

**Space Weather Highlights**  
**15 April - 21 April 2019**

**SWPC PRF 2277**  
**22 April 2019**

Solar activity was very low throughout the period. Region 2738 (N06, L=301, class/area-Hhx/400 on 17 Apr) produced several B-class events including a B8 flare at 20/0050 UTC. Region 2739 (N05, L=258, class/area-Cro/20 on 18 Apr) was inactive and stable during its migration across the solar disk. No Earth-directed coronal mass ejections (CMEs) were observed.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels on 15 April with moderate levels observed throughout the remainder of the reporting period.

Geomagnetic field activity reached unsettled levels on 15-16 April due to coronal hole high-speed stream (CH HSS) influence. Quiet conditions were observed throughout the remainder of the reporting period.

**Space Weather Outlook**  
**22 April - 18 May 2019**

Solar activity is expected to be very low 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 high levels on 02-12 May with normal to moderate levels expected throughout the remainder of the outlook period.

Geomagnetic field activity is expected to reach active levels on 27 April and 01-02, 07 May in response to several recurrent, negative-polarity CH HSSs. Quiet to unsettled levels are expected throughout the remainder of the outlook period.



### ***Daily Solar Data***

| Date     | Radio<br>Flux<br>10.7cm | Sun<br>spot<br>No. | Sunspot<br>Area<br>(10 <sup>-6</sup> hemi.) | X-ray<br>Background<br>Flux | Flares |   |   |         |   |   |   |   |
|----------|-------------------------|--------------------|---|-----------------------------|--------|---|---|---------|---|---|---|---|
|          |                         |                    |   |                             | X-ray  |   |   | Optical |   |   |   |   |
|          |                         |                    |   |                             | C      | M | X | S       | 1 | 2 | 3 | 4 |
| 15 April | 75                      | 11                 | 300   | A0.0                        | 0      | 0 | 0 | 1       | 0 | 0 | 0 | 0 |
| 16 April | 74                      | 11                 | 330   | A0.0                        | 0      | 0 | 0 | 0       | 0 | 0 | 0 | 0 |
| 17 April | 76                      | 24                 | 410   | A0.0                        | 0      | 0 | 0 | 0       | 0 | 0 | 0 | 0 |
| 18 April | 75                      | 23                 | 280   | A0.0                        | 0      | 0 | 0 | 0       | 0 | 0 | 0 | 0 |
| 19 April | 73                      | 23                 | 270   | A8.2                        | 0      | 0 | 0 | 0       | 0 | 0 | 0 | 0 |
| 20 April | 70                      | 11                 | 10  | A8.1                        | 0      | 0 | 0 | 0       | 0 | 0 | 0 | 0 |
| 21 April | 69                      | 0                  | 0   | A7.2                        | 0      | 0 | 0 | 0       | 0 | 0 | 0 | 0 |

### ***Daily Particle Data***

| Date     | Proton Fluence<br>(protons/cm <sup>2</sup> -day -sr) |         |          | Electron Fluence<br>(electrons/cm <sup>2</sup> -day -sr) |         |        |
|----------|--|---------|----------|--|---------|--------|
|          | >1 MeV   | >10 MeV | >100 MeV | >0.6 MeV   | >2MeV   | >4 MeV |
|          |  |         |          |  |         |        |
| 15 April | 7.1e+05  | 1.9e+04 | 3.8e+03  |  | 5.6e+07 |        |
| 16 April | 5.9e+05  | 1.8e+04 | 3.5e+03  |  | 1.8e+07 |        |
| 17 April | 7.7e+05  | 1.8e+04 | 3.7e+03  |  | 2.6e+07 |        |
| 18 April | 8.7e+05  | 1.8e+04 | 3.9e+03  |  | 2.3e+07 |        |
| 19 April | 9.3e+05  | 1.8e+04 | 3.6e+03  |  | 1.7e+07 |        |
| 20 April | 7.7e+05  | 1.8e+04 | 3.7e+03  |  | 7.8e+06 |        |
| 21 April | 7.2e+05  | 1.9e+04 | 3.7e+03  |  | 7.7e+06 |        |

### ***Daily Geomagnetic Data***

| Date     | Middle Latitude<br>Fredericksburg |                 | High Latitude<br>College |                 | Estimated<br>Planetary |                 |
|----------|-----------------------------------|-----------------|--------------------------|-----------------|------------------------|-----------------|
|          | A                                 | K-indices       | A                        | K-indices       | A                      | K-indices       |
|          |                                   |                 |                          |                 |                        |                 |
| 15 April | 8                                 | 1-1-3-2-2-1-3-2 | 8                        | 1-1-3-4-2-0-2-1 | 8                      | 2-2-3-2-2-1-2-2 |
| 16 April | 6                                 | 2-1-3-2-2-0-1-1 | 12                       | 2-1-5-2-4-0-0-0 | 6                      | 2-2-3-2-2-1-1-1 |
| 17 April | 3                                 | 1-1-0-1-1-1-1-1 | 1                        | 1-0-0-0-0-0-1-1 | 3                      | 1-0-1-0-0-1-2-1 |
| 18 April | 2                                 | 0-0-0-1-2-0-1-1 | 0                        | 0-0-0-0-0-0-0-0 | 2                      | 0-0-0-0-1-0-1-0 |
| 19 April | 4                                 | 0-1-2-1-1-1-2-1 | 3                        | 0-0-0-2-2-1-1-0 | 4                      | 0-0-1-2-1-1-2-1 |
| 20 April | 4                                 | 1-1-1-1-2-1-1-1 | 1                        | 0-1-0-1-0-0-1-0 | 4                      | 1-1-1-1-1-1-1-1 |
| 21 April | 4                                 | 1-1-1-1-2-1-1-1 | 2                        | 1-0-1-2-0-0-0-0 | 6                      | 2-1-1-1-1-0-0-1 |

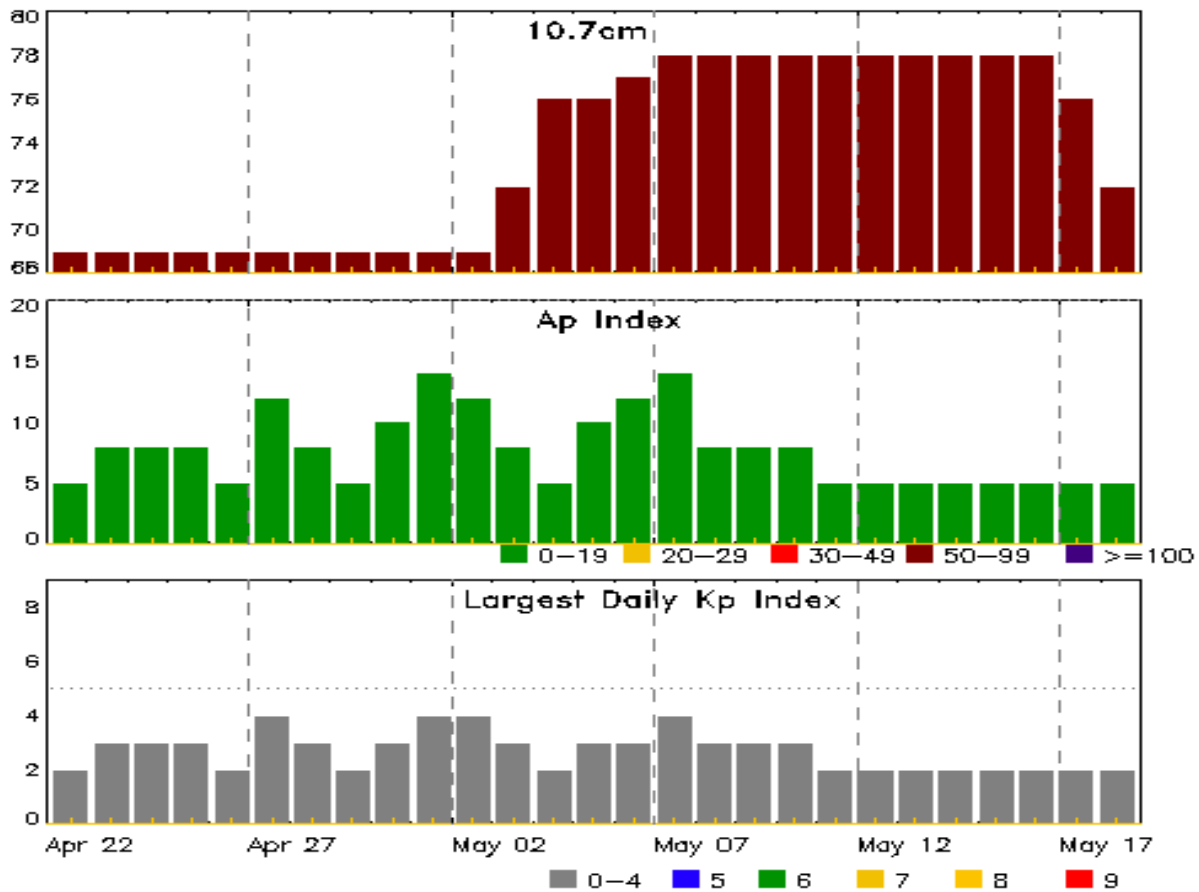


### *Alerts and Warnings Issued*

| <b>Date &amp; Time<br/>of Issue UTC</b> | <b>Type of Alert or Warning</b>                                | <b>Date &amp; Time<br/>of Event UTC</b> |
|---|--|---|
| 15 Apr 1734                             | CONTINUED ALERT:<br>Electron 2MeV Integral Flux $\geq$ 1000pfu | 11/1450                                 |
| 21 Apr 0533                             | ALERT: Type II Radio Emission                                  | 21/0444                                 |



## Twenty-seven Day Outlook



| Date   | Radio Flux<br>10.7cm | Planetary<br>A Index | Largest<br>Kp Index | Date   | Radio Flux<br>10.7cm | Planetary<br>A Index | Largest<br>Kp Index |
|--------|----------------------|----------------------|---------------------|--------|----------------------|----------------------|---------------------|
| 22 Apr | 69                   | 5                    | 2                   | 06 May | 77                   | 12                   | 3                   |
| 23     | 69                   | 8                    | 3                   | 07     | 78                   | 14                   | 4                   |
| 24     | 69                   | 8                    | 3                   | 08     | 78                   | 8                    | 3                   |
| 25     | 69                   | 8                    | 3                   | 09     | 78                   | 8                    | 3                   |
| 26     | 69                   | 5                    | 2                   | 10     | 78                   | 8                    | 3                   |
| 27     | 69                   | 12                   | 4                   | 11     | 78                   | 5                    | 2                   |
| 28     | 69                   | 8                    | 3                   | 12     | 78                   | 5                    | 2                   |
| 29     | 69                   | 5                    | 2                   | 13     | 78                   | 5                    | 2                   |
| 30     | 69                   | 10                   | 3                   | 14     | 78                   | 5                    | 2                   |
| 01 May | 69                   | 14                   | 4                   | 15     | 78                   | 5                    | 2                   |
| 02     | 69                   | 12                   | 4                   | 16     | 78                   | 5                    | 2                   |
| 03     | 72                   | 8                    | 3                   | 17     | 76                   | 5                    | 2                   |
| 04     | 76                   | 5                    | 2                   | 18     | 72                   | 5                    | 2                   |
| 05     | 76                   | 10                   | 3                   |        |                      |                      |                     |

### ***Energetic Events***

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

**No Events Observed**

### ***Flare List***

| Date   | Time  |      |      | X-ray<br>Class | Imp/<br>Brtns | Optical<br>Location<br>Lat CMD | Rgn<br># |
|--------|-------|------|------|----------------|---------------|--------------------------------|----------|
|        | Begin | Max  | End  |                |               |                                |          |
| 15 Apr | 1927  | 1931 | 1934 | B3.3           | SF            | N04W34                         | 2738     |
| 19 Apr | 1610  | 1613 | 1616 | B1.3           |               |                                | 2738     |
| 20 Apr | 0009  | 0013 | 0017 | B1.6           |               |                                | 2738     |
| 20 Apr | 0039  | 0050 | 0103 | B8.1           |               |                                | 2738     |
| 20 Apr | 0924  | 0928 | 0932 | B6.8           |               |                                | 2738     |



## Region Summary

| Date        | Location | Sunspot Characteristics |                                |                   |               |               |              | Flares |   |   |         |   |   |   |   |
|-------------|----------|-------------------------|--------------------------------|-------------------|---------------|---------------|--------------|--------|---|---|---------|---|---|---|---|
|             | Lat CMD  | Helio                   | Area<br>10 <sup>-6</sup> hemi. | Extent<br>(helio) | Spot<br>Class | Spot<br>Count | Mag<br>Class | X-ray  |   |   | Optical |   |   |   |   |
|             |          | Lon                     |                                |                   |               |               |              | C      | M | X | S       | 1 | 2 | 3 | 4 |
| Region 2738 |          |                         |                                |                   |               |               |              |        |   |   |         |   |   |   |   |
| 07 Apr      | N06E72   | 298                     | 300                            | 3                 | Hsx           | 1             | A            |        |   |   |         |   |   |   |   |
| 08 Apr      | N06E60   | 297                     | 250                            | 3                 | Hhx           | 2             | A            |        |   |   | 2       |   |   |   |   |
| 09 Apr      | N06E46   | 298                     | 300                            | 4                 | Cho           | 2             | B            |        |   |   | 1       |   |   |   |   |
| 10 Apr      | N06E33   | 298                     | 350                            | 4                 | Cho           | 3             | B            |        |   |   |         |   |   |   |   |
| 11 Apr      | N06E20   | 298                     | 260                            | 4                 | Hhx           | 3             | A            |        |   |   |         |   |   |   |   |
| 12 Apr      | N06E07   | 297                     | 300                            | 5                 | Cho           | 4             | B            |        |   |   | 1       |   |   |   |   |
| 13 Apr      | N06W06   | 297                     | 300                            | 5                 | Cho           | 4             | B            |        |   |   |         |   |   |   |   |
| 14 Apr      | N06W19   | 297                     | 250                            | 6                 | Hhx           | 1             | A            |        |   |   |         |   |   |   |   |
| 15 Apr      | N06W34   | 299                     | 300                            | 4                 | Hhx           | 1             | A            |        |   |   | 1       |   |   |   |   |
| 16 Apr      | N06W48   | 300                     | 330                            | 3                 | Hhx           | 1             | A            |        |   |   |         |   |   |   |   |
| 17 Apr      | N06W62   | 301                     | 400                            | 3                 | Hhx           | 1             | A            |        |   |   |         |   |   |   |   |
| 18 Apr      | N06W76   | 301                     | 260                            | 3                 | Hhx           | 1             | A            |        |   |   |         |   |   |   |   |
| 19 Apr      | N06W90   | 302                     | 250                            | 3                 | Hhx           | 1             | A            |        |   |   |         |   |   |   |   |
|             |          |                         |                                |                   |               |               |              | 0      | 0 | 0 | 5       | 0 | 0 | 0 | 0 |

Crossed West Limb.

Absolute heliographic longitude: 297

|                    |        |     |       |   |     |   |   |   |   |   |   |   |   |   |   |
|--------------------|--------|-----|-------|---|-----|---|---|---|---|---|---|---|---|---|---|
| <b>Region 2739</b> |        |     |       |   |     |   |   |   |   |   |   |   |   |   |   |
| 17 Apr             | N05W17 | 256 | 10    | 3 | Bxo | 3 | B |   |   |   |   |   |   |   |   |
| 18 Apr             | N05W33 | 258 | 20    | 2 | Cro | 2 | B |   |   |   |   |   |   |   |   |
| 19 Apr             | N05W48 | 260 | 20    | 4 | Bxo | 2 | B |   |   |   |   |   |   |   |   |
| 20 Apr             | N06W67 | 266 | 10    | 1 | Axx | 1 | A |   |   |   |   |   |   |   |   |
| 21 Apr             | N06W80 | 266 | plage |   |     |   |   |   |   |   |   |   |   |   |   |
|                    |        |     |       |   |     |   |   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Still on Disk.

Absolute heliographic longitude: 256

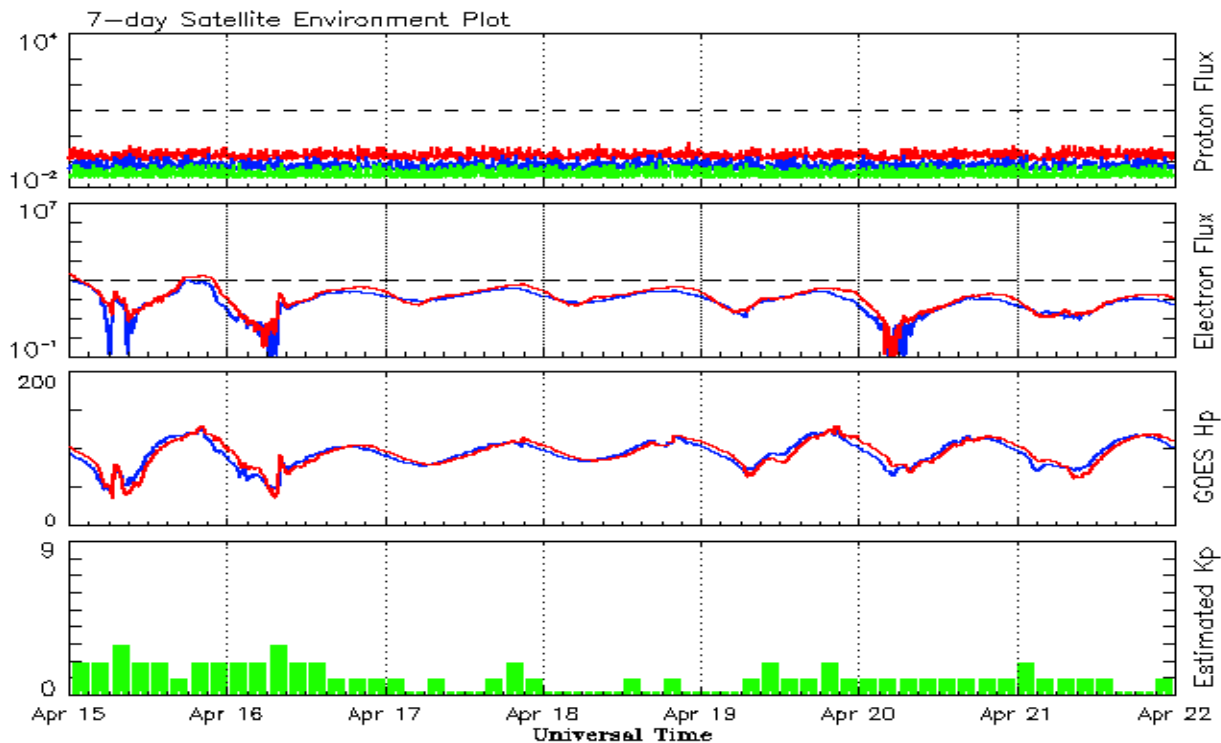


**Recent Solar Indices (preliminary)**  
**Observed monthly mean values**

| 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  |
| <b>2017</b> |                 |      |        |               |      |            |        |             |        |
| April       | 30.4            | 19.4 | 0.64   | 24.3          | 14.9 | 80.9       | 78.4   | 13          | 11.5   |
| May         | 18.1            | 11.3 | 0.62   | 23.1          | 14.0 | 73.5       | 77.7   | 9           | 11.3   |
| June        | 18.0            | 11.5 | 0.64   | 22.0          | 13.3 | 74.8       | 77.3   | 7           | 11.3   |
| July        | 18.8            | 10.7 | 0.59   | 20.8          | 12.6 | 77.7       | 76.8   | 9           | 11.0   |
| August      | 25.0            | 19.6 | 0.80   | 19.7          | 11.8 | 77.9       | 76.3   | 12          | 10.7   |
| September   | 42.2            | 26.2 | 0.62   | 18.6          | 11.0 | 92.0       | 75.9   | 19          | 10.3   |
| October     | 16.0            | 7.9  | 0.49   | 16.8          | 10.0 | 76.4       | 75.1   | 11          | 9.8    |
| November    | 7.7             | 3.4  | 0.44   | 15.7          | 9.2  | 72.1       | 74.6   | 11          | 9.5    |
| December    | 7.6             | 4.9  | 0.64   | 15.7          | 9.1  | 71.5       | 74.4   | 8           | 9.4    |
| <b>2018</b> |                 |      |        |               |      |            |        |             |        |
| January     | 7.8             | 4.1  | 0.51   | 15.0          | 8.5  | 70.0       | 74.0   | 6           | 9.3    |
| February    | 16.0            | 6.4  | 0.40   | 13.7          | 7.6  | 72.0       | 73.3   | 7           | 9.1    |
| March       | 6.0             | 1.5  | 0.25   | 11.5          | 5.9  | 68.4       | 71.9   | 8           | 8.6    |
| April       | 7.0             | 5.3  | 0.76   | 9.6           | 4.7  | 70.0       | 70.6   | 7           | 8.0    |
| May         | 15.0            | 7.9  | 0.53   | 9.2           | 4.5  | 70.9       | 70.2   | 8           | 7.6    |
| June        | 19.7            | 9.4  | 0.48   | 9.1           | 4.3  | 72.5       | 70.0   | 7           | 7.4    |
| July        | 1.3             | 1.0  | 0.77   | 9.4           | 4.3  | 69.7       | 70.0   | 6           | 7.3    |
| August      | 10.0            | 5.2  | 0.53   | 9.0           | 4.0  | 69.1       | 70.0   | 10          | 7.3    |
| September   | 5.7             | 2.0  | 0.35   | 8.7           | 4.0  | 68.3       | 70.1   | 9           | 7.3    |
| October     | 6.9             | 2.9  | 0.42   |               |      | 69.5       |        | 7           |        |
| November    | 7.3             | 2.9  | 0.48   |               |      | 68.9       |        | 6           |        |
| December    | 5.6             | 1.9  | 0.34   |               |      | 70.0       |        | 7           |        |
| <b>2019</b> |                 |      |        |               |      |            |        |             |        |
| January     | 16.0            | 4.7  | 0.29   |               |      | 71.6       |        | 6           |        |
| February    |                 | 0.5  |        |               |      | 70.6       |        | 7           |        |
| March       | 14.8            | 5.7  | 0.39   |               |      | 71.5       |        | 6           |        |

**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 15 April 2019*

The proton flux plot contains the five-minute averaged integral proton flux (protons/cm<sup>2</sup>-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.

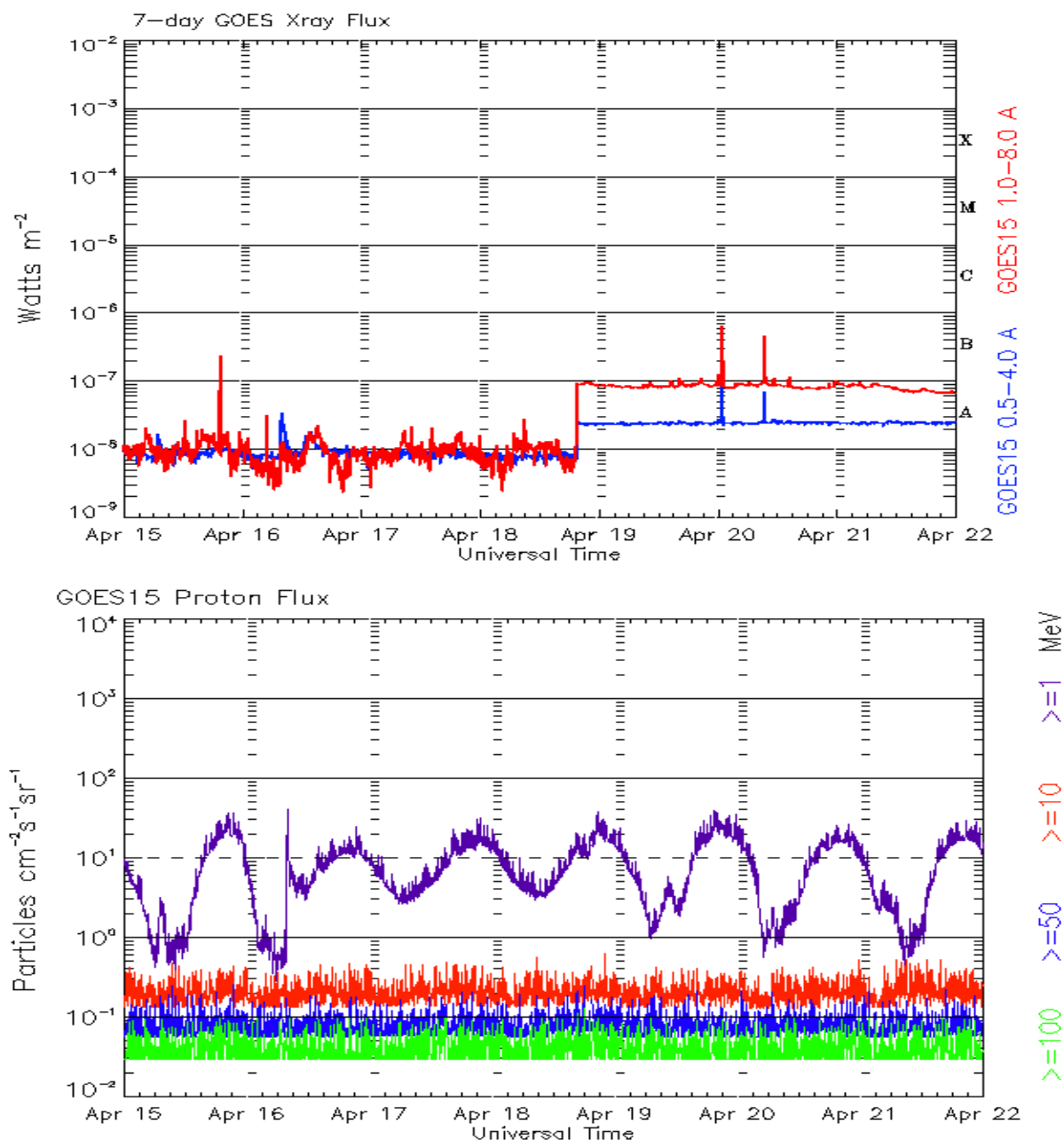
The electron flux plot contains the five-minute averaged integral electron flux (electrons/cm<sup>2</sup>-sec -sr) with energies greater than 2 MeV by the SWPC Primary GOES satellite.

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 15 April 2019*

The x-ray plots contains five-minute averages x-ray flux ( $\text{Watt/m}^2$ ) 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 integral flux units ( $\text{pfu} = \text{protons/cm}^2\text{-sec -sr}$ ) 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.

U.S. Department of Commerce  
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](mailto: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 archive 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](http://spaceweather.gov/weekly/Usr_guide.pdf) -- User Guide

