Space Weather Highlights **SWPC PRF 2453**
29 August - 04 September 2022 **05 September 2022**

Solar activity ranged from low to high levels during the period. High activity levels were observed on 29 Aug when Region 3088 (S27, L=300, class/area Dkc/650 on 27 Aug) produced an M8.6 x-ray event at 29/1108 UTC. During the 29th, the region produced three additional M-class events including an M2.5 at 29/1456 UTC with an associated Type II (286 km/s), a Type IV Sweep and a 1000 sfu Tenflare. Moderate levels were observed on 30 Aug with a pair of small M-class events observed from Rgn 3088, including a long duration (LDE) M2.1 at 30/1929 UTC. A weak Type II (332 km/s) Sweep was observed with a C5.4 event at 30/1720 UTC.

Low activity levels were observed on 31 Aug - 04 Sep with numerous (43) C-class flares observed from Rgn 3089 (S23, L=195, class/area Ekc/520 on 04 Sep). Additional C-class activity was observed from Rgns 3092 (S09, L=095, class/area Cao/170 on 02 Sep), 3093 (S27, L=105, class/area Cro/030 on 04 Sep) and 3094 (N20, L=069, class/area Cao/100 on 02 Sep). Some weak CME activity was observed off the SW limb on 02 Sep that was analyzed as having a potential, weak Earth-directed component for 06 Sep.

No proton events were observed at geosynchronous orbit. A weak enhancement to 0.88 pfu was observed at 30/0210 UTC associated with W limb M-class activity from Rgn 3088.

The GOES-16 greater than 2 MeV electron flux at geosynchronous orbit was at normal to moderate levels on 29 Aug - 03 Sep and reached high levels on 04 Sep with a peak flux of 6,689 pfu observed at 04/1625 UTC.

Geomagnetic field activity was at quiet to active levels on 29 Aug - 02 Sep due to negative polarity CH HSS influence coupled with SW limb CME effects on 29-30 Aug. By 03 Sep, and through 04 Sep, a large equatorial, positive polarity CH HSS moved into a geoeffective position. Steady Minor to Major geomagnetic storm activity was observed through both days. Total field values of 12 nT coupled with steady -12 nT Bz values were observed on the 3rd and 4th. Wind speeds reached maximum speeds of near 685 km/s through most of 04 Sep.

Space Weather Outlook
05 September - 01 October 2022

Solar activity is expected to be at very low to low levels through 10 Sep. From 11 - 25 Sep, a chance for R1-R2, (Minor-Moderate) flare activity exists as previously active regions return to the visible disk. A return to very low levels is expected from 26 Sep - 01 Oct.

No proton events are expected at geosynchronous orbit from 05 - 10 Sep and 26 Sep - 01 Oct. There is a slight chance for a proton event from 11 Sep - 01 Oct.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at high levels on 05 - 11 Sep, 15 - 19 Sep, 25 - 28 Sep and 01 Oct due to CH HSS influence.

Geomagnetic field activity is expected to reach G1 (Minor) storm conditions on 05 Sep and 01 Oct due to CH HSS influence. Unsettled to active conditions are expected on 06 - 11 Sep, 13 - 17 Sep and 23 - 30 Sep due to recurrent CH HSSs. Mostly quiet to unsettled levels are expected for the remainder of the period.

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
29 August	131	87	930	C2.1	5	4	0	13	1	0	0	0
30 August	126	50	280	C3.5	5	2	0	4	0	0	0	0
31 August	113	42	500	C1.0	5	0	0	6	0	0	0	0
01 September	116	67	480	B6.4	6	0	0	0	0	0	0	0
02 September	130	71	650	B7.2	12	0	0	7	0	0	0	0
03 September	123	68	770	B6.5	15	0	0	11	0	0	0	0
04 September	128	62	740	C1.3	16	0	0	5	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
29 August	1.6e+07	6.7e+04	1.1e+06
30 August	3.1e+06	3.6e+04	1.5e+06
31 August	2.0e+05	3.2e+04	2.5e+06
01 September	8.9e+04	3.1e+04	2.0e+06
02 September	9.3e+04	3.1e+04	3.1e+06
03 September	1.8e+05	3.0e+04	7.1e+06
04 September	1.4e+06	3.0e+04	6.9e+07

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
29 August	13	2-4-3-3-3-2-3-1	21	2-4-5-4-5-1-2-0	14	2-4-3-3-3-2-3-1
30 August	13	2-4-2-3-3-2-2-3	17	2-4-3-5-3-2-2-2	13	2-4-2-3-2-2-2-3
31 August	12	3-3-1-2-3-2-2-4	13	2-2-2-4-4-2-2-3	13	3-3-2-3-2-2-2-4
01 September	9	2-3-2-2-3-2-2-1	9	3-3-2-3-2-1-1-1	9	2-4-2-2-2-2-1-1
02 September	10	2-1-2-3-2-2-1-4	7	1-0-2-2-4-1-1-1	8	2-1-2-2-2-1-1-4
03 September	23	5-3-3-4-4-3-2-4	33	4-3-5-5-6-3-3-3	25	5-3-4-4-4-3-3-4
04 September	33	4-4-5-5-4-4-3-5	91	5-6-7-7-6-7-5-5	56	5-6-6-6-5-6-4-5

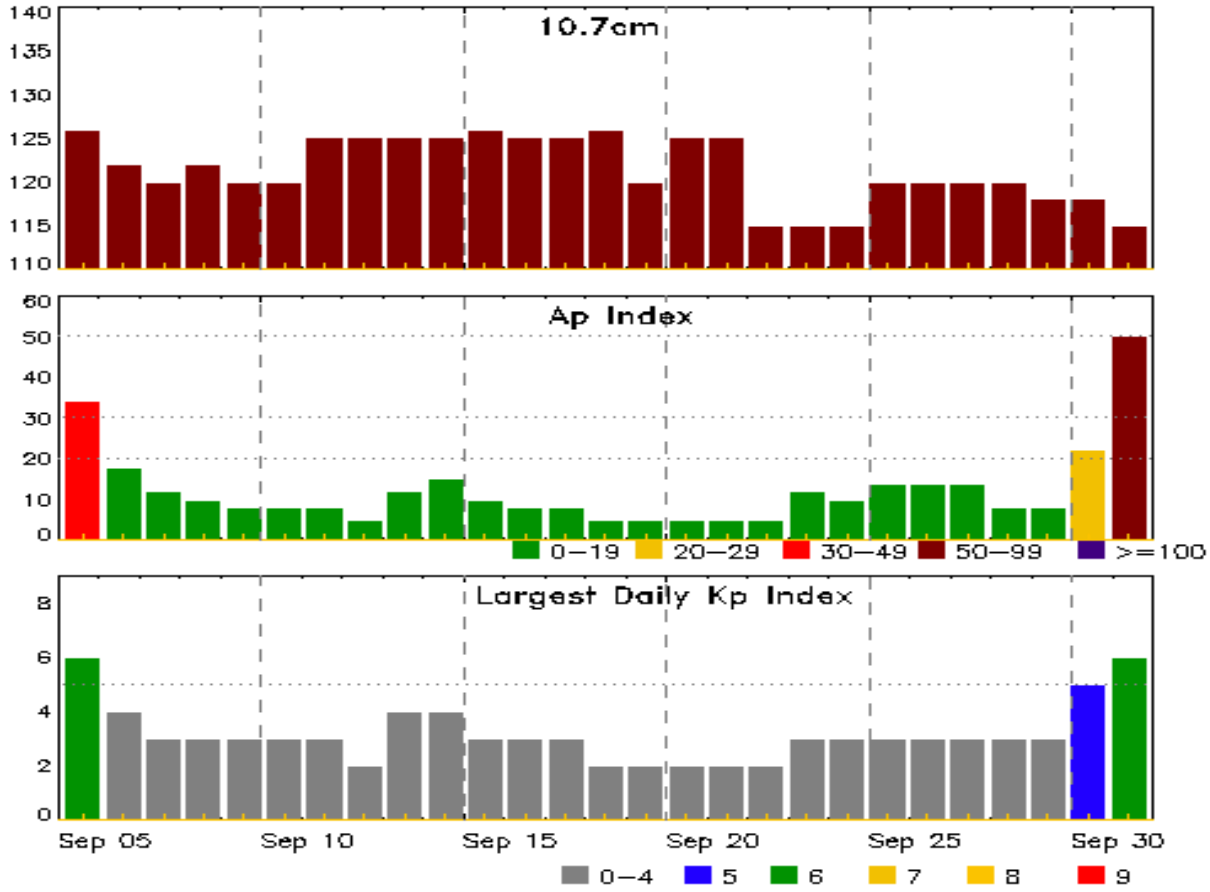
Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
29 Aug 0352	WARNING: Geomagnetic K = 4	29/0350 - 1800
29 Aug 0520	ALERT: Geomagnetic K = 4	29/0520
29 Aug 0556	WARNING: Geomagnetic K = 5	29/0555 - 1500
29 Aug 1115	ALERT: X-ray Flux exceeded M5	29/1108
29 Aug 1143	SUMMARY: X-ray Event exceeded M5	29/1048 - 1112
29 Aug 1724	ALERT: Type II Radio Emission	29/1652
29 Aug 1806	ALERT: Type IV Radio Emission	29/1701
29 Aug 1918	SUMMARY: 10cm Radio Burst	29/1654 - 1828
30 Aug 0350	WARNING: Geomagnetic K = 4	30/0350 - 0900
30 Aug 0416	ALERT: Geomagnetic K = 4	30/0401
30 Aug 0442	WARNING: Geomagnetic K = 5	30/0442 - 0900
30 Aug 0855	EXTENDED WARNING: Geomagnetic K = 4	30/0350 - 1500
30 Aug 1832	ALERT: Type II Radio Emission	30/1741
30 Aug 1912	WARNING: Geomagnetic Sudden Impulse expected	30/1910 - 2030
30 Aug 1913	WARNING: Geomagnetic K = 4	30/1915 - 2359
31 Aug 0412	WARNING: Geomagnetic K = 4	31/0412 - 0900
31 Aug 2224	WARNING: Geomagnetic K = 4	31/2220 - 01/1200
31 Aug 2226	ALERT: Geomagnetic K = 4	31/2225
01 Sep 2118	WATCH: Geomagnetic Storm Category G2 predicted	
02 Sep 1628	WATCH: Geomagnetic Storm Category G2 predicted	
02 Sep 2357	WARNING: Geomagnetic K = 4	02/2350 - 03/1200
02 Sep 2357	ALERT: Geomagnetic K = 4	02/2356
03 Sep 0159	WARNING: Geomagnetic K = 5	03/0158 - 1200
03 Sep 0220	ALERT: Geomagnetic K = 5	03/0219
03 Sep 1139	EXTENDED WARNING: Geomagnetic K = 4	02/2350 - 03/2100
03 Sep 1139	EXTENDED WARNING: Geomagnetic K = 5	03/0158 - 1800
03 Sep 2029	EXTENDED WARNING: Geomagnetic K = 4	02/2350 - 04/0300
04 Sep 0109	EXTENDED WARNING: Geomagnetic K = 4	02/2350 - 05/0900
04 Sep 0128	WARNING: Geomagnetic K = 5	04/0126 - 2359

Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
04 Sep 0151	ALERT: Geomagnetic K = 5	04/0150
04 Sep 0241	WARNING: Geomagnetic K = 6	04/0239 - 1500
04 Sep 0516	ALERT: Geomagnetic K = 6	04/0515
04 Sep 0727	ALERT: Geomagnetic K = 5	04/0725
04 Sep 0747	ALERT: Geomagnetic K = 6	04/0744
04 Sep 1043	ALERT: Geomagnetic K = 5	04/1040
04 Sep 1150	ALERT: Geomagnetic K = 6	04/1148
04 Sep 1400	ALERT: Geomagnetic K = 5	04/1359
04 Sep 1419	ALERT: Electron 2MeV Integral Flux >= 1000pfu	04/1405
04 Sep 1430	EXTENDED WARNING: Geomagnetic K = 6	04/0239 - 2100
04 Sep 1622	WATCH: Geomagnetic Storm Category G2 predicted	
04 Sep 1715	ALERT: Geomagnetic K = 6	04/1715
04 Sep 2315	ALERT: Geomagnetic K = 5	04/2311
04 Sep 2319	EXTENDED WARNING: Geomagnetic K = 5	04/0126 - 05/1200
04 Sep 2319	EXTENDED WARNING: Geomagnetic K = 4	02/2350 - 05/2359

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
05 Sep	126	34	6	19 Sep	120	5	2
06	122	18	4	20	125	5	2
07	120	12	3	21	125	5	2
08	122	10	3	22	115	5	2
09	120	8	3	23	115	12	3
10	120	8	3	24	115	10	3
11	125	8	3	25	120	14	3
12	125	5	2	26	120	14	3
13	125	12	4	27	120	14	3
14	125	15	4	28	120	8	3
15	126	10	3	29	118	8	3
16	125	8	3	30	118	22	5
17	125	8	3	01 Oct	115	50	6
18	126	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
29 Aug	0324	0338	0347	M3.3	0.028	SF	S23W80			3088			
29 Aug	1048	1108	1112	M8.6	0.030					3088			
29 Aug	1446	1456	1508	M2.5	0.024					3088			
29 Aug	1845	1857	1908	M4.7	0.044					3088			
30 Aug	0158	0213	0224	M1.5	0.023					3088			
30 Aug	1804	1929	2123	M2.1	0.190					3088			

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
29 Aug	0000	0002	0014		SF	S23E21	3089
29 Aug	0156	0157	0205		SF	S23E21	3089
29 Aug	0244	0249	0253	C3.7	SF	S23W80	3088
29 Aug	0324	0338	0347	M3.3	SF	S23W80	3088
29 Aug	0535	0543	0549	C4.7			
29 Aug	0606	0608	0627		SF	S21E22	3089
29 Aug	0632	0648	0700		SF	S21E17	3089
29 Aug	0831	U0912	0929		SF	S20E15	3089
29 Aug	0855	0910	0920	C8.5			3088
29 Aug	0912	0914	0915		SF	S21W23	3086
29 Aug	0929	0935	0942		SF	S20E15	3089
29 Aug	0944	0948	1009		SF	S20E15	3089
29 Aug	1009	1011	1014		SF	S20E15	3089
29 Aug	1016	1018	1019		SF	S20E15	3089
29 Aug	1025	1026	1027		SF	S20E14	3089
29 Aug	1048	1108	1112	M8.6			3088
29 Aug	1323	1328	1414		1B	S26W80	3088
29 Aug	1425	1440	1446	C8.7			
29 Aug	1446	1456	1508	M2.5			3088
29 Aug	1845	1857	1908	M4.7			3088
29 Aug	2142	2154	2207	C6.0			3088
30 Aug	0158	0213	0224	M1.5			3088
30 Aug	0444	0457	0510	C7.6			3088
30 Aug	0819	0832	0849	C2.4	SF	S22W01	3089
30 Aug	1043	1059	1102	C1.6			3088

Flare List

Date	Time			Optical			
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
30 Aug	1257	1259	1314		SF	S20W00	3089
30 Aug	1410	1413	1420	C1.1	SF	S20W02	3089
30 Aug	1556	1558	1602		SF	S20W03	3089
30 Aug	1648	1720	1735	C5.4			3088
30 Aug	1804	1929	2123	M2.1			3088
31 Aug	0733	0746	0824	C4.3	SF	S24W08	3089
31 Aug	0826	0831	0834		SF	S23W11	3089
31 Aug	1121	1122	1129		SF	S23W12	3089
31 Aug	1228	1230	1232		SF	S23W16	3089
31 Aug	1245	1247	1308		SF	N15E05	
31 Aug	1450	1459	1508	C2.1	SF	S23W11	3089
31 Aug	1833	1840	1846	C1.3			3089
31 Aug	1936	1945	1959	C2.7			3089
31 Aug	2357	0001	0008	C1.2			3089
01 Sep	0114	0120	0125	C1.3			3089
01 Sep	0946	0953	0959	C1.0			3086
01 Sep	1215	1220	1224	C1.6			3086
01 Sep	1346	1358	1409	C4.1			3092
01 Sep	1904	1914	1922	C1.2			3092
01 Sep	2203	2213	2220	C1.5			3089
02 Sep	0217	0224	0228	C1.1			3089
02 Sep	0245	0251	0258	B9.7			3089
02 Sep	0301	0306	0309	B9.6			3094
02 Sep	0309	0315	0320	C1.1			3094
02 Sep	0414	0424	0435	C1.8			3089
02 Sep	B0559	U0632	0657		SF	S22W37	3089
02 Sep	1000	1006	1010	C1.6			3094
02 Sep	1316	1321	1328	C2.1	SF	S22W41	3089
02 Sep	1332	1356	1417	C2.4	SF	S23W40	3094
02 Sep	1456	1519	1551	C2.6	SF	S23W42	3089
02 Sep	1610	1610	1639	C3.5	SF	S23W43	3089
02 Sep	1643	1650	1655	C2.9	SF	S22W42	3089
02 Sep	1704	1716	1727	C3.8	SF	S22W42	3089
02 Sep	1957	2004	2009	C3.4			3093
02 Sep	2316	2324	2335	C1.8			3089
03 Sep	0205	0214	0219	C1.7			3089
03 Sep	0301	0308	0312	C1.0			3092
03 Sep	0625	0626	0628		SF	S24W50	3089

Flare List

Date	Time			Optical			
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
03 Sep	0643	0653	0656	C1.2			3089
03 Sep	0656	0711	0721	C2.0			3089
03 Sep	0700	0704	0723		SF	S20W51	3089
03 Sep	0701	0743	0801		SF	S23W45	3089
03 Sep	0733	0744	0755	C2.6	SF	S20W51	3089
03 Sep	0934	0935	0946		SF	S23W52	3089
03 Sep	1107	1114	1118	B8.8			3089
03 Sep	1123	1134	1142	C1.1	SF	S23W53	3089
03 Sep	1203	1205	1208	C2.1	SF	S20W52	3089
03 Sep	1336	1340	1345	C1.3	SF	S24W53	3089
03 Sep	1515	1518	1524	C1.0			3089
03 Sep	1550	U1609	1625		SF	S26W55	3089
03 Sep	1629	1634	1638	C1.0	SF	S23W55	3089
03 Sep	1640	1648	1654	C3.1			3089
03 Sep	2012	2017	2024	C2.6			3089
03 Sep	2132	2136	2142	C2.8	SF	S24W58	3089
03 Sep	2315	2318	2322	C2.1			3089
03 Sep	2353	0006	0017	C4.0			3089
04 Sep	0251	0302	0319	C6.4	SF	S23W61	3089
04 Sep	B0515	U0530	A0610	C4.8	1F	S24W62	3089
04 Sep	0709	0717	0728	C2.2			3094
04 Sep	0735	0754	0812	C3.9			3093
04 Sep	1014	1021	1040	C2.3	SF	S24W62	3089
04 Sep	1051	1055	1100	C2.5			3089
04 Sep	1122	1132	1141	C3.1			3089
04 Sep	1211	1216	1221	C4.3			3089
04 Sep	1347	1355	1402	C2.5			3089
04 Sep	1403	1410	1426	C2.9			3089
04 Sep	1618	1623	1628	C2.1	1N	S27W70	3089
04 Sep	1630	1638	1645	C8.2			3089
04 Sep	1800	1806	1814	C1.8			3092
04 Sep	1821	1827	1831	C2.2			3092
04 Sep	1849	1850	1854		SF	S09E33	3092
04 Sep	2044	2051	2056	C2.3			3089
04 Sep	2140	2148	2157	C2.5			3089
04 Sep	2312	2313	2320		SF	S08E31	3092
04 Sep	2336	2338	2342		SF	S19W74	3089

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 3085												
21 Aug	N29E16	290	50	5	Dao	6	B	2			1				
22 Aug	N30E01	291	150	7	Dso	11	B	9			8				
23 Aug	N25W08	287	250	8	Dki	15	B								
24 Aug	N30W21	287	260	8	Dko	10	B								
25 Aug	N32W35	287	280	9	Dko	10	B								
26 Aug	N30W49	289	140	8	Dso	4	B				2				
27 Aug	N30W62	289	100	8	Cso	2	B				1				
28 Aug	N30W76	290	80	5	Hsx	1	A								
29 Aug	N31W90	290	60	2	Hsx	1	A								
								11	0	0	12	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 291

			Region 3086												
23 Aug	S21E44	235	90	4	Cao	6	B	1							
24 Aug	S24E28	238	100	6	Dso	5	B								
25 Aug	S24E14	238	120	8	Dso	3	B								
26 Aug	S22E01	239	50	8	Dao	6	B								
27 Aug	S22W12	239	70	5	Cai	8	B	1			2				
28 Aug	S23W25	239	30	6	Cro	6	B								
29 Aug	S24W38	238	30	4	Dso	2	B				1				
30 Aug	S23W53	239	30	2	Dso	2	B								
31 Aug	S23W67	241	plage												
01 Sep	S22W78	239	10	4	Cro	3	B	2							
								4	0	0	3	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 239

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 3087												
23 Aug	S15E65	214	40	2	Hax	1	A								
24 Aug	S17E53	213	40	1	Hax	1	A								
25 Aug	S16E38	213	40	1	Hax	1	A								
26 Aug	S13E26	214	30	1	Hrx	1	A								
27 Aug	S14E13	214	20	1	Hrx	1	A								
28 Aug	S14W01	215	10	1	Axx	1	A								
29 Aug	S14W13	213	10	1	Axx	1	A								
30 Aug	S14W27	214	plage												
31 Aug	S14W41	215	plage												
01 Sep	S14W55	216	plage												
02 Sep	S14W69	217	plage												
								0	0	0	0	0	0	0	0

Died on Disk.
Absolute heliographic longitude: 215

			Region 3088												
25 Aug	S26W45	298	240	6	Dai	10	B	7	1		5	1			
26 Aug	S28W58	298	420	7	Dkc	15	B	4			2	3			
27 Aug	S27W73	300	650	7	Dkc	9	BG	12	4		28	2			
28 Aug	S27W87	301	220	6	Dkc	4	BG	8	3		15	1			
29 Aug	S27W95	301	250	6	Dkc	4	BG	3	4		2	1			
								34	12	0	52	8	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 298

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 3089												
25 Aug	S24E56	196	150	6	Dsi	9	B	9	1		4	2			
26 Aug	S21E44	196	190	8	Dai	12	BG	6	3		14	4			
27 Aug	S22E31	196	280	7	Dki	14	B				4				
28 Aug	S23E18	196	320	11	Eki	17	BD	1							
29 Aug	S22E06	194	580	14	Ekc	29	BGD				10				
30 Aug	S22W06	192	250	15	Eac	28	BG	2			4				
31 Aug	S22W20	194	490	14	Ekc	21	BGD	5			5				
01 Sep	S22W33	194	350	12	Eki	20	BD	2							
02 Sep	S23W46	194	340	12	Ekc	20	BG	8			7				
03 Sep	S22W61	195	510	11	Ekc	18	BGD	14			11				
04 Sep	S23W74	195	520	11	Ekc	13	BGD	12			3	2			
								59	4	0	62	8	0	0	0

Still on Disk.
Absolute heliographic longitude: 194

			Region 3090												
25 Aug	N14E60	191	10		Axx	1	A								
26 Aug	N16E48	192	plage												
27 Aug	N16E34	193	plage												
28 Aug	N16E20	194	plage												
29 Aug	N16E06	194	plage												
30 Aug	N16W08	195	plage												
31 Aug	N16W19	193	10	1	Axx	1	A								
01 Sep	N16W33	194	plage												
02 Sep	N16W47	195	plage												
03 Sep	N16W62	196	plage												
04 Sep	N16W76	197	plage												
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 194

			Region 3091												
01 Sep	N14W17	178	10	1	Axx	1	A								
02 Sep	N14W31	179	plage												
03 Sep	N14W46	180	plage												
04 Sep	N14W60	181	plage												
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 178

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 3092												
01 Sep	S09E67	94	110	3	Cao	3	B	2							
02 Sep	S09E53	95	170	3	Cao	3	B								
03 Sep	S10E38	96	130	3	Cso	3	B	1							
04 Sep	S10E27	94	90	3	Cso	3	B	2			2				
								5	0	0	2	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 94

			Region 3093												
02 Sep	S26E42	106	20	6	Cro	7	B	1							
03 Sep	S27E26	108	30	5	Bxo	4	B								
04 Sep	S27E16	105	30	3	Cro	3	B	1							
								2	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 105

			Region 3094												
02 Sep	N22E79	69	120	3	Hsx	1	A	3							
03 Sep	N20E67	69	100	4	Cao	3	B								
04 Sep	N21E53	68	100	2	Cao	3	B	1							
								4	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 68

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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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