Space Weather Highlights **SWPC PRF 2516**
13 November - 19 November 2023 **20 November 2023**

Solar activity ranged from low to moderate levels. Low levels were observed on 13, 15-17 and 19 November. Moderate (R1-minor) levels were observed on 14 and 18 November. Region 3485 (S19, L=205, class/area Dai/080 on 12 Nov) produced an M1.0/Sn at 14/2305 UTC. New Region 3490 (N23, L=355, class/area Eac/150 on 19 Nov) produced three M-class flares; an M1.2 at 19/0542 UTC, and M1.1 at 19/1644 UTC and an M1.0 at 19/2233 UTC.

Early on 16 November, dimming was observed near N10W15. An associated CME was observed in SOHO/LASCO C2 imagery off the WNW limb at 16/0336 UTC. Model analysis of this CME suggested likely Earth impact early on 20 November.

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 was at mostly quiet to unsettled levels with isolated active and minor storm (G1-minor) levels early on 13 November. The isolated active and minor storm levels was due to waning CME influence. The remainder of 13 November through 15 November was at quiet to unsettled levels due to positive polarity CH HSS influence. Mostly quiet levels were observed on 16-19 November.

Space Weather Outlook
20 November - 16 December 2023

Solar activity is expected to be at very low to low levels with a chance for moderate levels on 20 November to 01 December and again on 14-16 December.

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 25 November through 09 December due to CH HSS influence.

Geomagnetic field activity is expected to be at unsettled to G1 (minor) levels on 20 November due to likely CME influence. Unsettled to isolated active levels are expected on 21-25 and 27-28 November and 04-07 and 12-13 December due to CH HSS influence.

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
13 November	134	85	560	B7.7	11	0	0	5	0	0	0	0
14 November	124	86	580	B9.3	20	1	0	1	0	0	0	0
15 November	119	41	210	B8.9	5	0	0	0	0	0	0	0
16 November	118	28	130	B8.6	2	0	0	0	0	0	0	0
17 November	120	26	180	B7.1	3	0	0	0	0	0	0	0
18 November	127	39	340	C1.5	4	3	0	0	0	0	0	0
19 November	140	51	400	C1.6	10	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	>2MeV
13 November	1.8e+05	1.7e+04	3.7e+06
14 November	9.3e+04	1.7e+04	2.3e+06
15 November	9.4e+04	1.7e+04	3.0e+06
16 November	4.4e+04	1.7e+04	7.2e+06
17 November	3.6e+04	1.8e+04	1.1e+07
18 November	1.5e+05	1.8e+04	1.3e+07
19 November	1.1e+05	1.9e+04	5.9e+06

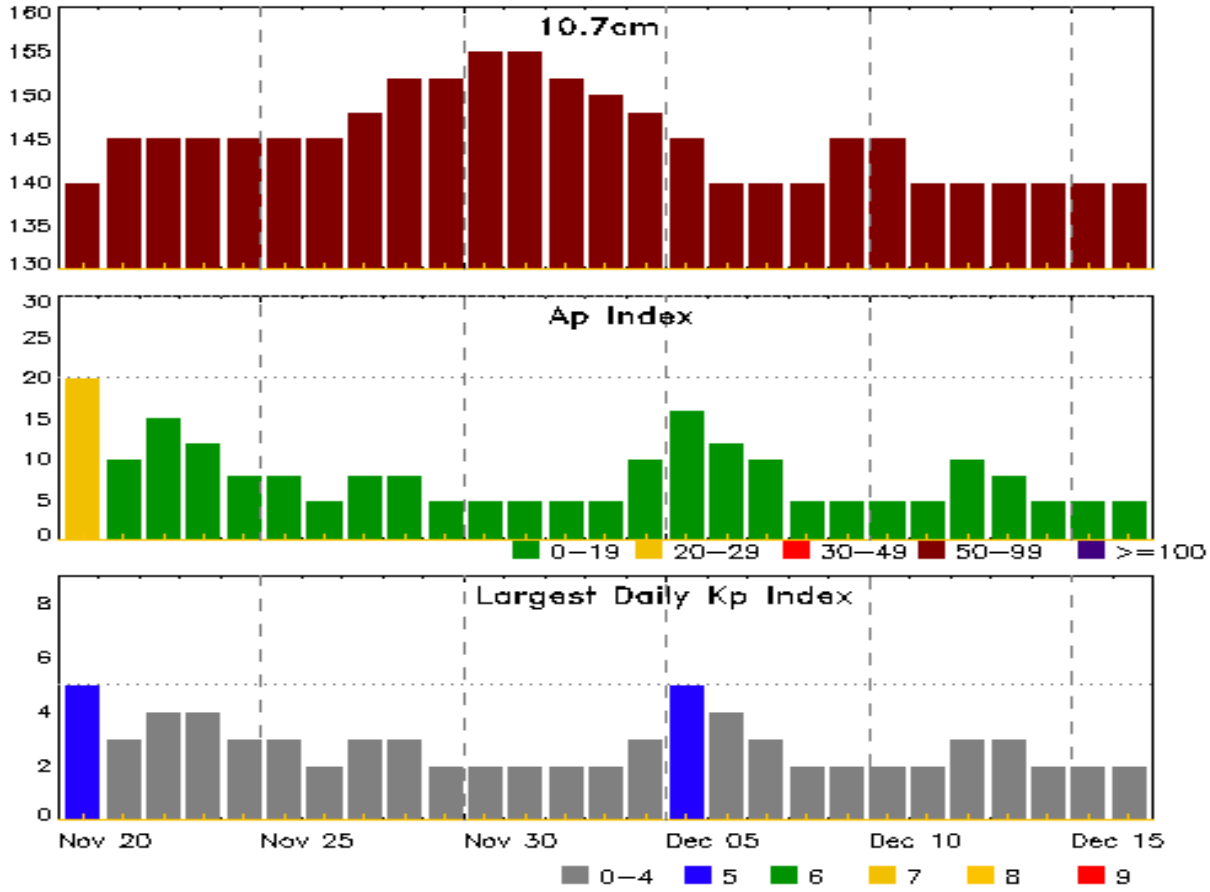
Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
13 November	15	5-4-1-2-3-2-2-1	11	3-3-2-2-4-3-1-0	16	5-4-2-2-3-3-2-1
14 November	5	2-1-0-1-2-3-2-0	5	1-1-1-1-1-3-2-0	6	2-1-0-1-1-3-2-1
15 November	11	2-1-3-2-3-4-2-2	22	1-2-3-4-6-4-2-2	12	2-2-2-2-3-3-3-3
16 November	7	1-1-2-2-2-3-2-2	12	1-1-4-3-4-2-1-2	8	2-1-3-2-2-2-1-2
17 November	3	1-0-0-1-2-2-1-0	2	0-1-1-2-1-0-0-0	3	1-0-0-1-1-2-1-0
18 November	2	0-1-0-0-2-1-1-1	1	0-1-1-1-0-0-0-0	3	0-1-1-1-1-0-1-1
19 November	3	0-0-1-1-2-2-1-1	4	0-0-3-3-1-0-0-0	3	1-0-2-2-1-1-1-1

Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
13 Nov 0102	WARNING: Geomagnetic K = 5	13/0102 - 0900
13 Nov 0123	ALERT: Geomagnetic K = 5	13/0123
15 Nov 1350	WARNING: Geomagnetic K = 4	15/1349 - 2100
15 Nov 2013	EXTENDED WARNING: Geomagnetic K = 4	15/1349 - 16/0300
16 Nov 1743	WATCH: Geomagnetic Storm Category G1 predicted	
17 Nov 1654	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
20 Nov	140	20	5	04 Dec	148	10	3
21	145	10	3	05	145	16	5
22	145	15	4	06	140	12	4
23	145	12	4	07	140	10	3
24	145	8	3	08	140	5	2
25	145	8	3	09	145	5	2
26	145	5	2	10	145	5	2
27	148	8	3	11	140	5	2
28	152	8	3	12	140	10	3
29	152	5	2	13	140	8	3
30	155	5	2	14	140	5	2
01 Dec	155	5	2	15	140	5	2
02	152	5	2	16	140	5	2
03	150	5	2				

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 Nov	2258	2305	2309	M1.0	0.003	SN	S17W75		3485			
18 Nov	0537	0542	0550	M1.2	0.006				3490			
18 Nov	1634	1644	1654	M1.1	0.009				3490			
18 Nov	2226	2234	2240	M1.0	0.008				3490			

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
13 Nov	0016	0024	0034	C1.9	SF	S12W65	3484
13 Nov	0140	0146	0152	C2.2	SF	S12W65	3484
13 Nov	0803	0814	0820	C1.8			
13 Nov	0944	0948	0952	C1.2			
13 Nov	1319	1331	1341	C2.6	SF	S14W69	3484
13 Nov	1434	1436	1438		SF	S13W69	3484
13 Nov	1448	1450	1453		SF	S13W70	3484
13 Nov	1616	1628	1654	C2.1			3484
13 Nov	1807	1811	1829	C1.6			3484
13 Nov	2036	2040	2041	C1.6			
13 Nov	2041	2050	2103	C2.8			
13 Nov	2141	2150	2200	C1.4			
13 Nov	2200	2204	2208	C1.3			
14 Nov	0150	0201	0207	C2.7			3484
14 Nov	0331	0336	0340	C1.8			3485
14 Nov	0340	0345	0403	C1.8			3485
14 Nov	0418	0422	0426	C2.1			3485
14 Nov	0648	0653	0657	C1.6			3484
14 Nov	0849	0853	0857	C1.5			3485
14 Nov	1003	1009	1021	C1.3			3486
14 Nov	1103	1112	1124	C1.9			3484
14 Nov	1139	1145	1149	C2.1			3483
14 Nov	1215	1223	0338	C1.8			3485
14 Nov	1437	1443	1447	C2.2			
14 Nov	1447	1450	1454	C2.5			
14 Nov	1519	1531	1542	C2.7			
14 Nov	1704	1710	1718	C1.2			

Flare List

Date	Time			Optical			
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
14 Nov	1718	1737	1744	C2.5			
14 Nov	1752	1811	1819	C5.8			3483
14 Nov	1919	1930	1936	C1.6			
14 Nov	1943	1949	1954	C3.9			
14 Nov	2105	2110	2115	C1.1			
14 Nov	2120	2124	2126	C1.1			
14 Nov	2208	2213	2224	C1.5			
14 Nov	2258	2305	2309	M1.0	SN	S17W75	3485
15 Nov	0314	0320	0326	C1.2			
15 Nov	0338	0351	0355	C1.8			
15 Nov	0421	0432	0439	C2.8			
15 Nov	0607	0617	0627	C1.4			
15 Nov	1205	1212	1218	C7.6			3485
16 Nov	0420	0433	0449	C2.5			
16 Nov	2003	2022	2053	C4.8			
17 Nov	1002	1010	1015	C1.5			3489
17 Nov	1450	1502	1519	C1.7			3489
17 Nov	1746	1753	1803	C1.4			
18 Nov	0418	0432	0449	C2.5			3489
18 Nov	0537	0542	0550	M1.2			3490
18 Nov	1034	1043	1051	C4.0			3490
18 Nov	1634	1644	1654	M1.1			3490
18 Nov	1948	1959	2019	C3.3			3490
18 Nov	2152	2222	2226	C8.0			3490
18 Nov	2226	2234	2240	M1.0			3490
19 Nov	0302	0313	0323	C3.2			3490
19 Nov	0446	0452	0501	C2.8			3489
19 Nov	0501	0510	0514	C3.2			3490
19 Nov	0636	0647	0655	C2.8			3490
19 Nov	0655	0705	0719	C3.7			3490
19 Nov	0825	0834	0852	C7.5	SF	S16E58	3489
19 Nov	1107	1111	1116	C3.6			3490
19 Nov	1513	1525	1530	C2.5			3490
19 Nov	1615	1615	1621		SF	S14E52	3489
19 Nov	1656	1659	1711		SF	S14E52	3489
19 Nov	2037	2044	2048	C2.4	SF	S12E48	3489
19 Nov	2213	2213	2215		SF	N19E85	
19 Nov	2218	2219	2223		SF	N13E79	3491

Flare List

	Time				Optical		
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
19 Nov	2313	2317	2334	C2.1			3491

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 3477													
31 Oct	S12E80	231	120	2	Hsx	1	A	1							
01 Nov	S15E66	232	160	3	Hsx	1	A								
02 Nov	S15E53	232	300	9	Cko	4	B								
03 Nov	S15E42	230	310	9	Cko	5	B								
04 Nov	S15E30	228	350	11	Cko	4	B								
05 Nov	S15E18	227	350	11	Cko	8	B				1				
06 Nov	S14E04	230	250	5	Cko	7	B								
07 Nov	S15W11	230	260	8	Cko	8	B								
08 Nov	S15W25	230	240	7	Cao	6	B								
09 Nov	S15W39	231	230	6	Dac	7	B								
10 Nov	S15W53	233	240	6	Dao	8	B	2			1				
11 Nov	S15W67	233	200	4	Cao	5	B	7	1		3				
12 Nov	S15W81	234	160	5	Cao	2	B				1				
13 Nov	S15W95	235	60	3	Cao	1	B								
								10	1	0	6	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 230

		Region 3478													
01 Nov	N12E71	227	10	1	Hrx	1	A								
02 Nov	N12E57	228	20	2	Hrx	1	A								
03 Nov	N12E43	229	10	1	Axx	1	A								
04 Nov	N12E30	228	10	1	Axx	1	A								
05 Nov	N12E17	228	10	1	Axx	1	A								
06 Nov	N12E03	228	plage												
07 Nov	N12W11	230	plage												
08 Nov	N12W25	231	plage												
09 Nov	N12W39	232	plage												
10 Nov	N12W53	233	plage												
11 Nov	N12W67	233	plage												
12 Nov	N12W81	234	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 228

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 3480													
01 Nov	S11E93	208	plage					4	2						
02 Nov	S11E78	208	plage					3	1						
03 Nov	S11E64	208	150	7	Dac	7	B	2							
04 Nov	S09E54	204	180	7	Dai	7	B								
05 Nov	S09E40	205	180	9	Dai	6	B	4	2		1	1			
06 Nov	S08E27	204	80	7	Dao	6	BG	2			1				
07 Nov	S08E13	206	50	8	Cao	5	B	1							
08 Nov	S08W00	205	50	6	Cao	6	B								
09 Nov	S08W14	207	30	2	Cro	2	B	1			1				
10 Nov	S09W26	206	20	3	Bxo	3	B								
11 Nov	S19W42	207	plage												
12 Nov	S19W56	209	plage								1				
13 Nov	S19W70	210	plage												
14 Nov	S19W84	211	plage												
								17	5	0	4	1	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 205

		Region 3481													
04 Nov	N20E48	210	10	1	Axx	1	A								
05 Nov	N20E34	211	plage												
06 Nov	N20E20	212	plage												
07 Nov	N20E06	213	plage												
08 Nov	N25W08	214	plage												
09 Nov	N25W19	211	30	3	Bxo	3	B	1							
10 Nov	N25W37	217	10	1	Axx	1	A								
11 Nov	N25W50	216	10	1	Axx	1	A								
12 Nov	N25W64	217	plage												
13 Nov	N25W78	218	plage												
								1	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 213

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 3482													
05 Nov	N02E68	177	30	1	Hrx	1	A								
06 Nov	N03E54	177	0		Axx	1	A								
07 Nov	N04E40	179	10	1	Hrx	1	A								
08 Nov	N03E28	177	10		Axx	1	A								
09 Nov	N04E16	177	10	1	Axx	1	A								
10 Nov	N04E01	179	plage												
11 Nov	N04W14	180	plage												
12 Nov	N04W29	182	plage												
13 Nov	N04W43	183	plage												
14 Nov	N04W58	184	plage												
15 Nov	N04W71	185	plage												
16 Nov	N04W86	186	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 179

		Region 3483													
07 Nov	N10E02	217	30	3	Cro	5	B	3			1				
08 Nov	N09W09	214	100	6	Dsi	13	BG	8			7				
09 Nov	N09W23	216	120	11	Eai	16	B								
10 Nov	N10W38	218	180	9	Dai	12	B								
11 Nov	N09W52	218	240	9	Dai	16	BG	5			9				
12 Nov	N09W65	218	290	9	Dki	8	BG								
13 Nov	N09W79	219	260	7	Dko	4	BG								
14 Nov	N09W93	220	260	7	Dko	4	BG	2							
								18	0	0	17	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 217

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 3484												
08 Nov	S18W16	221	10	2	Axx	2	A								
09 Nov	S19W19	218	plage								1				
10 Nov	S14W34	214	30	4	Bxo	6	B								
11 Nov	S14W49	215	40	7	Bxi	8	B	1							
12 Nov	S15W62	215	80	6	Cai	8	B	2			2				
13 Nov	S15W76	216	70	7	Cao	3	B	5			5				
14 Nov	S15W89	216	30	6	Cao	3	B	3							
								11	0	0	8	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 221

			Region 3485												
10 Nov	S19W25	205	20	3	Bxo	3	B								
11 Nov	S19W39	205	20	6	Bxo	5	B	1							
12 Nov	S19W52	205	80	7	Dai	6	B								
13 Nov	S18W66	206	70	9	Dao	5	B								
14 Nov	S18W79	206	90	8	Cao	3	B	4	1		1				
15 Nov	S18W93	207	plage					1							
								6	1	0	1	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 205

			Region 3486												
12 Nov	S09W08	161	100	5	Dao	4	B	1							
13 Nov	S09W22	162	70	7	Dso	5	B								
14 Nov	S08W36	163	140	7	Dao	9	B	1							
15 Nov	S08W49	163	190	6	Dao	8	B								
16 Nov	S08W63	163	120	7	Dao	5	B								
17 Nov	S08W74	160	120	3	Dso	4	B								
18 Nov	S09W90	163	80	2	Hsx	1	A								
								2	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 161

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 3487												
13 Nov	S16W33	173	30	5	Dro	7	B								
14 Nov	S17W47	174	30	4	Cro	6	B								
15 Nov	S17W61	175	10	3	Bxo	2	B								
16 Nov	S17W76	176	10	3	Bxo	3	B								
17 Nov	S17W90	177	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 173

			Region 3488												
14 Nov	N29E76	51	30	1	Hrx	1	A								
15 Nov	N29E63	51	10	1	Axx	1	A								
16 Nov	N31E52	51	plage												
17 Nov	N31E38	49	plage												
18 Nov	N31E24	50	plage												
19 Nov	N31E10	51	plage												
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 51

			Region 3489												
17 Nov	S15E71	15	60	2	Cao	2	B	2							
18 Nov	S15E58	15	180	4	Dao	3	B	1							
19 Nov	S15E45	16	220	11	Eac	12	B	3			4				
								6	0	0	4	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 16

			Region 3490												
18 Nov	N18E69	344	80	5	Dao	5	B	3	3						
19 Nov	N23E65	355	150	13	Eac	8	B	6							
								9	3	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 355

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 3491													
19 Nov	N11E68	353	30	2	Hsx	1	A	1			1				
								1	0	0	1	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 353

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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