

Space Weather Highlights
08 March – 14 March 2010

SWO PRF 1802
16 March 2010

Solar activity was at very low levels during 08 – 11 March with isolated to occasional B-class flares. Activity increased to low levels during 12 – 14 March due to isolated low-level C-class flares from Region 1054 (N15, L=149, class/area Eai/240 on 15 March). One of these flares, a long-duration C1/Sf at 13/2349 UTC, was associated with a slow, Earth-directed partial-halo CME (estimated plane-of-sky velocity around 360 km/sec, based on SOHO/LASCO images).

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal levels during 08 – 10 March. Fluxes increased to moderate levels on 11 March. A further increase to high levels occurred during 12 – 14 March in response to a coronal hole high-speed stream.

Geomagnetic field activity was at quiet levels at all latitudes during 08 – 09 March. Field activity increased to quiet to unsettled levels during 10 – 11 March with brief active to minor periods at high latitudes. Activity increased to quiet to active levels on 12 March with a brief period of minor storm at high latitudes. Activity decreased to mostly quiet levels during 13 – 14 March. ACE in situ solar wind measurements indicated a coronal hole high-speed stream (CH HSS) occurred during 10 – 13 March. The CH HSS peak velocity was 577 km/sec at 12/0601 UTC. Interplanetary Magnetic Field changes during the CH HSS included increased Bt (peak 9 nT at 10/1521 UTC) and periods of sustained southward Bz (minimum -7 nT at 10/1515 UTC).

Space Weather Outlook
17 March – 12 April 2010

Solar activity is expected to be very low with possible isolated periods of low levels during the forecast 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 levels through most of the period. However, moderate to high flux levels are possible during 08 – 11 April.

Geomagnetic field activity is expected to be at quiet to unsettled levels during 17 – 18 March due to weak CME effects. Quiet conditions are expected during 19 March – 06 April. Activity is expected to increase to quiet to active levels during 07 – 08 April due to a recurrent coronal hole high-speed stream. Activity is expected to decrease to quiet levels during 09 – 12 April.



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 | |
| 08 March | 76 | 0 | 0 | A1.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09 March | 78 | 0 | 0 | A1.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 March | 80 | 12 | 10 | A3.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 March | 84 | 31 | 140 | A4.2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 12 March | 90 | 36 | 220 | A6.7 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 13 March | 92 | 32 | 230 | A6.5 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| 14 March | 89 | 30 | 230 | A6.0 | 1 | 0 | 0 | 3 | 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 |
| | | | | | | |
| 08 March | 3.7e+05 | 1.9e+04 | 4.1e+03 | | 8.1e+04 | |
| 09 March | 6.8e+05 | 1.9e+04 | 4.0e+03 | | 1.2e+05 | |
| 10 March | 5.3e+05 | 1.8e+04 | 3.7e+03 | | 8.4e+04 | |
| 11 March | 9.0e+05 | 1.8e+04 | 3.7e+03 | | 5.8e+06 | |
| 12 March | 8.9e+05 | 1.7e+04 | 3.4e+03 | | 5.2e+07 | |
| 13 March | 8.6e+05 | 1.7e+04 | 3.4e+03 | | 1.6e+08 | |
| 14 March | 8.3e+05 | 1.8e+04 | 4.0e+03 | | 1.6e+08 | |

Daily Geomagnetic Data

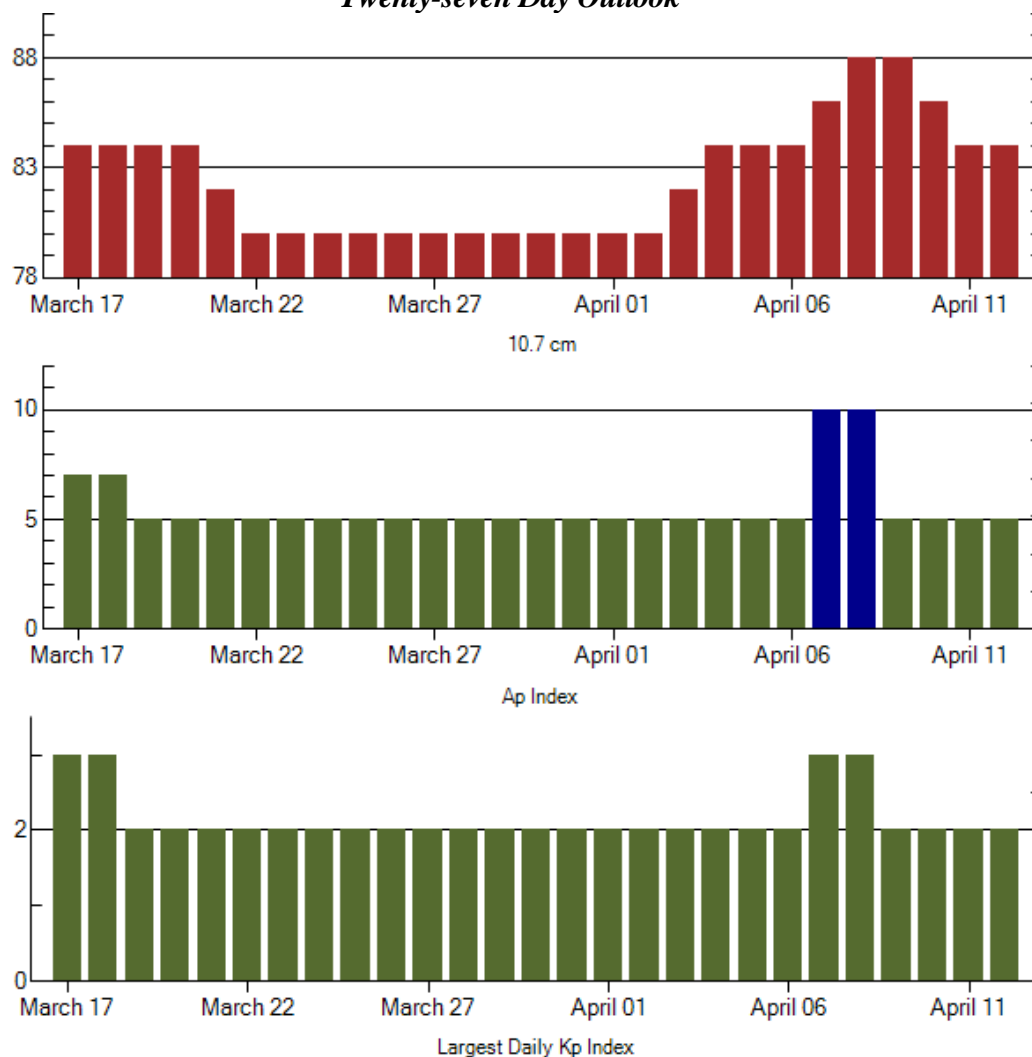
| Date | Middle Latitude Fredericksburg | | High Latitude College | | Estimated Planetary | |
|----------|-----------------------------------|-----------------|--------------------------|-----------------|------------------------|-----------------|
| | A | K-indices | A | K-indices | A | K-indices |
| | | | | | | |
| 08 March | 1 | 1-1-1-0-0-0-0-0 | 1 | 0-0-1-1-0-1-0-0 | 3 | 1-1-1-0-0-1-1-1 |
| 09 March | 2 | 0-0-0-0-2-1-1-1 | 0 | 0-0-0-0-1-0-0-0 | 2 | 0-0-0-0-1-1-0-1 |
| 10 March | 6 | 2-1-1-1-2-3-1-2 | 7 | 1-0-1-1-4-3-1-1 | 7 | 1-1-2-1-2-3-2-2 |
| 11 March | 9 | 4-3-3-2-1-1-1-0 | 18 | 2-4-5-5-2-1-1-0 | 9 | 3-3-3-2-1-1-1-1 |
| 12 March | 6 | 2-3-2-1-2-1-1-1 | 13 | 1-2-2-3-5-4-0-0 | 9 | 2-4-2-2-2-2-1-2 |
| 13 March | 2 | 1-0-0-0-1-1-1-0 | 1 | 0-0-1-2-0-0-0-0 | 4 | 1-0-0-0-0-2-2-1 |
| 14 March | 2 | 1-1-1-0-1-1-0-1 | 9 | 1-0-4-2-4-2-0-1 | 6 | 2-1-1-1-2-2-1-2 |

Alerts and Warnings Issued

| Date & Time of Issue | Type of Alert or Warning | Date & Time of Event UTC |
|----------------------|--|--------------------------|
| 12 Mar 0517 | WARNING: Geomagnetic K = 4 | 12 Mar 0520 - 1600 |
| 12 Mar 0521 | ALERT: Geomagnetic K = 4 | 12 Mar 0521 |
| 12 Mar 1551 | ALERT: Electron 2MeV Integral Flux >= 1000pfu | 12 Mar 1535 |
| 13 Mar 1018 | ALERT: Electron 2MeV Integral Flux >= 1000pfu | 13 Mar 1000 |
| 14 Mar 0043 | ALERT: Type IV Radio Emission | 13 Mar 2345 |
| 14 Mar 0920 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 13 Mar 1000 |



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 |
|--------|-----------------------|----------------------|---------------------|--------|-----------------------|----------------------|---------------------|
| 17 Mar | 84 | 7 | 3 | 31 Mar | 80 | 5 | 2 |
| 18 | 84 | 7 | 3 | 01 Apr | 80 | 5 | 2 |
| 19 | 84 | 5 | 2 | 02 | 80 | 5 | 2 |
| 20 | 84 | 5 | 2 | 03 | 82 | 5 | 2 |
| 21 | 82 | 5 | 2 | 04 | 84 | 5 | 2 |
| 22 | 80 | 5 | 2 | 05 | 84 | 5 | 2 |
| 23 | 80 | 5 | 2 | 06 | 84 | 5 | 2 |
| 24 | 80 | 5 | 2 | 07 | 86 | 10 | 3 |
| 25 | 80 | 5 | 2 | 08 | 88 | 10 | 3 |
| 26 | 80 | 5 | 2 | 09 | 88 | 5 | 2 |
| 27 | 80 | 5 | 2 | 10 | 86 | 5 | 2 |
| 28 | 80 | 5 | 2 | 11 | 84 | 5 | 2 |
| 29 | 80 | 5 | 2 | 12 | 84 | 5 | 2 |
| 30 | 80 | 5 | 2 | | | | |



Energetic Events

| Date | Time | | X-ray | | Optical Information | | | Peak | | Sweep Freq | |
|------|---------------|-----|-------|-------|---------------------|----------|-----|------------|------|------------|----|
| | $\frac{1}{2}$ | | Integ | | Imp/ | Location | Rgn | Radio Flux | | Intensity | |
| | Begin | Max | Max | Class | Brtns | Lat CMD | # | 245 | 2695 | II | IV |

No Events Observed

Flare List

| Date | Time | | | X-ray | Imp / | Optical | | Rgn |
|------|-------|-----|-----|-------|-------|----------|---------|-----|
| | Begin | Max | End | | | Location | Lat CMD | |

| | | | | | | | | |
|----------|--------------------|------|------|------|----|--------|--|------|
| 08 March | No Flares Observed | | | | | | | |
| 09 March | No Flares Observed | | | | | | | |
| 10 March | 0610 | 0713 | 0747 | B3.0 | | | | |
| | 1529 | 1534 | 1541 | B1.7 | | | | |
| 11 March | 0419 | 0423 | 0427 | B1.2 | | | | |
| | 1218 | 1225 | 1228 | B2.5 | | | | |
| | 1650 | 1653 | 1657 | B1.4 | | | | |
| | 1714 | 1718 | 1724 | B1.6 | | | | |
| | 1741 | 1745 | 1750 | B1.5 | | | | |
| | 2008 | 2024 | 2027 | B2.8 | | | | |
| | 2038 | 2039 | 2042 | B4.6 | SF | N12E47 | | 1054 |
| | 2148 | 2155 | 2200 | B1.4 | | | | |
| | 2052 | 2053 | 2056 | B3.2 | | | | |
| | 2052 | 2053 | 2056 | B3.2 | | | | |
| 12 March | 0002 | 0008 | 0011 | B2.0 | | | | |
| | 1102 | 1110 | 1115 | B2.5 | | | | |
| | 1317 | 1325 | 1331 | B1.4 | | | | |
| | 1342 | 1346 | 1351 | B1.9 | | | | |
| | 1447 | 1453 | 1503 | B3.3 | | | | |
| | 1524 | 1531 | 1536 | B3.2 | | | | |
| | 1624 | 1629 | 1639 | B4.3 | | | | |
| | 1815 | 1825 | 1847 | C2.3 | SF | N13E33 | | 1054 |
| 13 March | 0259 | 0259 | 0303 | B8.7 | SF | N13E27 | | 1054 |
| | 0947 | 0950 | 0959 | B2.4 | | | | |
| | 1545 | 1552 | 1601 | B5.4 | | | | |
| | 1914 | 1917 | 1920 | B2.2 | | | | |
| | 2017 | 2022 | 2025 | B4.0 | | | | |
| | 2336 | 2341 | 0033 | C1.5 | SF | N14E15 | | 1054 |
| 14 March | 0959 | 1004 | 1007 | B3.6 | | | | |
| | 0228 | 0236 | 0241 | B3.1 | | | | |
| | 0419 | 0420 | 0428 | C1.3 | SF | N13E15 | | 1054 |
| | 0523 | 0525 | 0529 | B3.3 | SF | N13E11 | | 1054 |
| | 0543 | 0549 | 0551 | B5.2 | | | | |
| | 0654 | 0701 | 0703 | | SF | N14E14 | | 1054 |
| | 0745 | 0754 | 0759 | B2.4 | | | | |
| | 1147 | 1202 | 1230 | B7.9 | | | | |
| | 1704 | 1713 | 1722 | B2.1 | | | | |



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 | 4 |
| | | | | | | | | | | | | | | | |
| <i>Region 1053</i> | | | | | | | | | | | | | | | |
| 01 Mar | S22W38 | 360 | 20 | 4 | BXO | 2 | B | | | | | | | | |
| 02 Mar | S23W51 | 360 | 30 | 5 | CSO | 4 | B | | | | | | | | |
| 03 Mar | S22W62 | 358 | 10 | 4 | BXO | 4 | B | | | | | | | | |
| 04 Mar | S22W77 | 360 | 40 | 8 | CRO | 4 | B | | | | | | | | |
| 05 Mar | S22W89 | 359 | 10 | 1 | AXX | 1 | A | | | | | | | | |
| | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Crossed West Limb.

Absolute heliographic longitude: 360

| | | | | | | | | | | | | | | | |
|--------------------|--------|-----|-----|----|-----|----|----|---|---|---|---|---|---|---|---|
| <i>Region 1054</i> | | | | | | | | | | | | | | | |
| 10 Mar | N12E56 | 148 | 10 | 3 | BXO | 2 | B | | | | | | | | |
| 11 Mar | N15E43 | 148 | 110 | 6 | DSO | 7 | B | | | | 1 | | | | |
| 12 Mar | N15E29 | 148 | 190 | 7 | DAO | 12 | B | 1 | | | 1 | | | | |
| 13 Mar | N15E15 | 149 | 230 | 11 | ESC | 22 | BG | 1 | | | 2 | | | | |
| 14 Mar | N14E01 | 149 | 230 | 13 | ESI | 20 | BG | 1 | | | 3 | | | | |
| | | | | | | | | 3 | 0 | 0 | 7 | 0 | 0 | 0 | 0 |

Still on Disk.

Absolute heliographic longitude: 149

| | | | | | | | | | | | | | | | |
|--------------------|--------|-----|----|---|-----|---|---|---|---|---|---|---|---|---|---|
| <i>Region 1055</i> | | | | | | | | | | | | | | | |
| 11 Mar | S23W15 | 206 | 30 | 3 | CSO | 4 | B | | | | | | | | |
| 12 Mar | S24W27 | 204 | 30 | 3 | CSO | 4 | B | | | | | | | | |
| 13 Mar | S24W40 | 204 | | | | | | | | | | | | | |
| 14 Mar | S24W53 | 204 | | | | | | | | | | | | | |
| | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Still on Disk.

Absolute heliographic longitude: 206



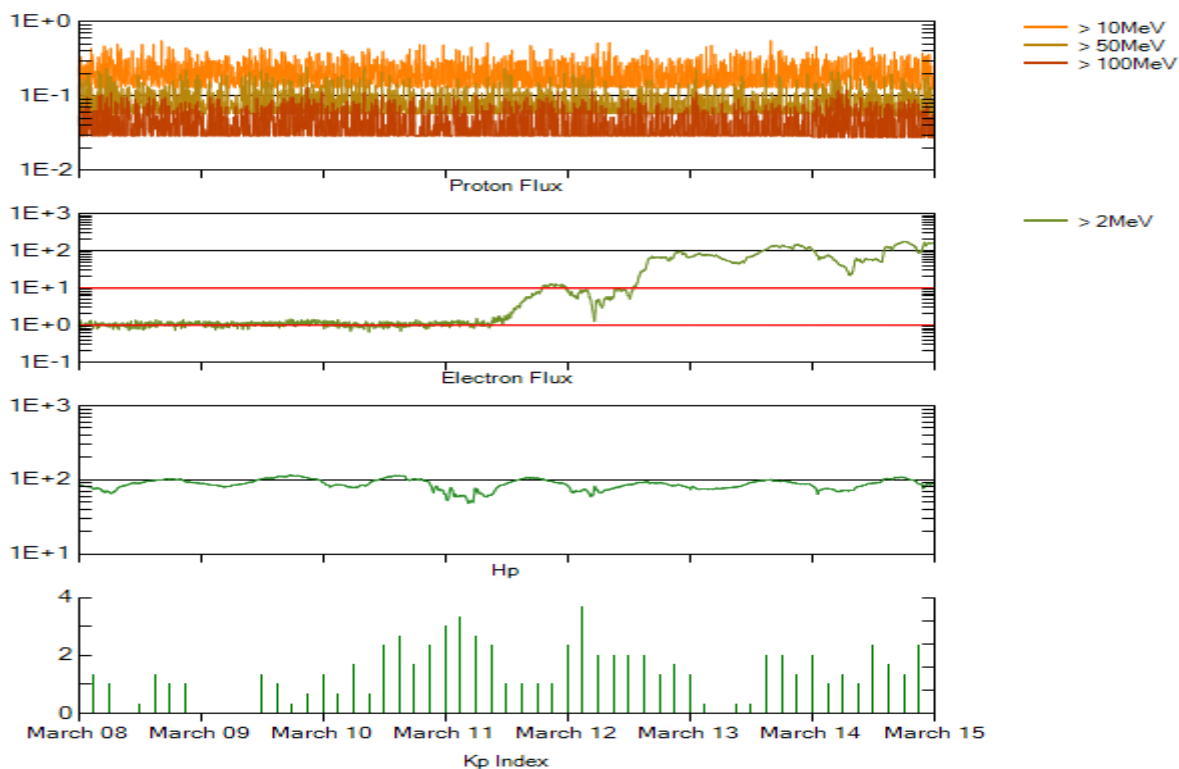
Recent Solar Indices (preliminary)
Of the observed monthly mean values

| 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 |
| 2008 | | | | | | | | | |
| March | 15.9 | 9.3 | 0.58 | 5.3 | 3.3 | 72.9 | 69.8 | 11 | 7.5 |
| April | 4.9 | 2.9 | 0.59 | 5.3 | 3.4 | 70.2 | 69.8 | 9 | 7.3 |
| May | 5.7 | 3.2 | 0.56 | 5.7 | 3.5 | 68.4 | 69.8 | 6 | 7.2 |
| 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 | | | 70.5 | | 4 | |
| October | 7.0 | 4.6 | 0.66 | | | 72.3 | | 3 | |
| November | 7.7 | 4.2 | 0.55 | | | 73.6 | | 3 | |
| December | 15.7 | 10.6 | 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 | | 4 | |

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 08 March 2010

GOES-11 designated Primary Proton and Electron Satellite.

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.

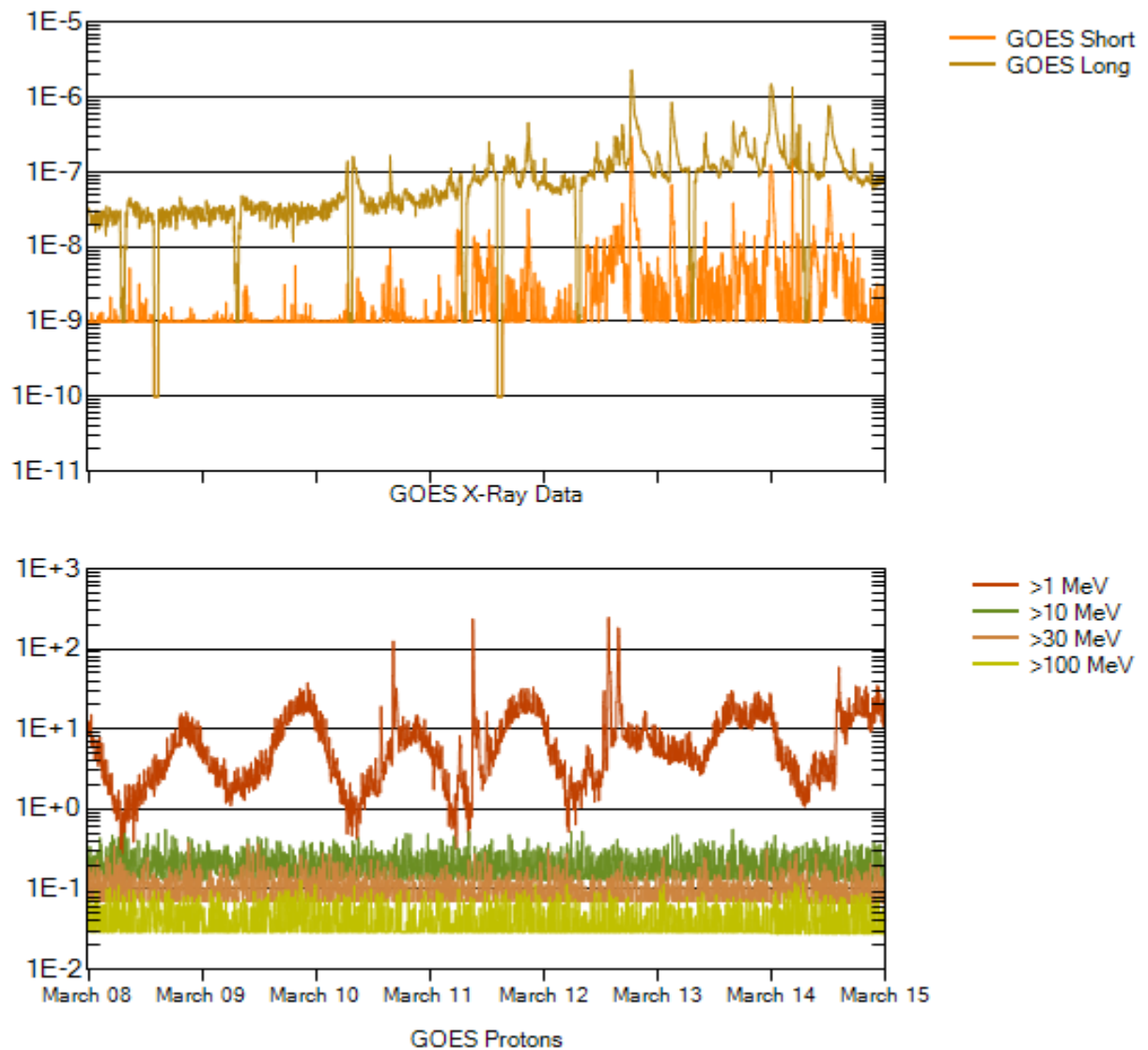
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²–sec–sr) with energies greater than 2 MeV at GOES-11.

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 (Watts/m²) 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.

Proton plot contains the five-minute averaged integral proton flux (protons/cm²-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 (protons/cm²-sec-sr) at greater than 10 MeV.

