Space Weather Highlights **SWPC PRF 2530**
19 February - 25 February 2024 **26 February 2024**

Solar activity reached high levels on 21 and 22 Feb and moderate levels on 23-25 Feb. The strongest of these events was an X6.3 (R3-Strong) flare at 22/2234 UTC, the strongest so far of the current solar cycle, from Region 3590 (N18, L=223, class/area=Fkc/1450 on 25 Feb), the largest region of the solar cycle so far. The region was responsible for two of other X-class flares, an X1.2 at 21/2307 UTC and an X1.7/2b at 22/0632 UTC, as well as 10 M-class (R1-Minor) flares. Despite the pronounced increase in flare activity, no Earth-directed CMEs were associated with the events from the Region. A Type II radio sweep on 21 Feb as well as a Type II and IV radio sweep on 22 Feb were both associated with events that were off the Sun-Earth line. While there were 13 other numbered active regions on the visible disk this week, they were either quiet or only produced C-class X-ray events.

Other activity included a filament eruption in the NW quadrant beginning around 21/1500 UTC. Analysis and modeling suggested a glancing blow would be possible around 25 Feb.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached moderate levels.

Geomagnetic field activity was mostly quiet through 23 Feb, with a single isolated period of unsettled observed late on 20 Feb due weak transient influence. Late on 24 Feb, the arrival of a CME from the filament eruption on 21 Feb was observed. The geomagnetic field responded with unsettled conditions that would persist through 25 Feb.

Space Weather Outlook
26 February - 23 March 2024

Solar activity is expected to be at moderate levels (R1-R2/Minor-Moderate) through 02 Mar, when Region 3590 (N18, L=223, class/area=Fkc/1450 on 25 Feb) rotates off the visible disk. While flare potential will likely decrease substantially from 02 Mar through the end of the period, a chance for M-class activity will remain due to multiple significant regions on the far side of the Sun due to rotate back onto the visible disk.

There is a slight chance for proton events (S1-Minor) at geosynchronous orbit through 02 Mar due to the flare potential of Region 3590.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at moderate levels.

Geomagnetic field activity is expected to reach unsettled levels on 26-28 Feb due to negative polarity CH HSS influence. The remainder of the outlook period is likely to 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
19 February	152	64	880	C1.1	9	0	0	1	0	0	0	0
20 February	153	50	870	C1.1	2	0	0	1	0	0	0	0
21 February	170	45	810	C1.0	15	1	1	7	0	0	0	0
22 February	173	46	980	C1.7	6	1	2	8	0	2	0	0
23 February	173	116	1410	C2.6	6	3	0	1	2	0	0	0
24 February	179	106	1710	C1.6	11	4	0	0	0	0	0	0
25 February	181	114	1910	C1.4	3	1	0	4	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
19 February	6.7e+05	5.5e+04	1.1e+06
20 February	1.4e+06	4.1e+04	1.1e+06
21 February	1.8e+06	2.7e+04	1.0e+06
22 February	1.1e+06	2.4e+04	1.1e+06
23 February	1.7e+06	2.6e+04	1.0e+06
24 February	3.3e+06	2.4e+04	9.7e+05
25 February	4.8e+05	1.8e+04	8.6e+05

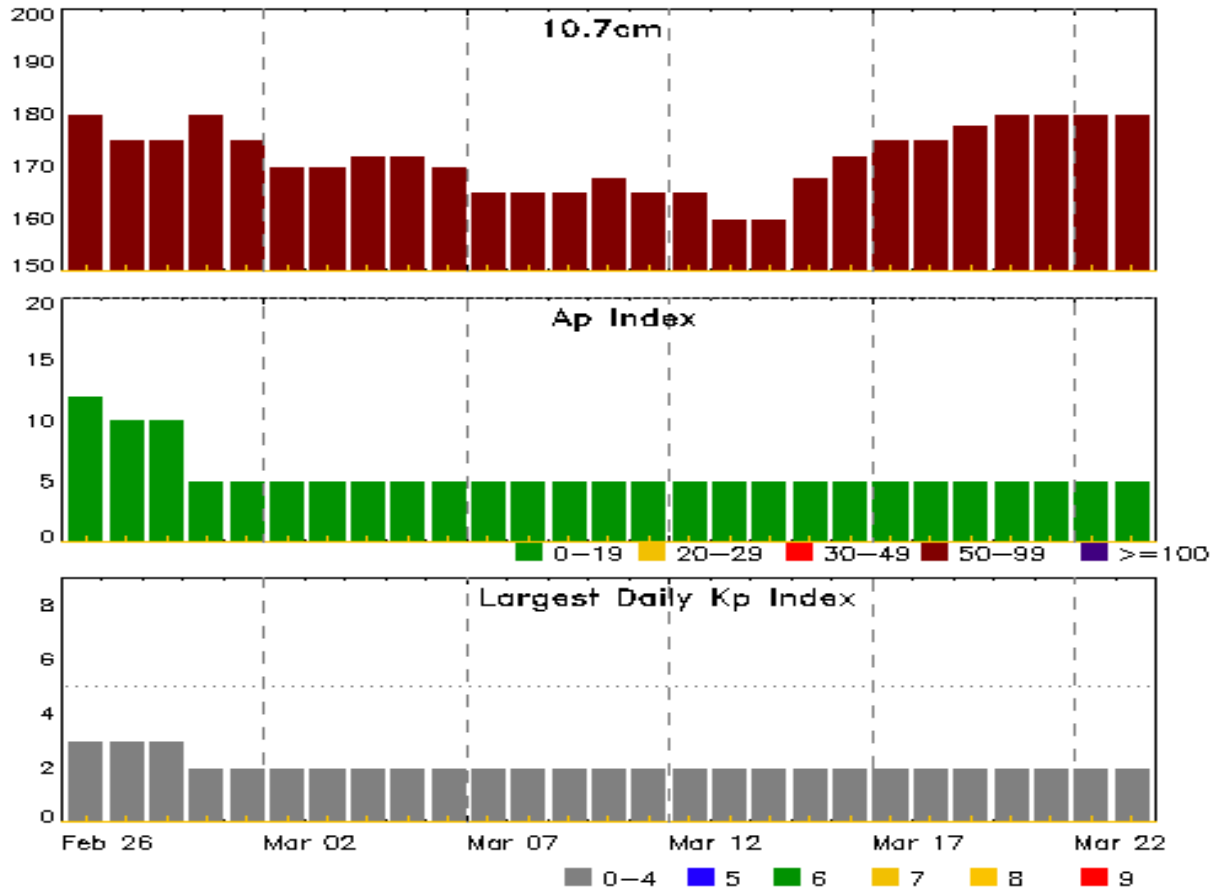
Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
19 February	1	0-0-0-0-0-0-1-1	1	0-0-0-0-2-0-0-0	3	2-0-1-2-0-0-0-1
20 February	5	1-0-2-2-2-1-2-2	12	0-0-3-4-4-4-0-1	6	1-0-2-2-2-1-2-3
21 February	3	0-0-1-1-1-2-1-1	1	0-0-0-0-0-1-2-0	4	1-0-1-1-1-2-2-1
22 February	6	2-2-2-2-2-1-1-2	3	0-1-1-2-2-1-0-0	6	2-2-2-2-1-1-2-1
23 February	2	0-0-1-1-2-0-1-1	1	0-0-0-2-1-0-0-0	3	0-0-1-1-1-0-1-1
24 February	6	1-0-0-1-3-2-2-3	5	0-0-0-2-4-1-1-1	7	1-1-1-2-2-3-2-3
25 February	14	2-3-3-2-4-2-3-3	19	1-4-4-5-4-2-2-2	6	2-3-3-3-3-2-3-3

Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
21 Feb 0413	ALERT: Type II Radio Emission	21/0201
21 Feb 2306	ALERT: X-ray Flux exceeded M5	21/2304
21 Feb 2321	SUMMARY: X-ray Event exceeded X1	21/2252 - 2314
22 Feb 0631	ALERT: X-ray Flux exceeded M5	22/0629
22 Feb 0647	SUMMARY: X-ray Event exceeded X1	22/0617 - 0640
22 Feb 1008	ALERT: Type II Radio Emission	22/0944
22 Feb 1226	ALERT: Type IV Radio Emission	22/1158
22 Feb 1917	WATCH: Geomagnetic Storm Category G1 predicted	
22 Feb 2230	ALERT: X-ray Flux exceeded M5	22/2225
22 Feb 2253	SUMMARY: X-ray Event exceeded X1	22/2208 - 2243
22 Feb 2341	SUMMARY: 10cm Radio Burst	22/2224 - 2235
25 Feb 0545	WARNING: Geomagnetic K = 4	25/0545 - 1500
25 Feb 1454	EXTENDED WARNING: Geomagnetic K = 4	25/0545 - 26/0600

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
26 Feb	180	12	3	11 Mar	165	5	2
27	175	10	3	12	165	5	2
28	175	10	3	13	160	5	2
29	180	5	2	14	160	5	2
01 Mar	175	5	2	15	168	5	2
02	170	5	2	16	172	5	2
03	170	5	2	17	175	5	2
04	172	5	2	18	175	5	2
05	172	5	2	19	178	5	2
06	170	5	2	20	180	5	2
07	165	5	2	21	180	5	2
08	165	5	2	22	180	5	2
09	165	5	2	23	180	5	2
10	168	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
21 Feb	2252	2307	2314	X1.8	0.099				3590			
21 Feb	2358	0014	0031	M1.5	0.026							
22 Feb	0617	0632	0640	X1.7	0.088	2B	N16E35		3590		99	
22 Feb	2029	2046	2103	M4.8	0.053	2B	N18E29		3590			
22 Feb	2208	2234	2243	X6.3	0.450				3590	390	240	
23 Feb	1312	1328	1354	M1.0	0.019				3590			
23 Feb	1541	1553	1606	M1.4	0.018	1N	N18E18		3590			
23 Feb	1726	1747	1807	M2.6	0.039	1N	N18E18		3590			
24 Feb	0621	0634	0644	M4.5	0.033				3590			
24 Feb	1032	1057	1103	M2.2	0.027				3590			
24 Feb	1103	1118	1125	M3.6	0.038				3590			
24 Feb	1154	1159	1204	M1.0	0.005				3590			
25 Feb	1647	1722	1747	M2.0	0.046	1N	N17W10		3590			

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
19 Feb	0003	0011	0017	C2.1			3576
19 Feb	0141	0147	0154	C1.9			3583
19 Feb	0617	0640	0708	C2.6			3583
19 Feb	0745	0749	0754	C2.6			3590
19 Feb	0826	0836	0853	C3.4			3590
19 Feb	0934	0940	0958	C6.7			3590
19 Feb	1239	1247	1252	C5.7	SF	N19E80	3590
19 Feb	1637	1644	1658	C2.0			3590
19 Feb	2239	2246	2258	C2.7			3583
20 Feb	1547	1556	1606	C2.8			3584
20 Feb	1656	1712	1730	C2.7			
20 Feb	2043	2045	2046		SF	N16E48	3590
21 Feb	0032	0037	0041	C2.4			3590
21 Feb	0044	0058	0116	C3.0			3583
21 Feb	0155	0217	0242	C4.3			
21 Feb	0338	0404	0435	C2.4			
21 Feb	0731	0735	0739	C1.7			3590
21 Feb	1022	1027	1032	C1.7	SF	N18E47	3590

Flare List

Date	Time			Optical			
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
21 Feb	1125	1138	1156		SF	N19E46	3590
21 Feb	1309	1315	1319	C1.4			3590
21 Feb	1341	1352	1403	C2.1			
21 Feb	1405	1406	1409		SF	N18E46	3590
21 Feb	1414	1421	1425	C1.9			
21 Feb	1539	1602	1642	C4.1			
21 Feb	1714	1714	1718		SF	N16E41	3590
21 Feb	1814	1825	1832	C3.4	SF	N15E42	3590
21 Feb	1922	1929	1933	C3.3	SF	N17E41	3590
21 Feb	2030	2035	2043	C4.0	SF	N16E39	3590
21 Feb	2221	2231	2238	C3.7			3590
21 Feb	2238	2242	2246	C4.3			
21 Feb	2252	2307	2314	X1.8			3590
21 Feb	2358	0014	0031	M1.5			
22 Feb	B0000	0012	0013		SF	N17E42	3590
22 Feb	0123	0123	0128		SF	N20E41	3590
22 Feb	0340	0347	0351	C4.0	SF	N18E36	3590
22 Feb	0426	0428	0428		SF	N15E32	3590
22 Feb	0617	0632	0640	X1.7	2B	N16E35	3590
22 Feb	1132	1139	1143	C3.4			
22 Feb	1527	1535	1541	C3.4	SF	N17E36	3590
22 Feb	1617	1629	1638	C9.4	SF	N17E36	3590
22 Feb	1708	1716	1720	C4.6			
22 Feb	1745	1757	1815	C4.5	SF	N18E32	3590
22 Feb	1907	1907	1911		SF	N18E29	3590
22 Feb	2029	2046	2103	M4.8	2B	N18E29	3590
22 Feb	2208	2234	2243	X6.3			3590
23 Feb	0616	0633	0648	C8.7			3590
23 Feb	B0702	U0703	A0713		SF	N21E29	3590
23 Feb	0943	0954	1009	C3.8			3590
23 Feb	1009	1015	1019	C3.8			3590
23 Feb	1312	1328	1354	M1.0			3590
23 Feb	1454	1652	1646	M1.4	1N	N18E18	3590
23 Feb	1726	1747	1807	M2.6	1N	N18E18	3590
23 Feb	2026	2039	2049	C5.4			3590
23 Feb	2108	2115	2126	C6.0			3590
23 Feb	2306	2313	2319	C4.9			3590
24 Feb	0056	0105	0120	C3.5			3590

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
24 Feb	0332	0353	0417	C5.9			3590
24 Feb	0517	0534	0558	C3.3			3590
24 Feb	0621	0634	0644	M4.5			3590
24 Feb	0803	0811	0820	C4.4			3590
24 Feb	0907	0913	0924	C5.3			3590
24 Feb	1017	1027	1032	C2.7			3590
24 Feb	1032	1057	1103	M2.2			3590
24 Feb	1103	1118	1125	M3.6			3590
24 Feb	1154	1159	1204	M1.0			3590
24 Feb	1435	1445	1455	C3.9			3590
24 Feb	1640	1648	1655	C4.1			3590
24 Feb	1713	1725	1739	C5.8			3590
24 Feb	1739	1756	1810	C7.8			3590
24 Feb	2016	2029	2039	C4.3			3590
25 Feb	0641	0658	0715	C4.2			3590
25 Feb	0902	0910	0916	C2.5			3590
25 Feb	1055	1101	1106	C3.1			3590
25 Feb	1647	1722	1747	M2.0	1N	N17W10	3590
25 Feb	1844	1850	1857		SF	N19W06	3590
25 Feb	2026	2030	2034		SF	S34E52	3591
25 Feb	2128	2128	2145		SF	N15W13	3590
25 Feb	2151	2158	2219		SF	N15W12	3590

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 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 3581													
08 Feb	S20E68	46	60	2	Hsx	1	A								
09 Feb	S21E58	3	80	2	Hsx	1	A								
10 Feb	S21E44	4	100	1	Hsx	1	A								
11 Feb	S21E31	2	80	1	Hsx	2	A								
12 Feb	S21E18	2	50	2	Hsx	2	A								
13 Feb	S21E05	3	50	3	Hsx	1	A								
14 Feb	S21W07	2	60	2	Hsx	1	A								
15 Feb	S22W20	2	50	2	Hsx	1	A								
16 Feb	S22W33	2	40	1	Hsx	1	A								
17 Feb	S21W46	1	30	1	Hsx	1	A								
18 Feb	S21W59	1	20	1	Hsx	1	A								
19 Feb	S21W73	121	10	1	Axx	1	A								
20 Feb	S21W87	2	10	3	Axx	1	A								
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 3

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 3583												
10 Feb	N09E42	6	20	4	Cro	6	B								
11 Feb	N09E29	5	110	7	Dso	14	B	3			2				
12 Feb	N09E15	6	250	9	Dki	22	BG	2			3				
13 Feb	N09E01	7	270	11	Eki	19	BG	2			1				
14 Feb	N09W13	8	260	13	Eho	13	B	1							
15 Feb	N09W26	8	270	14	Eso	10	B	1			1				
16 Feb	N09W40	9	290	16	Fko	9	B								
17 Feb	N09W53	8	270	16	Fki	11	B	2			2				
18 Feb	N09W67	9	250	17	Fki	11	B	4							
19 Feb	N08W78	6	170	17	Fso	6	B	3							
20 Feb	N08W92	8	plage												
								18	0	0	9	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 7

			Region 3584												
10 Feb	S15E71	337	20	1	Hsx	1	A								
11 Feb	S15E57	337	20	1	Hsx	1	A								
12 Feb	S15E43	338	30	1	Hsx	1	A								
13 Feb	S13E30	338	40	4	Cao	3	B								
14 Feb	S13E16	339	20	3	Hsx	3	A	3			4				
15 Feb	S15E07	335	20	1	Hrx	1	A								
16 Feb	S15W07	336	10	1	Axx	1	A								
17 Feb	S14W21	336	20	6	Cro	6	B	1			1				
18 Feb	S15W33	335	20	4	Bxo	6	B								
19 Feb	S14W47	335	10	3	Axx	2	A								
20 Feb	S15W61	336	10		Axx	1	A	1							
21 Feb	S15W75	338	plage												
22 Feb	S15W89	339	plage												
								5	0	0	5	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 335

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 3585													
13 Feb	N14E61	307	50	2	Hax	1	A								
14 Feb	N15E47	308	20	2	Cro	4	B								
15 Feb	N13E33	309	10	4	Bxo	3	B								
16 Feb	N13E19	310	plage												
17 Feb	N13E05	310	plage												
18 Feb	N13W09	311	plage												
19 Feb	N13W23	312	plage												
20 Feb	N13W37	313	plage												
21 Feb	N13W51	314	plage												
22 Feb	N13W65	315	plage												
23 Feb	N13W79	315	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 310

		Region 3586													
14 Feb	N29E68	287	50	3	Hsx	1	A								
15 Feb	N27E57	285	100	2	Hsx	1	A	1							
16 Feb	N27E45	284	160	2	Hsx	1	A	1							
17 Feb	N27E33	282	150	2	Hsx	1	A								
18 Feb	N27E20	282	140	2	Hsx	2	A								
19 Feb	N27E07	282	160	2	Cso	1	B								
20 Feb	N27W07	282	90	2	Hsx	1	A								
21 Feb	N27W20	282	70	3	Hsx	2	A								
22 Feb	N27W32	281	80	2	Hsx	2	A								
23 Feb	N28W46	282	80	2	Hsx	1	A								
24 Feb	N27W58	281	80	2	Hsx	1	A								
25 Feb	N27W70	280	120	2	Hsx	1	A								
								2	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 282

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 3587													
15 Feb	S21E37	305	20	2	Cro	5	B	1							
16 Feb	S22E23	306	20	3	Bxo	4	B				1				
17 Feb	S21E10	305	10	5	Bxo	6	B								
18 Feb	S20W02	304	10	5	Bxo	3	B								
19 Feb	S20W16	305	plage												
20 Feb	S20W30	306	plage												
21 Feb	S20W44	307	plage												
22 Feb	S20W58	308	plage												
23 Feb	S20W72	308	plage												
24 Feb	S20W86	309	plage												
								1	0	0	1	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 304

		Region 3588													
15 Feb	S03E30	312	10	5	Bxo	2	B	1							
16 Feb	S03E15	314	plage												
17 Feb	S03W00	315	plage												
18 Feb	S03W15	317	plage												
19 Feb	S03W30	319	plage												
20 Feb	S03W45	321	plage												
21 Feb	S03W60	323	plage												
22 Feb	S03W75	325	plage												
23 Feb	S03W90	326	plage												
								1	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 315

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 3590												
18 Feb	N19E78	224	250	4	Hhx	1	A	3			1				
19 Feb	N18E61	226	530	14	Eho	4	B	5			1				
20 Feb	N17E51	223	760	20	Fki	7	BG				1				
21 Feb	N17E38	224	740	17	Fki	23	BGD	8		1	7				
22 Feb	N18E26	222	900	17	Fkc	24	BGD	4	1	2	8		2		
23 Feb	N18E13	223	1150	18	Fkc	44	BGD	6	3		1	2			
24 Feb	N18W01	224	1400	20	Fkc	45	BGD	11	4						
25 Feb	N18W13	223	1450	20	Fkc	29	BGD	3	1		3	1			
								40	9	3	22	3	2	0	0

Still on Disk.
Absolute heliographic longitude: 224

			Region 3591												
23 Feb	S35E71	165	60	3	Hsx	1	A								
24 Feb	S36E60	163	40	3	Hsx	1	A								
25 Feb	S36E46	164	70	3	Hsx	1	A				1				
								0	0	0	1	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 164

			Region 3592												
23 Feb	S10E69	167	80	7	Dso	2	B								
24 Feb	S12E58	165	140	4	Dso	5	B								
25 Feb	S13E45	165	130	7	Dao	7	B								
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 165

			Region 3593												
23 Feb	S07W69	305	10	3	Bxo	3	B								
24 Feb	S07W84	307	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 305

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 3594													
23 Feb	N06E68	168	30	5	Cao	5	B								
24 Feb	N05E55	168	50	2	Cao	4	B								
25 Feb	N05E43	167	60	5	Cao	6	B								
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 167

		Region 3595													
25 Feb	N20E46	164	80	5	Cai	10	B								
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 164

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

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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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