

Space Weather Highlights
10 - 16 Jan 2000

Solar activity varied from low to moderate levels. Moderate levels occurred during 10 - 12 January by virtue of isolated M-class flares from Regions 8824 (S13, L = 173, class/area Fki/430 on 13 January) and 8829 (N16, L = 147, class/area Eso/170 on 13 January) (see the Energetic Events list for flare times). Region 8824 increased in size and magnetic complexity during 10 - 14 January to include the development of a magnetic delta formation in its leader portion. It gradually decayed during the final two days of the period. Region 8829 produced a low-level M-class flare with an associated Type II radio sweep while rotating into view on 12 January. It stabilized shortly thereafter. Activity declined to low levels during 13 - 16 January. All visible regions were either stable or declining as the period ended.

Real-time solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft for most of the period. A negative-polarity coronal hole signature was evident during 11 - 12 January with increased velocities (peak near 700 km/sec on 12 January) and low densities (02 to 05 p/cc). IMF Bz showed southward deflections to minus 15 nT (GSM) late on 11 January, then varied from plus to minus 05 nT for most of the rest of the period. Phi data indicated a negative-polarity sector during most of the period.

There were no proton events detected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels during 10 January. Otherwise, fluxes were at normal to moderate levels.

The geomagnetic field was disturbed during the latter half of 11 January due to coronal hole effects. Active to minor storm levels were detected during the disturbance with isolated major storm periods at high latitudes. Activity was at quiet to unsettled levels during the rest of the period.

Space Weather Outlook
19 January - 14 February 2000

Solar activity is expected to range from low to moderate levels during the period. Occasional C-class flares are likely throughout the period. Isolated M-class flares will be possible through 25 January, then again during 05 February through the end of the period.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at normal to moderate levels through 27 January. Fluxes are expected to increase to moderate to high levels during 28 - 31 January, then return to normal to moderate levels for the rest of the period.

Geomagnetic field activity is expected to be at quiet to unsettled levels through 26 January, barring an Earth-directed CME. Active to minor storm levels are expected during 27 - 30 January due to recurrent coronal hole effects. Quiet to unsettled levels are expected for the balance of the period.



Daily Solar Data

Date	Radio Flux 10.7 cm	Sun spot No. (10^6 hemi.)	Sunspot Area	X-ray Background	Flares							
					X-ray Flux			Optical				
					C	M	X	S	1	2	3	4
10 January	163	88	470	B6.8	8	1	0	5	0	1	0	0
11 January	178	148	670	B7.4	8	1	0	11	0	0	0	0
12 January	196	204	930	C1.7	9	3	0	16	1	0	0	0
13 January	202	218	1120	B9.9	7	0	0	4	1	0	0	0
14 January	201	228	1110	C1.0	5	0	0	2	0	0	0	0
15 January	211	268	1240	B9.3	4	0	0	7	0	0	0	0
16 January	208	262	1150	C1.0	2	0	0	7	0	0	0	0

Daily Particle Data

Date	Proton Fluence (protons/cm ² -day-sr)			Electron Fluence (electrons/cm ² -day-sr)		
	>1MeV	>10MeV	>100MeV	>.6MeV	>2MeV	>4MeV
10 January	5.0E+6	6.5E+4	3.0E+3		4.7E+7	
11 January	3.2E+6	2.7E+4	3.0E+3		6.2E+6	
12 January	2.9E+5	1.4E+4	2.9E+3		1.2E+6	
13 January	1.9E+5	1.4E+4	3.0E+3		8.6E+6	
14 January	2.5E+5	1.3E+4	2.9E+3		2.3E+7	
15 January	2.1E+5	1.3E+4	3.0E+3		2.7E+7	
16 January	1.1E+5	1.3E+4	2.9E+3		1.2E+7	

Daily Geomagnetic Data

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	10 January	4	1-1-1-0-1-1-1-3	3	0-0-0-1-1-0-1-3	6
11 January	15	2-1-1-2-2-3-4-5	25	2-1-1-2-4-5-6-4	16	2-1-1-2-3-4-5-4
12 January	8	2-3-2-2-3-2-2-1		3-2-3-2-*-2-2-*	9	3-3-2-2-1-2-3-2
13 January	9	1-3-2-2-4-1-1-1		1-1-5-4-4-3-*-*	10	2-2-3-3-2-3-2-2
14 January	4	2-2-1-0-1-1-2-1	15	2-2-1-3-4-2-5-2	7	2-2-0-1-2-3-3-2
15 January	5	1-1-1-0-2-3-1-1	8	0-2-1-0-5-0-1-0	5	2-1-1-1-2-2-2-2
16 January	4	1-1-1-2-1-2-1-1	4	1-1-0-3-2-1-0-0	6	2-1-0-1-2-2-2-3

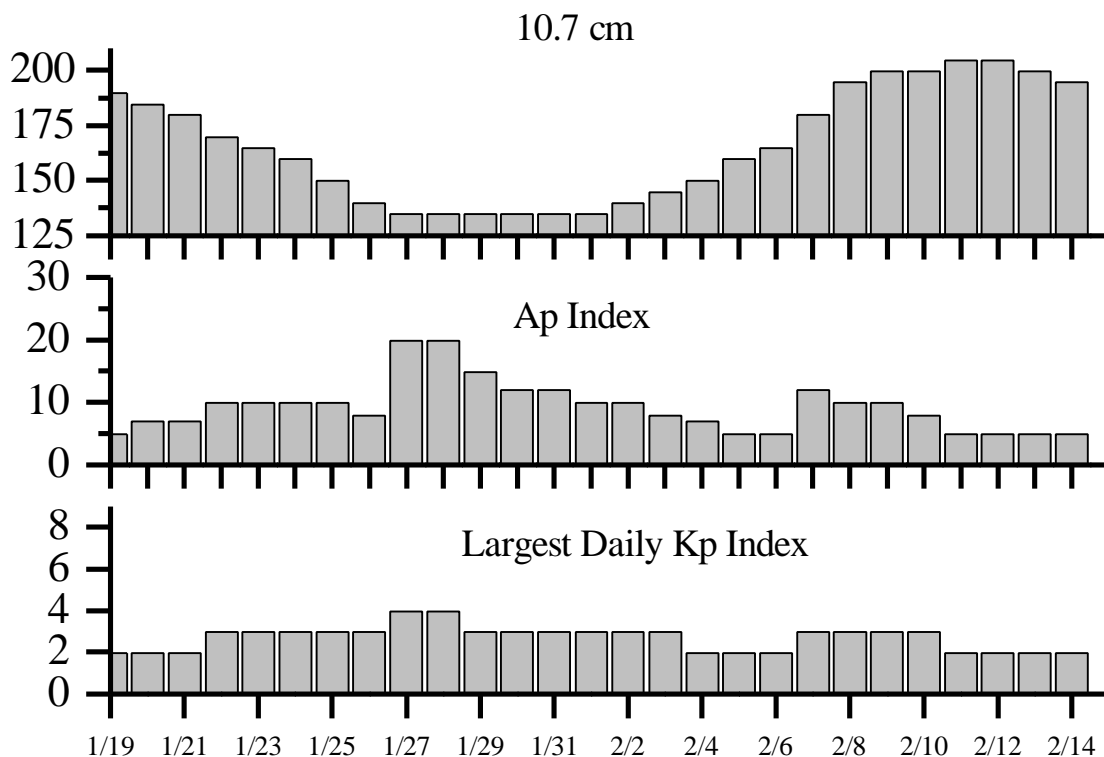


Alerts and Warnings Issued

Date & Time of Issue (UT)	Type of Alert or Warning	Date & Time of Event (UT)
10 Jan 0100	CONTINUED Electron Event ≥ 1000 pfu @ >2 MeV	01 Jan 0305
11 Jan 0100	CONTINUED Electron Event ≥ 1000 pfu @ >2 MeV	01 Jan 0305
11 Jan 1801	K= 4 Observed	11 Jan 15- 18
11 Jan 1930	K = 4 Warning	11/1930 - 12/0000 Jan
11 Jan 2100	K= 4 Observed	11 Jan 18- 2100
11 Jan 2305	CONTINUED K= 4 Warning	11/1930 - 12/2000 Jan
12 Jan 0018	2 - 245 MHz Bursts	11 Jan
12 Jan 0202	10cm Radio Burst 240 s.f.u.	12 Jan 0142
12 Jan 0238	Type II Radio Emission	12 Jan 0144
13 Jan 0026	1 - 245 MHz Bursts	12 Jan
13 Jan 0900	K= 4 Observed	13 Jan 06 - 09



Twenty-seven Day Outlook



Date	Radio Flux 10.7 cm	Planetary A Index	Largest Kp Index	Date	Radio Flux 10.7 cm	Planetary A Index	Largest Kp Index
19 Jan	190	5	2	02 Feb	140	10	3
20	185	7	2	03	145	8	3
21	180	7	2	04	150	7	2
22	170	10	3	05	160	5	2
23	165	10	3	06	165	5	2
24	160	10	3	07	180	12	3
25	150	10	3	08	195	10	3
26	140	8	3	09	200	10	3
27	135	20	4	10	200	8	3
28	135	20	4	11	205	5	2
29	135	15	3	12	205	5	2
30	135	12	3	13	200	5	2
31	135	12	3	14	195	5	2
01 Feb	135	10	3				



Energetic Events

Date	Time (UT)			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	½ Max	Class	Integ Flux	Imp/ Brtns	Location Lat CMD	Rgn #	Radio Flux		Intensity	
									245	2695	II	IV
10 Jan 00	1331	1350	1408	M3.3	.043	2N	S13E69	8824		37		
11 Jan 00	0413	0424	0438	M1.5	.019							
12 Jan 00	0004	0017	0041	M1.2	.018	1F	S12E47	8824				
12 Jan 00	0132	0138	0143	M2.8	.011	SF	N13E81	8829	48	240		
12 Jan 00	2036	2049	2058	M1.1	.009	SF	N13E67	8829				

Flare List

Date	Time			X-ray Class.	Optical Imp / Brtns	Location Lat CMD	Rgn #	
	Begin	Max	End					
10 January	0309	0317	0324	C1.7				
	0540	0546	0551	C1.2				
	0738	0759	0808	B9.7				
	B0915	U0923	0939	C9.7	SF	S14E70	8824	
	0943	0943	0952		SF	N29E40	8821	
	1246	1250	1255	C1.3				
	B1343	1344	1428	M3.3	2N	S13E69	8824	
	1536	1543	1603	C5.1	SF	S13E63	8824	
	1644	1644	1653	C1.3	SF	S13E68	8824	
	1855	1902	1912	C1.3	SF	S12E68	8824	
	2204	2210	2227	C1.3				
	11 January	B0110	U0118	A0150	C9.4	SF	S12E58	8824
		0413	0424	0438	M1.5			
0708		0710	0715		SF	N18W12		
0945		0949	1005	C1.3	SF	S13E56	8824	
1515		1516	1535	C1.4	SF	S11E57	8824	
1642		1644	1648		SF	S13E57	8824	
1654		1656	1659		SF	S12E57	8824	
1815		1819	1824	C1.5	SF	S12E55	8824	
1923		1927	1941	C2.4	SF	S12E55	8824	
2046		2047	2056	C2.8	SF	S15E53	8824	
2102		2104	2124	C1.9	SF	S14E53	8824	
2148		2148	2151	C7.5	SF	N12E89	8829	
12 January		0019	0022	0047	M1.2	1F	S12E47	8824
	0135	0136	0150	M2.8	SF	N13E81	8829	
	0151	0151	0154		SF	N12E89	8829	
	0351	0404	0415	C4.2	SF	S15E47	8824	
	0542	0546	0548	C1.5				
	0652	0653	0657		SF	S11W23	8827	
	0749	0749	0754		SF	S13W26	8827	
	0821	0828	0838	C2.6				
	0849	0907	0916	C4.2				
	B1135	U1142	1157	C2.8	SF	S19E52	8828	
1301	1314	1341	C2.2	SF	S13E43	8824		



Flare List-continued

Date	Time			X-ray Class.	Imp / Brtns	Optical	Rgn #	
	Begin	Max	End			Location Lat CMD		
12 January	1540	1540	1545		SF	S13E42	8824	
	1624	1624	1631		SF	S12E32	8824	
	1719	1719	1722		SF	N14E72	8829	
	1813	1814	1819	C4.2	SF	N12E73	8829	
	1919	1923	1929		SF	N17W33	8826	
	1957	1958	2022	C3.6	SF	S13E39	8824	
	2038	2048	2109	M1.1	SF	N13E67	8829	
	2305	2305	2310	C3.2	SF	S15E35	8824	
	2346	2352	0000		SF	S13E39	8824	
	13 January	0229	0248	0310	C5.5	1F	N12E66	8829
0329		0334	0336		SF	N17W37	8826	
1201		1220	1239	C1.6				
1338		1344	1402	C1.8				
1506		1512	1544	C3.5	SF	S13E28	8824	
1826		1830	1843	C2.6	SF	S13W46	8827	
1900		1923	1952	C2.4				
2036		2044	2121	C2.6	SF	N11E56	8829	
14 January		0640	0644	0649	C1.9			
		1026	1102	1212	C2.2			
	1709	1711	1730	C6.3	SF	S12W56	8827	
	1754	1754	1803		SF	S10E17	8824	
	1935	1938	1941	C3.3				
15 January	2134	2141	2149	C3.6				
	0159	0159	0204	C4.0	SF	S12W61	8827	
	0218	0222	0227		SF	S13W62	8827	
	B1029	U1032	A1033	C1.9	SF	S12W67	8827	
	1624	1624	1630		SF	S13W71	8827	
	1910	1910	A1926	C1.7	SF	N13E26	8829	
	2011	2015	2027	C2.8	SF	S13W07	8824	
	2223	2224	2229		SF	S13W08	8824	
16 January	0143	0149	0157	C2.9				
	0547	0548	A0556		SF	S20E39	8831	
	0824	0829	0833		SF	S14W78	8827	
	1626	1627	1636		SF	S13W14	8824	
	1646	1648	1654		SF	N19E11	8829	
	1945	1945	1950	C1.9	SF	N18E10	8829	
	2021	2023	2037		SF	S16W16	8824	
	2022	2023	2027		SF	S19W41	8832	



Region Summary

Date	Location		Sunspot Characteristics				Flares							
	(° Lat ° CMD)	Helio	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical			
		Lon						C	M	X	S	1	2	3

Region 8815

31 Dec N10E61	306	0030	05	CRO	002	B											
01 Jan N10E48	306	0040	08	CRO	009	B											
02 Jan N08E35	307	0070	08	CAO	012	B											
03 Jan N10E22	307	0050	08	CAO	015	B	1				1						
04 Jan N10E11	304	0020	05	BXO	014	B											
05 Jan N11W02	304	0010	02	HRX	003	A											
06 Jan N10W17	306	0020	07	BXO	010	B											
07 Jan N12W33	309	0000	04	BXO	003	B											
08 Jan N12W46	309																
09 Jan N12W59	309										1						
10 Jan N12W72	309																
							1	0	0	2	0	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 304

Region 8817

04 Jan N24E10	305	0010	04	CRO	005	B											
05 Jan N25W03	305	0030	06	CSO	007	B											
06 Jan N24W17	306	0020	05	BXO	007	B											
07 Jan N24W32	308	0000	03	BXO	003	B											
08 Jan N24W45	308																
09 Jan N24W58	308																
10 Jan N24W71	308																
							0	0	0	0	0	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 305

Region 8819

06 Jan N10W25	314	0000	03	BXO	003	B											
07 Jan N09W40	316	0050	05	CAO	011	B	5				9						
08 Jan N10W52	315	0010	06	BXO	010	B	1				2						
09 Jan N10W65	314	0030	08	CRO	006	B	1				1						
10 Jan N10W78	314																
							7	0	0	12	0	0	0	0	0		

Crossed West Limb.

Absolute heliographic longitude: 314



Region Summary - continued.

Date	Location		Sunspot Characteristics				Flares							
	(° Lat ° CMD)	Helio	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical			
		Lon						C	M	X	S	1	2	3

Region 8820

06 Jan	S16E71	218	0050	02	HAX	001	A											
07 Jan	S15E59	217	0060	07	CAO	006	B											
08 Jan	S15E46	217	0060	01	HSX	001	A											
09 Jan	S16E33	216	0050	05	CSO	003	B											
10 Jan	S15E19	217	0030	02	HSX	003	A											
11 Jan	S13E05	218	0020	03	DSO	004	B											
12 Jan	S14W08	218	0010	03	BXO	003	B											
13 Jan	S15W20	217	0010	03	BXO	002	B											
14 Jan	S15W33	217																
15 Jan	S15W46	217																
16 Jan	S15W59	217																

0 0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 218

Region 8821

06 Jan	N25E80	209	0050	02	HSX	001	A											
07 Jan	N26E62	214	0080	02	HSX	001	A											
08 Jan	N26E51	212	0100	02	HSX	001	A	1			1							
09 Jan	N26E40	209	0120	05	CAO	004	B	1			1							
10 Jan	N27E30	206	0150	10	DAO	006	B				1							
11 Jan	N28E15	208	0190	11	ESO	009	B											
12 Jan	N28E05	205	0180	11	CSO	008	B											
13 Jan	N28W10	207	0120	02	HSX	001	A											
14 Jan	N28W24	208	0110	08	CSO	004	B											
15 Jan	N28W35	205	0110	09	CAO	005	B											
16 Jan	N27W48	205	0080	12	CSO	004	B											

2 0 0 3 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 205

Region 8822

07 Jan	N16E03	273	0010	03	BXO	004	B											
08 Jan	N16W10	273	0020	04	CSO	003	B											
09 Jan	N16W24	273	0030	06	CRO	002	B											
10 Jan	N16W41	277	0000	00	AXX	001	A											
11 Jan	N16W54	277																
12 Jan	N16W67	277																
13 Jan	N16W80	277																

0 0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 273



Region Summary - continued.

Date	Location		Sunspot Characteristics				Flares											
	(° Lat ° CMD)	Helio Lon	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
								C	M	X	S	1	2	3	4			
<i>Region 8826</i>																		
11 Jan	N18W21	244	0030	04	DSO	006	B											
12 Jan	N18W35	245	0080	06	DAO	008	B						1					
13 Jan	N18W48	245	0060	07	CAO	006	B						1					
14 Jan	N18W59	243	0040	01	HSX	002	A											
15 Jan	N18W71	241	0040	06	CSO	004	B											
16 Jan	N18W84	241	0000	01	AXX	002	A											
								0	0	0	2	0	0	0	0	0	0	
Still on Disk.																		
Absolute heliographic longitude: 244																		
<i>Region 8827</i>																		
11 Jan	S11W20	243	0020	04	CSO	005	B											
12 Jan	S12W33	243	0070	06	DAO	018	B						2					
13 Jan	S12W46	243	0110	07	CSO	015	B	1					1					
14 Jan	S12W58	242	0160	06	CAO	011	B	1					1					
15 Jan	S12W70	240	0150	06	CAO	008	B	2					4					
16 Jan	S11W84	241	0080	06	CAO	006	B						1					
								4	0	0	9	0	0	0	0	0	0	
Still on Disk.																		
Absolute heliographic longitude: 243																		
<i>Region 8828</i>																		
11 Jan	S19E58	165	0000	01	AXX	001	A											
12 Jan	S20E44	166	0010	04	BXO	005	B	1					1					
13 Jan	S21E31	166	0030	06	CSO	008	B											
14 Jan	S21E18	166	0020	07	BXO	010	B											
15 Jan	S22E06	164	0120	07	DAO	016	B											
16 Jan	S22W09	166	0100	08	DAO	018	B											
								1	0	0	1	0	0	0	0	0		
Still on Disk.																		
Absolute heliographic longitude: 164																		
<i>Region 8829</i>																		
11 Jan	N16E78	145	0110	04	CAO	002	B	1					1					
12 Jan	N16E66	144	0170	10	DAO	007	B	1	2				5					
13 Jan	N15E52	145	0170	11	ESO	009	B	2					1	1				
14 Jan	N17E40	144	0140	12	CSO	014	B											
15 Jan	N15E24	146	0120	13	ESO	018	B	1					1					
16 Jan	N16E10	147	0110	11	ESO	012	B	1					2					
								6	2	0	10	1	0	0	0	0		
Still on Disk.																		
Absolute heliographic longitude: 147																		



Region Summary- continued.

Location		Sunspot Characteristics					Flares							
Date	(° Lat ° CMD)	Helio Lon	Area (10 ⁶ hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical			
							C	M	X	S	1	2	3	4
<i>Region</i>		<i>8835</i>												
15 Jan	N08E57	113	0000	05	BXO	004	B							
16 Jan	N09E42	115	0010	03	BXO	002	B							
								0	0	0	0	0	0	0
Still on Disk.														
Absolute heliographic longitude: 115														
<i>Region</i>		<i>8836</i>												
16 Jan	S12E49	108	0010	06	BXO	002	B							
								0	0	0	0	0	0	0
Still on Disk.														
Absolute heliographic longitude: 108														

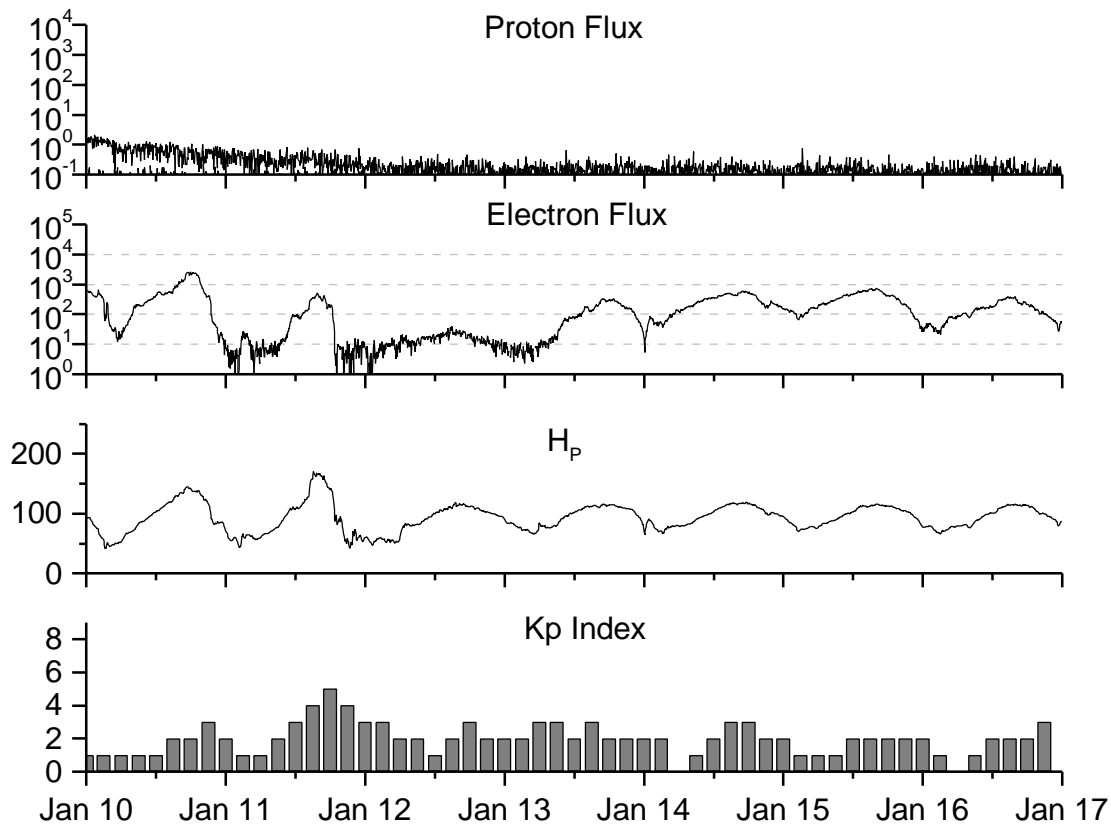


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

Month	Sunspot Numbers				Radio Flux		Geomagnetic		
	Observed SWO	values RI	Ratio RI/SWO	Smooth SWO	values RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
1998									
January	51.8	31.9	0.62	60.6	43.7	93.4	97.5	08	09.9
February	54.4	40.3	0.74	67.4	48.8	93.4	101.7	08	10.5
March	81.8	54.8	0.67	73.3	53.4	109.1	105.8	13	11.1
April	73.6	53.4	0.73	77.7	56.5	108.3	109.1	10	11.3
May	74.3	56.3	0.76	81.4	59.3	106.7	112.4	18	11.6
June	93.6	70.7	0.76	85.9	62.4	108.4	116.2	10	11.9
July	98.3	66.2	0.67	90.3	65.4	114.0	120.3	11	12.2
August	118.6	91.7	0.77	93.7	67.8	136.0	124.1	18	12.4
September	119.0	92.9	0.78	96.1	69.4	138.4	126.8	13	12.5
October	77.0	55.5	0.72	97.7	70.5	117.3	127.9	13	12.5
November	99.5	74.0	0.74	101.3	73.0	140.2	130.0	16	12.3
December	120.8	81.9	0.69	108.8	77.9	150.1	134.3	08	11.9
1999									
January	94.3	62.4	0.66	116.5	82.6	142.6	139.0	10	11.7
February	93.4	66.3	0.71	120.2	84.6	142.0	142.6	12	11.6
March	100.5	68.8	0.68	120.5	83.8	126.3	144.0	14	11.6
April	092.9	063.9	0.69	123.8	85.4	117.2	145.8	12	12.1
May	140.5	106.3	0.76	131.7	90.4	148.6	150.0	08	12.1
June	208.3	137.4	0.66	136.0	93.0	169.8	152.9	07	12.0
July	169.2	113.5	0.67			165.6		10	
August	136.1	93.7	0.69			170.8		15	
September	107.4	70.9	0.66			135.7		18	
October	167.7	116.4	0.69			164.9		18	
November	199.3	132.7	0.67			191.7		12	
December	123.5	86.4	0.70			169.8		09	

NOTE: All smoothed values after January 1998 and monthly values after September 1998 are preliminary estimates. The lowest smoothed sunspot index number for Cycle 22, RI = 8.0, occurred in May 1996. The highest smoothed sunspot number for Cycle 22, RI= 158.5, occurred July 1989. * After June 1991, the 10.7 cm radio flux data source is Penticton, B.C. Canada. Prior to that, it was Ottawa.





Weekly Geosynchronous Satellite Environment Summary
Week Beginning 10 January 1999

Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by GOES-8 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

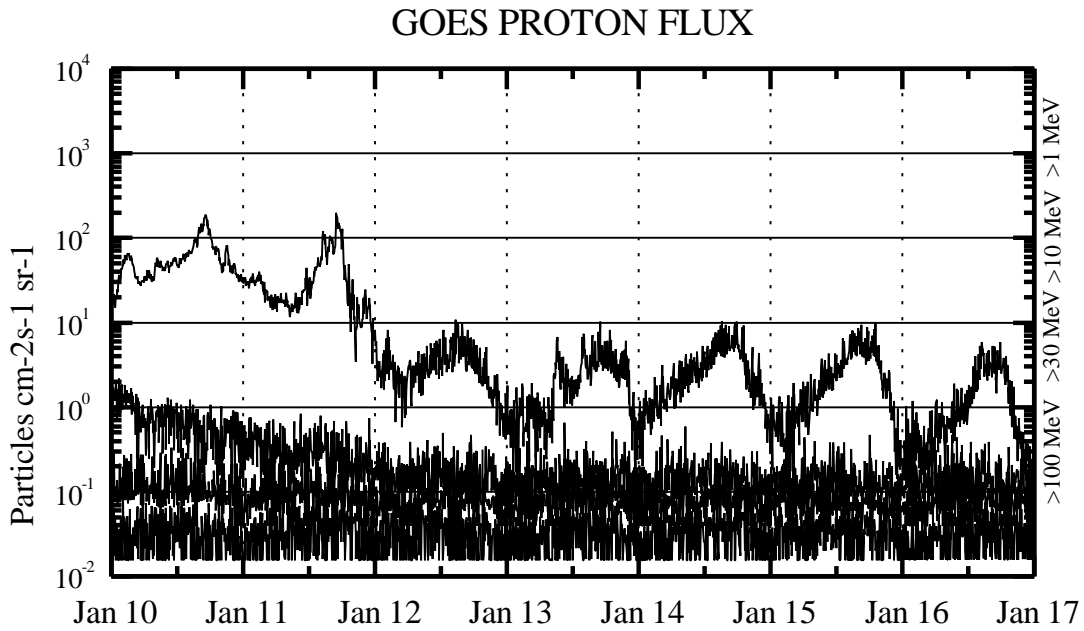
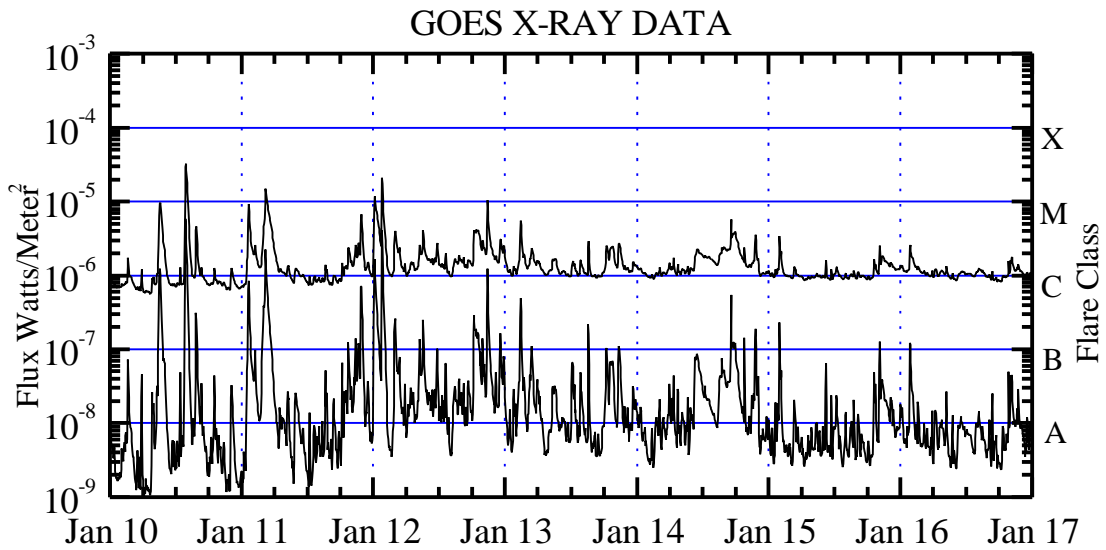
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm² -sec -sr) with energies greater than 2 MeV at GOES-8.

H_p plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-8. The H component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

K_p plot contains the estimated planetary 3-hour K-index (derived by the USAF 55th Space Weather Squadron) in real time from magnetometers at Meanook, Canada; Sitka, AK; Glenlea, Canada; St. Johns, Canada; Ottawa, Canada; Newport, WA; Fredericksburg, VA; Boulder, CO; Fresno, CA and Heartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC) and the US Geological Survey. These may differ from the final K_p values derived from a more extensive network of magnetometers.

The data included here are those now available in real time at the SWO and are incomplete in that they do not include the full set of parameters and energy ranges known to cause satellite operating anomalies. The proton and electron fluxes and K_p are " global " parameters that are applicable to a first order approximation over large areas. H_pparallel is subject to more localized phenomena and the measurements generally are applicable to within a few degrees of longitude of the measuring satellite.





Weekly GOES Satellite X-ray and Proton Plots

X-ray plot contains five minute averaged x-ray flux (watts/m²) as measured by GOES 8 and 10 in two wavelength bands, .05 - .4 and .1 - .8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 - .8 nm band.

Proton plot contains the five minute averaged integral proton flux (protons/cm² -sec -sr) as measured by GOES-8 (W75) for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu (protons/cm²-sec-sr) at greater than 10 MeV.

