Space Weather Highlights **SWPC PRF 2523**
01 January - 07 January 2024 **08 January 2024**

Solar activity was at low to moderate levels. Moderate activity (R1/Minor) was observed from Region 3536 (N06, L=151, class/area Eko/250 on 03 Jan) on 01, 02 and 04 Jan. The largest of these M flares was an M4.7 observed at 01/1225 UTC. This region also produced a total of 35 C-class flares. Region 3538 (N21, L=175, class/area Dai/070 on 05 Jan) produced a total of 17 C-class flares, the largest a C7.1/1n at 06/1527 UTC. C-class activity was also produced by Regions 3534 (S13, L=225, class/area Dao/150 on 30 Dec), 3535 (S05, L=285, class/area Bxo/010 on 28 Dec), 3537 (N18, L=153, class/area Dsi/120 on 05 Jan) and 3540 (S18, L=095, class/area Dki/350 on 06 Jan).

Numerous CME signatures were detected during the period, but none were determined to have an Earth-directed component.

The 10 MeV protons at geosynchronous orbit was above threshold during this period. The event began at 03/2005 UTC, reached a maximum of 20 pfu at 04/0835 UTC and ended at 04/2215 UTC. This event was related to the X-5 event observed from Region 3536 on 31 Dec 2023.

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

Geomagnetic field activity was at unsettled to isolated active levels on 01-03 Jan due to negative polarity CH HSS influence and weak CME influence the last half of 03 Jan. Mostly quiet levels were observed on 04-07 Jan. The solar wind field was at slightly enhanced levels on 01-03 Jan. During this period, total field readings peaked at 12 nT, the Bz component varied between +/-11 nT and wind speeds reached maximum speeds of near 500 km/s. From 04-07 Jan, wind parameters were at mostly background levels. The phi orientation was in a mostly negative orientation through about 07/1800 UTC when the field oriented into a mostly positive direction.

Space Weather Outlook
08 January - 03 February 2024

Solar activity is expected to be low with a chance for M-class (R1-R2/Minor-Moderate) flares and a slight chance for X-class (R3/Strong) flares from 08-24 Jan, 26-31 Jan and 01-03 Feb. Low activity is expected on 25 Jan.

A slight chance for proton events exists at geosynchronous orbit through the period.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at moderate to high levels on 09-12 Jan. Low to moderate levels are expected on 08 Jan, 13-31 Jan and 01-03 Feb.

Geomagnetic field activity is expected to be at unsettled periods on 08-09 Jan and 28-30 Jan due to geoeffective CH HSS flow. The remainder of the outlook period is likely to be mostly quiet.

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
01 January	136	44	210	B9.6	10	2	0	4	1	0	0	0
02 January	142	59	300	B7.7	11	1	0	10	1	0	0	0
03 January	140	63	350	B7.0	10	0	0	4	0	0	0	0
04 January	126	64	230	B8.6	7	2	0	3	0	1	0	0
05 January	153	121	470	B9.6	6	0	0	3	0	0	0	0
06 January	159	149	820	C1.1	17	0	0	9	1	0	0	0
07 January	167	171	800	C1.1	17	0	0	8	2	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
01 January	3.5e+07	5.6e+04	2.7e+06
02 January	2.1e+07	1.4e+05	1.3e+06
03 January	9.2e+06	6.8e+05	2.8e+06
04 January	2.1e+07	1.1e+06	1.6e+06
05 January	1.8e+07	4.6e+05	2.1e+06
06 January	6.4e+06	1.9e+05	2.3e+06
07 January	6.5e+06	1.1e+05	3.4e+06

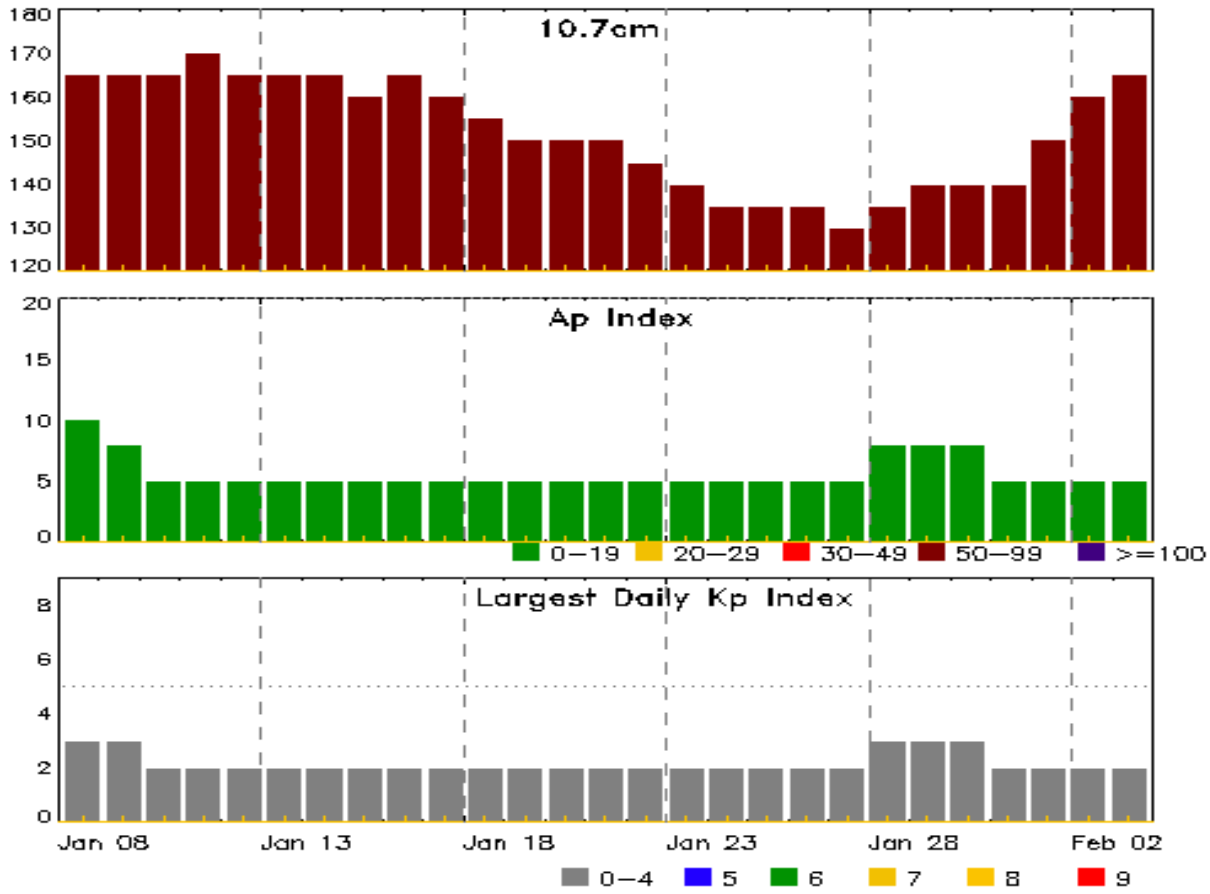
Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
01 January	6	0-1-0-2-2-2-2-3	14	0-0-1-4-4-4-3-3	10	0-1-1-2-2-3-3-4
02 January	8	2-2-1-2-3-3-2-1	13	1-2-1-3-5-4-0-1	8	3-3-1-2-2-3-1-1
03 January	8	2-2-1-2-2-3-2-2	11	1-3-1-4-3-2-2-2	11	3-3-2-2-2-3-3-3
04 January	5	2-1-1-1-1-2-1-2	3	1-1-0-2-0-2-0-2	6	2-1-2-1-1-1-1-3
05 January	4	2-1-0-1-2-2-1-1	7	2-1-0-2-3-4-0-0	5	2-1-0-1-1-2-1-1
06 January	2	1-1-0-1-1-2-0-0	1	0-1-0-1-0-0-0-0	3	1-1-0-0-0-0-1-1
07 January	3	0-0-0-1-2-2-2-0	1	0-0-0-1-0-1-0-0	2	0-0-1-1-1-1-1-0

Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
01 Jan 1950	WATCH: Geomagnetic Storm Category G1 predicted	
01 Jan 2052	WARNING: Geomagnetic K = 4	01/2052 - 02/0900
01 Jan 2235	ALERT: Geomagnetic K = 4	
03 Jan 0724	WARNING: Proton 10MeV Integral Flux > 10pfu	03/0725 - 04/0000
03 Jan 2022	ALERT: Proton Event 10MeV Integral Flux >= 10pfu	03/2005
03 Jan 2214	EXTENDED WARNING: Proton 10MeV Integral Flux > 10pfu	03/0725 - 04/1200
04 Jan 1155	EXTENDED WARNING: Proton 10MeV Integral Flux > 10pfu	03/0725 - 05/0000
04 Jan 2051	EXTENDED WARNING: Proton 10MeV Integral Flux > 10pfu	03/0725 - 05/0900
05 Jan 1936	SUMMARY: Proton Event 10MeV Integral Flux >= 10pfu	03/2005 - 04/2215

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
08 Jan	165	10	3	22 Jan	145	5	2
09	165	8	3	23	140	5	2
10	165	5	2	24	135	5	2
11	170	5	2	25	135	5	2
12	165	5	2	26	135	5	2
13	165	5	2	27	130	5	2
14	165	5	2	28	135	8	3
15	160	5	2	29	140	8	3
16	165	5	2	30	140	8	3
17	160	5	2	31	140	5	2
18	155	5	2	01 Feb	150	5	2
19	150	5	2	02	160	5	2
20	150	5	2	03	165	5	2
21	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
01 Jan	0833	0854	0904	M2.3	0.025	1N	N04E70		3536				
01 Jan	1154	1225	1235	M4.7	0.044				3536				
02 Jan	1802	1830	1856	M1.1	0.025				3536	130			
04 Jan	0108	0116	0122	M1.1	0.003				3536				
04 Jan	0122	0155	0212	M3.8	0.069	2N	N04E39		3536				

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
01 Jan	0134	0138	0142	C4.1			
01 Jan	0751	0806	0820	C4.7			3536
01 Jan	B0829	U0847	A0925	M2.3	1N	N04E70	3536
01 Jan	1015	1020	1025	C1.9			
01 Jan	1154	1225	1235	M4.7			3536
01 Jan	B1327	U1328	A1339		SF	N05E70	3536
01 Jan	1501	1518	1532		SF	N06E67	3536
01 Jan	1617	1628	1646	C2.6	SF	N06E67	3536
01 Jan	1647	1704	1716	C5.7	SF	N06E65	3536
01 Jan	1830	1841	1853	C1.3			3536
01 Jan	1938	1951	1959	C1.7			3536
01 Jan	1959	2004	2010	C2.1			3533
01 Jan	2010	2015	2020	C2.3			3536
01 Jan	2152	2207	2230	C1.5			3537
02 Jan	0041	0049	0114	C1.5			3537
02 Jan	0431	0437	0445	C1.5			3537
02 Jan	0551	0606	0636	C1.4	SF	N04E60	3536
02 Jan	0638	0651	0701	C2.0	SF	N05E58	3536
02 Jan	0710	0715	0719	C2.0			3537
02 Jan	0735	0743	0754	C1.0	SF	S08W70	3535
02 Jan	0807	0807	0813		SF	S09W70	3535
02 Jan	0921	0932	0938	C2.8	SF	N04E56	3536
02 Jan	0948	0952	0956	C2.5			3536
02 Jan	1012	1013	1021		SF	S09W70	3535
02 Jan	1022	1030	1036	C1.2	SF	S09W72	3535
02 Jan	1342	1345	1349	C1.2	SF	S08W74	3535

Flare List

Date	Time			Optical			
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
02 Jan	1410	1415	1422		SF	N04E53	3536
02 Jan	1802	1830	1856	M1.1			3536
02 Jan	2019	2020	2106		1F	N06E52	3536
02 Jan	2156	2203	2209	C1.1	SF	N07E52	3536
03 Jan	0254	0259	0305	C1.2	SF	N05E49	3536
03 Jan	1000	1010	1014	C1.8			3536
03 Jan	1014	1018	1024	C3.0	SF	N05E49	3536
03 Jan	1329	1334	1344	C1.3			3536
03 Jan	1442	1457	1515	C1.8			3537
03 Jan	1613	1621	1628	C1.3			3538
03 Jan	1649	1656	1708	C1.5			3538
03 Jan	1938	1958	2011	C2.6	SF	N06E39	3536
03 Jan	2106	2118	2132		SF	S16W37	3534
03 Jan	2246	2253	2257	C1.1			3538
03 Jan	2359	0010	0013	C1.4			3536
04 Jan	0013	0025	0051	C2.1			3536
04 Jan	0108	0116	0122	M1.1			3536
04 Jan	0112	0113	0258	M3.8	2N	N04E39	3536
04 Jan	0719	0728	0748	C1.5			
04 Jan	0855	0906	0916	C1.7	SF	N25E07	3538
04 Jan	0916	0936	0942	C3.0			
04 Jan	1005	1006	1008		SF	N19E34	3537
04 Jan	1020	1030	1035	C2.2	SF	N04E31	3536
04 Jan	1720	1731	1739	C3.3			3538
04 Jan	2237	2248	2258	C2.5			3540
05 Jan	0032	0052	0108	C3.2			3536
05 Jan	0243	0251	0256	C1.7			3536
05 Jan	0418	0425	0430	C1.6			3540
05 Jan	0755	0809	0819	C3.7			3534
05 Jan	0808	0810	0838		SF	N05E19	3536
05 Jan	0810	0810	0812		SF	S18W55	3534
05 Jan	1249	1256	1300	C1.4			3540
05 Jan	1722	1726	1726		SF	N05E14	3536
05 Jan	2157	2203	2210	C1.4			3540
06 Jan	0041	0052	0100	C1.7			
06 Jan	0431	0450	0502	C5.2			3538
06 Jan	0528	0537	0541	C3.3			3536
06 Jan	0541	0547	0553	C3.8			3536

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
06 Jan	0553	0559	0604	C4.1			3536
06 Jan	0742	0747	0752	C2.9			3536
06 Jan	0817	0825	0831	C3.0			3540
06 Jan	1053	1058	1102	C2.1			3538
06 Jan	1138	1144	1154	C2.5			3538
06 Jan	1527	1535	1540	C7.1	1N	N20W19	3538
06 Jan	1626	1633	1640	C2.3			
06 Jan	1702	1708	1707		SF	N21W25	3538
06 Jan	1708	1708	1712		SF	N21W25	3538
06 Jan	1713	1721	1725	C2.1	SF	N20W24	3538
06 Jan	1753	1759	1802		SF	N20W26	3538
06 Jan	1826	1840	1843	C3.4	SF	N21W24	3538
06 Jan	1927	1936	1940	C4.5	SF	N22W23	3538
06 Jan	2002	2006	2012	C2.6	SF	N21W25	3538
06 Jan	2129	2129	2134		SF	N22W21	3538
06 Jan	2153	2159	2205	C1.7			3540
06 Jan	2239	2244	2251	C1.4	SF	N21W27	3538
07 Jan	0152	0222	0224	C2.3			3359
07 Jan	0224	0229	0237	C2.3			3359
07 Jan	0411	0418	0424	C1.6	SF	S20E56	3540
07 Jan	0517	0529	0541	C2.7	SF	N03W07	3536
07 Jan	0557	0605	0625	C2.4	SF	N03W05	3536
07 Jan	0627	0636	0644	C3.1	SF	N03W08	3536
07 Jan	0731	0748	0752	C5.6			3536
07 Jan	0742	0756	0814	C6.3	1N	N04W10	3536
07 Jan	B0823	U0832	A0834	C3.2	1F	N05W10	3536
07 Jan	0958	1005	1009	C2.2			3536
07 Jan	1009	1016	1030	C3.0	SF	N03W10	3536
07 Jan	1012	1022	1023		SF	N09E03	3539
07 Jan	1044	1051	1056	C2.9			3536
07 Jan	1329	1342	1355	C4.2			3536
07 Jan	1516	1520	1530	C1.7			3538
07 Jan	1741	1744	1749	C3.8			3538
07 Jan	2052	2103	2116	C3.3	SN	N21W41	3538
07 Jan	2211	2225	2237	C8.7			
07 Jan	2243	U2246	A2309		SF	N04W15	3536

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 3531													
20 Dec	S20E68	304	60	3	Hax	1	A	1							
21 Dec	S21E55	304	70	2	Hsx	1	A								
22 Dec	S20E42	304	80	3	Hsx	1	A								
23 Dec	S20E29	304	90	3	Hax	1	A								
24 Dec	S20E16	304	120	3	Hax	2	A								
25 Dec	S20E03	302	160	4	Hax	3	A				1				
26 Dec	S19W10	302	200	8	Cso	7	B								
27 Dec	S19W22	301	150	6	Cso	2	B								
28 Dec	S20W36	303	140	7	Cso	2	B								
29 Dec	S20W53	306	210	9	Cso	2	B								
30 Dec	S20W66	307	200	2	Hsx	1	A								
31 Dec	S20W77	304	160	3	Hsx	1	A	1							
01 Jan	S19W94	308	60	10	Hsx	1	A								
								2	0	0	1	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 302

		Region 3533													
22 Dec	N15E44	302	10	4	Bxo	5	B								
23 Dec	N15E29	304	20	4	Bxo	5	B								
24 Dec	N15E16	304	40	5	Cri	8	B								
25 Dec	N15E03	304	10	6	Bxo	6	B	1							
26 Dec	N15W09	301	10	5	Bxo	4	B								
27 Dec	N15W22	301	10	3	Axx	1	A								
28 Dec	N14W36	303	110	7	Dao	7	B	2							
29 Dec	N14W52	305	170	8	Dao	9	B	5			1				
30 Dec	N14W66	307	120	6	Cao	5	B								
31 Dec	N14W78	305	20	5	Bxo	2	B								
								8	0	0	1	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 304

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 3534												
27 Dec	S12E60	218	20	3	Cro	4	B	2							
28 Dec	S12E47	220	20	8	Cro	5	B	1							
29 Dec	S13E30	223	90	9	Dao	9	B								
30 Dec	S13E15	226	150	9	Dao	12	B	1							
31 Dec	S13E03	224	120	8	Dao	10	B								
01 Jan	S14W11	225	10	7	Bxo	8	B								
02 Jan	S12W22	222	10	7	Bxo	4	B								
03 Jan	S14W37	225	10	1	Bxo	2	B				1				
04 Jan	S15W51	226	30	5	Dao	5	B								
05 Jan	S15W61	223	70	4	Dao	3	B	1			1				
06 Jan	S15W75	223	70	4	Hsx	3	A								
07 Jan	S12W86	220	80	3	Hsx	2	A								
								5	0	0	2	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 224

			Region 3535												
28 Dec	S05W18	285	10	3	Bxo	3	B								
29 Dec	S05W31	284	2	1	Axx	3	A								
30 Dec	S05W46	287	plage												
31 Dec	S05W60	287	plage												
01 Jan	S05W75	289	plage												
02 Jan	S08W89	290	10	2	Axx	2	A	3			5				
								3	0	0	5	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 285

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 3536												
30 Dec	N05E90	152	plage					1							
31 Dec	N05E75	152	80	3	Hax	2	A	7	1	1				1	
01 Jan	N06E63	151	140	13	Eai	5	BD	6	2		4	1			
02 Jan	N05E49	151	240	13	Eai	11	BG	5	1		5	1			
03 Jan	N06E37	151	250	11	Eko	10	BG	6			3				
04 Jan	N06E24	151	130	9	Dao	8	BG	2	2		1		1		
05 Jan	N06E11	150	100	7	Dai	11	BG	2			2				
06 Jan	N05W05	153	130	12	Eai	24	BG	4							
07 Jan	N05W20	154	100	11	Eai	18	BG	10			5	2			
								43	6	1	20	4	1	1	0

Still on Disk.
Absolute heliographic longitude: 153

			Region 3537												
01 Jan	N19E64	150	plage					1							
02 Jan	N18E48	151	40	5	Cao	2	B	3							
03 Jan	N18E34	154	60	1	Cao	6	B	1							
04 Jan	N18E21	154	40	6	Dao	3	BG				1				
05 Jan	N18E03	159	50	2	Hsx	1	A								
06 Jan	N18W11	159	50	2	Cao	3	B								
07 Jan	N18W23	158	60	2	Hax	2	A								
								5	0	0	1	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 159

			Region 3538												
03 Jan	N21E11	177	30	3	Dao	5	B	3							
04 Jan	N21W02	177	30	5	Dri	8	BG	2			1				
05 Jan	N21W14	175	70	6	Dai	8	B								
06 Jan	N21W28	176	70	6	Dai	8	G	9			9	1			
07 Jan	N25W42	177	30	6	Cri	10	B	3			1				
								17	0	0	11	1	0	0	0

Still on Disk.
Absolute heliographic longitude: 177

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 3539												
05 Jan	N10E25	136	10	1	Axx	2	A								
06 Jan	N11E14	134	60	5	Dsi	9	BG								
07 Jan	N11W01	135	30	5	Dri	7	BG				1				
								0	0	0	1	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 135

			Region 3540												
04 Jan	S18E81	94	plage					1							
05 Jan	S18E67	94	100	9	Dao	9	B	3							
06 Jan	S18E53	95	350	9	Dki	12	BG	2							
07 Jan	S17E47	92	310	11	Eki	17	BG	1			1				
								7	0	0	1	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 92

			Region 3541												
05 Jan	S21E65	96	10	2	Hax	1	A								
06 Jan	S21E51	97	30	2	Cao	4	B								
07 Jan	S20E43	94	60	2	Cao	3	B								
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 94

			Region 3542												
05 Jan	N19E12	150	60	5	Dao	6	B								
06 Jan	N19W02	150	60	5	Cao	6	B								
07 Jan	N16W15	150	50	4	Cao	3	B								
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 150

			Region 3543												
07 Jan	S05W21	155	50	7	Dai	8	B								
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 155

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 3544													
07 Jan	N19E60	75	30	1	Hax	1	A	0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 75

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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https://www.swpc.noaa.gov/products/weekly-highlights-and-27-day-forecast -- Current
ftp://ftp.swpc.noaa.gov/pub/warehouse -- Online archive from 1997
https://www.ngdc.noaa.gov/stp/satellite/goes-r.html -- NCEI GOES data textarchive
https://www.swpc.noaa.gov/products/solar-cycle-progression -- Solar Cycle Progression web site
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