

**Space Weather Highlights**  
**07 - 13 June 2010**

**SWO PRF 1815**  
15 June 2010

Solar activity ranged from very low to moderate levels. Very low levels prevailed from 07-11 June, but activity increased to moderate on 12 June due to an M2/Sn flare at 0057 UTC from Region 1081 (N24, L=99, class/area Dao/90 on 13 June), which was associated with a type II radio sweep and a Tenflare. There was a weak CME associated with this event but it was not earthward directed. Region 1081 grew quickly after being assigned on 11 June but seemed to be stabilizing or possibly decaying late on 13 June. An additional M1/Sf occurred on 13 June at 0539 UTC from Region 1079 (S24, L=123, class/area Bxo/10 on 12 June) which also had an associated Type II radio sweep. A CME was observed off the West limb in association with this event. The spot class and area for Region 1079 on 13 June were highly uncertain due to its location on the west limb.

No proton events were observed at geosynchronous orbit. A weak enhancement of proton flux levels was noted between 0600-1000 UTC on 12 June, most likely related to the M2 event that occurred at 12/0057 UTC.

The greater than 2 MeV electron flux at geosynchronous orbit was at high levels throughout the period.

The geomagnetic field was predominantly quiet during the week with the exception of some isolated unsettled periods and an isolated active period at high latitudes on 13 June. Solar wind data from the ACE spacecraft showed generally nominal conditions with the exception of a weak coronal hole high speed stream on 10 June and a solar sector boundary change that started late on 12 June.

**Space Weather Outlook**  
**16 June – 12 July 2010**

Solar activity is expected to be at very low to low levels.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to be at normal background levels for the most of the forecast period with the exception of 17-18 June and 27 June – 03 July due to recurrent high speed streams.

The geomagnetic field is expected to be unsettled with a chance for active periods for 16-17 June due to a coronal hole high speed stream. Quiet levels are expected for 18-24 June, followed by another increase to mostly unsettled levels with isolated active periods for 25-30 June due to another coronal hole high speed stream. Quiet levels are expected for 01-12 July.



### *Daily Solar Data*

Date	Radio Flux 10.7 cm	Sun spot No.	Sunspot Area (10 <sup>-6</sup> hemi.)	X-ray Background	Flares						
					X-ray Flux			Optical			
					C	M	X	S	1	2	3 4
07 June	69	12	20	A4.3	0	0	0	1	0	0	0 0
08 June	72	12	80	A5.3	0	0	0	0	0	0	0 0
09 June	72	28	190	A6.5	0	0	0	1	0	0	0 0
10 June	73	41	210	A5.8	0	0	0	0	0	0	0 0
11 June	75	43	155	A6.8	0	0	0	0	0	0	0 0
12 June	76	46	140	B1.3	2	1	0	2	0	0	0 0
13 June	76	46	110	B1.5	6	1	0	10	0	0	0 0

### *Daily Particle Data*

Date	Proton Fluence (protons/cm <sup>2</sup> -day-sr)			Electron Fluence (electrons/cm <sup>2</sup> -day-sr)		
	>1 MeV	>10 MeV	>100 MeV	>.6 MeV	>2MeV	>4 MeV
07 June	2.1e+05	1.5e+04	3.7e+03		2.3e+08	
08 June	3.0e+05	1.6e+04	4.0e+03		3.2e+08	
09 June	4.5e+05	1.6e+04	4.0e+03		3.2e+08	
10 June	3.8e+05	1.5e+04	4.0e+03		7.2e+07	
11 June	2.7e+05	1.5e+04	3.9e+03		5.5e+07	
12 June	5.8e+05	3.1e+04	4.2e+03		6.9e+07	
13 June	1.3e+06	2.2e+04	4.0e+03		4.2e+07	

### *Daily Geomagnetic Data*

Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
07 June	4	2-1-0-1-1-1-2-1	8	3-1-1-3-3-2-1-1	6	3-1-0-1-2-2-2-1
08 June	3	2-0-1-1-1-1-1-0	1	1-0-0-0-0-0-1-0	3	1-0-1-0-0-1-1-1
09 June	3	1-0-1-2-1-1-1-1	2	1-0-1-0-0-1-1-1	4	1-1-1-1-1-2-1-2
10 June	5	2-2-2-1-1-1-1-1	7	3-3-1-3-1-0-0-1	6	2-2-1-2-1-1-1-2
11 June	4	1-2-1-0-2-1-1-1	7	1-2-1-2-3-3-0-1	5	2-2-1-1-1-1-1-1
12 June	1	0-0-0-0-1-0-1-1	0	0-0-0-0-0-0-0-0	3	1-0-0-0-1-1-2-2
13 June	5	1-2-2-1-1-1-2-2	8	0-2-3-4-1-1-1-1	6	1-2-2-2-2-2-2-2

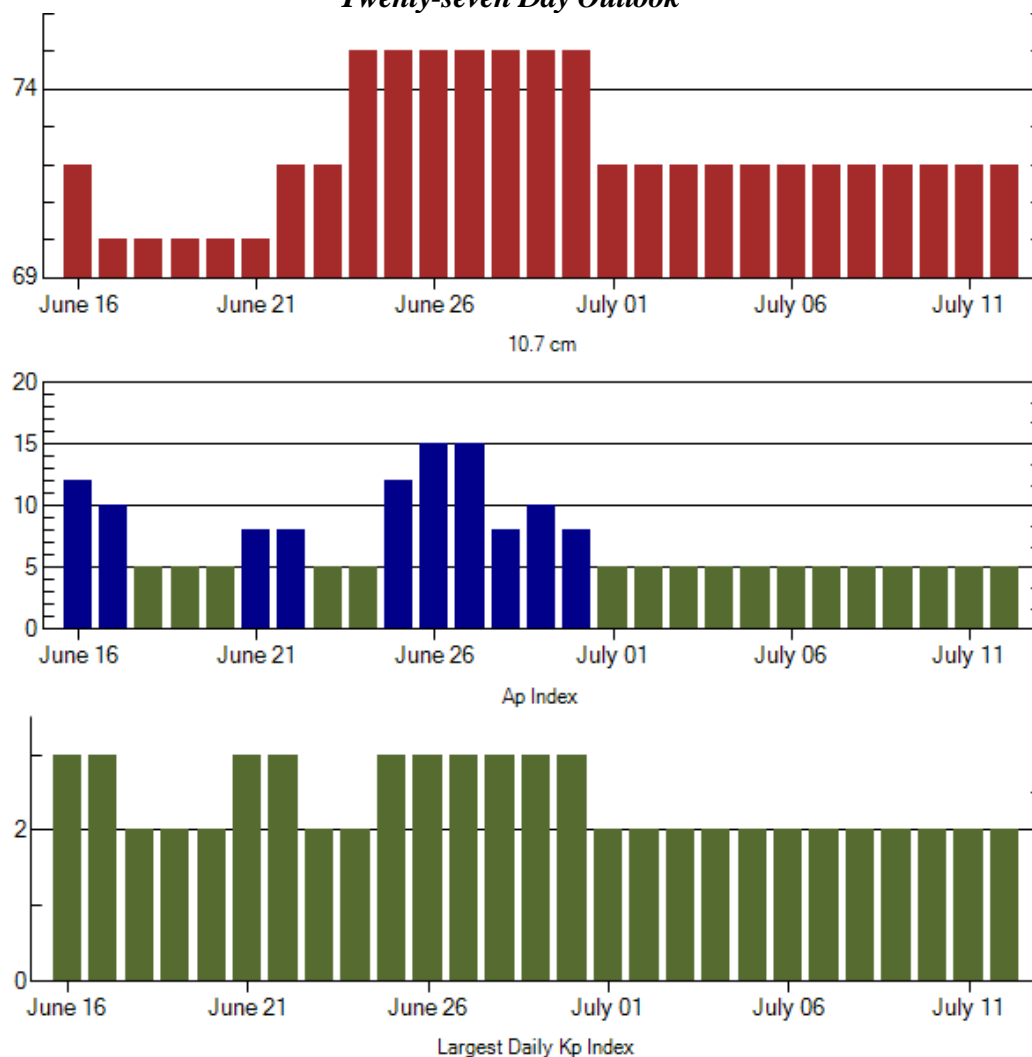


### *Alerts and Warnings Issued*

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
07 Jun 0852	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	30 May 1015
08 Jun 0512	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	30 May 1015
09 Jun 0508	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	30 May 1015
10 Jun 1148	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	30 May 1015
11 Jun 1339	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	30 May 1015
12 Jun 0122	ALERT: Type II Radio Emission	12 Jun 0057
12 Jun 0135	SUMMARY: 10cm Radio Burst	12 Jun 0055 - 0056
12 Jun 0938	ALERT: Type IV Radio Emission	12 Jun 0918
12 Jun 1328	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	30 May 1015
13 Jun 0621	ALERT: Type II Radio Emission	13 Jun 0539
13 Jun 1658	CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu	30 May 1015



### 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
16 Jun	72	12	3	30 Jun	75	8	3
17	70	10	3	01 Jul	72	5	2
18	70	5	2	02	72	5	2
19	70	5	2	03	72	5	2
20	70	5	2	04	72	5	2
21	70	8	3	05	72	5	2
22	72	8	3	06	72	5	2
23	72	5	2	07	72	5	2
24	75	5	2	08	72	5	2
25	75	12	3	09	72	5	2
26	75	15	3	10	72	5	2
27	75	15	3	11	72	5	2
28	75	8	3	12	72	5	2
29	75	10	3				



### ***Energetic Events***

Date	Time			X-ray		Optical Information			Peak		Sweep Freq	
	Begin	Max	$\frac{1}{2}$	Class	Flux	Imp/ Brtns	Location Lat CMD	Rgn #	Radio Flux		Intensity	
			Max						245	2695	II	IV
12 Jun	0030	0057	0102	M2.0	0.007	SN	N23W43	1081	27000	130	2	
13 Jun	0530	0539	0544	M1.0	0.004	SF	S25W84	1079	180		1	

### ***Flare List***

Date	Time			X-ray Class.	Optical		Rgn
	Begin	Max	End		Imp / Brtns	Location Lat CMD	
07 June	0629	0630	0637	B2.0	SF	N19W65	1077
	1915	1924	1931	B2.0			
08 June	1128	1133	1143	B1.4	SF	S23W48	1078
	1343	1350	1356	B1.4			
	1249	1256	1258	B1.2			
09 June	0007	0102	0107	B2.3			
	0507	0516	0530	B5.1			
	0839	0846	0853	B2.5			
	1328	1332	1334	B1.1			
	1335	1343	1350	B2.1			
	1941	1948	1954	B2.7			
	2015	2024	2030	B3.5			
	2053	2059	2102	B3.2			
2231	2250	2312	B1.2				
10 June	No Flares Observed						
11 June	1051	1055	1058	B1.4	SN	N23W43	1081
	1158	1202	1204	B3.0			
	2034	2046	2054	B4.5			
	2356	0002	0004	B6.3			
12 June	0055	0056	0113	M2.0			
	0253	0258	0303	B3.8			
	0357	0406	0417	C1.0			
	0806	0809	0814	B2.4			
	0859	0922	0940	C6.1			
	2343	2354	2359	B3.0			
				SF	N22W52	1081	



*Flare List - continued*

Date	Time			X-ray Class.	Imp / Brtns	Optical	
	Begin	Max	End			Location Lat CMD	Rgn
13 June	0006	0014	0026	B8.8			
	0228	0231	0235	B4.6			
	0535	0535	0540	M1.0	SF	S25W84	1079
	0557	0559	0602		SF	N23W63	1081
	0610	0611	0615	C1.2	SF	N23W59	1081
	0659	0701	0707	B5.3	SF	N23W64	1081
	0707	0708	0711	C1.2	SF	S23W69	1080
	0731	0736	0739	C1.2	SF	N24W58	1081
	0751	0755	0758		SF	N24W64	1081
	0814	0817	0825	C1.2	SF	N22W66	1081
	0914	0916	0922		SF	N22W68	1081
	0944	0949	0957	C1.7	SF	S23W75	1081
	1047	1053	1055	C1.5			
	1224	1227	1229	B4.3			
	1320	1323	1326	B2.5			
	1424	1427	1430	B2.4			
	1545	1552	1559	B4.2			
	1810	1813	1817	B1.8			



## Region Summary

Date	Location		Sunspot Characteristics					Flares							
	° Lat ° CMD)	Helio	Area (10 <sup>-6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical				
		Lon						C	M	X	S	1	2	3	4
<i>Region 1073</i>															
29 May	N13E35	192	20	4	BXO	5	B								
30 May	N13E21	193	20	4	BXO	6	B								
31 May	N12E09	192	10	5	BXO	3	B								
01 Jun	N12W04	192													
02 Jun	N12W17	192													
03 Jun	N12W30	191													
04 Jun	N12W43	191													
05 Jun	N12W56	191													
06 Jun	N12W69	191													
07 Jun	N12W82	191													
								0	0	0	0	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 192

<i>Region 1076</i>															
31 May	S19E07	194	20	4	BXO	5	B								
01 Jun	S20W06	193	20	5	BXO	4	B								
02 Jun	S19W22	196	40	6	DAI	8	B				4				
03 Jun	S19W35	196	190	8	DSO	7	B				1				
04 Jun	S19W49	197	70	8	DSO	8	B								
05 Jun	S19W61	196	15	7	BXO	4	B								
06 Jun	S19W74	195	90	5	DRO	2	B								
07 Jun	S19W86	193	20	1	BXO	2	B								
								0	0	0	5	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 193

<i>Region 1077</i>															
05 Jun	N20W47	181	10	1	AXX	1	A								
06 Jun	N20W59	181													
07 Jun	N20W72	181									1				
								0	0	0	1	0	0	0	0

Died on Disk.

Absolute heliographic longitude: 181



### Region Summary - continued

Date	Location		Sunspot Characteristics					Flares							
	(° Lat ° CMD)	Helio	Area (10 <sup>-6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray				Optical			
		Lon						C	M	X	S	1	2	3	4

*Region 1078*

08 Jun	S22W45	140	80	7	CRO	2	B								
09 Jun	S21W60	141	180	9	DSI	6	BG					1			
10 Jun	S22W73	141	200	9	DAO	5	B								
11 Jun	S22W86	141	5	1	AXX	1	A								
								0	0	0	1	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 140

*Region 1079*

09 Jun	S26W36	117	10	4	BXO	2	B								
10 Jun	S26W55	123	0	0	AXX	1	A								
11 Jun	S26W68	123													
12 Jun	S24W82	123	10	2	BXO	2	B								
13 Jun	S23W95	124	10	2	AXX	4	A		1		1				
								0	1	0	1	0	0	0	0

Crossed West Limb.

Absolute heliographic longitude: 123

*Region 1080*

10 Jun	S25W39	107	10	4	BXO	5	B								
11 Jun	S23W54	109	100	6	DAI	4	B								
12 Jun	S23W67	108	50	6	DRO	4	B	1							
13 Jun	S24W77	105	10	5	AXX	4	A	1			1				
								2	0	0	1	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 107

*Region 1081*

11 Jun	N22W43	98	50	5	DRO	8	B								
12 Jun	N24W58	99	80	8	DRO	10	B	1	1		2				
13 Jun	N24W71	99	90	8	DAO	8	B	5			8				
								6	1	0	10	0	0	0	0

Still on Disk.

Absolute heliographic longitude: 99





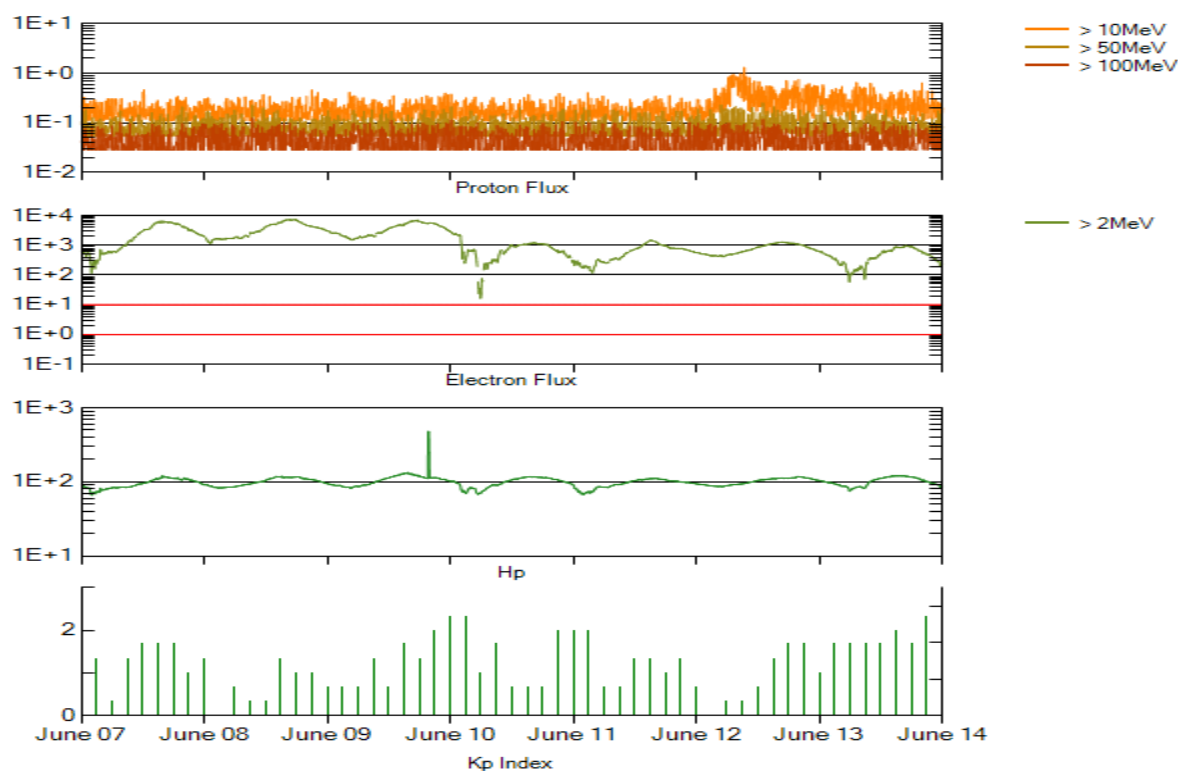
**Recent Solar Indices (preliminary)**  
**Of the observed monthly mean values**

Month	Sunspot Numbers					Radio Flux		Geomagnetic	
	Observed	values	Ratio	Smooth	values	*Penticton	Smooth	Planetary	Smooth
	SEC	RI	RI/SEC	SEC	RI	10.7 cm	Value	Ap	Value
June	4.2	3.4	0.81	5.2	3.3	65.9	69.4	7	7.0
July	1.0	0.8	0.80	4.5	2.8	65.7	68.8	5	6.8
August	0.0	0.5	**	4.4	2.7	66.3	68.6	5	6.3
September	1.5	1.1	0.73	3.7	2.3	67.1	68.4	6	5.8
October	5.2	2.9	0.56	2.9	1.8	68.3	68.2	7	5.4
November	6.8	4.1	0.60	2.7	1.7	68.6	68.3	4	5.1
December	1.3	0.8	0.62	2.7	1.7	69.2	68.5	4	4.9
2009									
January	2.8	1.3	0.46	3.0	1.8	69.8	68.7	4	4.7
February	2.5	1.4	0.56	3.1	1.9	70.0	68.8	5	4.7
March	0.7	0.7	1.00	3.4	2.0	69.2	69.0	5	4.6
April	1.2	0.8	1.00	3.7	2.2	69.7	69.3	4	4.3
May	3.9	2.9	0.74	3.8	2.3	70.5	69.7	4	4.1
June	6.6	2.9	0.39	4.4	2.7	68.6	70.2	4	4.0
July	5.0	3.2	0.70	5.8	3.6	68.2	71.0	4	3.9
August	0.3	0.0	0.00	7.7	4.8	67.4	72.1	5	3.8
September	6.6	4.3	0.64	9.9	6.1	70.5	73.3	4	3.8
October	7.0	4.8	0.66	11.3	7.0	72.3	74.1	3	4.1
November	7.7	4.1	0.55	12.4	7.6	73.6	74.5	3	4.5
December	15.7	10.8	0.68			76.8		2	
2010									
January	21.3	13.1	0.62			81.1		3	
February	31.0	18.6	0.60			84.7		5	
March	24.7	15.4	0.62			83.3		5	
April	11.2	7.9	0.71			75.9		10	
May	19.9	8.8	0.44			73.8		8	

**NOTE:** Values are final except for the most recent 6 months which are considered preliminary.  
 Cycle 23 started in May 1996 with an RI=8.0. Cycle 23 maximum was April 2000 with an RI=120.8.

\*\* SWPC sunspot number was zero, so a ratio could not be computed.





*Weekly Geosynchronous Satellite Environment Summary*  
*Week Beginning 07 June 2010*

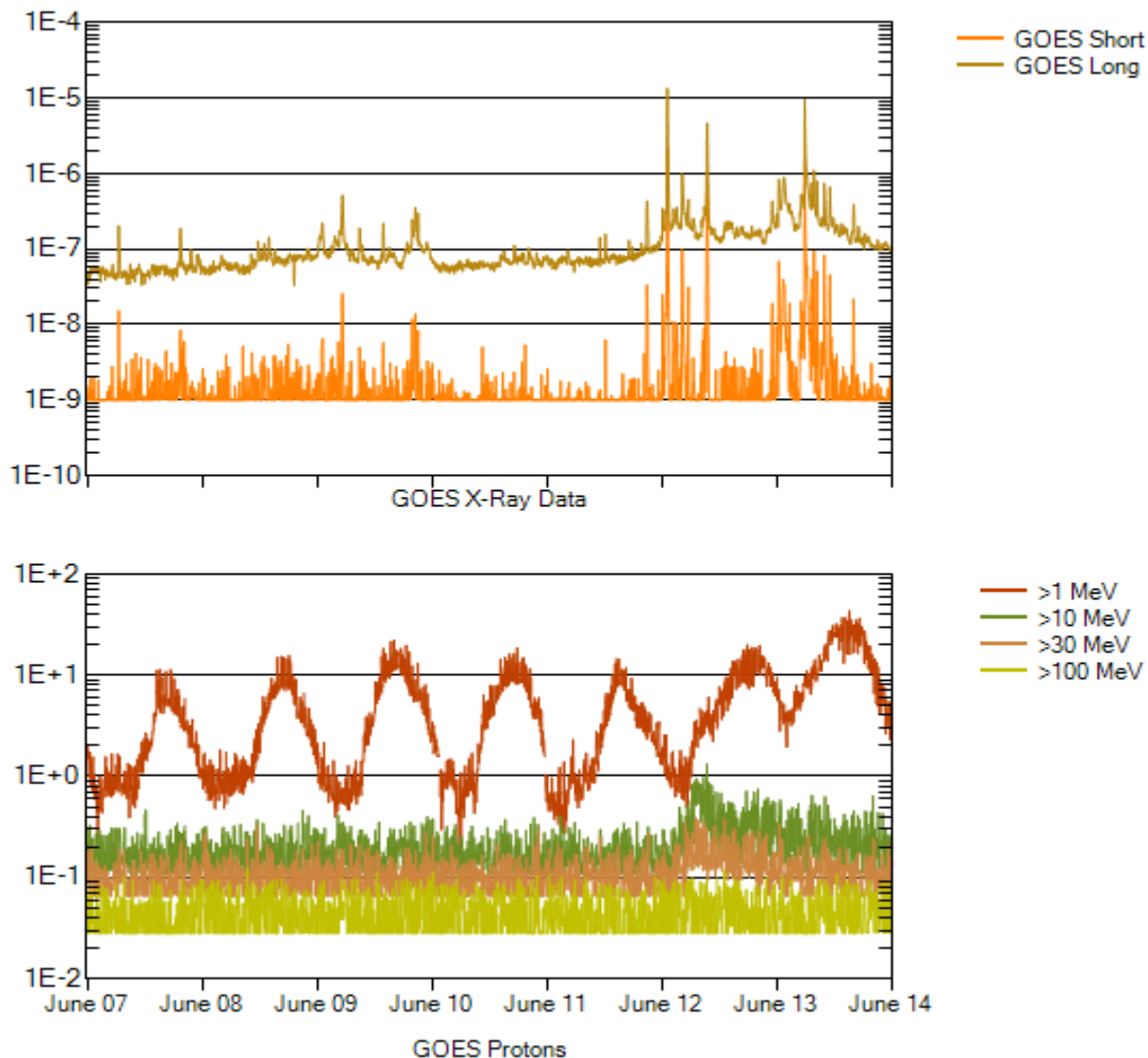
The proton flux plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>–sec–sr) as measured by GOES-13 (W75) for each of three energy thresholds: greater than 10, 50, and 100 MeV. The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>–sec–sr) with energies greater than 2 MeV at GOES-13.

The Hp plot contains the five minute averaged Hp magnetic field component in nanoteslas (nT) as measured by GOES-13. The Hp component is parallel to the spin axis of the satellite, which is nearly parallel to the Earth's rotation axis.

Kp plot contains the estimated planetary 3-hour K-index (derived by the Air Force Weather Agency) 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 Hartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC), British Geological Survey (BGS) and the US Geological Survey. These may differ from the final Kp values derived from a more extensive network of magnetometers.

The data included here are those now available in real time at the SWPC 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 Kp are “global” parameters that are applicable to a first order approximation over large areas. H parallel 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*

The x-ray plot contains five-minute averaged x-ray flux ( $\text{Watts/m}^2$ ) as measured by GOES 14 (W105) in two wavelength bands, 0.05 - 0.4 and 0.1 - 0.8 nm. The letters A, B, C, M and X refer to x-ray event levels for the 0.1 - 0.8 nm band.

The proton plot contains the five-minute averaged integral proton flux ( $\text{protons/cm}^2\text{-sec-sr}$ ) as measured by GOES-13 for each of the energy thresholds: >1, >10, >30 and >100 MeV. P10 event threshold is 10 pfu ( $\text{protons/cm}^2\text{-sec-sr}$ ) at greater than 10 MeV.

