Space Weather Highlights **SWPC PRF 2457**
26 September - 02 October 2022 **03 October 2022**

Solar activity ranged from low to high levels during the period. Low levels occured from 26-29 Sep with numerous C-class flares observed from Regions 3105 (S17, L=210, class/area Dki/490 on 22 Sep), 3107 (S25, L=113, class/area Fai/240 on 24 Sep) and 3112 (N23, L=052, class/area Fki/750 on 02 Oct), the largest region on the disk. The largest of these flares was a long duration C5.5 from Region 3112.

Activity increased to moderate levels with three M-class flares from Region 3112 including an M2.9 at 30/1622 UTC. No Earth-directed CMEs were detected with these flares. Activity levels further increased to high with an M5.8/1b flare observed at 01/2010 UTC from Region 3110 (N16, L=158, class/area Dhi/320 on 25 Sep). Analysis and modelling of the subsequent CME indicated a possible Earth-directed component. In addition, a slow rise and fall C3.5 x-ray event, with an associated filament eruption, was detected from Region 3113 (N16, L=154, class/area Dao/100 on 01 Oct). Analysis and modelling of the subsequent CME indicated a possible Earth-directed component.

High levels continued with M-class activity from Regions 3110 and 3112, the largest of these was an M8.7/1n from Region 3110. Associated with this event was a Type IV, a Tenflare (190 sfu) and a possible Earth-directed CME. Late on 02 Oct, the largest event of the highlight period was observed from Region 3110, an X1.0 with an associated Type II (1157 km/s) and 420 sfu Tenflare. Also associated with this event was a CME that had not been analyzed as of this writing.

The greater than 2 MeV electron flux at geosynchronous orbit was at high levels on 26 Sep with a peak flux of 2,640 pfu observed at 26/1640 UTC. The greater than 10 MeV proton flux at geosynchronous orbit was slightly elevated to near 2 pfu on the 27th and near 1 pfu on 01 and 02 Oct due to major flare activity.

Geomagnetic field activity ranged from quiet to major storm levels. Mostly quiet levels were observed on 26 Sep. By 27 Sep, levels increased to unsettled to major storm due to negative polarity CH HSS effects coupled with CME effects from 24 Sep. Mostly quiet levels were observed on 28-29 Sep. Unsettled to active levels were observed on 30 Sep due to positive polarity CH HSS effects. Quiet levels returned on 01 Oct through midday or so on 02 Oct. Later on 02 Oct, unsettled to minor storm levels were observed due to positive polarity CH HSS effects.

Space Weather Outlook
03 October - 29 October 2022

Solar activity is expected to be low with M-class flares likely and a chance for X-class from 03-14 Oct and again from 18-29 Oct due to current active regions on the visible disk and returning active regions. Low levels are expected during the interim dates from 15-17 Oct.

A chance for proton events at geosynchronous orbit are possible from 03-14 Oct and again from 18-29 Oct due to current active regions on the visible disk and returning active regions. No proton events are expected during the interim dates from 15-17 Oct.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at mostly normal to moderate levels during the outlook period.

Geomagnetic field activity is expected to be at minor to major storm levels on 03-05 Oct due to combined positive polarity CH HSS and CME effects. Unsettled levels are possible on 10 Oct, 15-16 Oct and 20-21 Oct with active levels possible on 15-16 Oct, all due to recurrent CH HSS effects.

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
26 September	135	120	730	B8.4	5	0	0	1	1	0	0	0
27 September	135	110	650	B8.2	10	0	0	11	0	0	0	0
28 September	135	72	650	B8.4	8	0	0	6	0	0	0	0
29 September	137	56	490	C1.6	7	0	0	2	0	0	0	0
30 September	137	74	570	C1.6	10	3	0	4	0	0	0	0
01 October	148	100	970	C1.5	11	1	0	1	1	0	0	0
02 October	154	102	1130	C1.4	10	3	1	16	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
26 September	9.7e+05	5.9e+04	7.6e+07
27 September	1.1e+07	9.4e+04	1.2e+06
28 September	3.0e+06	5.7e+04	1.2e+06
29 September	4.4e+06	3.7e+04	1.1e+06
30 September	1.4e+06	3.1e+04	1.3e+06
01 October	3.1e+05	3.1e+04	1.5e+06
02 October	2.4e+06	3.5e+04	1.3e+06

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
26 September	5	1-1-0-1-1-2-1-3	4	1-0-0-2-3-0-0-1	6	2-1-0-1-1-1-1-3
27 September	33	5-3-2-3-3-7-3-2	25	5-3-2-6-4-2-2-2	24	6-4-2-4-3-3-3-3
28 September	3	1-1-0-1-1-2-1-1	3	2-1-0-0-0-1-2-0	5	2-1-1-1-1-1-2-1
29 September	7	1-0-3-3-2-2-1-1	8	1-0-3-3-3-2-1-2	7	1-1-3-2-2-2-1-1
30 September	12	2-4-4-2-3-2-1-0	27	1-3-5-5-6-3-1-0	13	3-4-4-3-3-2-1-1
01 October	2	0-0-0-0-0-1-2-1	1	0-0-1-1-0-0-0-0	3	1-0-0-1-0-1-1-1
02 October	9	2-2-0-2-2-2-2-4	23	1-1-0-6-4-3-2-5	9	2-2-1-2-2-3-2-5

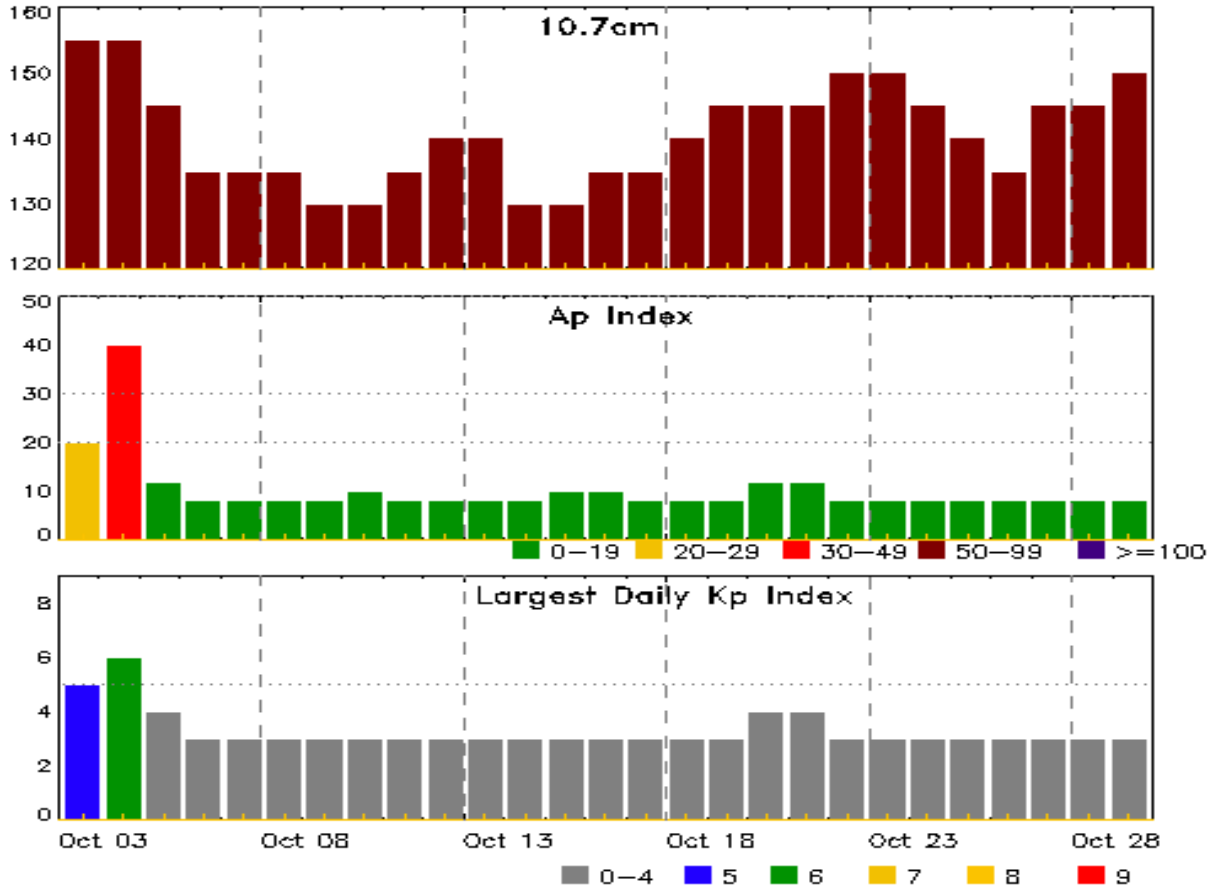
Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
26 Sep 1142	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	25/1235
26 Sep 2209	WARNING: Geomagnetic K = 4	26/2210 - 27/0600
27 Sep 0117	ALERT: Geomagnetic K = 4	27/0113
27 Sep 0123	WARNING: Geomagnetic K = 5	27/0122 - 0600
27 Sep 0132	ALERT: Geomagnetic K = 5	27/0131
27 Sep 0146	WARNING: Geomagnetic K = 6	27/0146 - 0600
27 Sep 0218	ALERT: Geomagnetic K = 6	27/0213
27 Sep 0218	EXTENDED WARNING: Geomagnetic K = 5	27/0122 - 1500
27 Sep 0218	EXTENDED WARNING: Geomagnetic K = 4	26/2210 - 27/1800
27 Sep 0218	EXTENDED WARNING: Geomagnetic K = 6	27/0146 - 1200
27 Sep 0218	WARNING: Geomagnetic K>= 7	27/0217 - 0900
27 Sep 0934	EXTENDED WARNING: Geomagnetic K = 4	26/2210 - 27/2100
27 Sep 0934	EXTENDED WARNING: Geomagnetic K = 6	27/0146 - 1500
27 Sep 0934	EXTENDED WARNING: Geomagnetic K = 5	27/0122 - 1800
27 Sep 1100	ALERT: Type II Radio Emission	27/1039
27 Sep 1957	WATCH: Geomagnetic Storm Category G1 predicted	
28 Sep 2038	WATCH: Geomagnetic Storm Category G2 predicted	
29 Sep 1222	ALERT: Type II Radio Emission	29/1159
29 Sep 2047	WATCH: Geomagnetic Storm Category G2 predicted	
30 Sep 0458	WARNING: Geomagnetic Sudden Impulse expected	30/0511 - 0541
30 Sep 0502	WARNING: Geomagnetic K = 4	30/0505 - 1200
30 Sep 0532	SUMMARY: Geomagnetic Sudden Impulse	30/0519
30 Sep 0556	ALERT: Geomagnetic K = 4	30/0556
30 Sep 1346	WARNING: Geomagnetic K = 4	30/1345 - 01/1200
30 Sep 1804	WATCH: Geomagnetic Storm Category G2 predicted	
01 Oct 2010	ALERT: X-ray Flux exceeded M5	01/2010
01 Oct 2033	SUMMARY: X-ray Event exceeded M5	01/1958 - 2016
02 Oct 0220	ALERT: X-ray Flux exceeded M5	02/0218

Alerts and Warnings Issued

Date & Time of Issue UTC	Type of Alert or Warning	Date & Time of Event UTC
02 Oct 0239	SUMMARY: 10cm Radio Burst	02/0218 - 0222
02 Oct 0246	SUMMARY: X-ray Event exceeded M5	02/0208 - 0226
02 Oct 0504	ALERT: Type IV Radio Emission	02/0227
02 Oct 2023	ALERT: X-ray Flux exceeded M5	02/2022
02 Oct 2046	ALERT: Type II Radio Emission	02/2024
02 Oct 2047	SUMMARY: X-ray Event exceeded X1	02/1953 - 2034
02 Oct 2142	WARNING: Geomagnetic K = 4	02/2142 - 03/1200
02 Oct 2222	ALERT: Geomagnetic K = 4	02/2220
02 Oct 2231	WARNING: Geomagnetic K = 5	02/2230 - 03/1200
02 Oct 2254	ALERT: Geomagnetic K = 5	02/2254

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
03 Oct	155	20	5	17 Oct	135	8	3
04	155	40	6	18	140	8	3
05	145	12	4	19	145	8	3
06	135	8	3	20	145	12	4
07	135	8	3	21	145	12	4
08	135	8	3	22	150	8	3
09	130	8	3	23	150	8	3
10	130	10	3	24	145	8	3
11	135	8	3	25	140	8	3
12	140	8	3	26	135	8	3
13	140	8	3	27	145	8	3
14	130	8	3	28	145	8	3
15	130	10	3	29	150	8	3
16	135	10	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
30 Sep	0346	0401	0651	M1.0	0.007			3112				
30 Sep	1611	1622	1633	M2.9	0.022			3112				
30 Sep	1730	1734	1745	M1.3	0.009			3112				
01 Oct	1958	2010	2016	M5.8	0.030	1B	N18W36	3110	220			
02 Oct	0208	0221	0226	M8.7	0.036	1N	N16W34	3110	910	190		1
02 Oct	1352	1405	1423	M1.2	0.017	SF	N25E73	3112				
02 Oct	1534	1545	1553	M1.0	0.008	SF	N22E69	3112				
02 Oct	1953	2025	2034	X1.0	0.086			3110	1400	560	2	

Flare List

	Time			Optical			
Date	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
26 Sep	0848	0911	0936	C4.7	1F	S25E16	3107
26 Sep	1239	1251	1309	C2.1			3107
26 Sep	1537	1545	1550	C2.9	SF	N19E42	3110
26 Sep	1757	1807	1825	C1.8			3107
26 Sep	2044	2114	2132	C3.6			3107
27 Sep	0408	0424	0432	C2.8	SF	S25W04	3107
27 Sep	0432	0436	0440	C4.0			3107
27 Sep	0559	0611	0627		SF	S25W04	3107
27 Sep	0637	0646	0658	C4.8	SF	S25W04	3107
27 Sep	1027	1031	1040		SF	S14W26	3105
27 Sep	1059	1059	1112		SF	S17W24	3105
27 Sep	1144	1156	1206	C4.0	SF	S25W03	3107
27 Sep	B1213	U1217	A1223		SF	S17W25	3105
27 Sep	1340	1352	1358	C2.1	SF	S25W07	3107
27 Sep	1403	1403	1406		SF	S25W07	3107
27 Sep	1439	1448	1453	C1.1			3105
27 Sep	1642	1650	1656	C2.0	SF	S16W29	3105
27 Sep	1949	1957	2004	C5.0	SF	S15W30	3105
27 Sep	2253	2300	2302	C1.7			3105
27 Sep	2302	2307	2311	C2.2			3105
28 Sep	0004	0016	0037	C1.7	SF	S25W10	3107
28 Sep	0041	0047	0051	C3.4	SF	S25W10	3107
28 Sep	0253	0257	0301	C1.9			3107

Flare List

Date	Time			Optical			
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
28 Sep	0612	0620	0623		SF	S24W18	3107
28 Sep	0746	0753	0757	C1.7	SF	S25W19	3107
28 Sep	0839	0846	0850	C1.3	SF	S25W20	3107
28 Sep	1108	1115	1128	C1.1			3107
28 Sep	1852	1900	1906	C2.6			3107
28 Sep	2340	2345	2349	C1.6	SF	S23W27	3107
29 Sep	0514	0530	0558	C5.6			3112
29 Sep	0558	0603	0611	C4.7			3112
29 Sep	0758	0759	0803		SF	S28W27	3107
29 Sep	1150	1201	1309	C5.7			3112
29 Sep	1309	1314	1318	C4.0			3112
29 Sep	1333	1339	1355	C5.0	SF	S25W20	3107
29 Sep	2010	2024	2055	C5.5			3112
29 Sep	2346	2359	0014	C2.3			3112
30 Sep	0151	0201	0210	C2.8			3112
30 Sep	0318	0327	0338	C2.8			3112
30 Sep	0346	0401	0651	M1.0			3112
30 Sep	0428	0430	0447		SF	N16W16	3110
30 Sep	0651	0705	0720	C5.5			3112
30 Sep	0836	0845	0902	C2.8			3112
30 Sep	1133	1138	1145	C3.0			3112
30 Sep	1317	1322	1327		SF	N16W21	3110
30 Sep	1403	1416	1432	C7.8			3112
30 Sep	1503	1514	1525	C4.0			3112
30 Sep	1527	1534	1544	C4.0			3112
30 Sep	1611	1622	1633	M2.9			3112
30 Sep	1730	1734	1745	M1.3			3112
30 Sep	2237	2243	2247	C3.4	SF	N30E30	3111
30 Sep	2333	2339	2343	C3.1	SF	N28E30	3111
01 Oct	0209	0218	0223	C2.9			3112
01 Oct	0355	0401	0407	C2.6			3112
01 Oct	0412	0417	0439	C3.8			3112
01 Oct	0442	0458	0512	C6.4			3107
01 Oct	0624	0630	0634	C2.3			3112
01 Oct	0707	0711	0719	C2.2			3107
01 Oct	0822	0831	0836	C3.8			3112
01 Oct	1134	1300	1322	C3.5			3113
01 Oct	1729	1741	1746	C3.4			3112

Flare List

Date	Time			Optical			
	Begin	Max	End	X-ray Class	Imp/ Brtns	Location Lat CMD	Rgn #
01 Oct	1758	1804	1808	C4.3	SF	N30E22	3111
01 Oct	1821	1827	1836	C2.4			3113
01 Oct	1958	2010	2016	M5.8	1B	N18W36	3110
02 Oct	0208	0221	0226	M8.7	1N	N16W34	3110
02 Oct	0518	0522	0531	C2.8			3110
02 Oct	0542	0621	0656	C4.1			3110
02 Oct	B0551	U0552	0601		SF	N18W40	3110
02 Oct	0624	0624	0640		SF	N18W42	3110
02 Oct	0924	0936	0945		SF	N18W43	3110
02 Oct	0952	0954	0956		SF	N23E73	3112
02 Oct	1031	1035	1048		SF	N23E73	3112
02 Oct	1036	1043	1053	C2.3			3110
02 Oct	1059	1115	1125		SF	N23E73	3112
02 Oct	1130	1139	1144	C2.4			3110
02 Oct	1133	1135	1143		SF	N23E73	3112
02 Oct	1145	1153	1209	C3.0	SF	N18W44	3110
02 Oct	1151	1152	1158		SF	N23E73	3112
02 Oct	1323	1324	1327		SF	N17W35	3113
02 Oct	1352	1405	1423	M1.2	SF	N25E73	3112
02 Oct	1448	1457	1512	C8.7	SF	S29W77	3107
02 Oct	1516	U1517	1521		SF	N18W47	3110
02 Oct	1534	1545	1553	M1.0	SF	N22E69	3112
02 Oct	1723	1734	1753	C3.6			3112
02 Oct	1753	1807	1826	C7.8			3110
02 Oct	1801	1810	1823		SF	N17W47	3110
02 Oct	1849	1908	1925	C8.1			3112
02 Oct	1953	2025	2034	X1.0			3110
02 Oct	2249	2308	2319	C9.1	SF	N22E66	3112

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 3105												
19 Sep	S18E67	217	50	4	Dao	6	B	1							
20 Sep	S14E62	208	350	8	Dhi	11	B								
21 Sep	S16E45	211	200	8	Dai	8	B	2			3				
22 Sep	S17E33	210	490	10	Dki	22	B	3			3	1			
23 Sep	S16E21	209	370	10	Dki	20	B				2				
24 Sep	S17E08	209	300	10	Dki	24	B								
25 Sep	S17W06	210	220	10	Dai	12	B								
26 Sep	S16W18	208	150	10	Dai	16	B								
27 Sep	S16W30	207	120	8	Cai	16	BG	5			5				
28 Sep	S20W45	208	90	6	Dao	6	B								
29 Sep	S17W57	208	30	5	Cao	3	B								
30 Sep	S17W71	209	10	1	Axx	1	A								
01 Oct	S17W84	209	plage												
								11	0	0	13	1	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 210

			Region 3106												
20 Sep	S10E56	214	10	3	Bxo	2	B								
21 Sep	S12E38	217	10	1	Axx	1	A								
22 Sep	S12E24	219	plage												
23 Sep	S12E10	220	plage												
24 Sep	S12W04	221	plage												
25 Sep	S12W18	222	plage												
26 Sep	S12W32	223	plage												
27 Sep	S12W46	223	plage												
28 Sep	S12W60	224	plage												
29 Sep	S12W74	225	plage												
30 Sep	S12W88	226	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 221

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 3107												
21 Sep	S24E60	196	120	3	Dso	2	B	1	1						
22 Sep	S25E46	197	190	4	Cao	6	B	4			1				
23 Sep	S24E37	193	230	10	Cao	10	B	6			6				
24 Sep	S25E26	191	240	16	Fai	17	BG	8			10				
25 Sep	S25E13	191	240	15	Eai	17	B	4			2				
26 Sep	S25E01	189	220	14	Esi	33	B	5				1			
27 Sep	S24W13	190	200	13	Eai	27	BG	5			6				
28 Sep	S28W25	189	190	12	Eai	17	BG	8			6				
29 Sep	S24W39	190	160	12	Eai	8	B	1			2				
30 Sep	S24W53	191	100	7	Cai	7	B								
01 Oct	S25W68	193	30	6	Cri	6	B	2							
02 Oct	S25W82	193	30	1	Hsx	2	A	1			1				
								45	1	0	34	1	0	0	0

Still on Disk.
Absolute heliographic longitude: 189

			Region 3108												
21 Sep	S13E16	240	10	8	Axx	2	A								
22 Sep	S13E03	240	30	5	Dao	7	B								
23 Sep	S12W10	240	90	6	Cso	6	B								
24 Sep	S12W24	241	70	7	Dso	7	B								
25 Sep	S12W38	242	50	7	Cso	5	B								
26 Sep	S13W47	237	50	6	Cso	7	B								
27 Sep	S13W65	242	10	2	Bxo	2	B								
28 Sep	S13W79	243	plage												
								0	0	0	0	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 240

			Region 3109												
22 Sep	N10W13	256	30	3	Cro	6	B	3			4				
23 Sep	N10W27	257	40	7	Dro	7	B	5			7				
24 Sep	N10W40	257	30	7	Dro	6	B								
25 Sep	N10W53	257	20	5	Cro	3	B								
26 Sep	N10W66	255	10	1	Axx	1	A								
27 Sep	N10W80	257	plage												
								8	0	0	11	0	0	0	0

Crossed West Limb.
Absolute heliographic longitude: 256

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 3110												
23 Sep	N16E72	158	160	5	Cao	4	B	2	1		1				
24 Sep	N16E59	158	240	9	Dsc	11	B	5			19				
25 Sep	N16E46	158	320	10	Dhi	9	B	6			3				
26 Sep	N15E35	154	300	10	Ehi	13	B				1				
27 Sep	N15E20	156	220	10	Cai	14	B								
28 Sep	N12E05	158	240	11	Cso	8	B								
29 Sep	N16W09	160	180	5	Cso	4	B								
30 Sep	N16W24	162	170	3	Hsx	1	A				2				
01 Oct	N17W38	163	160	4	Cso	5	B		1			1			
02 Oct	N17W52	163	180	4	Dao	10	B	6	1	1	6	1			
								19	3	1	32	2	0	0	0

Still on Disk.
Absolute heliographic longitude: 158

			Region 3111												
27 Sep	N27E68	109	100	1	Hax	1	A								
28 Sep	N24E54	109	130	1	Hsx	1	A								
29 Sep	N27E43	108	120	2	Hsx	1	A								
30 Sep	N27E30	108	100	2	Hsx	1	A	2			2				
01 Oct	N28E18	107	90	2	Hsx	3	A	1			1				
02 Oct	N28E04	107	70	2	Hsx	1	A								
								3	0	0	3	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 107

			Region 3112												
30 Sep	N20E76	62	100	5	Hsx	1	A	8	3						
01 Oct	N22E71	53	560	15	Eki	15	BGD	6							
02 Oct	N23E59	52	750	18	Fki	18	BGD	3	2		8				
								23	5	0	8	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 52

			Region 3113												
30 Sep	N16W14	152	90	5	Cao	3	B								
01 Oct	N16W29	154	100	5	Dao	8	B	2							
02 Oct	N16W40	151	80	7	Dai	8	B				1				
								2	0	0	1	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 152

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 3114													
01 Oct	S33E26	99	30	6	Cao	3	B								
02 Oct	S34E11	100	20	7	Bxo	3	B								
								0	0	0	0	0	0	0	0

Still on Disk.
Absolute heliographic longitude: 100

Preliminary Report and Forecast of Solar Geophysical Data (The Weekly)

Published every Monday by the Space Weather Prediction Center.

U.S. Department of Commerce
NOAA / National Weather Service
Space Weather Prediction Center
325 Broadway, Boulder CO 80305

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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