

Space Weather Highlights
15 - 21 December 2008

SWO PRF 1738
23 December 2008

Solar activity was very low. The visible disk was spotless during the entire summary period.

No proton events were observed at geosynchronous orbit.

The greater than 2 MeV electron flux at geosynchronous orbit was at normal level during the entire summary period.

Geomagnetic field activity was at mostly quiet levels at all latitudes during the period. Isolated unsettled activity was observed at high latitudes late on 17 December due to a brief excursion of southward Bz (-5 nT at 17/1400 UTC) as measured at ACE. During the summary period, ACE solar wind measurements varied between a high of 377 km/s at 17/0338 UTC to a low of 278 km/s at 21/1833 UTC. The Bz component of the IMF varied between a low of -6.8 nT at 17/0101 UTC to a high of +8.5 nT at 17/0255 UTC.

Space Weather Outlook
24 December 2008 - 19 January 2009

Solar activity is expected to be at very low levels.

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 - 06 January. Normal levels are expected 24 December - 01 January and again on 07 - 19 January.

Geomagnetic field activity is expected to be at quiet levels during 24 - 30 December. Activity is expected to increase to unsettled levels during 31 December - 02 January due to a recurrent coronal hole high speed stream. Activity is expected to decrease to quiet levels during 03 - 17 January. Activity is expected to increase to unsettled levels during 18 - 19 January.



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 |
| 15 December | 69 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 December | 69 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 December | 69 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 December | 68 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19 December | 69 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 December | 69 | 0 | 0 | <A1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 December | 69 | 0 | 0 | <A1.0 | 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 | >.6 MeV | >2MeV | >4 MeV |
| | 15 December | 2.7E+6 | 1.9E+4 | 4.4E+3 | | 3.0E+7 |
| 16 December | 3.9E+6 | 2.0E+4 | 4.2E+3 | | 1.9E+7 | |
| 17 December | 1.8E+6 | 1.8E+4 | 4.2E+3 | | 3.6E+6 | |
| 18 December | 1.5E+6 | 1.9E+4 | 4.1E+3 | | 4.3E+6 | |
| 19 December | 1.4E+6 | 1.9E+4 | 4.1E+3 | | 3.6E+6 | |
| 20 December | 1.1E+6 | 1.9E+4 | 4.2E+3 | | 1.7E+6 | |
| 21 December | 1.1E+6 | 2.0E+4 | 4.1E+3 | | 1.4E+6 | |

Daily Geomagnetic Data

| Date | Middle Latitude Fredericksburg | | High Latitude College | | Estimated Planetary | |
|-------------|-----------------------------------|-----------------|--------------------------|-----------------|------------------------|-----------------|
| | A | K-indices | A | K-indices | A | K-indices |
| | 15 December | 1 | 1-1-0-0-0-0-0-1 | 0 | 0-0-0-1-0-0-0-0 | 1 |
| 16 December | 4 | 1-1-0-1-1-1-2-2 | 2 | 0-0-0-1-1-1-1-1 | 4 | 0-1-1-0-1-0-1-2 |
| 17 December | 3 | 2-2-1-0-1-1-1-0 | 6 | 1-1-2-1-3-3-0-0 | 5 | 2-2-1-0-1-2-1-1 |
| 18 December | 0 | 0-0-0-0-0-0-0-0 | 0 | 0-0-0-0-1-0-0-0 | 1 | 0-0-0-0-0-0-0-1 |
| 19 December | 2 | 0-0-0-2-1-1-0-1 | 3 | 0-0-1-2-2-1-0-0 | 3 | 0-0-1-1-1-1-0-1 |
| 20 December | 2 | 0-0-1-1-1-0-1-0 | 3 | 0-0-1-1-2-2-0-0 | 2 | 1-0-0-0-1-0-0-1 |
| 21 December | 1 | 1-1-1-0-0-0-0-0 | 0 | 0-0-0-0-0-0-0-0 | 2 | 1-0-1-0-0-0-0-0 |



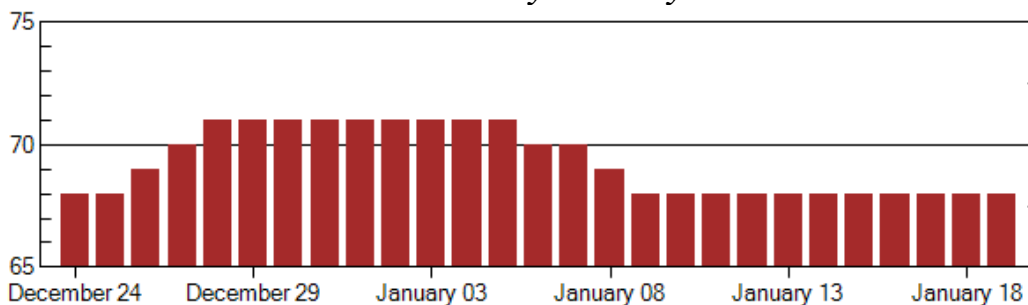
Alerts and Warnings Issued

| Date & Time of Issue | Type of Alert or Warning | Date & Time of Event UTC |
|----------------------|--------------------------|--------------------------|
|----------------------|--------------------------|--------------------------|

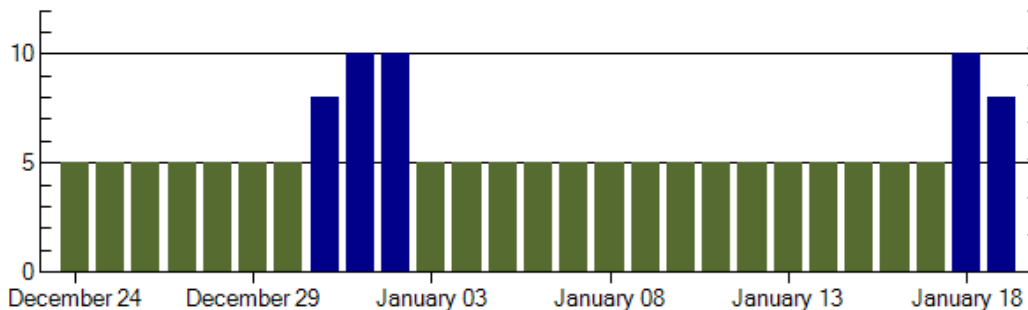
No Alerts Issued



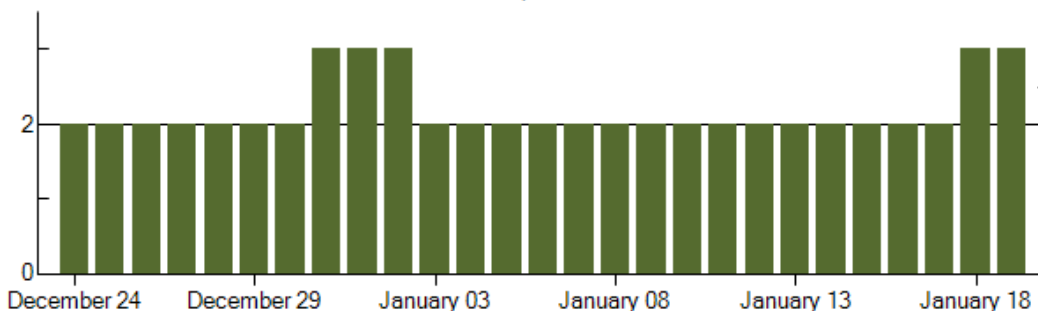
Twenty-seven Day Outlook



10.7 cm



Ap Index



Largest Daily Kp Index

| Date | Radio Flux 10.7 cm | Planetary A Index | Largest Kp Index | Date | Radio Flux 10.7 cm | Planetary A Index | Largest Kp Index |
|--------|--------------------|-------------------|------------------|--------|--------------------|-------------------|------------------|
| 24 Dec | 68 | 5 | 2 | 07 Jan | 70 | 5 | 2 |
| 25 | 68 | 5 | 2 | 08 | 69 | 5 | 2 |
| 26 | 69 | 5 | 2 | 09 | 68 | 5 | 2 |
| 27 | 70 | 5 | 2 | 10 | 68 | 5 | 2 |
| 28 | 71 | 5 | 2 | 11 | 68 | 5 | 2 |
| 29 | 71 | 5 | 2 | 12 | 68 | 5 | 2 |
| 30 | 71 | 5 | 2 | 13 | 68 | 5 | 2 |
| 31 | 71 | 8 | 3 | 14 | 68 | 5 | 2 |
| 01 Jan | 71 | 10 | 3 | 15 | 68 | 5 | 2 |
| 02 | 71 | 10 | 3 | 16 | 68 | 5 | 2 |
| 03 | 71 | 5 | 2 | 17 | 68 | 5 | 2 |
| 04 | 71 | 5 | 2 | 18 | 68 | 10 | 3 |
| 05 | 71 | 5 | 2 | 19 | 68 | 8 | 3 |
| 06 | 70 | 5 | 2 | | | | |



Energetic Events

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

No Events Observed

Flare List

| Date | Time | | | X-ray | Imp / | Location | Rgn |
|--------|---------------------------|-----|-----|--------|-------|----------|-----|
| | Begin | Max | End | Class. | Brtns | Lat CMD | |
| 15 Dec | <i>No Flares Observed</i> | | | | | | |
| 16 Dec | <i>No Flares Observed</i> | | | | | | |
| 17 Dec | <i>No Flares Observed</i> | | | | | | |
| 18 Dec | <i>No Flares Observed</i> | | | | | | |
| 19 Dec | <i>No Flares Observed</i> | | | | | | |
| 20 Dec | <i>No Flares Observed</i> | | | | | | |
| 21 Dec | <i>No Flares Observed</i> | | | | | | |

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 | 2 | 3 | 4 |

No active regions.



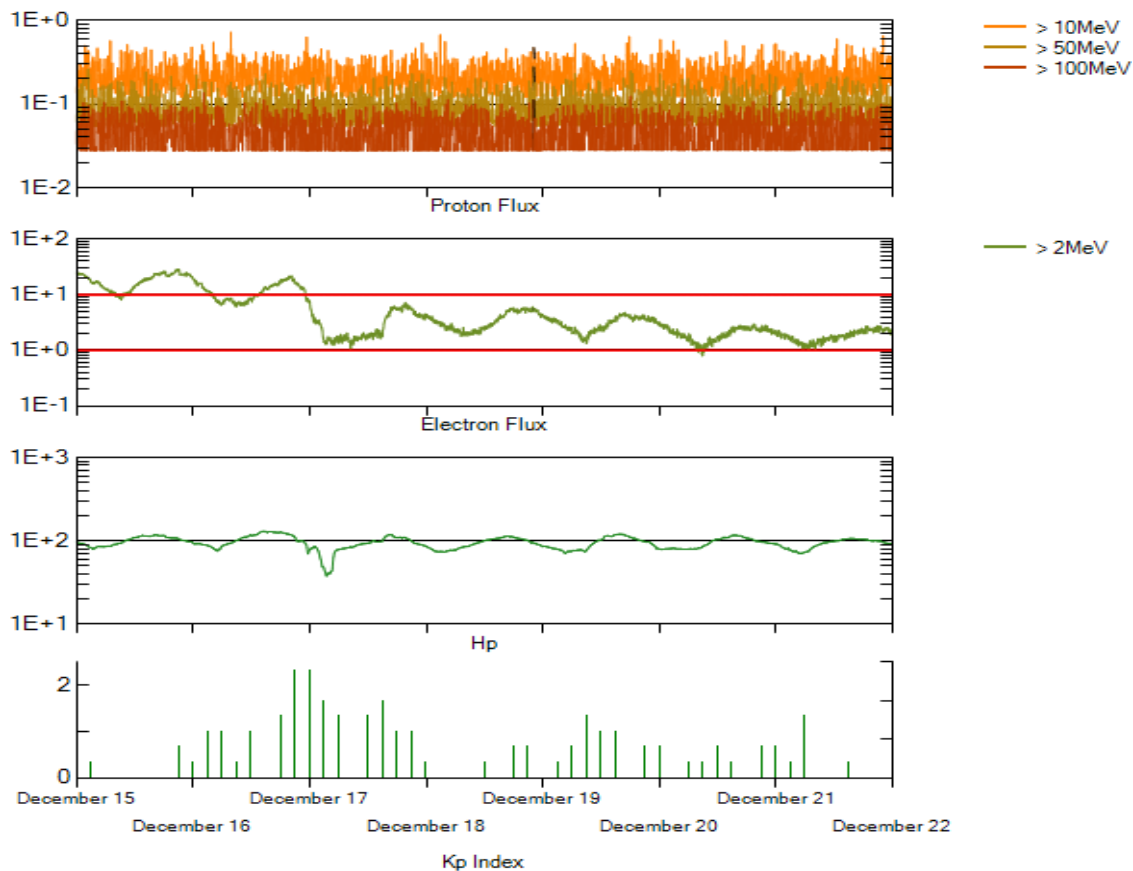
Recent Solar Indices (preliminary)
Of the observed monthly mean values

| Month | Sunspot Numbers | | | Radio Flux | | Geomagnetic | | | |
|-------------|------------------------|-------------|-----------------|----------------------|---------------------|-----------------------|-----------------|-----------------|-----------------|
| | Observed values SEC | Ratio RI | Ratio RI/SEC | Smooth values SEC | Smooth values RI | *Penticton 10.7 cm | Smooth Value | Planetary Ap | Smooth Value |
| 2006 | | | | | | | | | |
| 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 | 11.6 | 7.0 | 71.6 | 72.5 | 8 | 7.4 |
| August | 9.9 | 6.2 | 0.63 | 10.2 | 6.1 | 69.2 | 71.8 | 7 | 7.6 |
| September | 4.8 | 2.4 | 0.50 | 9.9 | 5.9 | 67.1 | 71.5 | 9 | 7.8 |
| October | 1.3 | 0.9 | 0.70 | 10.0 | 6.1 | 65.5 | 71.5 | 9 | 7.9 |
| November | 2.5 | 1.7 | 0.68 | 9.4 | 5.7 | 69.7 | 71.1 | 5 | 7.8 |
| December | 16.2 | 10.1 | 0.62 | 8.1 | 5.0 | 78.6 | 70.5 | 4 | 7.8 |
| 2008 | | | | | | | | | |
| January | 5.1 | 3.4 | 0.67 | 6.9 | 4.2 | 72.1 | 70.0 | 6 | 7.7 |
| February | 3.8 | 2.1 | 0.55 | 5.9 | 3.6 | 71.2 | 69.6 | 9 | 7.6 |
| March | 15.9 | 9.3 | 0.58 | 5.3 | 3.3 | 72.9 | 69.5 | 10 | 7.4 |
| April | 4.9 | 2.9 | 0.59 | 5.3 | 3.3 | 70.3 | 69.6 | 9 | 7.1 |
| May | 5.7 | 2.9 | 0.51 | | | 68.4 | | 6 | |
| June | 4.2 | 3.1 | 0.74 | | | 65.9 | | 7 | |
| July | 1.0 | 0.5 | 0.50 | | | 65.8 | | 6 | |
| August | 0.0 | 0.5 | ** | | | 66.4 | | 5 | |
| September | 1.5 | 1.1 | 0.73 | | | 67.1 | | 5 | |
| October | 5.2 | 2.9 | 0.56 | | | 68.3 | | 6 | |

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.

**SEC sunspot number was less than RI value, so a ratio could not be done.





*Weekly Geosynchronous Satellite Environment Summary
Week Beginning 08 December 2008*

GOES-11 designated Primary Electron Satellite and GOES-10 Secondary: December 1, 2008 the GOES-12 Electron sensor began experiencing periods of noise and sensor is unreliable.

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.

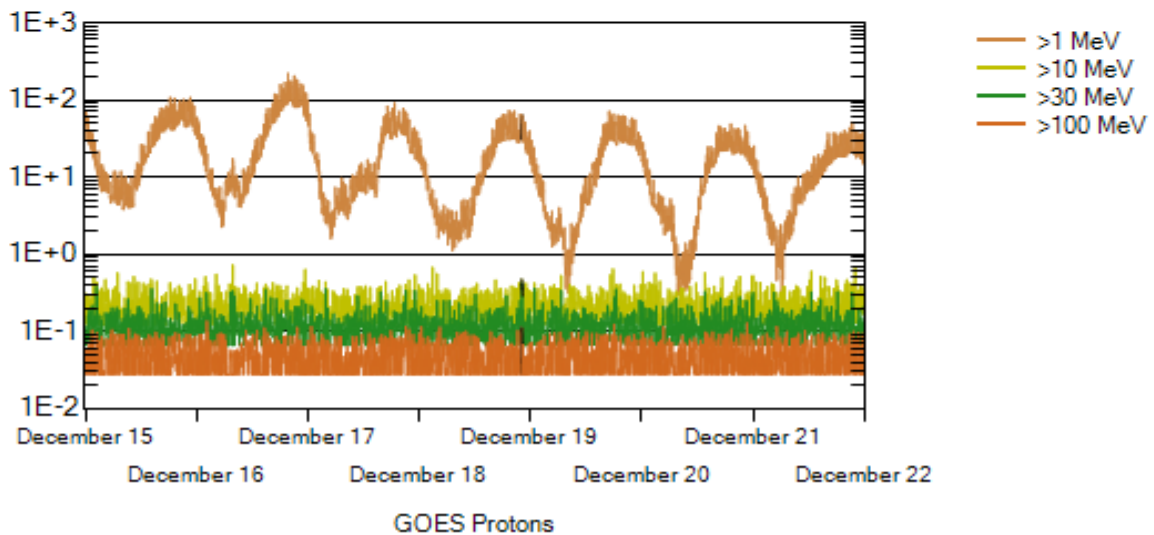
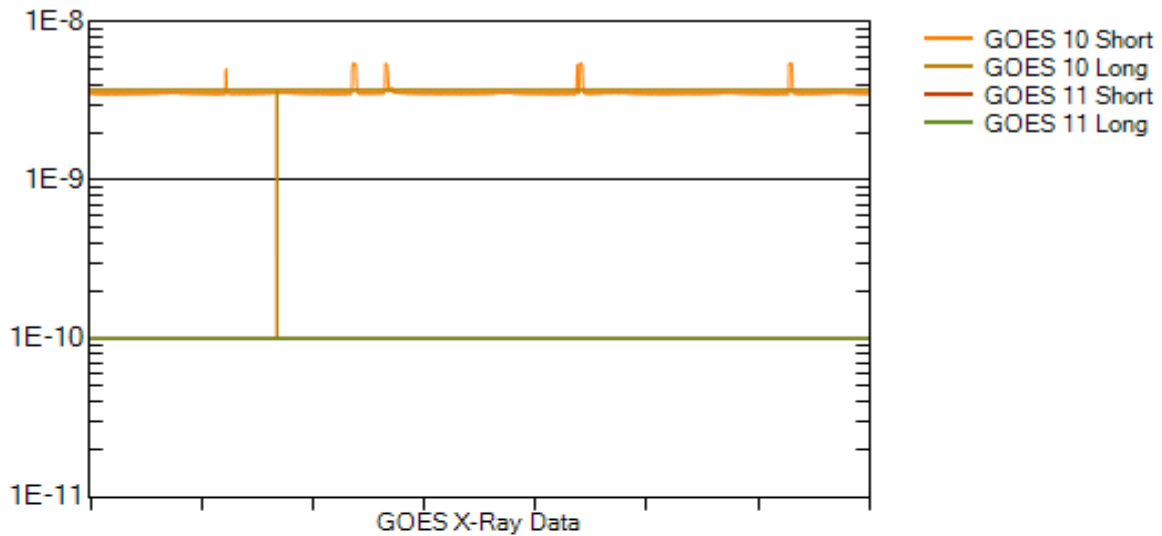
Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-11 (W135).

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 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 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 (protons/cm²-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 (protons/cm²-sec-sr) at greater than 10 MeV.

