

**Space Weather Highlights**  
**29 June – 05 July 2009**

**SWO PRF 1766**  
**07 July 2009**

Solar activity was very low to low. No flares were observed during 29 June - 02 July. Region 1024 (S27, L=247, class/area Dsi/170 on 05 July) emerged rapidly on 03 July. It produced frequent B-class flares during 04 July. Activity rose to low levels on 05 July due to a C2/Sf flare at 05/0713 UTC from Region 1024 as it continued to grow in spot count and magnetic complexity.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal to moderate levels during the period.

Geomagnetic field activity was at unsettled to active levels early on 29 June, then decreased to mostly quiet levels for the remainder of the period. ACE solar wind measurements indicated the 29 June active conditions were associated with the onset of a coronal hole high-speed stream. Solar wind velocities increased from 303 to 569 km/sec during 29 June, then gradually decreased during the remainder of the period (minimum 310 km/sec at 04/2301 UTC).

**Space Weather Outlook**  
**01 July – 27 July 2009**

Solar activity is expected to be very low (Region 1024 began to gradually decay and simplify on 06 July).

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.

Geomagnetic field activity is expected to be at quiet levels on 08 July. Activity is expected to increase to unsettled levels during 09 - 10 July due to a coronal hole high-speed stream. Activity is expected to decrease to mostly quiet levels during the rest of the period with a chance for unsettled levels on 21 and 25 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
29 June	69	0	0	<A1.0	0	0	0	0	0	0	0	0
30 June	68	0	0	<A1.0	0	0	0	0	0	0	0	0
01 July	68	0	0	<A1.0	0	0	0	0	0	0	0	0
02 July	67	0	0	<A1.0	0	0	0	0	0	0	0	0
03 July	67	17	60	<A1.0	0	0	0	0	0	0	0	0
04 July	71	24	100	A1.5	0	0	0	3	0	0	0	0
05 July	72	26	170	A2.2	1	0	0	1	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
	29 June	6.9e+05	2.0e+04	4.1e+03		3.3e+06
30 June	5.5e+05	1.9e+04	4.0e+03		8.7e+06	
01 July	5.0e+05	1.9e+04	4.2e+03		1.6e+07	
02 July	5.7e+05	2.0e+04	4.5e+03		1.7e+07	
03 July	8.0e+05	2.0e+04	4.5e+03		1.6e+07	
04 July	1.1e+06	2.0e+04	4.4e+03		1.4e+07	
05 July	1.3e+06	2.0e+04	4.6e+03		1.2e+07	

### *Daily Geomagnetic Data*

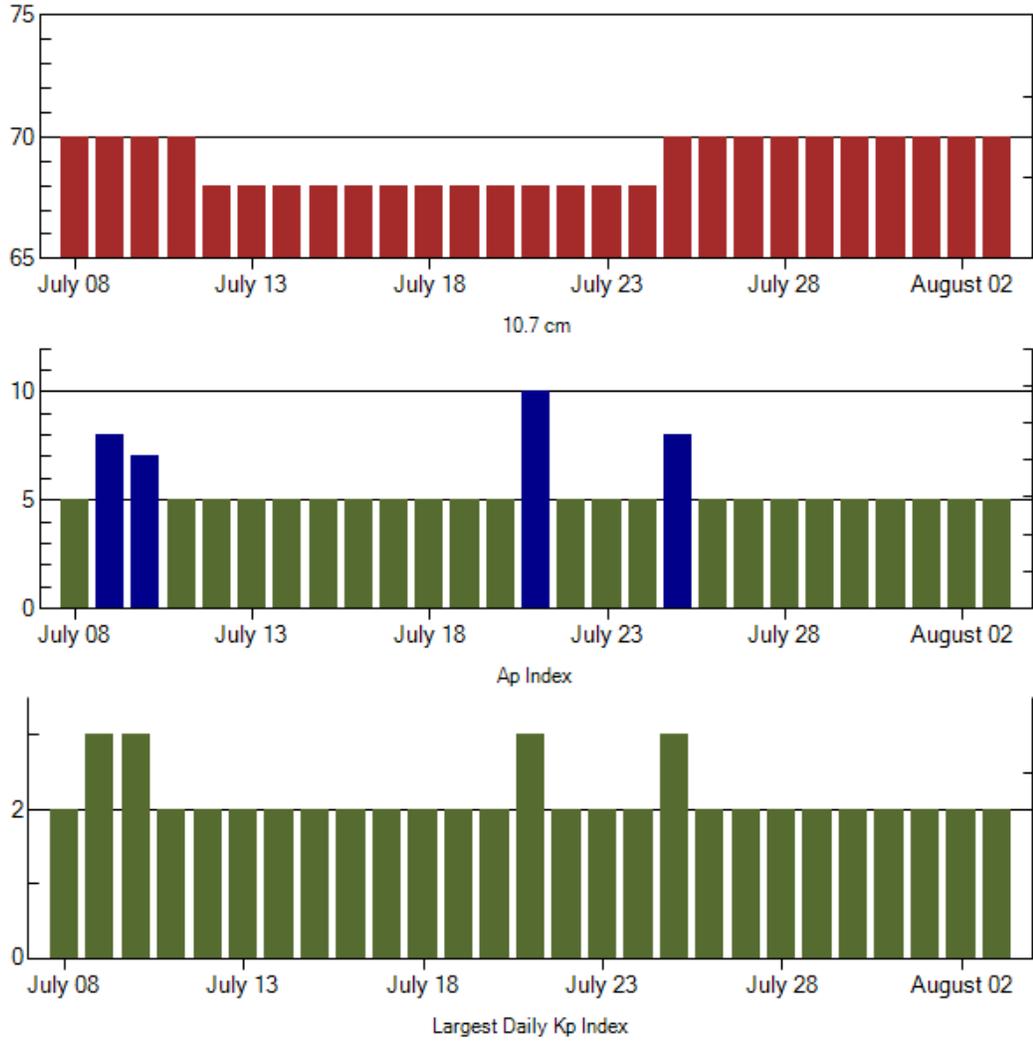
Date	Middle Latitude Fredericksburg		High Latitude College		Estimated Planetary	
	A	K-indices	A	K-indices	A	K-indices
	29 June	7	4-2-1-2-2-1-1-0	13	4-3-2-3-4-2-1-1	10
30 June	5	1-3-1-0-1-2-1-1	4	2-2-1-2-0-2-1-0	5	1-2-1-1-0-2-2-1
01 July	3	1-2-1-1-1-1-0-1	3	1-2-1-0-0-1-1-1	4	2-2-1-0-0-1-1-1
02 July	2	0-1-0-1-1-1-1-0	1	0-1-0-1-0-0-0-1	3	1-1-1-0-0-0-1-2
03 July	3	0-0-0-0-1-2-2-1	2	1-0-0-2-1-0-1-0	5	1-1-0-1-1-2-2-2
04 July	2	2-0-0-0-1-1-1-1	2	1-0-1-1-1-1-0-0	3	2-0-0-0-1-1-1-1
05 July	4	2-2-0-0-1-1-1-2	4	2-2-0-0-0-0-2-2	6	2-2-0-0-1-2-2-2

### *Alerts and Warnings Issued*

Date & Time of Issue	Type of Alert or Warning	Date & Time of Event UTC
29 Jun 0230	ALERT: Geomagnetic K = 4	29 Jun 0228
29 Jun 0234	ALERT: Geomagnetic K = 5	29 Jun 0233



### 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
08 Jul	70	5	2	22 Jul	68	5	2
09	70	8	3	23	68	5	2
10	70	7	3	24	68	5	2
11	70	5	2	25	70	8	3
12	68	5	2	26	70	5	2
13	68	5	2	27	70	5	2
14	68	5	2	28	70	5	2
15	68	5	2	29	70	5	2
16	68	5	2	30	70	5	2
17	68	5	2	31	70	5	2
18	68	5	2	01 Aug	70	5	2
19	68	5	2	02	70	5	2
20	68	5	2	03	70	5	2
21	68	10	3				



***Energetic Events***

Date	Time		X-ray	Optical Information			Peak		Sweep Freq	
	Begin	Max	Integ	Imp/	Location		Radio Flux		Intensity	
			Class	Flux	Brtns	Lat	CMD	#	245	2695

*No Events Observed*

***Flare List***

Date	Time			X-ray Class.	Imp / Brtns	Optical		Rgn
	Begin	Max	End			Lat	CMD	
29 June	No Flares Observed							
30 June	No Flares Observed							
01 July	No Flares Observed							
02 July	No Flares Observed							
03 July	2305	2308	2310	B1.3				
	2349	2354	2358	B3.2				
04 July	0102	0119	0126	B3.6				
	0208	0212	0213	B4.7	SF	S27E15		1024
	0246	0304	0307	B3.7				
	0437	0438	0442	B8.3	SF	S26E11		1024
	0600	0606	0613	B2.1				
	0748	0752	0756	B2.8				
	0941	0944	0946	B1.2				
	1159	1207	1214	B3.1				
	1231	1234	1238	B2.0				
	1340	1355	1357	B5.3				
	1509	1511	1516	B4.8	SF	S27E06		1024
05 July	1611	1614	1616	B1.5				
	2201	2209	2215	B5.9				
	0053	0056	0100	B1.1				
	0106	0115	0129	B5.9				
	0208	0213	0217	B2.2				
	0441	0447	0450	B2.3				
	0451	0501	0508	B2.2				
	0608	0614	0621	B5.1				
	0711	0713	0721	C2.7	SF	S27W02		1024
	0934	0937	0950	B3.0				
	1053	1057	1100	B1.2				
	1105	1109	1113	B5.0				
	1245	1250	1255	B3.5				
1542	1547	1604	B1.4					
1638	1649	1654	B1.8					
1734	1737	1746	B1.0					



## Region Summary

Date	Location		Sunspot Characteristics				Flares											
	Helio		Area (10 <sup>6</sup> hemi)	Extent (helio)	Spot Class	Spot Count	Mag Class	X-ray			Optical							
	(° Lat ° CMD)	Lon						C	M	X	S	1	2	3	4			
<i>Region 1022</i>																		
21 Jun		S27E15	45	20	3 BXO	2	B											
22 Jun		S26E01	46	10	1 AXX	1	A											
23 Jun		S26W12	46															
24 Jun		S26W25	46															
25 Jun		S26W38	46															
26 Jun		S26W51	46															
27 Jun		S26W64	46															
																		0 0 0 0 0 0 0 0

Died on Disk.

Absolute heliographic longitude: 46

<i>Region 1023</i>																		
22 Jun	S22E29	18	40	5	CSO	3	B											
23 Jun	S25E15	19	30	7	CSO	2	B											
24 Jun	S23E01	20	40	7	CSO	4	B											
25 Jun	S23W14	22																
26 Jun	S23W27	22																
27 Jun	S23W40	22																
28 Jun	S23W53	22																
29 Jun	S23W66	22																
30 Jun	S23W79	22																
																		0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 20

<i>Region 1024</i>																		
03 Jul	S25E16	246	60	5	DSO	7	B											
04 Jul	S27E02	247	100	6	DSI	14	B											3
05 Jul	S27W13	247	170	10	DSI	16	B	1										1
																		1 0 0 4 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 247



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

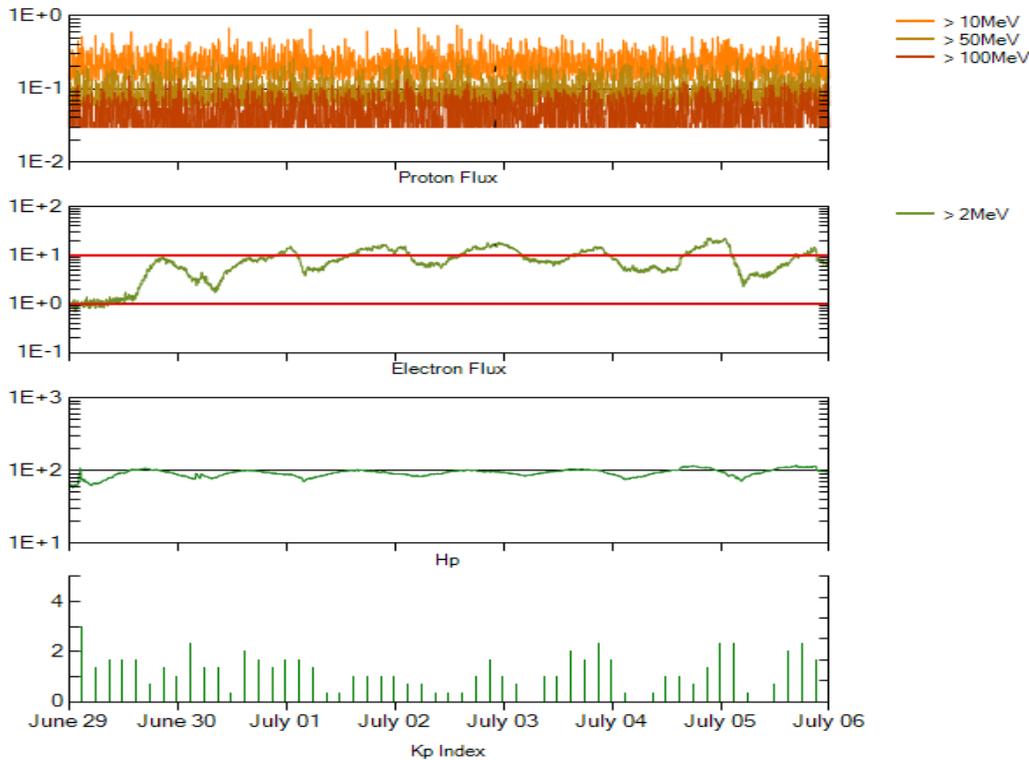
Month	Sunspot Numbers			Smooth values		Radio Flux		Geomagnetic	
	Observed SEC	values RI	Ratio RI/SEC	SEC	RI	*Penticton 10.7 cm	Smooth Value	Planetary Ap	Smooth Value
<b>2007</b>									
June	20.0	12.0	0.60	12.8	7.7	73.7	73.2	7	7.8
July	15.6	10.0	0.64	11.6	7.0	71.6	72.5	8	7.4
August	9.9	6.2	0.63	10.2	6.1	69.2	71.8	7	7.6
September	4.8	2.4	0.50	9.9	5.9	67.1	71.5	9	7.8
October	1.3	0.9	0.70	10.0	6.1	65.5	71.5	9	7.9
November	2.5	1.7	0.68	9.4	5.7	69.7	71.1	5	7.8
December	16.2	10.1	0.62	8.1	5.0	78.6	70.5	4	7.8
<b>2008</b>									
January	5.1	3.4	0.67	6.9	4.2	72.1	70.0	6	7.7
February	3.8	2.1	0.55	5.9	3.6	71.2	69.6	9	7.6
March	15.9	9.3	0.58	5.3	3.3	72.9	69.5	10	7.4
April	4.9	2.9	0.59	5.3	3.3	70.3	69.6	9	7.1
May	5.7	2.9	0.51	5.7	3.5	68.4	69.7	6	6.9
June	4.2	3.1	0.74	5.2	3.2	65.9	69.2	7	6.8
July	1.0	0.5	0.50	4.5	2.7	65.8	68.8	6	6.6
August	0.0	0.5	**	4.4	2.6	66.4	68.6	5	6.2
September	1.5	1.1	0.73	3.7	2.2	67.1	68.4	5	5.8
October	5.2	2.9	0.56	2.9	1.8	68.3	68.2	6	5.4
November	6.8	4.1	0.60	2.7	1.7	68.6	68.3	3	5.1
December	1.3	0.8	0.62			69.2		2	
<b>2009</b>									
January	2.8	1.5	0.54			69.8		3	
February	2.5	1.4	0.56			70.0		4	
March	0.7	0.7	1.00			69.2		4	
April	1.2	1.2	1.00			69.7		4	
May	3.9	2.9	0.74			70.6		4	

**NOTE:** All smoothed and monthly values are preliminary estimates.

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 less than RI value, so a ratio could not be computed.





*Weekly Geosynchronous Satellite Environment Summary  
Week Beginning 29 June 2009*

**GOES-11 designated Primary Electron Satellite and GOES-10 Secondary: December 1, 2008 the GOES-12 Electron sensor began experiencing periods of noise and sensor is unreliable.**

Protons plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-sec -sr) as measured by GOES-11 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

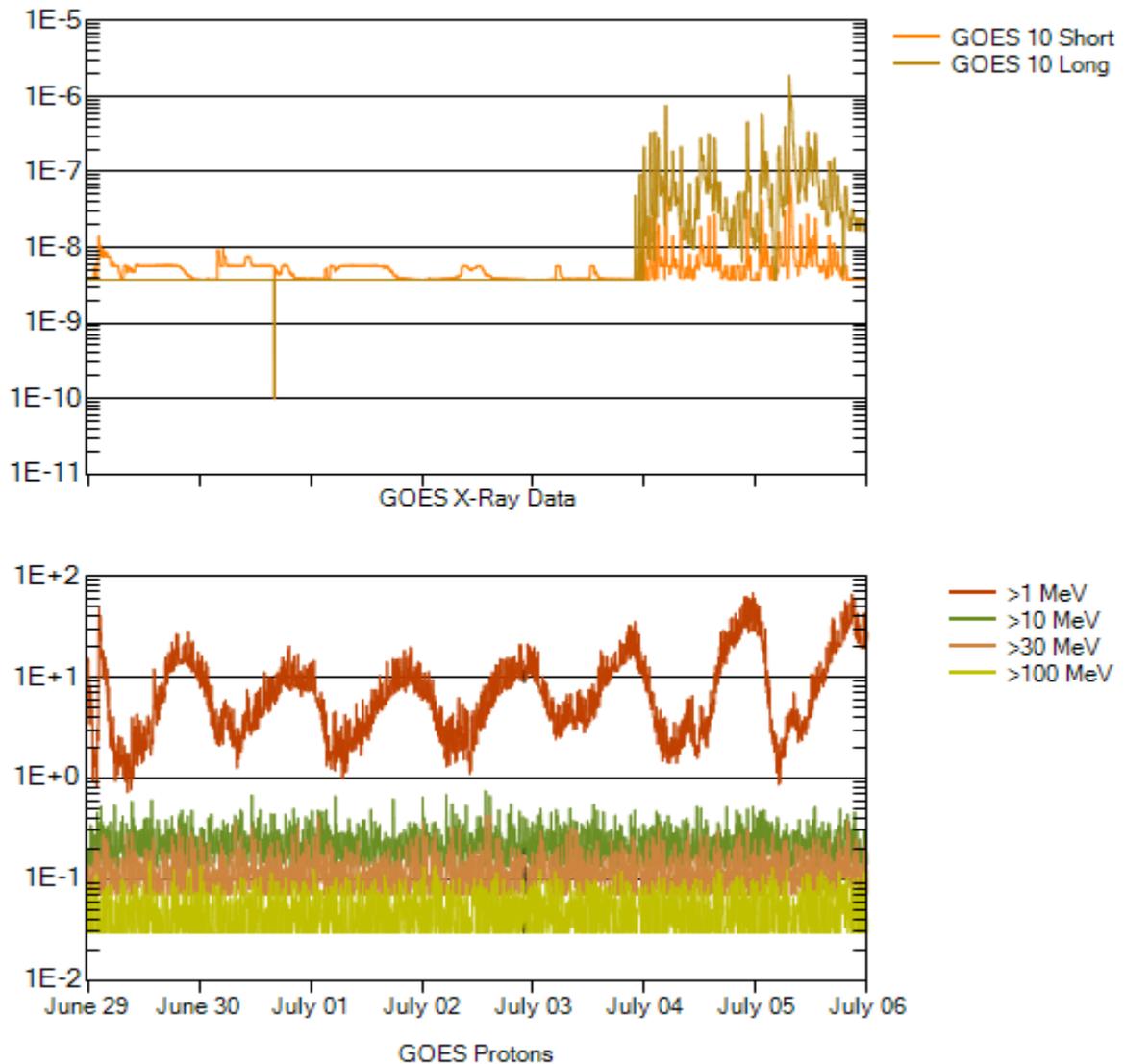
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV at GOES-11.

Hp plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-11. The H 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*

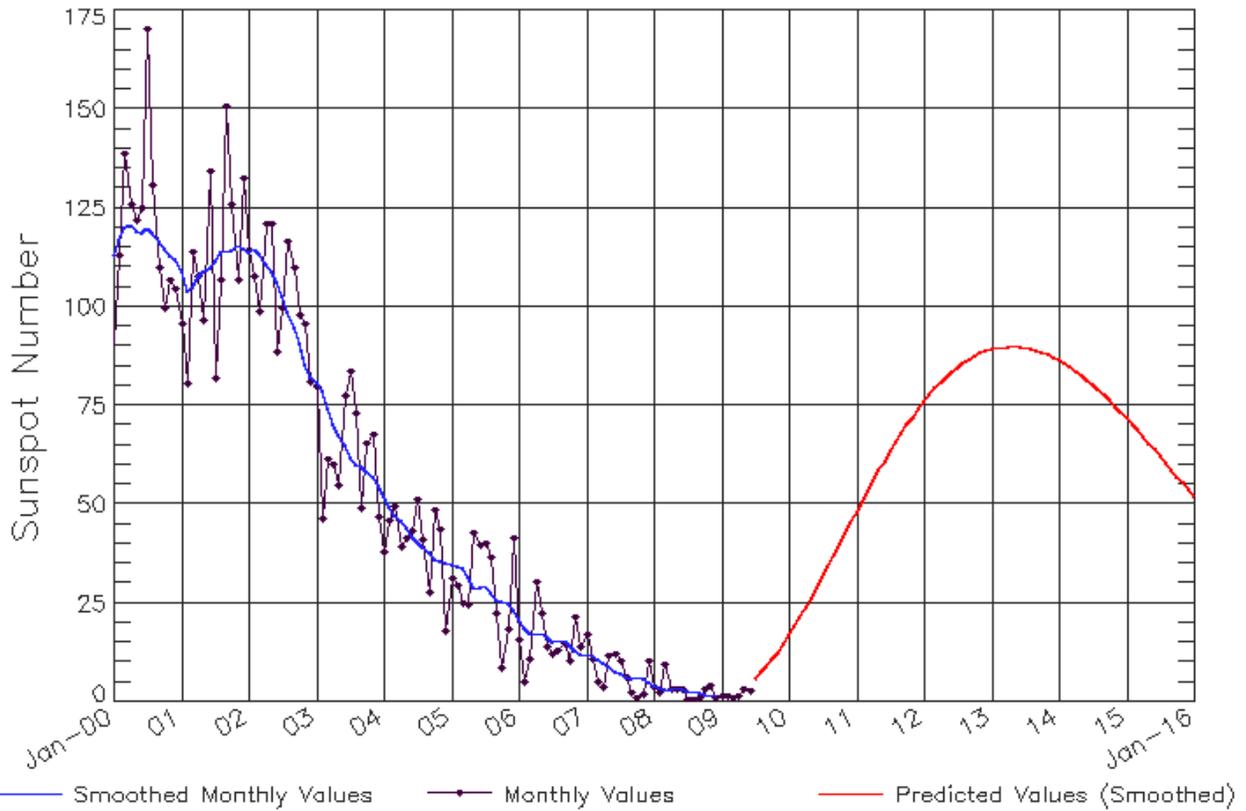
X-ray plot contains five-minute averaged x-ray flux ( $\text{watts/m}^2$ ) as measured by GOES 10 (W060) and GOES 11 (W135) in two wavelength bands, .05 - .4 and .1 - .8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 - .8 nm band.

Proton plot contains the five-minute averaged integral proton flux ( $\text{protons/cm}^2\text{-sec-sr}$ ) as measured by GOES-11 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.



# ISES Solar Cycle Sunspot Number Progression

Data Through Jun 09



Updated 2009 Jul 4

NOAA/SWPC Boulder, CO USA

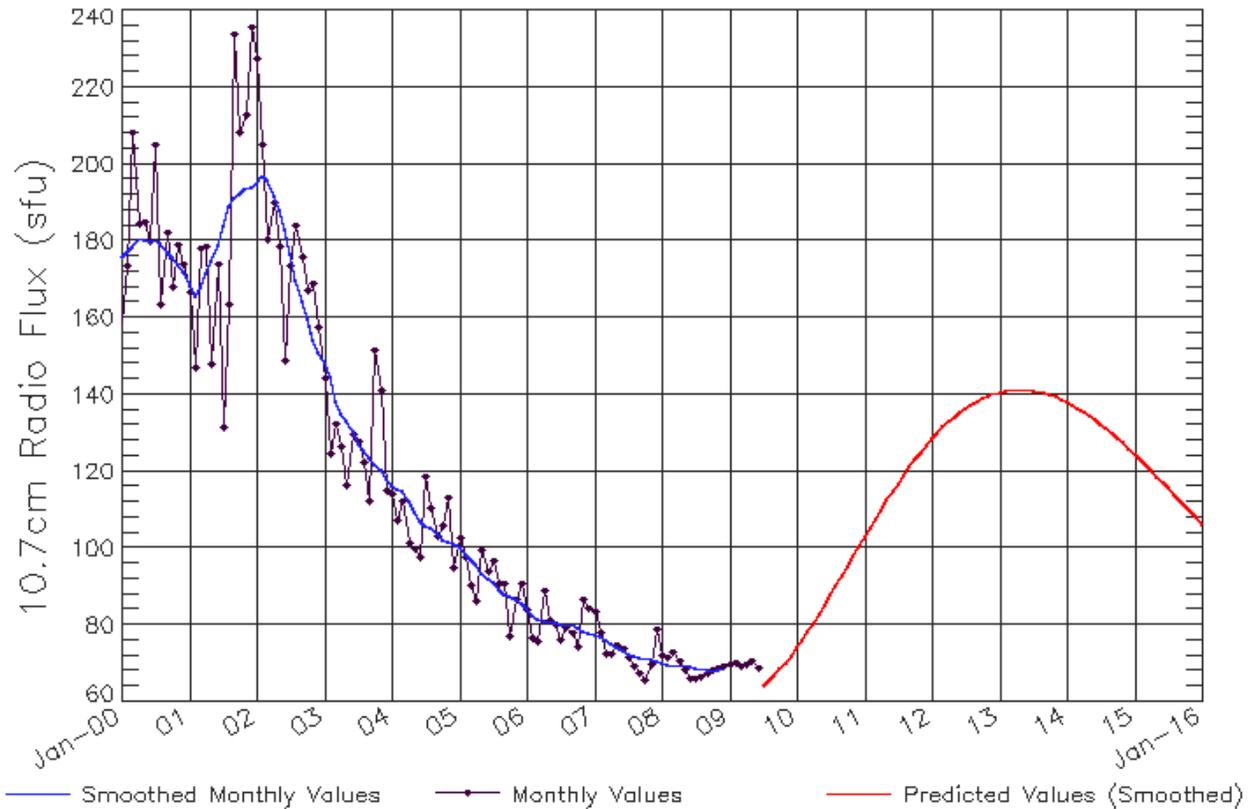
### Smoothed Sunspot Number Prediction

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Hi/Lo											
2008	4 (***)	4 (***)	3 (***)	3 (***)	4 (***)	3 (***)	3 (***)	3 (***)	2 (***)	2 (***)	2 (***)	2 (***)
2009	<b>2</b> (1)	<b>2</b> (2)	<b>3</b> (3)	<b>4</b> (5)	<b>4</b> (5)	<b>5</b> (6)	<b>7</b> (7)	<b>8</b> (7)	<b>9</b> (8)	<b>11</b> (9)	<b>13</b> (9)	<b>15</b> (10)
2010	<b>17</b> (10)	<b>19</b> (10)	<b>21</b> (10)	<b>24</b> (10)	<b>26</b> (10)	<b>29</b> (10)	<b>32</b> (10)	<b>34</b> (10)	<b>37</b> (10)	<b>40</b> (10)	<b>43</b> (10)	<b>45</b> (10)
2011	<b>48</b> (10)	<b>51</b> (10)	<b>53</b> (10)	<b>56</b> (10)	<b>59</b> (10)	<b>61</b> (10)	<b>63</b> (10)	<b>66</b> (10)	<b>68</b> (10)	<b>70</b> (10)	<b>72</b> (10)	<b>74</b> (10)
2012	<b>76</b> (10)	<b>78</b> (10)	<b>79</b> (10)	<b>81</b> (10)	<b>82</b> (10)	<b>84</b> (10)	<b>85</b> (10)	<b>86</b> (10)	<b>87</b> (10)	<b>88</b> (10)	<b>88</b> (10)	<b>89</b> (10)
2013	<b>89</b> (10)	<b>90</b> (10)	<b>90</b> (10)	<b>90</b> (10)	<b>90</b> (10)	<b>90</b> (10)	<b>90</b> (10)	<b>89</b> (10)	<b>89</b> (10)	<b>89</b> (10)	<b>88</b> (10)	<b>87</b> (10)
2014	<b>86</b> (10)	<b>86</b> (10)	<b>85</b> (10)	<b>84</b> (10)	<b>83</b> (10)	<b>81</b> (10)	<b>80</b> (10)	<b>79</b> (10)	<b>78</b> (10)	<b>76</b> (10)	<b>75</b> (10)	<b>73</b> (10)
2015	<b>72</b> (10)	<b>70</b> (10)	<b>69</b> (10)	<b>67</b> (10)	<b>65</b> (10)	<b>64</b> (10)	<b>62</b> (10)	<b>60</b> (10)	<b>59</b> (10)	<b>57</b> (10)	<b>55</b> (10)	<b>54</b> (10)



# ISES Solar Cycle F10.7cm Radio Flux Progression

Data Through Jun 09



Updated 2009 Jul 4

NOAA/SWPC Boulder, CO USA

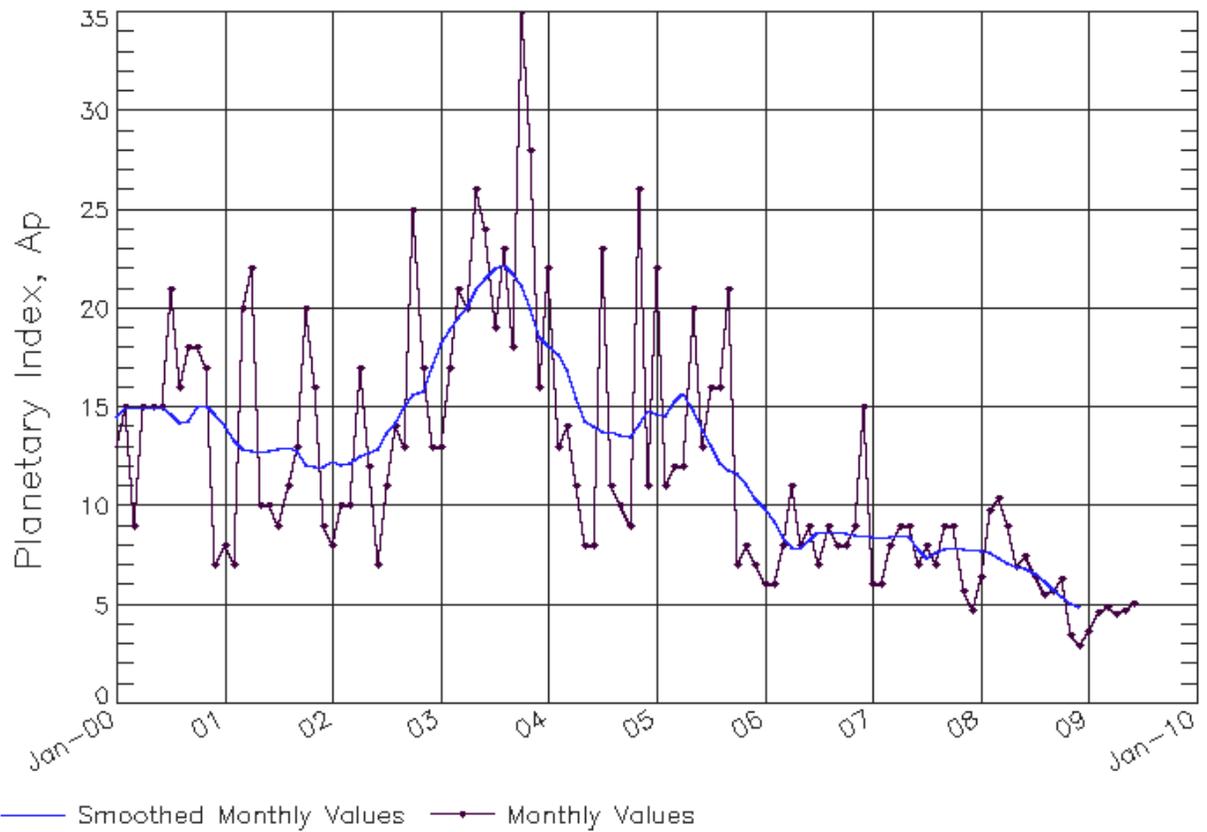
## Smoothed Sunspot Number Prediction

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Hi/Lo											
2008	4 (***)	4 (***)	3 (***)	3 (***)	4 (***)	3 (***)	3 (***)	3 (***)	2 (***)	2 (***)	2 (***)	2 (1)
2009	2 (2)	3 (3)	3 (5)	4 (5)	5 (6)	5 (7)	7 (7)	8 (8)	10 (9)	11 (9)	13 (10)	15 (10)
2010	17 (10)	19 (10)	21 (10)	24 (10)	26 (10)	29 (10)	32 (10)	34 (10)	37 (10)	40 (10)	43 (10)	45 (10)
2011	48 (10)	51 (10)	53 (10)	56 (10)	59 (10)	61 (10)	63 (10)	66 (10)	68 (10)	70 (10)	72 (10)	74 (10)
2012	76 (10)	78 (10)	79 (10)	81 (10)	82 (10)	84 (10)	85 (10)	86 (10)	87 (10)	88 (10)	88 (10)	89 (10)
2013	89 (10)	90 (10)	90 (10)	90 (10)	90 (10)	90 (10)	90 (10)	89 (10)	89 (10)	89 (10)	88 (10)	87 (10)
2014	86 (10)	86 (10)	85 (10)	84 (10)	83 (10)	81 (10)	80 (10)	79 (10)	78 (10)	76 (10)	75 (10)	73 (10)
2015	72 (10)	70 (10)	69 (10)	67 (10)	65 (10)	64 (10)	62 (10)	60 (10)	59 (10)	57 (10)	55 (10)	54 (10)



# ISES Solar Cycle Ap Progression

Data Through Jun 09



Updated 2009 Jul 4

NOAA/SWPC Boulder, CO USA



# M5 or Greater X-Ray Flares



Space Environment Center

June 2009  
(Month 153)

Preliminary data

Comparison of Cycles at current month in cycle

