	1233	1239	1244	M1.4	SN	N24W10	2965
15 Mar	1301	1301	1307		SF	N26W07	2965
15 Mar	1526	1532	1538	C1.0	SF	N24W15	2965
15 Mar	2000	2006	2011	B4.5			2695
15 Mar	2239	2246	2252	M1.5	SF	N24W17	2965
15 Mar	2320	2325	2329	C6.6	SF	N24W19	2965
15 Mar	2334	2334	2335		SF	N24W19	2965
15 Mar	2348	2349	2351		SF	N25W13	2965
16 Mar	0342	0348	0358	B4.7			2965
16 Mar	0600	0606	0612	B4.6			2965
16 Mar	2220	2225	2237	B4.5			
17 Mar	0136	0154	0202	C1.2			2965
17 Mar	0311	0317	0325	B5.9			2965
17 Mar	1652	1656	1700	B9.0			2965
17 Mar	1906	1918	1935	C1.0			2965

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
18 Mar	1622	1628	1632	B2.9			2965
18 Mar	1956	2003	2010	B3.3			2965
18 Mar	2333	2348	0008	B7.1			2965
19 Mar	0349	0413	0738	C1.2			2965
19 Mar	0449	0457	0503	B5.3	SF	N27W56	2965
19 Mar	0738	0745	0752	B3.7			2965
19 Mar	1144	1155	1206	B5.6			2965
19 Mar	1314	1323	1332	B8.2			2970
19 Mar	1423	1430	1434	B4.8			2965
19 Mar	2059	2111	2120	C2.1			2965
19 Mar	2210	2219	2243	B3.1			2965
19 Mar	2331	2345	0000	B7.3			
20 Mar	0406	0414	0425	B7.5			2965
20 Mar	0601	0613	0623	B5.2			
20 Mar	0730	0745	0753	C4.6	1F	N16E14	2971
20 Mar	1300	1313	1331	B4.7			
20 Mar	1331	1336	1346	B4.3			
20 Mar	1346	1352	1356	B4.6			
20 Mar	1719	1729	1738	B5.9			2971
20 Mar	1804	1811	1817	C1.2			
20 Mar	2034	2047	2102	B5.5			

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 2960													
02 Mar	S21E81	339	plage					2							
03 Mar	S21E67	339	110	5	Dao	4	B	1			1				
04 Mar	S21E57	336	430	6	Dho	5	B	1			2				
05 Mar	S20E45	335	450	10	Dki	8	B	1			2				
06 Mar	S20E31	336	420	10	Dhi	9	B								
07 Mar	S21E18	335	340	11	Ehi	14	BG								
08 Mar	S21E07	333	320	12	Ehi	14	BG								
09 Mar	S20W05	332	400	11	Eho	7	B								
10 Mar	S20W18	332	390	11	Eho	5	B								
11 Mar	S20W31	332	380	9	Dho	2	B								
12 Mar	S20W45	333	320	8	Cho	2	B								
13 Mar	S20W61	335	300	7	Cho	2	B								
14 Mar	S20W75	336	130	2	Hsx	1	A								
15 Mar	S20W89	337	150	2	Hsx	1	A								
								5	0	0	5	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 332

		Region 2962													
05 Mar	N26E55	325	30	2	Bxo	2	B	3							
06 Mar	N26E43	324	30	4	Cro	8	B	3			1				
07 Mar	N28E30	323	30	7	Cro	5	B								
08 Mar	N27E18	322	20	7	Cro	4	B								
09 Mar	N27E05	322	10	1	Axx	1	A								
10 Mar	N27W08	322	10	1	Axx	1	A								
11 Mar	N27W21	322	plage												
12 Mar	N27W35	323	plage					1							
13 Mar	N27W49	323	plage					1			1				
14 Mar	N27W63	324	plage												
15 Mar	N27W77	325	plage												
								8	0	0	2	0	0	0	0

Died on Disk.
Absolute heliographic longitude: 322

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 2965												
08 Mar	N22E75	265	20	4	Dao	3	B								
09 Mar	N23E60	267	330	15	Eki	11	B	2							
10 Mar	N23E47	267	600	15	Eki	14	B								
11 Mar	N23E34	267	600	15	Eki	15	B	2			1				
12 Mar	N23E22	266	620	17	Fki	34	BG	2							
13 Mar	N24E09	265	600	17	Fki	20	B								
14 Mar	N24W03	264	500	17	Fki	25	BG	4	1		2				
15 Mar	N24W17	265	310	18	Fai	25	BG	5	2		10				
16 Mar	N24W30	265	270	19	Fai	20	BG								
17 Mar	N24W44	266	230	19	Fao	8	B	2							
18 Mar	N25W55	264	220	17	Fao	6	B								
19 Mar	N26W68	263	170	17	Cao	4	B	2			1				
20 Mar	N23W97	279	30	2	Hsx	1	A								
								19	3	0	14	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 264

			Region 2967												
12 Mar	N17E60	228	30	1	Hsx	1	A								
13 Mar	N17E46	228	30	1	Hsx	1	A								
14 Mar	N17E33	228	30	1	Hsx	1	A								
15 Mar	N18E19	229	20	1	Hrx	1	A								
16 Mar	N18E05	230	20	1	Hrx	1	A								
17 Mar	N17W09	231	20	1	Hrx	1	A								
18 Mar	N17W22	231	10	1	Axx	1	A								
19 Mar	N17W35	230	plage												
20 Mar	N17W49	231	plage												
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 230

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 2968												
13 Mar	S21E43	231	10	1	Axx	1	A	1							
14 Mar	S21E29	232	plage												
15 Mar	S22E04	243	plage												
16 Mar	S23W04	239	plage												
17 Mar	S23W20	242	10	1	Axx	2	A								
18 Mar	S23W34	243	plage												
19 Mar	S23W48	243	plage												
20 Mar	S23W62	244	plage												
								1	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 243

			Region 2969												
14 Mar	S19W24	285	0		Axx	1	A								
15 Mar	S19W38	286	plage												
16 Mar	S19W52	287	plage												
17 Mar	S19W66	288	plage												
18 Mar	S19W80	289	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 285

			Region 2970												
14 Mar	S23E19	242	10	4	Bxo	4	B								
15 Mar	S23E04	244	10	4	Bxo	4	B								
16 Mar	S23W10	245	plage												
17 Mar	S23W24	246	plage												
18 Mar	S23W38	247	plage												
19 Mar	S23W52	247	plage												
20 Mar	S23W66	248	plage												
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 244

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 2971												
17 Mar	N17E42	180	20	2	Bxo	2	B								
18 Mar	N16E30	179	plage												
19 Mar	N16E16	179	plage												
20 Mar	N16E03	179	plage					1				1			
								1	0	0	0	1	0	0	0
Still on Disk. Absolute heliographic longitude: 179															
			Region 2972												
19 Mar	S28E17	178	20	4	Bxo	5	B								
20 Mar	S27E04	178	30	4	Bxo	4	B								
								0	0	0	0	0	0	0	0
Still on Disk. Absolute heliographic longitude: 178															
			Region 2973												
20 Mar	N19E45	137	20	5	Bxo	4	B								
								0	0	0	0	0	0	0	0
Still on Disk. Absolute heliographic longitude: 137															

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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