**Space Weather Highlights**
**24 April - 30 April 2017**

**SWPC PRF 2174**
**01 May 2017**

Solar activity was at very low levels. The most significant event of the period was observed early on 30 April at 0057 UTC when Region 2653 (S09, L=031, class/area, Hax/110 on 23 Apr) produced a long-duration B3 flare with an associated slow-moving CME off the WSW limb, first visible in LASCO C2 imagery at 30/0336 UTC. Analysis and subsequent WSA-Enlil model output suggested a possible weak, glancing blow at Earth beginning late on 03 May.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached very high levels on 24-28 April and high levels on 29-30 April. A maximum flux of 66,472 pfu was observed at 26/1735 UTC.

Geomagnetic field activity was at quiet to active levels on 24-25 April under the waning influence of a negative polarity CH HSS. Predominately quiet levels were observed from 26-30 April.

**Space Weather Outlook**
**01 May - 27 May 2017**

Solar activity is expected to be very low with a slight 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 likely to reach high levels on 01-02, 04-06, 17-20 and 24-27 May with very high levels likely on 21-23 May. Normal to moderate flux levels are expected for the remainder of the period.

Geomagnetic field activity is likely to reach G2 (Moderate) geomagnetic storm levels on 19-20 May with G1 (Minor) geomagnetic storm levels likely on 17-18 May due to the influence of multiple, recurrent CH HSSs. Active conditions are likely on 01, 16 and 21 May due to CH HSS influence with additional active conditions possible on 03-04 May due to CME effects. Quiet to unsettled levels are expected for the remainder of the period.

## *Daily Solar Data*

| Date | Radio Flux 10.7cm | Sun spot No. | Sunspot Area ($10^{-6}$ hemi.) | X-ray Background Flux | | Flares | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | X-ray | | | Optical | | | |
| | | | | | | C | M | X | S | 1 | 2 | 3 | 4 |
| 24 April | 80 | 41 | 210 | B1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 April | 81 | 36 | 150 | A9.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 April | 80 | 36 | 140 | A9.5 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 27 April | 78 | 23 | 110 | A9.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 April | 78 | 35 | 100 | A8.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 April | 77 | 34 | 80 | A7.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 April | 77 | 33 | 60 | A7.3 | 0 | 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 |
| 24 April | 6.1e+07 | 1.5e+04 | 3.3e+03 | 1.2e+09 | | |
| 25 April | 4.7e+07 | 1.5e+04 | 3.4e+03 | 1.6e+09 | | |
| 26 April | 5.5e+07 | 1.5e+04 | 3.4e+03 | 2.4e+09 | | |
| 27 April | 6.1e+07 | 1.6e+04 | 3.3e+03 | 2.8e+09 | | |
| 28 April | 4.7e+07 | 1.5e+04 | 3.5e+03 | 2.8e+09 | | |
| 29 April | 4.6e+07 | 1.6e+04 | 3.6e+03 | 7.6e+08 | | |
| 30 April | 2.9e+07 | 1.5e+04 | 3.5e+03 | 2.7e+08 | | |

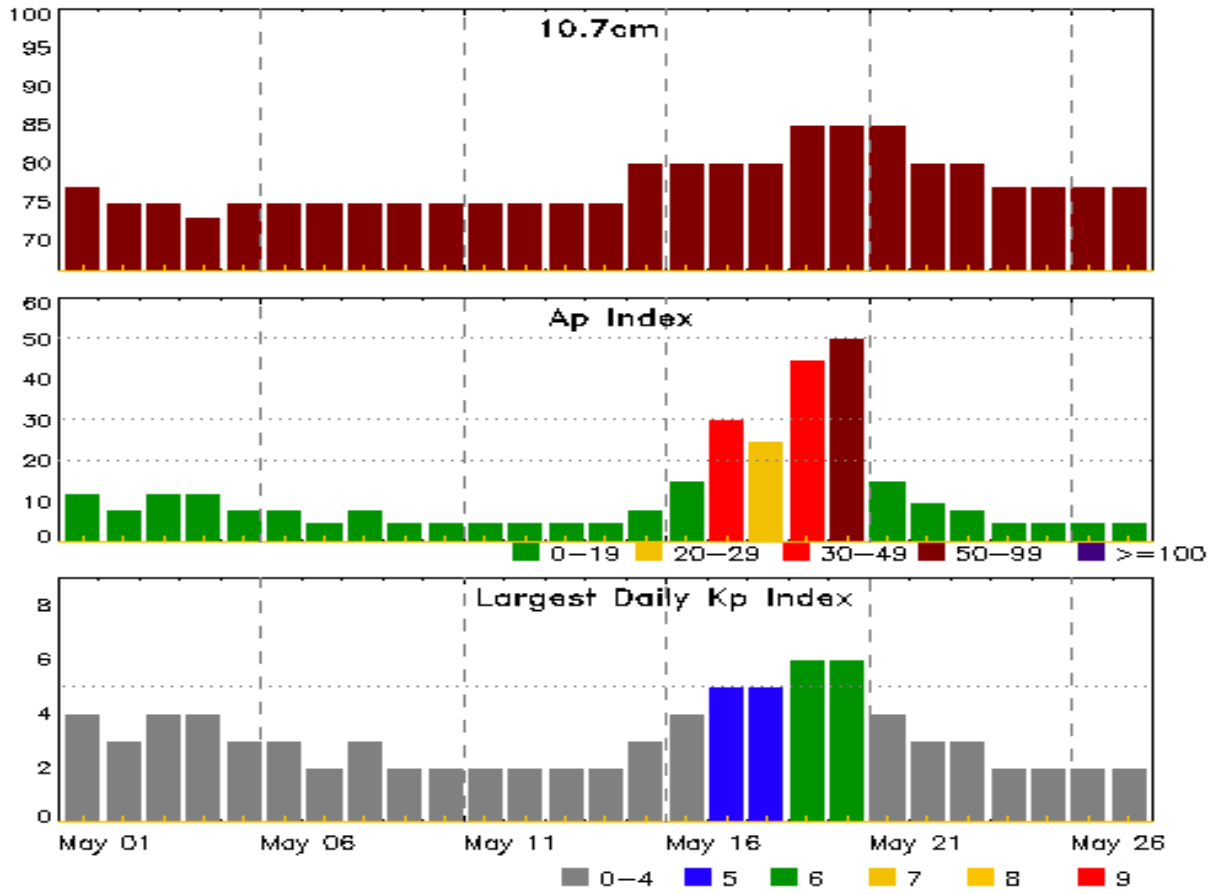
## *Daily Geomagnetic Data*

| Date | Middle Latitude Fredericksburg | | High Latitude College | | Estimated Planetary | |
|---|---|---|---|---|---|---|
| | A | K-indices | A | K-indices | A | K-indices |
| 24 April | 19 | 4-4-4-4-2-2-3-3 | 36 | 3-3-6-6-4-4-4-3 | 20 | 4-4-4-4-2-3-4-3 |
| 25 April | 10 | 3-3-3-2-2-1-2-2 | 28 | 3-2-5-6-5-3-2-1 | 12 | 4-3-3-3-3-2-3-2 |
| 26 April | 8 | 3-1-3-1-2-2-2-1 | 14 | 2-3-4-3-3-3-2-2 | 9 | 3-2-3-2-2-2-2-2 |
| 27 April | 10 | 2-3-3-0-2-1-4-2 | 11 | 2-3-5-2-1-1-1-1 | 7 | 2-3-3-1-1-1-2-2 |
| 28 April | 6 | 1-1-2-1-2-2-1-3 | 7 | 1-1-4-2-1-1-1-1 | 6 | 1-1-2-1-2-1-1-2 |
| 29 April | 6 | 2-2-2-1-1-2-2-2 | 8 | 2-1-3-3-3-1-0-1 | 6 | 2-1-2-2-1-1-2-2 |
| 30 April | 6 | 2-1-1-1-2-2-2-2 | 8 | 2-1-2-4-1-1-2-1 | 6 | 2-1-2-2-1-1-2-2 |

## *Alerts and Warnings Issued*

| Date & Time of Issue UTC | Type of Alert or Warning | Date & Time of Event UTC |
|---|---|---|
| 24 Apr 0256 | EXTENDED WARNING: Geomagnetic K = 5 | 21/1920 - 24/0900 |
| 24 Apr 0500 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 21/1425 |
| 24 Apr 0842 | EXTENDED WARNING: Geomagnetic K = 5 | 21/1920 - 24/1500 |
| 24 Apr 0848 | EXTENDED WARNING: Geomagnetic K = 4 | 21/1546 - 25/0900 |
| 25 Apr 0500 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 21/1425 |
| 26 Apr 0500 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 21/1425 |
| 26 Apr 1300 | CANCELLATION: Geomagnetic Storm Category G1 predicted | |
| 27 Apr 0500 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 21/1425 |
| 28 Apr 0500 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 21/1425 |
| 29 Apr 0500 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 21/1425 |
| 30 Apr 0740 | CONTINUED ALERT: Electron 2MeV Integral Flux >= 1000pfu | 21/1425 |

## *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 |
|---|---|---|---|---|---|---|---|
| 01 May | 77 | 12 | 4 | 15 May | 80 | 8 | 3 |
| 02 | 75 | 8 | 3 | 16 | 80 | 15 | 4 |
| 03 | 75 | 12 | 4 | 17 | 80 | 30 | 5 |
| 04 | 73 | 12 | 4 | 18 | 80 | 25 | 5 |
| 05 | 75 | 8 | 3 | 19 | 85 | 45 | 6 |
| 06 | 75 | 8 | 3 | 20 | 85 | 50 | 6 |
| 07 | 75 | 5 | 2 | 21 | 85 | 15 | 4 |
| 08 | 75 | 8 | 3 | 22 | 80 | 10 | 3 |
| 09 | 75 | 5 | 2 | 23 | 80 | 8 | 3 |
| 10 | 75 | 5 | 2 | 24 | 77 | 5 | 2 |
| 11 | 75 | 5 | 2 | 25 | 77 | 5 | 2 |
| 12 | 75 | 5 | 2 | 26 | 77 | 5 | 2 |
| 13 | 75 | 5 | 2 | 27 | 77 | 5 | 2 |
| 14 | 75 | 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 # |
| 24 Apr | 2131 | 2136 | 2141 | B2.2 | | | 2653 |
| 24 Apr | 2215 | 2219 | 2225 | B2.6 | | | 2652 |
| 25 Apr | 0016 | 0024 | 0032 | B1.1 | | | |
| 25 Apr | 0539 | 0542 | 0550 | B1.0 | | | 2651 |
| 25 Apr | 0656 | 0701 | 0714 | B1.2 | | | 2651 |
| 25 Apr | 2014 | 2025 | 2037 | B7.2 | | | 2651 |
| 26 Apr | 0229 | 0232 | 0236 | B1.4 | | | 2653 |
| 26 Apr | 1224 | 1230 | 1246 | B2.9 | | | 2652 |
| 26 Apr | 1528 | 1538 | 1550 | B3.4 | | | 2652 |
| 26 Apr | 1736 | 1748 | 1758 | B4.5 | SF | S12E15 | 2653 |
| 28 Apr | 1709 | 1712 | 1715 | B1.3 | | | 2653 |
| 30 Apr | 0012 | 0057 | 0225 | B3.0 | | | 2653 |
| 30 Apr | 1827 | 1832 | 1837 | B1.9 | | | 2651 |
| 30 Apr | 2344 | 2348 | 2350 | B1.1 | | | |

## *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 2651*** | | | | | | | | | | | | |
| 17 Apr | N12E81 | 72 | plage | | | | | 1 | | | | | | | |
| 18 Apr | N12E67 | 72 | 20 | 1 | Dso | 2 | BG | 2 | | | | | | | |
| 19 Apr | N13E57 | 69 | 110 | 5 | Dso | 4 | BG | | | | | | | | |
| 20 Apr | N12E44 | 70 | 130 | 5 | Dao | 5 | B | | | | 2 | | | | |
| 21 Apr | N12E30 | 71 | 130 | 5 | Cao | 7 | B | | | | 4 | | | | |
| 22 Apr | N12E17 | 71 | 140 | 5 | Cao | 7 | B | | | | 2 | | | | |
| 23 Apr | N12E04 | 70 | 150 | 5 | Cso | 8 | B | | | | | | | | |
| 24 Apr | N11W09 | 70 | 110 | 5 | Hax | 6 | A | | | | | | | | |
| 25 Apr | N11W23 | 71 | 80 | 5 | Hsx | 3 | A | | | | | | | | |
| 26 Apr | N11W35 | 70 | 80 | 5 | Hsx | 2 | A | | | | | | | | |
| 27 Apr | N10W50 | 72 | 70 | 4 | Hsx | 2 | A | | | | | | | | |
| 28 Apr | N12W63 | 71 | 60 | 5 | Hsx | 2 | A | | | | | | | | |
| 29 Apr | N12W76 | 71 | 40 | 4 | Hsx | 2 | A | | | | | | | | |
| 30 Apr | N13W90 | 72 | 30 | 1 | Hsx | 1 | A | | | | | | | | |
| | | | | | | | | 3 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |

Still on Disk.
Absolute heliographic longitude: 70

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ***Region 2652*** | | | | | | | | | | | | |
| 20 Apr | N13E60 | 54 | 10 | 1 | Hrx | 1 | A | | | | | | | | |
| 21 Apr | N13E45 | 56 | 10 | 1 | Hrx | 1 | A | | | | | | | | |
| 22 Apr | N13E31 | 57 | plage | | | | | | | | | | | | |
| 23 Apr | N14E17 | 57 | 10 | 3 | Bxo | 3 | B | | | | | | | | |
| 24 Apr | N13E01 | 60 | 10 | 2 | Bxo | 3 | B | | | | | | | | |
| 25 Apr | N13W13 | 61 | 10 | | Axx | 1 | A | | | | | | | | |
| 26 Apr | N14W26 | 61 | 10 | 1 | Axx | 3 | A | | | | | | | | |
| 27 Apr | N14W40 | 62 | plage | | | | | | | | | | | | |
| 28 Apr | N14W54 | 62 | plage | | | | | | | | | | | | |
| 29 Apr | N14W68 | 63 | plage | | | | | | | | | | | | |
| 30 Apr | N14W82 | 64 | plage | | | | | | | | | | | | |
| | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Still on Disk.
Absolute heliographic longitude: 60

## *Region Summary - continued*

| | 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 2653*** | | | | | | | | | | | | |
| 21 Apr | S09E82 | 19 | 40 | 2 | Hax | 1 | A | | | | | | | | |
| 22 Apr | S09E57 | 31 | 100 | 4 | Hax | 2 | A | | | | | | | | |
| 23 Apr | S09E45 | 29 | 100 | 4 | Hax | 2 | A | | | | | | | | |
| 24 Apr | S08E34 | 27 | 90 | 2 | Hax | 2 | A | | | | | | | | |
| 25 Apr | S11E21 | 27 | 60 | 2 | Hax | 2 | A | | | | | | | | |
| 26 Apr | S09E08 | 27 | 50 | 3 | Hsx | 1 | A | | | | 1 | | | | |
| 27 Apr | S09W06 | 28 | 40 | 2 | Hax | 1 | A | | | | | | | | |
| 28 Apr | S09W20 | 28 | 30 | 1 | Hsx | 1 | A | | | | | | | | |
| 29 Apr | S09W33 | 28 | 30 | 1 | Hsx | 1 | A | | | | | | | | |
| 30 Apr | S09W46 | 28 | 20 | 1 | Hrx | 1 | A | | | | | | | | |
| | | | | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

Still on Disk.
Absolute heliographic longitude: 28

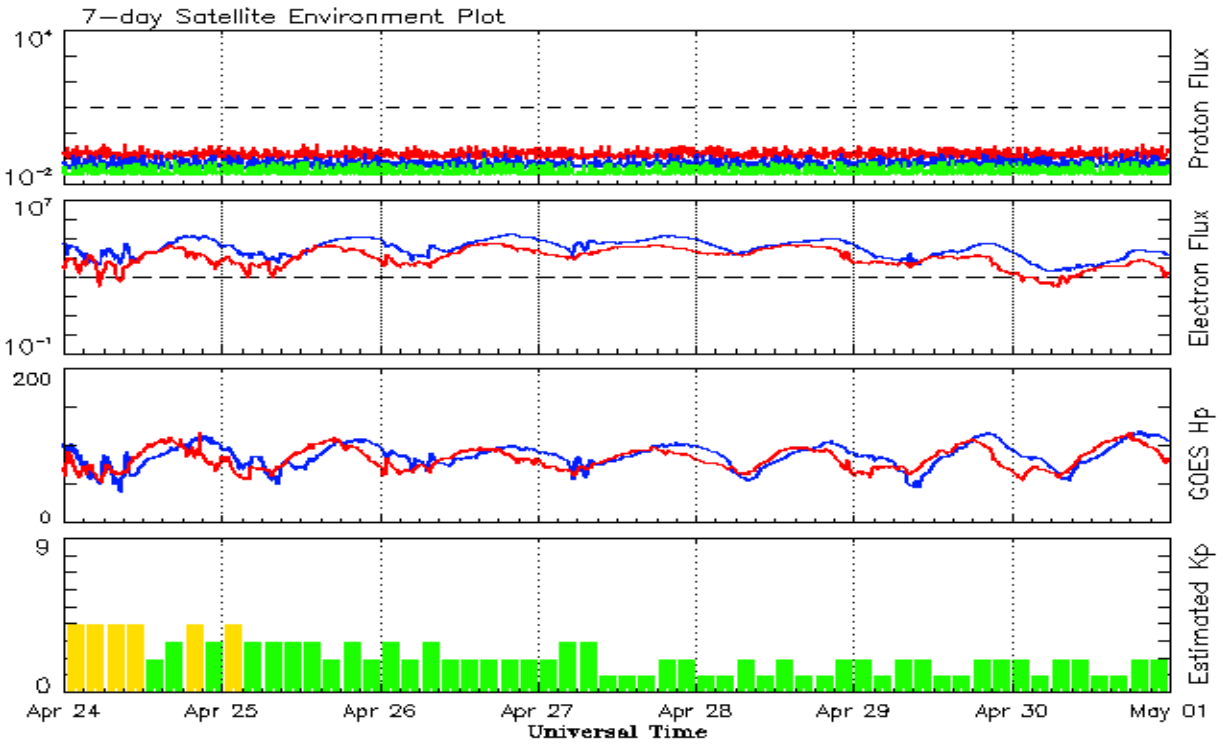
| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ***Region 2654*** | | | | | | | | | | | | |
| 28 Apr | N10E52 | 316 | 10 | 1 | Axx | 2 | A | | | | | | | | |
| 29 Apr | N11E38 | 317 | 10 | 1 | Axx | 1 | A | | | | | | | | |
| 30 Apr | N11E25 | 317 | 10 | 1 | Axx | 1 | A | | | | | | | | |
| | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Still on Disk.
Absolute heliographic longitude: 317

## *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*** | | | | | |
| 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 | 31.1 | | 86.1 | 82.5 | 16 | 11.6 |
| 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 | |
| April | 30.4 | | | | | 80.9 | | 13 | |

**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 24 April 2017*

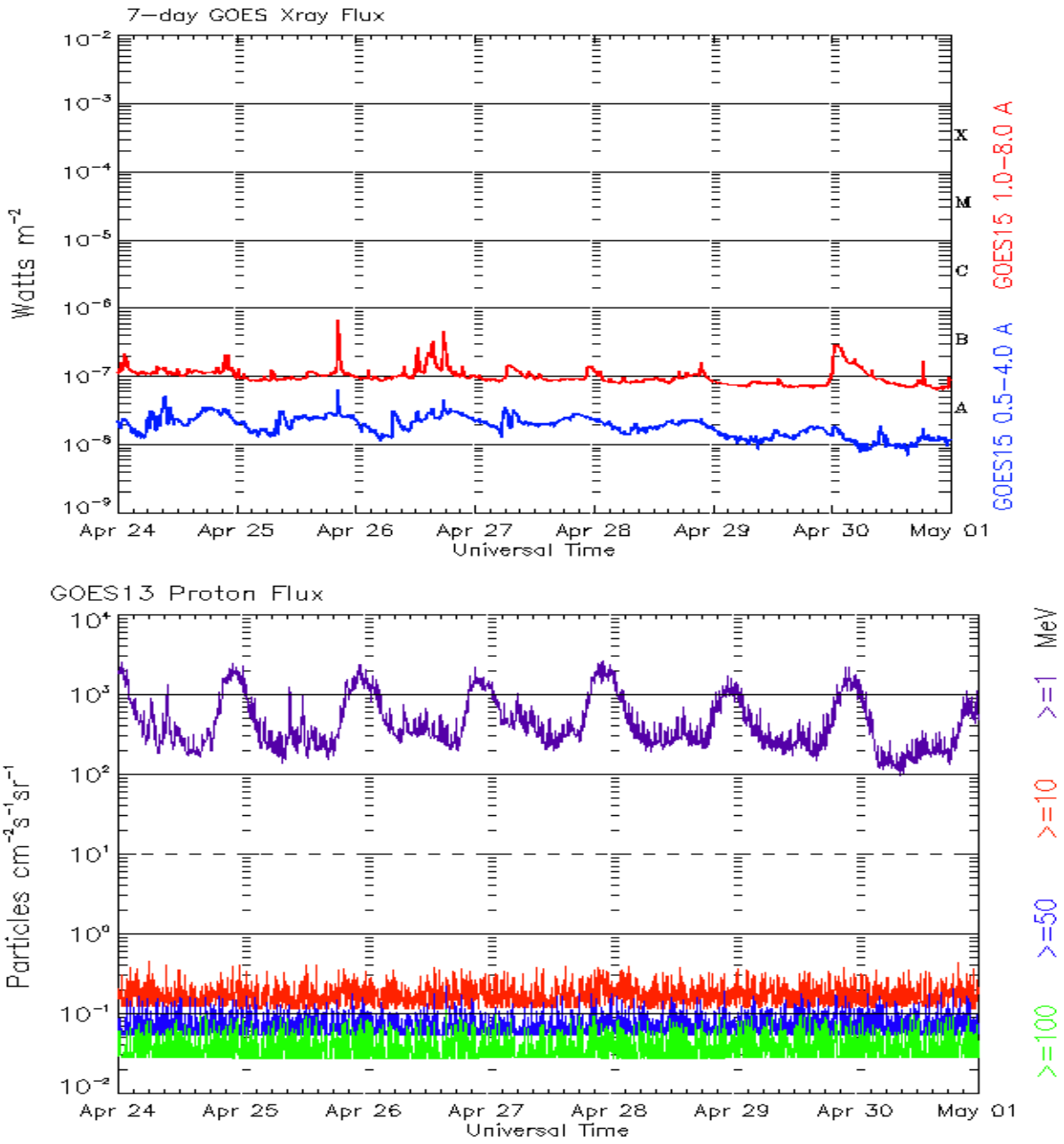
The proton flux plot contains the five-minute averaged integral proton flux (protons/cm$^2$-sec -sr) as measured by the SWPC Primary GOES satellite, near West 75, for each of three energy thresholds: greater than 10, 50, and 100 MeV.

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 24 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)*

Published every Monday by the Space Weather Prediction Center.

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NOAA / National Weather Service
Space Weather Prediction Center
325 Broadway, Boulder CO 80305

**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