

Space Weather Highlights
24 December – 30 December 2007

SEC PRF 1687
02 January 2008

Solar activity was very low to low. Activity was at very low levels through 29 December. Solar activity reached low levels due to a C1.7 flare observed at 30/2005 UTC. The most likely origin of the flare was from a brightening on the east limb near where old Region 978 (S08, L=223) is expected to return.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels 24 – 27 and 29 – 30 December.

The geomagnetic field was quiet throughout the summary period.

Space Weather Outlook
02 January – 28 January 2008

Solar activity is expected to be very low to low. Isolated M-class activity is possible during 01 – 13 January due to the return of old Region 978.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach high levels during 02 – 08 January, 12 – 13 January, and 14 – 28 January.

The geomagnetic field is expected to be at quiet levels during 02 – 05 January. Activity is expected to increase to unsettled levels during 06 – 08 January due to recurrence. Activity is expected to decrease to quiet levels during 09 – 12 January. Activity is expected to increase to unsettled to active levels during 13 – 16 January due to a recurrent coronal hole high-speed stream. Activity is expected to decrease to quiet to unsettled levels for the rest of the period as the high-speed stream subsides.



Daily Solar Data

| Date | Radio Flux 10.7 cm | Sun spot No. | Sunspot Area (10 ⁻⁶ hemi.) | X-ray Background | Flares | | | | | | | |
|-------------|-----------------------|-----------------|--|------------------|------------|---|---|---------|---|---|---|---|
| | | | | | X-ray Flux | | | Optical | | | | |
| | | | | | C | M | X | S | 1 | 2 | 3 | 4 |
| 24 December | 71 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 December | 72 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 December | 73 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 December | 72 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 December | 72 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 December | 73 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 December | 75 | 0 | 0 | <A1.0 | 1 | 0 | 0 | 0 | 0 | 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 | >100 MeV | >.6 MeV | >2MeV | >4 MeV |
| | 24 December | 3.2E+6 | 1.7E+4 | 4.0E+3 | | 3.7E+8 |
| 25 December | 2.9E+6 | 1.8E+4 | 4.0E+3 | | 3.3E+8 | |
| 26 December | 4.8E+6 | 1.8E+4 | 4.2E+3 | | 3.0E+8 | |
| 27 December | 4.3E+6 | 1.8E+4 | 4.3E+3 | | 4.6E+7 | |
| 28 December | 2.2E+6 | 1.9E+4 | 4.3E+3 | | 4.2E+7 | |
| 29 December | 2.7E+6 | 2.0E+4 | 4.3E+3 | | 7.1E+7 | |
| 30 December | 3.2E+6 | 1.9E+4 | 4.5E+3 | | 7.6E+7 | |

Daily Geomagnetic Data

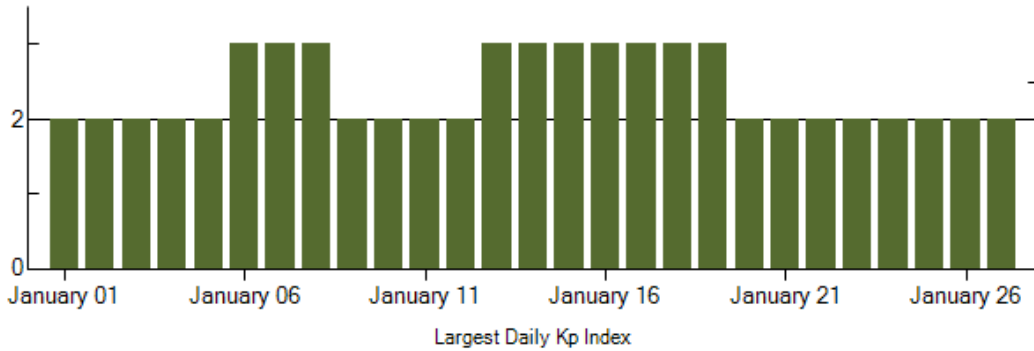
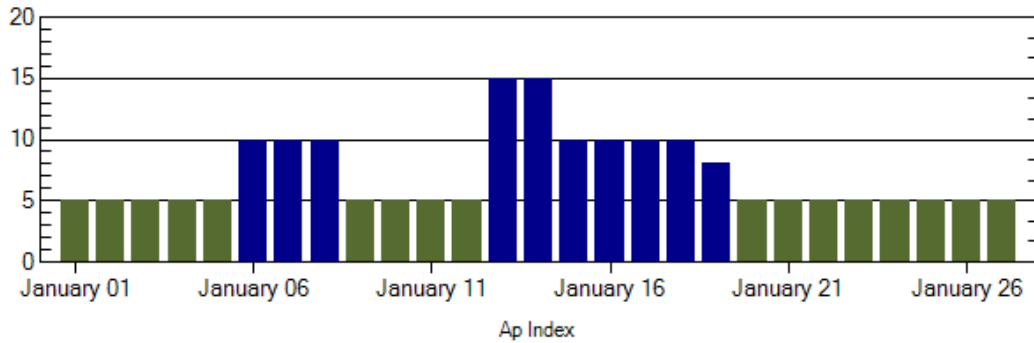
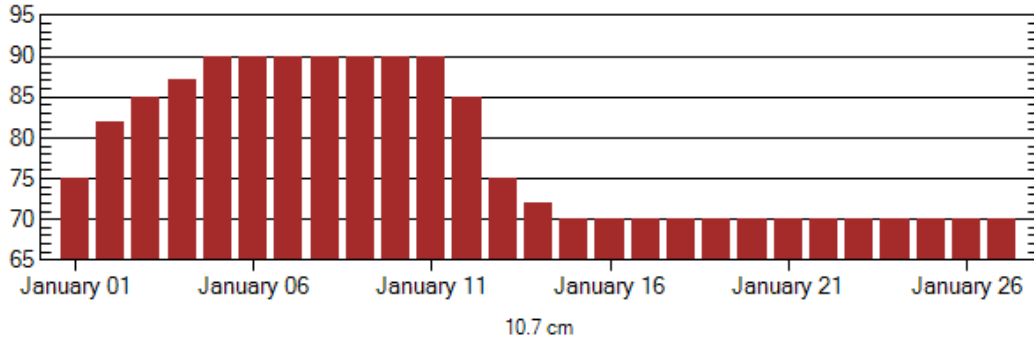
| Date | Middle Latitude Fredericksburg | | High Latitude College | | Estimated Planetary | |
|-------------|-----------------------------------|-----------------|--------------------------|-----------------|------------------------|-----------------|
| | A | K-indices | A | K-indices | A | K-indices |
| | 24 December | 1 | 0-0-1-0-0-1-1-0 | 1 | 0-0-1-0-1-0-0-0 | 2 |
| 25 December | 2 | 0-0-1-0-1-2-1-0 | 0 | 0-0-0-0-1-0-0-0 | 2 | 0-0-0-0-0-0-1-0 |
| 26 December | 1 | 0-0-0-0-1-1-0-0 | 1 | 0-0-0-1-1-0-0-0 | 2 | 0-0-1-1-0-0-0-1 |
| 27 December | 4 | 1-1-1-1-1-1-2-1 | 4 | 0-0-3-2-2-0-0-1 | 4 | 1-2-2-1-1-1-1-1 |
| 28 December | 2 | 2-2-0-0-1-0-0-0 | 1 | 0-1-0-1-0-0-0-0 | 2 | 2-2-0-0-0-0-0-0 |
| 29 December | 2 | 0-0-0-1-0-1-1-1 | 1 | 0-0-1-1-0-0-0-0 | 2 | 0-0-0-1-0-0-0-1 |
| 30 December | 3 | 1-2-0-0-1-2-0-0 | 1 | 0-0-0-1-0-1-0-0 | 2 | 1-1-0-0-0-1-0-0 |

Alerts and Warnings Issued

| Date & Time of Issue | Type of Alert or Warning | Date & Time of Event UTC |
|----------------------|---|--------------------------|
| 24 Dec 0502 | ALERT: Electron 2MeV Integral Flux ≥1000pfu | 24 Dec 0500 |
| 25 Dec 0526 | ALERT: Electron 2MeV Integral Flux ≥1000pfu | 25 Dec 0500 |
| 26 Dec 0502 | ALERT: Electron 2MeV Integral Flux ≥1000pfu | 26 Dec 0500 |
| 27 Dec 1553 | ALERT: Electron 2MeV Integral Flux ≥1000pfu | 27 Dec 1530 |
| 29 Dec 1326 | ALERT: Electron 2MeV Integral Flux ≥1000pfu | 29 Dec 1305 |
| 30 Dec 1152 | ALERT: Electron 2MeV Integral Flux ≥1000pfu | 30 Dec 1130 |



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 |
|--------|--------------------|-------------------|------------------|--------|--------------------|-------------------|------------------|
| 02 Jan | 82 | 5 | 2 | 16 Jan | 70 | 10 | 3 |
| 03 | 85 | 5 | 2 | 17 | 70 | 10 | 3 |
| 04 | 87 | 5 | 2 | 18 | 70 | 10 | 3 |
| 05 | 90 | 5 | 2 | 19 | 70 | 8 | 3 |
| 06 | 90 | 10 | 3 | 20 | 70 | 5 | 2 |
| 07 | 90 | 10 | 3 | 21 | 70 | 5 | 2 |
| 08 | 90 | 10 | 3 | 22 | 70 | 5 | 2 |
| 09 | 90 | 5 | 2 | 23 | 70 | 5 | 2 |
| 10 | 90 | 5 | 2 | 24 | 70 | 5 | 2 |
| 11 | 90 | 5 | 2 | 25 | 70 | 5 | 2 |
| 12 | 85 | 5 | 2 | 26 | 70 | 5 | 2 |
| 13 | 75 | 15 | 3 | 27 | 70 | 5 | 2 |
| 14 | 72 | 15 | 3 | 28 | 70 | 5 | 2 |
| 15 | 70 | 10 | 3 | | | | |



Energetic Events

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

No Events Observed

Flare List

| Date | Time | | | Optical X-ray Class. | Imp / Brtns | Location Lat CMD | Rgn |
|-------------|---------------------------|------|------|----------------------------|----------------|---------------------|-----|
| | Begin | Max | End | | | | |
| 24 December | <i>No Flares Observed</i> | | | | | | |
| 25 December | <i>No Flares Observed</i> | | | | | | |
| 26 December | <i>No Flares Observed</i> | | | | | | |
| 27 December | <i>No Flares Observed</i> | | | | | | |
| 28 December | <i>No Flares Observed</i> | | | | | | |
| 29 December | <i>No Flares Observed</i> | | | | | | |
| 30 December | 1932 | 2005 | 2019 | C1.7 | | | |

Region Summary

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

No Active Regions



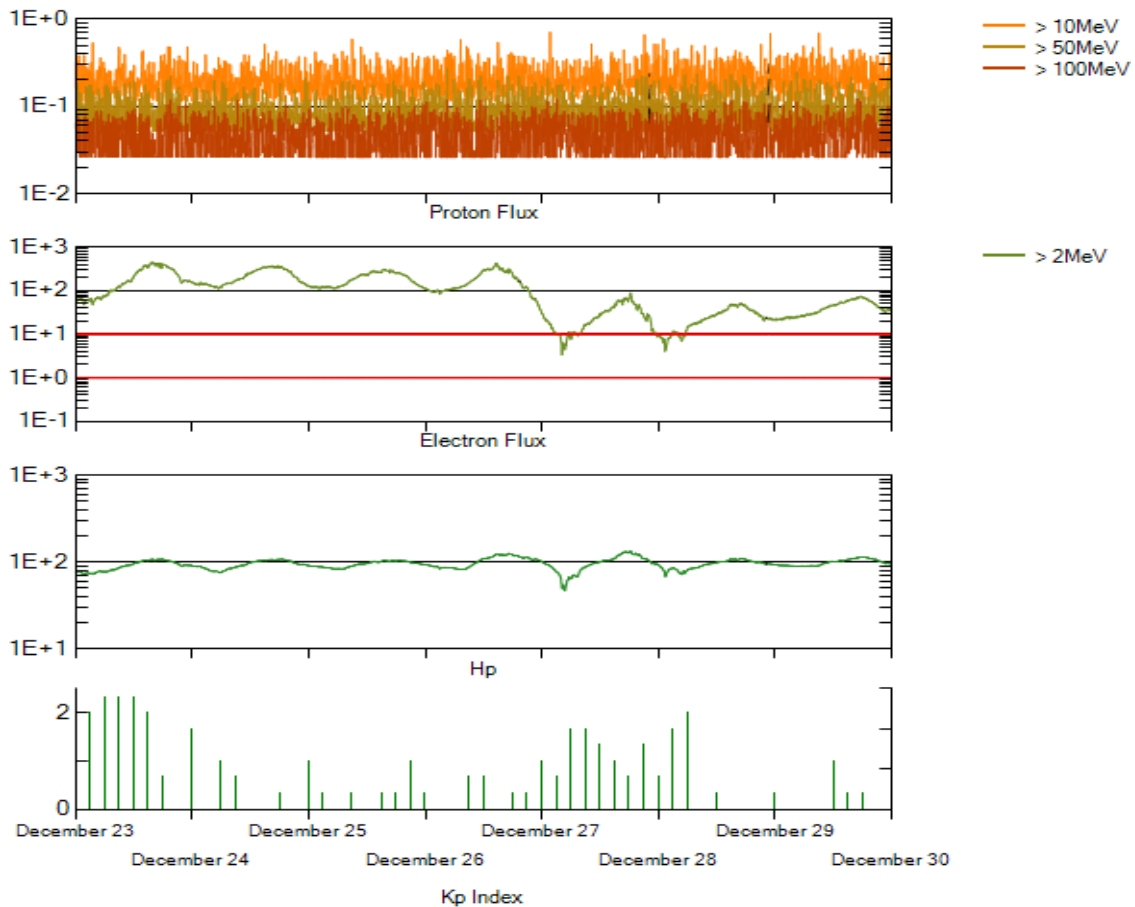
Recent Solar Indices (preliminary)
Of the observed monthly mean values

| Month | Sunspot Numbers | | | Radio Flux | | Geomagnetic | | | |
|-------------|-----------------|--------------|-----------------|---------------|--------------|-----------------------|-----------------|-----------------|-----------------|
| | Observed SEC | values RI | Ratio RI/SEC | Smooth SEC | values RI | *Penticton 10.7 cm | Smooth Value | Planetary Ap | Smooth Value |
| 2006 | | | | | | | | | |
| January | 28.0 | 15.4 | 0.55 | 37.2 | 20.8 | 83.8 | 84.0 | 6 | 9.9 |
| February | 5.3 | 4.7 | 0.89 | 33.4 | 18.7 | 76.6 | 82.6 | 6 | 9.2 |
| March | 21.3 | 10.8 | 0.51 | 31.0 | 17.4 | 75.5 | 81.6 | 8 | 8.4 |
| April | 55.2 | 30.2 | 0.55 | 30.6 | 17.1 | 89.0 | 80.9 | 11 | 7.9 |
| May | 39.6 | 22.2 | 0.56 | 30.7 | 17.3 | 81.0 | 80.8 | 8 | 7.9 |
| June | 37.7 | 13.9 | 0.37 | 28.9 | 16.3 | 80.1 | 80.6 | 9 | 8.3 |
| July | 22.6 | 12.2 | 0.54 | 27.2 | 15.3 | 75.8 | 80.3 | 7 | 8.7 |
| August | 22.8 | 12.9 | 0.57 | 27.6 | 15.6 | 79.0 | 80.3 | 9 | 8.7 |
| September | 25.2 | 14.5 | 0.58 | 27.7 | 15.6 | 77.8 | 80.2 | 8 | 8.7 |
| October | 15.7 | 10.4 | 0.66 | 25.2 | 14.2 | 74.3 | 79.4 | 8 | 8.6 |
| November | 31.5 | 21.5 | 0.68 | 22.3 | 12.7 | 86.4 | 78.5 | 9 | 8.5 |
| December | 22.2 | 13.6 | 0.61 | 20.7 | 12.1 | 84.3 | 77.9 | 15 | 8.5 |
| 2007 | | | | | | | | | |
| January | 26.6 | 16.9 | 0.64 | 19.7 | 12.0 | 83.5 | 77.5 | 6 | 8.4 |
| February | 17.2 | 10.6 | 0.62 | 18.9 | 11.6 | 77.8 | 76.9 | 6 | 8.4 |
| March | 9.7 | 4.8 | 0.49 | 17.5 | 10.8 | 72.3 | 76.0 | 8 | 8.4 |
| April | 6.9 | 3.7 | 0.54 | 16.0 | 9.9 | 72.4 | 75.2 | 9 | 8.5 |
| May | 19.4 | 11.7 | 0.60 | 14.2 | 8.7 | 74.5 | 74.2 | 9 | 8.4 |
| 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 | | | 71.6 | | 8 | |
| August | 9.9 | 6.2 | 0.63 | | | 69.2 | | 7 | |
| September | 4.8 | 2.4 | 0.50 | | | 67.1 | | 8 | |
| October | 1.3 | 0.9 | 0.70 | | | 65.5 | | 9 | |
| November | 2.5 | 1.7 | 0.68 | | | 69.7 | | 5 | |
| December | 16.2 | 10.1 | 0.62 | | | 78.6 | | 4 | |

NOTE: All smoothed values after September 2002 and monthly values after March 2003 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 23, RI= 120.8, occurred April 2000.

*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 24 December 2007*

Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by GOES-11 (W135) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

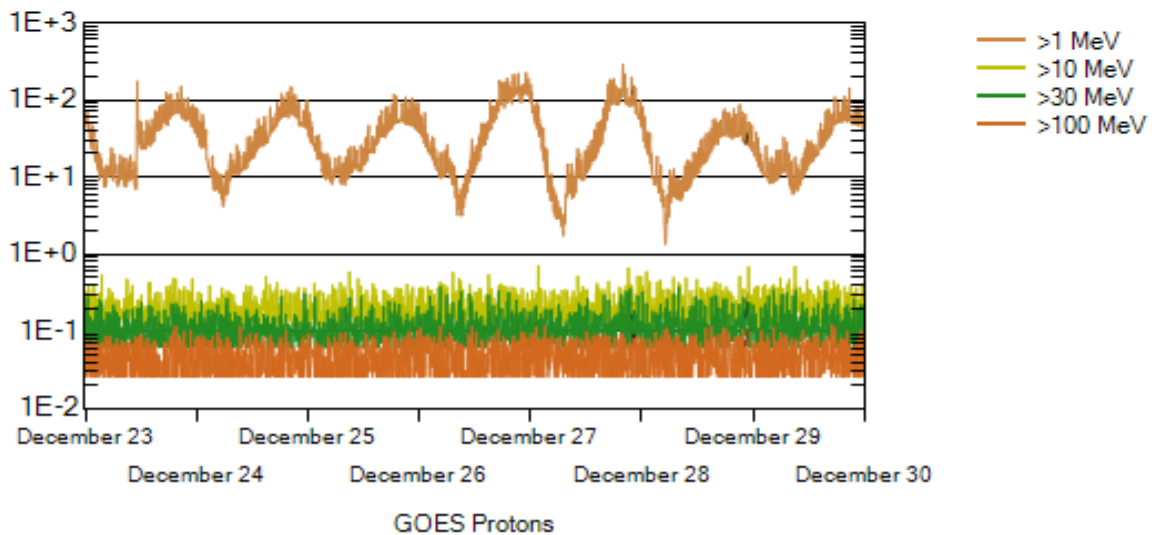
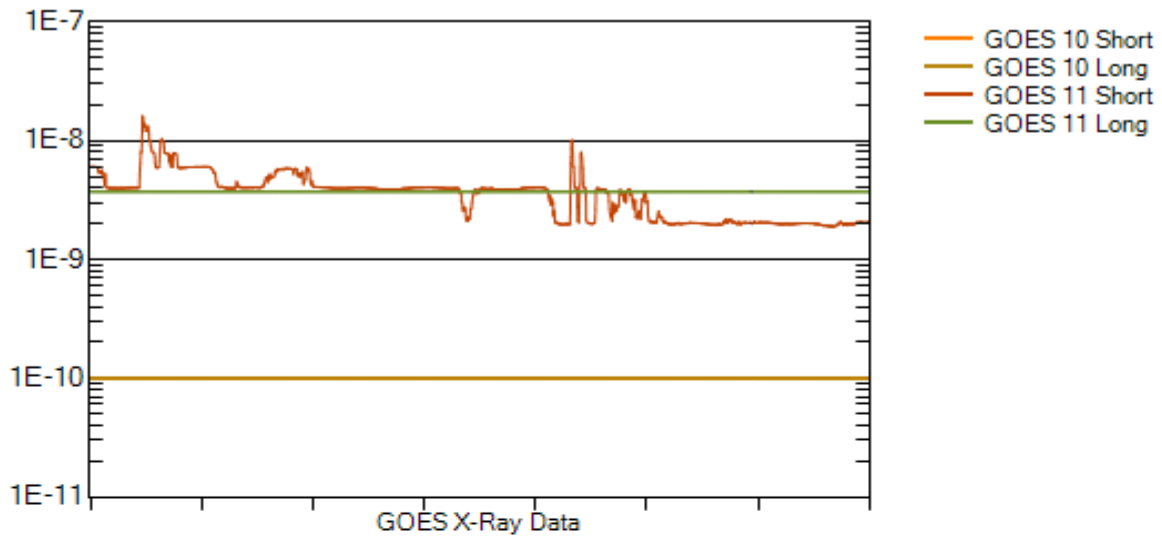
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-12 (W075).

Hp plot contains the five minute averaged magnetic field H - component in nanoteslas (nT) as measured by GOES-12. 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 SEC 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

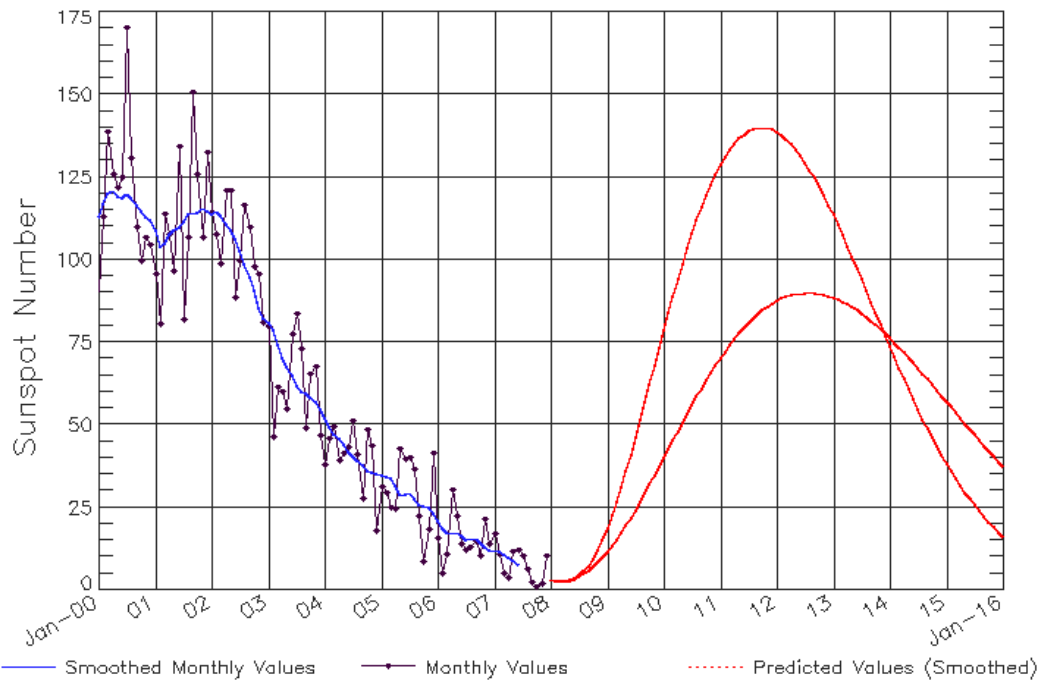
X-ray plot contains five-minute averaged x-ray flux (watts/m^2) as measured by GOES 10 (W060) and GOES 11 (W135) in two wavelength bands, .05 - .4 and .1 - .8 nm. The letters A, B, C, M and X refer to x-ray event levels for the .1 - .8 nm band.

Proton plot contains the five-minute averaged integral proton flux ($\text{protons/cm}^2\text{-sec-sr}$) as measured by GOES-11 (W135) 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 31 Dec 07



Updated 2008 Jan 2

NOAA/SWPC Boulder, CO USA

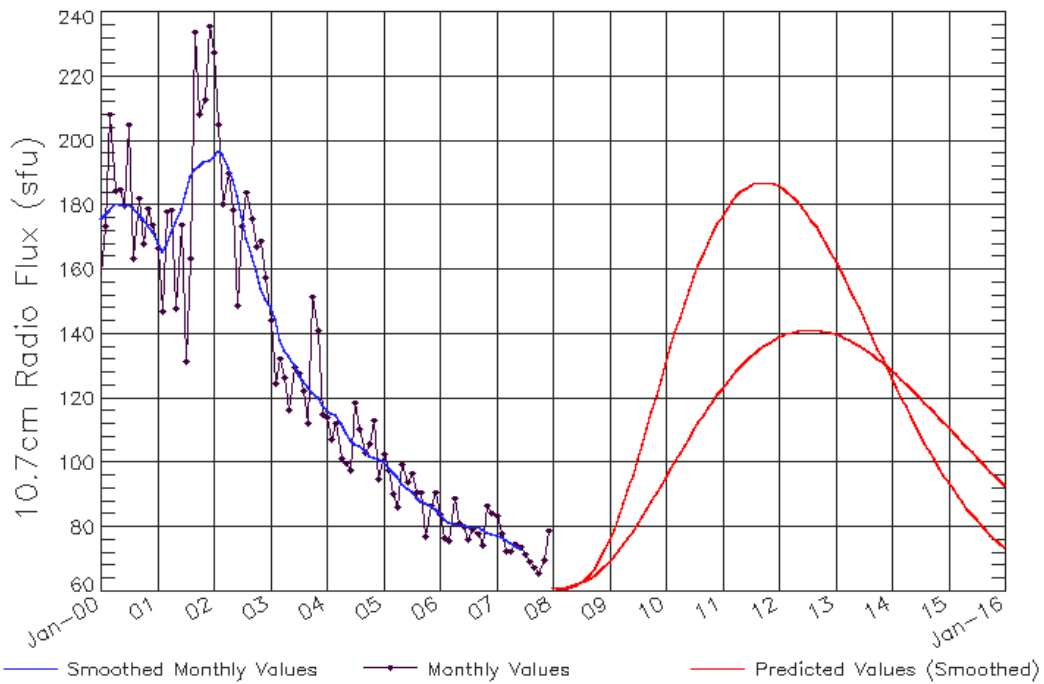
SEC Prediction of Smoothed Sunspot Number

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo |
| 2006 | 21 (***) | 19 (***) | 17 (***) | 17 (***) | 17 (***) | 16 (***) | 15 (***) | 16 (***) | 16 (***) | 14 (***) | 13 (***) | 12 (***) |
| 2007 | 12 (***) | 12 (***) | 11 (***) | 10 (***) | 9 (***) | 7/7 (1) | 7/6 (1) | 6/5 (3) | 6/5 (5) | 6/5 (7) | 5/4 (8) | 4/4 (9) |
| 2008 | 4/3 (10) | 4/3 (11) | 4/3 (12) | 4/3 (13) | 5/4 (14) | 6/5 (15) | 4/4 (15) | 6/5 (15) | 7/6 (15) | 10/7 (15) | 12/8 (15) | 15/10 (15) |
| 2009 | 19/12 (15) | 23/13 (15) | 27/15 (15) | 31/17 (15) | 36/20 (15) | 41/22 (15) | 46/24 (15) | 52/27 (15) | 57/29 (15) | 62/32 (15) | 68/35 (15) | 73/37 (15) |
| 2010 | 79/40 (15) | 84/43 (15) | 89/45 (15) | 94/48 (15) | 99/51 (15) | 103/53 (15) | 108/56 (15) | 112/59 (15) | 116/61 (15) | 119/63 (15) | 123/66 (15) | 126/68 (15) |
| 2011 | 129/70 (15) | 131/72 (15) | 133/74 (15) | 135/76 (15) | 137/78 (15) | 138/79 (15) | 139/81 (15) | 140/82 (15) | 140/84 (15) | 140/85 (15) | 140/86 (15) | 139/87 (15) |
| 2012 | 139/88 (15) | 138/88 (15) | 136/89 (15) | 135/89 (15) | 133/90 (15) | 131/90 (15) | 129/90 (15) | 127/90 (15) | 125/90 (15) | 122/90 (15) | 119/89 (15) | 116/89 (15) |
| 2013 | 114/89 (15) | 110/88 (15) | 107/87 (15) | 104/86 (15) | 101/86 (15) | 97/85 (15) | 94/84 (15) | 91/83 (15) | 87/81 (15) | 84/80 (15) | 80/79 (15) | 77/78 (15) |
| 2014 | 74/76 (15) | 70/75 (15) | 67/73 (15) | 64/72 (15) | 61/70 (15) | 58/69 (15) | 55/67 (15) | 52/65 (15) | 49/64 (15) | 46/62 (15) | 44/60 (15) | 41/59 (15) |
| 2015 | 38/57 (15) | 36/55 (15) | 34/54 (15) | 32/52 (15) | 30/50 (15) | 28/49 (15) | 26/47 (15) | 24/45 (15) | 22/44 (15) | 21/42 (15) | 19/40 (15) | 18/39 (15) |

Note: Hi is for the larger solar cycle prediction, Lo is for the smaller solar cycle prediction



ISES Solar Cycle F10.7cm Radio Flux Progression
Data Through 31 Dec 07



Updated 2008 Jan 2

NOAA/SWPC Boulder, CO USA

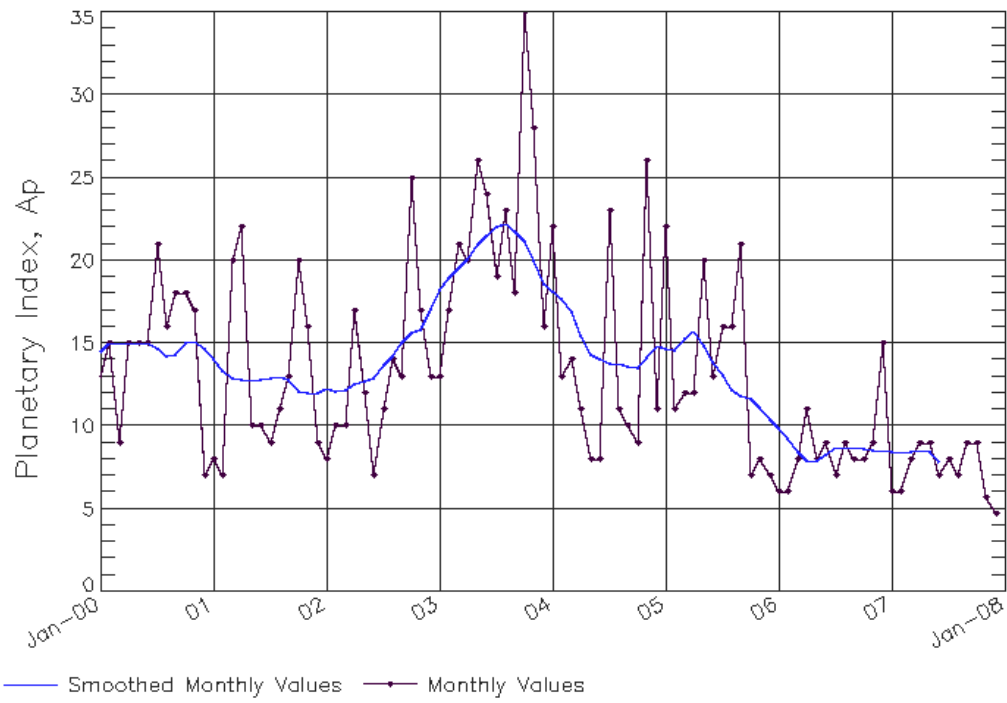
SEC Prediction of Smoothed F10.7cm Radio Flux

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo | Hi/Lo |
| 2006 | 84 (***) | 83 (***) | 82 (***) | 81 (***) | 81 (***) | 81 (***) | 80 (***) | 80 (***) | 80 (***) | 79 (***) | 79 (***) | 78 (***) |
| 2007 | 78 (***) | 77 (***) | 76 (***) | 75 (***) | 75 (***) | 73/67 (1) | 72/66 (1) | 71/64 (3) | 69/63 (5) | 68/62 (7) | 67/61 (9) | 66/60 (11) |
| 2008 | 65/60 (13) | 65/60 (15) | 65/60 (17) | 65/60 (19) | 65/60 (21) | 64/60 (22) | 63/63 (23) | 64/63 (23) | 65/64 (23) | 67/65 (23) | 70/66 (23) | 73/68 (23) |
| 2009 | 76/69 (23) | 79/71 (23) | 83/73 (23) | 87/75 (23) | 92/77 (23) | 96/79 (23) | 101/81 (23) | 106/83 (23) | 111/86 (23) | 116/88 (23) | 121/90 (23) | 126/93 (23) |
| 2010 | 131/95 (23) | 136/98 (23) | 140/100 (23) | 145/103 (23) | 149/105 (23) | 154/108 (23) | 158/110 (23) | 161/112 (23) | 165/115 (23) | 168/117 (23) | 171/119 (23) | 174/121 (23) |
| 2011 | 178/123 (23) | 179/125 (23) | 181/127 (23) | 183/128 (23) | 184/130 (23) | 185/132 (23) | 186/133 (23) | 187/134 (23) | 187/135 (23) | 187/136 (23) | 187/137 (23) | 187/138 (23) |
| 2012 | 186/139 (23) | 185/140 (23) | 184/140 (23) | 183/141 (23) | 181/141 (23) | 179/141 (23) | 177/141 (23) | 175/141 (23) | 173/141 (23) | 171/141 (23) | 168/141 (23) | 167/140 (23) |
| 2013 | 163/140 (23) | 160/139 (23) | 157/139 (23) | 154/138 (23) | 151/137 (23) | 148/136 (23) | 145/136 (23) | 142/135 (23) | 139/134 (23) | 136/132 (23) | 133/131 (23) | 130/130 (23) |
| 2014 | 128/128 (23) | 125/125 (24) | 123/123 (25) | 121/121 (26) | 119/119 (27) | 117/117 (27) | 115/115 (28) | 112/112 (29) | 110/110 (29) | 108/108 (30) | 106/106 (30) | 104/104 (31) |
| 2015 | 103/103 (31) | 101/101 (32) | 99/99 (32) | 97/97 (32) | 95/95 (32) | 94/94 (33) | 92/92 (33) | 90/90 (33) | 89/89 (33) | 87/87 (33) | 86/86 (33) | 85/85 (33) |



ISES Solar Cycle Ap Progression

Data Through 31 Dec 07



Updated 2008 Jan 2

NOAA/SWPC Boulder, CO USA





Space
Environment
Center

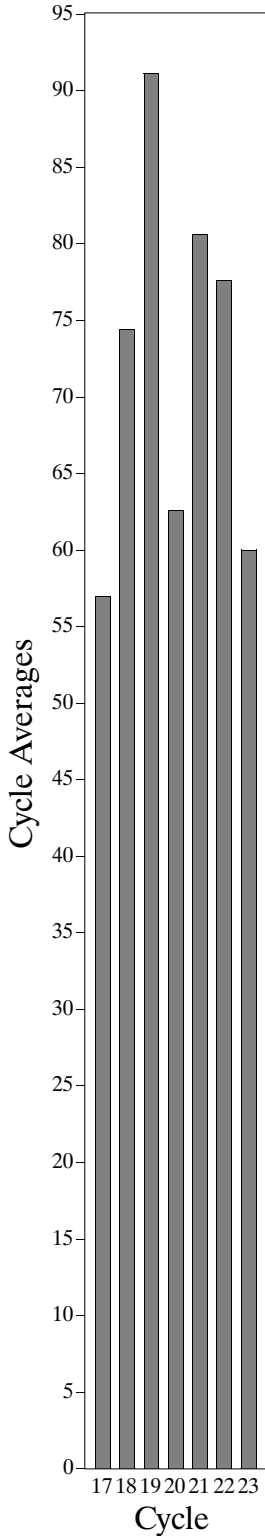
Sunspot Number (RI)

November 2007
(Month 134)

Preliminary data



Comparison of Cycles
at current month in cycle



N.Cohen

