**Space Weather Highlights**
**10 April - 16 April 2017**

**SWPC PRF 2172**
**17 April 2017**

Solar activity was at very low levels throughout the summary period. Region 2650 (N11, L=193, class/area=Cao/40 on 11 Apr 2017) produced numerous B-class flares throughout the period and was the only active region with sunspots this period. No Earth-directed CMEs were observed.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached moderate levels on 16 Apr and high levels on 10-15 Apr with a peak flux of 3,860 pfu observed at 1715 UTC on 10 Apr.

Geomagnetic field activity was at quiet levels on 10, 13, and 16 Apr. Quiet to unsettled levels were observed on 12 and 15 Apr, and quiet to active levels were observed on 11 and 14 Apr due to waning CH HSS influence and a solar sector boundary change.

**Space Weather Outlook**
**17 April - 13 May 2017**

Solar activity is expected to be very low with a chance for C-class flare activity throughout the outlook period.

No proton events are expected at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach very high levels on 29-30 Apr and high levels on 18-28 Apr and 01, 06-12 May. Moderate flux levels are expected throughout the remainder of the period.

Geomagnetic field activity is expected to reach G2 (Moderate) geomagnetic storm levels on 23 Apr and G1 (Minor) storm levels on 17, 24-27 Apr, and 01 May due to the influence of recurrent CH HSSs. Active conditions are expected on 19, 28 Apr and 05-06 May with generally quiet or quiet to unsettled levels likely throughout the remainder of the period.

## *Daily Solar Data*

| Date | Radio Flux 10.7cm | Sun spot No. | Sunspot Area ($10^{-6}$ hemi.) | X-ray Background | | Flares | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | X-ray | | | Optical | | | |
| | | | | Flux | | C | M | X | S | 1 | 2 | 3 | 4 |
| 10 April | 74 | 13 | 40 | A5.8 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| 11 April | 75 | 12 | 40 | A4.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 April | 71 | 13 | 20 | A4.7 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 13 April | 74 | 12 | 20 | A4.8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 14 April | 73 | 11 | 10 | A4.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 April | 73 | 11 | 10 | A4.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 April | 75 | 0 | 0 | A7.7 | 0 | 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 | >0.6 MeV | >2MeV | >4 MeV |
| 10 April | 8.7e+06 | 1.5e+04 | 3.8e+03 | | 1.3e+08 | |
| 11 April | 8.5e+06 | 1.5e+04 | 3.8e+03 | | 4.1e+07 | |
| 12 April | 7.3e+06 | 1.6e+04 | 4.0e+03 | | 7.9e+07 | |
| 13 April | 1.0e+07 | 1.6e+04 | 3.8e+03 | | 1.2e+08 | |
| 14 April | 1.5e+07 | 1.6e+04 | 3.8e+03 | | 5.9e+07 | |
| 15 April | 1.5e+07 | 1.6e+04 | 3.9e+03 | | 3.2e+07 | |
| 16 April | 1.6e+07 | 1.6e+04 | 3.7e+03 | | 3.6e+07 | |

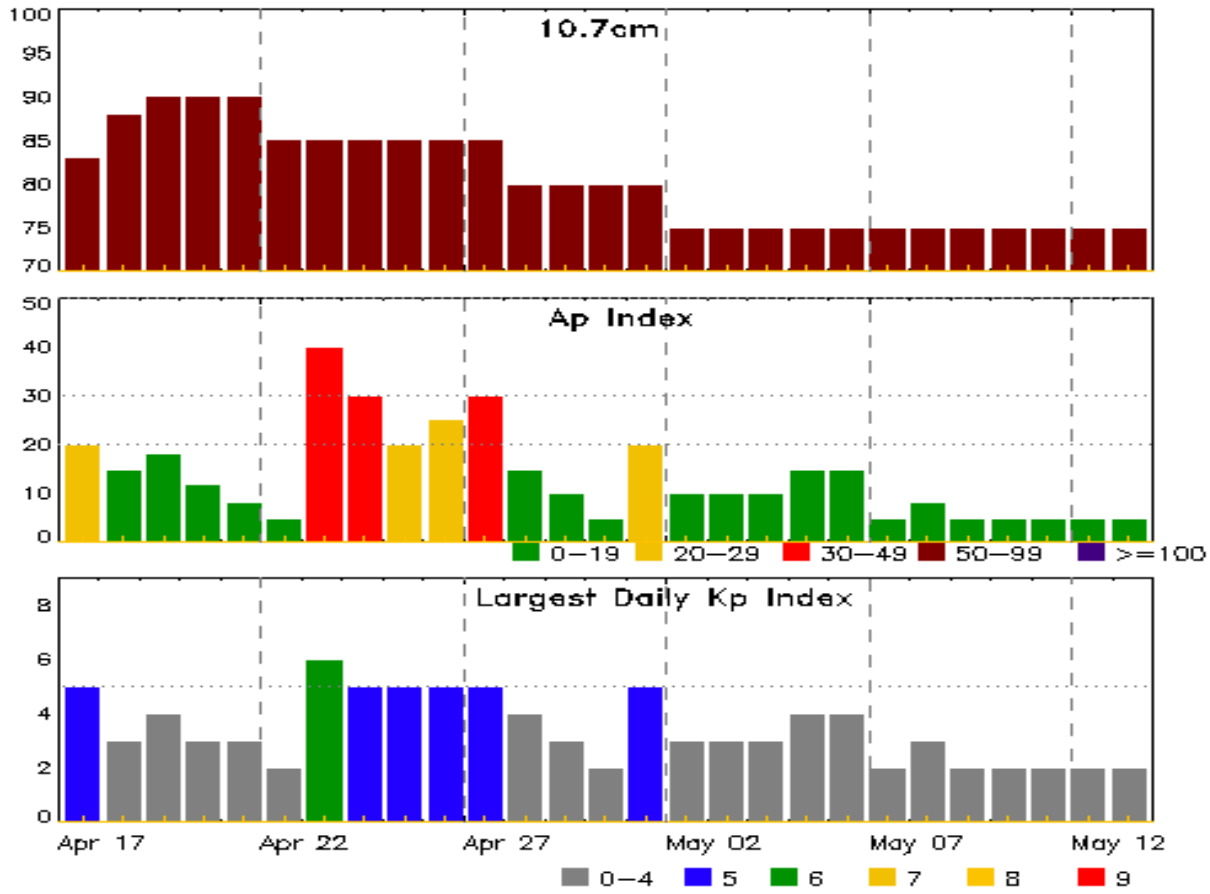
## *Daily Geomagnetic Data*

| Date | Middle Latitude Fredericksburg | | High Latitude College | | Estimated Planetary | |
|---|---|---|---|---|---|---|
| | A | K-indices | A | K-indices | A | K-indices |
| 10 April | 5 | 2-1-1-1-2-1-1-2 | 4 | 2-0-0-0-1-2-3-1 | 5 | 2-1-1-1-2-1-1-2 |
| 11 April | 10 | 1-1-3-3-3-2-3-2 | 17 | 1-0-3-6-3-2-3-1 | 12 | 1-2-3-4-3-2-3-2 |
| 12 April | 6 | 3-2-2-1-2-1-1-0 | 10 | 2-3-4-4-1-0-0-0 | 6 | 3-3-2-2-1-0-0-0 |
| 13 April | 4 | 0-1-1-1-2-1-2-1 | 2 | 0-1-0-0-1-1-1-1 | 5 | 1-2-1-0-1-1-2-2 |
| 14 April | 10 | 3-3-3-2-2-2-2-2 | 25 | 2-3-4-5-5-5-2-1 | 14 | 3-4-3-2-3-2-3-2 |
| 15 April | 5 | 2-2-2-1-2-1-1-0 | 4 | 2-3-2-0-1-1-0-0 | 7 | 3-2-2-1-1-1-1-1 |
| 16 April | 4 | 1-1-2-2-1-1-1-1 | 5 | 1-0-2-4-0-0-0-0 | 4 | 1-1-2-2-0-1-1-1 |

## *Alerts and Warnings Issued*

| Date & Time of Issue UTC | Type of Alert or Warning | Date & Time of Event UTC |
|---|---|---|
| 10 Apr 1121 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 09/1330 |
| 11 Apr 1030 | WARNING: Geomagnetic K = 4 | 11/1030 - 1500 |
| 11 Apr 1203 | ALERT: Geomagnetic K = 4 | 11/1159 |
| 11 Apr 1454 | EXTENDED WARNING: Geomagnetic K = 4 | 11/1030 - 2100 |
| 12 Apr 0159 | WARNING: Geomagnetic K = 4 | 12/0200 - 0900 |
| 12 Apr 1127 | ALERT: Electron 2MeV Integral Flux >= 1000pfu | 12/1115 |
| 13 Apr 0851 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 12/1115 |
| 14 Apr 0133 | WARNING: Geomagnetic K = 4 | 14/0135 - 0600 |
| 14 Apr 0557 | EXTENDED WARNING: Geomagnetic K = 4 | 14/0135 - 1200 |
| 14 Apr 0601 | ALERT: Geomagnetic K = 4 | 14/0559 |
| 14 Apr 1147 | EXTENDED WARNING: Geomagnetic K = 4 | 14/0135 - 1800 |
| 14 Apr 1248 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 12/1115 |
| 14 Apr 1918 | WATCH: Geomagnetic Storm Category G1 predicted | |
| 15 Apr 1546 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 12/1115 |

## *Twenty-seven Day Outlook*




| Date | Radio Flux 10.7cm | Planetary A Index | Largest Kp Index | Date | Radio Flux 10.7cm | Planetary A Index | Largest Kp Index |
|---|---|---|---|---|---|---|---|
| 17 Apr | 83 | 20 | 5 | 01 May | 80 | 20 | 5 |
| 18 | 88 | 15 | 3 | 02 | 75 | 10 | 3 |
| 19 | 90 | 18 | 4 | 03 | 75 | 10 | 3 |
| 20 | 90 | 12 | 3 | 04 | 75 | 10 | 3 |
| 21 | 90 | 8 | 3 | 05 | 75 | 15 | 4 |
| 22 | 85 | 5 | 2 | 06 | 75 | 15 | 4 |
| 23 | 85 | 40 | 6 | 07 | 75 | 5 | 2 |
| 24 | 85 | 30 | 5 | 08 | 75 | 8 | 3 |
| 25 | 85 | 20 | 5 | 09 | 75 | 5 | 2 |
| 26 | 85 | 25 | 5 | 10 | 75 | 5 | 2 |
| 27 | 85 | 30 | 5 | 11 | 75 | 5 | 2 |
| 28 | 80 | 15 | 4 | 12 | 75 | 5 | 2 |
| 29 | 80 | 10 | 3 | 13 | 75 | 5 | 2 |
| 30 | 80 | 5 | 2 | | | | |

## *Energetic Events*

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

**No Events Observed**

## *Flare List*

| | Time | | | | Optical | | |
|---|---|---|---|---|---|---|---|
| Date | Begin | Max | End | X-ray Class | Imp/ Brtns | Location Lat CMD | Rgn # |
| 10 Apr | 0423 | 0436 | 0447 | B2.7 | | | 2650 |
| 10 Apr | 0836 | 0839 | 0847 | B1.1 | SF | N12E65 | 2650 |
| 10 Apr | 0953 | 0958 | 1012 | B1.3 | | | 2650 |
| 10 Apr | 1816 | 1823 | 1828 | B4.8 | SF | N14E66 | 2650 |
| 10 Apr | 2117 | 2122 | 2126 | B1.6 | | | 2650 |
| 11 Apr | 0256 | 0300 | 0304 | B3.9 | | | 2650 |
| 11 Apr | 0345 | 0400 | 0412 | B1.3 | | | 2650 |
| 11 Apr | 1059 | 1111 | 1116 | B1.3 | | | 2650 |
| 11 Apr | 1846 | 1850 | 1854 | B1.0 | | | 2650 |
| 11 Apr | 1938 | 1945 | 1953 | B1.4 | | | 2650 |
| 12 Apr | 0007 | 0011 | 0032 | B1.3 | | | 2650 |
| 12 Apr | 1427 | 1432 | 1438 | B2.1 | | | |
| 12 Apr | 1441 | 1441 | 1444 | | SF | N15E40 | |
| 13 Apr | 1554 | 1554 | 1600 | | SF | N14E26 | |
| 14 Apr | 1618 | 1621 | 1625 | B1.2 | | | |
| 16 Apr | 2153 | 2158 | 2210 | B2.6 | | | |

## *Region Summary*

| | Location | | Sunspot Characteristics | | | | | Flares | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Helio | Area | Extent | Spot | Spot | Mag | X-ray | | | Optical | | | | |
| Date | Lat CMD | Lon | $10^{-6}$ hemi. | (helio) | Class | Count | Class | C | M | X | S | 1 | 2 | 3 | 4 |
| | | | ***Region 2648*** | | | | | | | | | | | | |
| 01 Apr | S03E72 | 293 | 10 | 3 | Bxo | 2 | B | | | | | | | | |
| 02 Apr | S03E61 | 291 | 20 | 5 | Cro | 3 | B | | | | | | | | |
| 03 Apr | S03E50 | 288 | 30 | 7 | Dro | 6 | B | | | | | | | | |
| 04 Apr | S03E37 | 288 | 30 | 8 | Cro | 8 | B | 1 | | | 1 | | | | |
| 05 Apr | S02E22 | 288 | 50 | 7 | Bxo | 5 | B | | | | | | | | |
| 06 Apr | S03E07 | 292 | 20 | 4 | Bxo | 4 | B | | | | | | | | |
| 07 Apr | S03W04 | 290 | 0 | 3 | Axx | 2 | A | | | | | | | | |
| 08 Apr | S03W19 | 291 | plage | | | | | | | | | | | | |
| 09 Apr | S03W34 | 293 | plage | | | | | | | | | | | | |
| 10 Apr | S03W49 | 295 | plage | | | | | | | | | | | | |
| 11 Apr | S03W64 | 297 | plage | | | | | | | | | | | | |
| 12 Apr | S03W79 | 299 | plage | | | | | | | | | | | | |
| | | | | | | | | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

Crossed West Limb.
Absolute heliographic longitude: 290

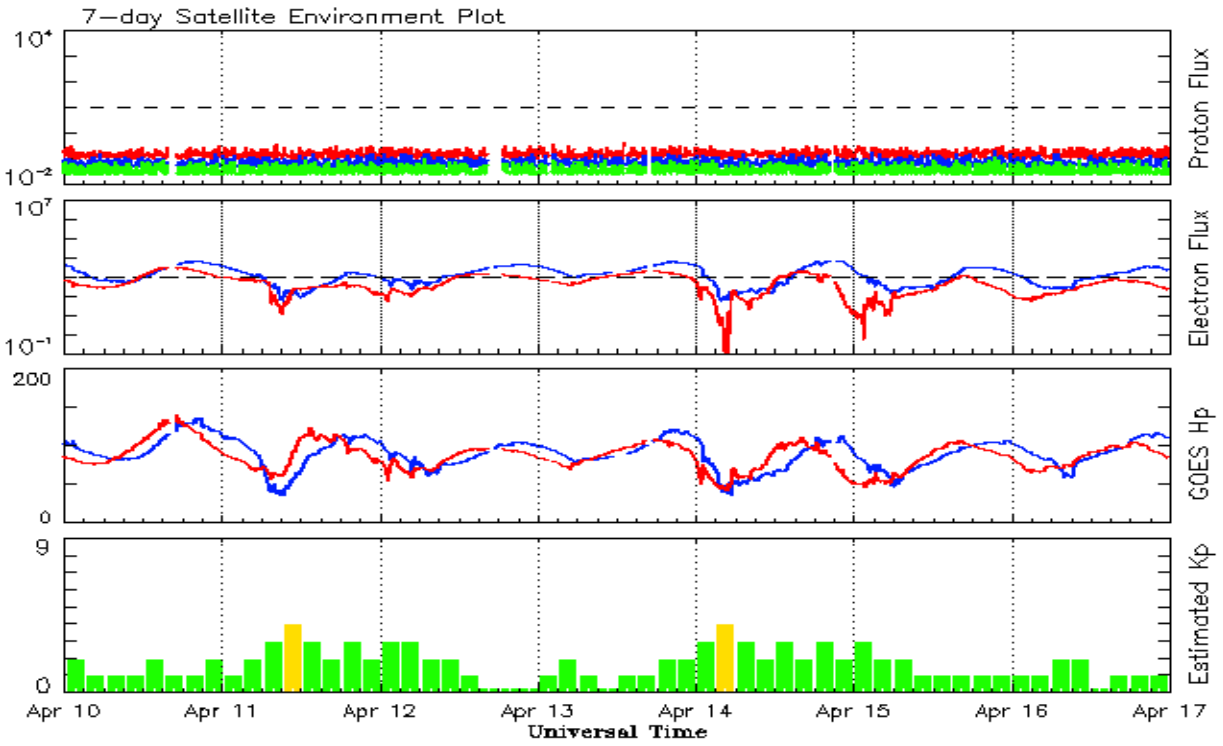
| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ***Region 2650*** | | | | | | | | | | | | |
| 09 Apr | N08E71 | 188 | 20 | 4 | Cro | 3 | B | | | | | | | | |
| 10 Apr | N09E56 | 190 | 40 | 6 | Cao | 3 | B | | | | 2 | | | | |
| 11 Apr | N11E40 | 193 | 40 | 6 | Cao | 2 | B | | | | | | | | |
| 12 Apr | N10E27 | 193 | 20 | 7 | Cso | 3 | B | | | | | | | | |
| 13 Apr | N08E14 | 192 | 20 | 7 | Cso | 2 | B | | | | | | | | |
| 14 Apr | N08W02 | 194 | 10 | | Hrx | 1 | A | | | | | | | | |
| 15 Apr | N08W16 | 196 | 10 | 1 | Axx | 1 | A | | | | | | | | |
| 16 Apr | N08W30 | 197 | plage | | | | | | | | | | | | |
| | | | | | | | | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |

Still on Disk.
Absolute heliographic longitude: 194

## *Recent Solar Indices (preliminary)*
## *Observed monthly mean values*

| | Sunspot Numbers | | | | | Radio Flux | | Geomagnetic | |
|---|---|---|---|---|---|---|---|---|---|
| | Observed values | | Ratio | Smooth values | | Penticton | Smooth | Planetary | Smooth |
| Month | SEC | RI | RI/SEC | SEC | RI | 10.7 cm | Value | Ap | Value |
| | | | | ***2015*** | | | | | |
| April | 72.5 | 45.2 | 0.75 | 80.5 | 47.3 | 129.2 | 127.3 | 12 | 12.4 |
| May | 83.0 | 53.3 | 0.71 | 77.5 | 45.7 | 120.1 | 123.3 | 9 | 12.7 |
| June | 77.3 | 39.9 | 0.53 | 73.1 | 43.3 | 123.2 | 119.5 | 14 | 13.0 |
| July | 68.4 | 39.5 | 0.58 | 68.2 | 41.0 | 107.0 | 116.0 | 10 | 13.1 |
| August | 61.6 | 38.6 | 0.63 | 65.5 | 39.8 | 106.2 | 113.3 | 16 | 13.1 |
| September | 72.5 | 47.2 | 0.65 | 64.0 | 39.5 | 102.1 | 110.8 | 16 | 12.8 |
| October | 59.5 | 38.2 | 0.62 | 61.8 | 38.6 | 104.1 | 107.9 | 15 | 12.5 |
| November | 61.8 | 37.3 | 0.61 | 59.0 | 36.7 | 109.6 | 105.3 | 13 | 12.5 |
| December | 54.1 | 34.8 | 0.64 | 55.1 | 34.7 | 112.8 | 102.5 | 15 | 12.5 |
| | | | | ***2016*** | | | | | |
| January | 50.4 | 34.2 | 0.67 | 51.4 | 32.6 | 103.5 | 99.9 | 10 | 12.3 |
| February | 56.0 | 33.8 | 0.61 | 49.6 | 31.5 | 103.5 | 98.1 | 10 | 12.0 |
| March | 40.9 | 32.5 | 0.80 | 47.7 | 30.2 | 91.6 | 96.6 | 11 | 11.8 |
| April | 39.2 | 22.7 | 0.58 | 45.0 | 28.7 | 93.4 | 95.3 | 10 | 11.8 |
| May | 48.9 | 30.9 | 0.64 | 42.1 | 26.9 | 93.1 | 93.2 | 12 | 11.7 |
| June | 19.3 | 12.3 | 0.65 | 39.0 | 24.9 | 81.9 | 90.4 | 9 | 11.4 |
| July | 36.8 | 19.4 | 0.53 | 36.5 | 23.1 | 85.9 | 87.7 | 10 | 11.2 |
| August | 50.4 | 30.1 | 0.60 | 34.2 | 21.6 | 85.0 | 85.5 | 10 | 11.2 |
| September | 37.4 | 26.8 | 0.72 | 32.1 | 19.9 | 87.8 | 83.7 | 16 | 11.3 |
| October | 30.0 | 20.0 | 0.67 | | | 86.1 | | 16 | |
| November | 22.4 | 12.8 | 0.57 | | | 78.7 | | 10 | |
| December | 17.6 | 11.1 | 0.64 | | | 75.1 | | 10 | |
| | | | | ***2017*** | | | | | |
| January | 28.1 | 15.5 | 0.55 | | | 77.4 | | 10 | |
| February | 22.0 | 15.7 | 0.71 | | | 76.9 | | 10 | |
| March | 25.4 | 10.6 | 0.42 | | | 74.6 | | 15 | |

**Note:** Values are final except for the most recent 6 months which are considered preliminary. Cycle 24 started in Dec 2008 with an RI=1.7.




*Weekly Geosynchronous Satellite Environment Summary*
*Week Beginning 10 April 2017*

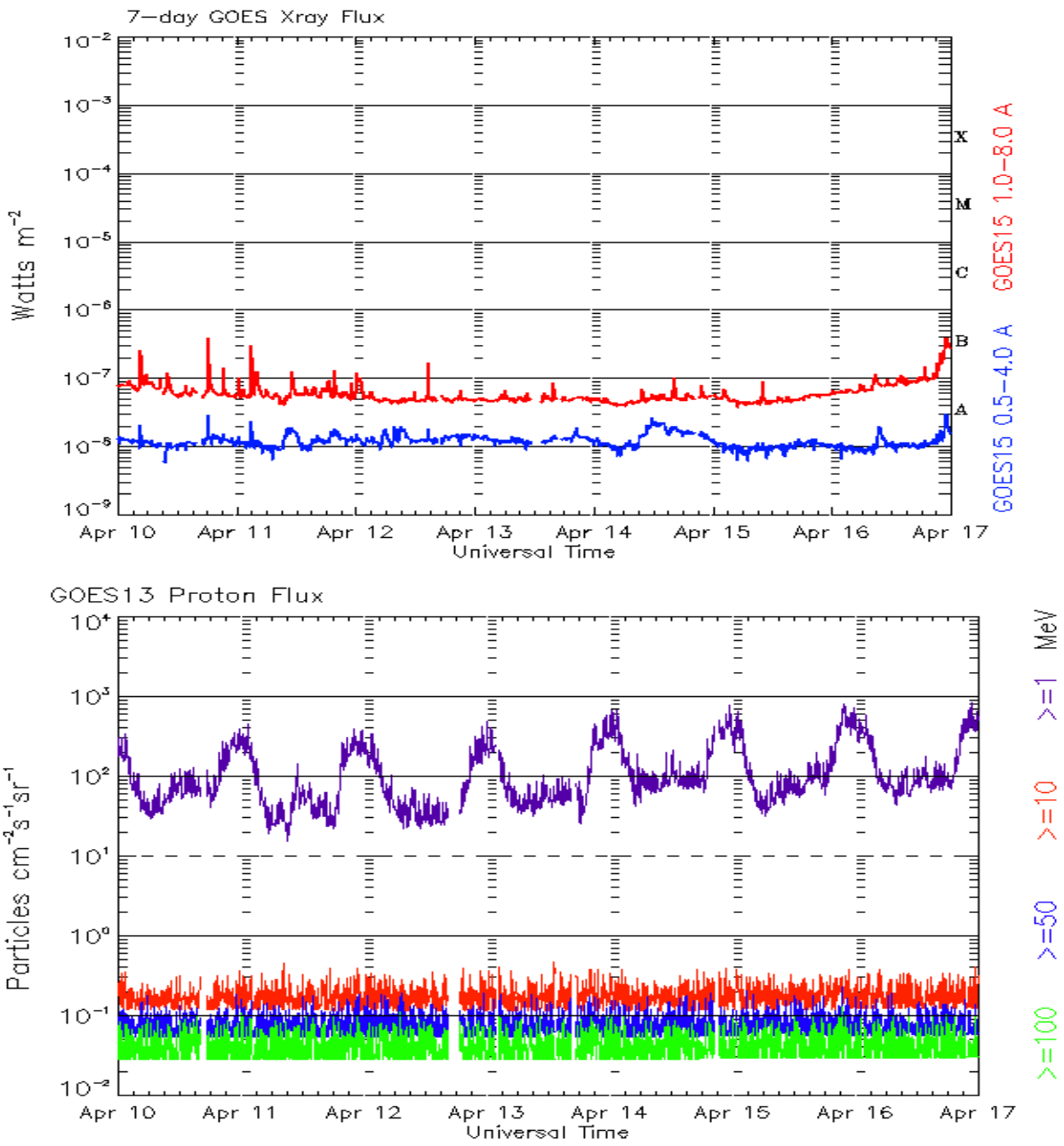
The proton flux plot contains the five-minute averaged integral proton flux (protons/cm$^2$-sec -sr) as measured by the SWPC Primary GOES satellite, near West 75, for each of three energy thresholds: greater than 10, 50, and 100 MeV.

The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm$^2$-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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

The Estimated 3-hour Planetary Kp-index is derived at the NOAA Space Weather Prediction Center using data from the following ground-based magnetometers: Boulder, Colorado; Chambon la Foret, France; Fredericksburg, Virginia; Fresno, California; Hartland, UK; Newport, Washington; Sitka, Alaska. These data are made available thanks to the cooperative efforts between SWPC and data providers around the world, which currently includes the U.S. Geological Survey, the British Geological Survey, and the Institut de Physique du Globe de Paris.

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*
*Week Beginning 10 April 2017*

The x-ray plots contains five-minute averages x-ray flux (Watt/m$^2$) as measure by the SWPC primary GOES X-ray satellite, usually at West 105 longitude, 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 intergral flux units (pfu = protons/cm$^2$ -sec -sr) as measured by the primary SWPC GOES Proton satellite for each of the energy thresholds: >1, >10, >30, and >100 MeV. The P10 event threshold is 10 pfu at greater than 10 MeV.

## *Preliminary Report and Forecast of Solar Geophysical Data (The Weekly)*

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**Notice:** The 27-day Outlook, Satellite Environment, X-ray and Proton plots have been redesigned. Comments and suggestions are welcome SWPC.Webmaster@noaa.gov

The Weekly has been published continuously since 1951 and is available online since 1997.

http://spaceweather.gov/weekly/ -- Current and previous year
http://spaceweather.gov/ftpmenu/warehouse.html -- Online achive from 1997
http://spaceweather.gov/ftpmenu/ -- Some content as ascii text
http://spaceweather.gov/SolarCycle/ -- Solar Cycle Progression web site

http://spaceweather.gov/contacts.html -- Contact and Copyright information
http://spaceweather.gov/weekly/Usr_guide.pdf -- User Guide