

Space Weather Highlights 01 - 07 December 2003

**SWO PRF 1475
09 December 2003**

Solar activity was at low to moderate levels this period. The period began at low levels with Region 508 (S17, L=284, class/area Ekc/480 on 23 November) as the likely source of the modest C-class activity. Region 508, though in decay, maintained considerable complexity as it rotated around the west limb on 01 December. Activity increased to moderate levels on 02 December with a number of X-ray events occurring on the southwest limb. The most likely source of this activity was Region 508. The first of these limb events was a C7 flare that occurred at 02/0948 UTC, followed by a significant long duration X-ray enhancement that peaked at 1145 UTC. LASCO and EIT imagery observed a full halo CME from this event, with a measured mean plane-of-sky speed at 1234 km/s. Two M1 flares were also observed from this region, at 1308 and 2300 UTC. Activity returned to low levels from 03 - 05 December, with occasional weak C-class flares observed. The frequency of the C-class activity increased late on 05 December with majority of the activity originating in Region 510 (S23, L=228, class/area Dai/150 on 28 November). Activity increased to moderate levels on the 6th with Region 510 producing an M1 and M2 flare at 1120 UTC and 1546 UTC. Activity returned to low levels on 07 December.

Solar wind data were available from the NASA Advanced Composition Explorer (ACE) spacecraft during most of the summary period. The period began with slightly elevated solar wind speeds due to a coronal hole. Solar wind plasma and IMF measurements were at nominal levels from 02 - 04 December. Early on the 5th, solar wind speed, temperature, and density increased. Total IMF also increased to near 20 nT and Bz ranged -5 to -18 nT for several hours. The signature was consistent with a co-rotating interaction region (CIR) preceding a high speed coronal hole stream; however, it is likely that the enhancement also included transient material from the 2 December CME. The weak high speed stream persisted through the 6th, before declining to near 400 km/s by early on the 7th. The gradual onset of another high speed stream was observed late on the 7th.

On 02 December, the greater than 10 MeV protons reached event threshold at 1505 UTC and shortly after, hit a maximum flux of 88.9 pfu at 1820 UTC. Flux levels decayed below event levels at 0000 UTC on 04 December. Protons remained elevated through 05 December. The most likely source of this event was the long duration X-ray enhancement and CME on 02 December from the southwest limb.

The greater than 2 MeV electron flux at geosynchronous orbit reached high levels on 04, 06, and 07 December.

The geomagnetic field ranged from quiet to severe storm levels. The period began with slightly elevated solar wind speeds, which produced isolated active conditions at all latitudes. Quiet to unsettled periods prevailed from 02 - 04 December. A combined high speed stream and transient impact on 05 December produced unsettled to major storm periods with occasional severe storm levels observed at high latitudes. Predominantly quiet to minor storm levels were observed on the 6th and 7th, with occasional major storm periods at high latitudes.

Space Weather Outlook 10 December - 05 January 2004

Solar activity is expected to range from very low to moderate levels. Activity is expected to be at low levels early in the period. Active longitudes are due to return to the visible disk by mid December and may produce moderate levels. Expect mostly low activity levels by early January.

There is a small chance for a greater than 10 MeV proton event from mid to late December.

The greater than 2 MeV electron flux at geosynchronous orbit is expected to reach high levels on 10 - 15 December, 19 - 23 December, and again on 03 - 05 January.

The geomagnetic field is expected to range from quiet to major storm levels. A large trans-equatorial coronal hole has moved into a geoeffective position and is expected to produce active to major storming through 14 December. Unsettled to minor storm periods are expected on 18 - 22 December, and again on 01 - 05 January due to high speed coronal hole streams.



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 |
| 01 December | 143 | 159 | 850 | B5.8 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02 December | 139 | 119 | 590 | B8.1 | 6 | 2 | 0 | 1 | 0 | 0 | 0 | 0 |
| 03 December | 124 | 100 | 470 | B4.1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04 December | 116 | 115 | 580 | B3.2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 05 December | 112 | 88 | 500 | B3.1 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 06 December | 109 | 87 | 400 | B4.7 | 10 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07 December | 92 | 53 | 310 | B2.1 | 2 | 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) | | |
|-------------|---|--------|---------|---|--------|-------|
| | >1MeV | >10MeV | >100MeV | >.6MeV | >2MeV | >4MeV |
| 01 December | 3.1E+5 | 1.2E+4 | 2.9E+3 | | 1.5E+7 | |
| 02 December | 4.0E+6 | 5.8E+5 | 3.2E+3 | | 2.4E+7 | |
| 03 December | 2.8E+7 | 1.5E+6 | 3.6E+3 | | 2.6E+7 | |
| 04 December | 1.6E+7 | 2.9E+5 | 3.4E+3 | | 4.0E+7 | |
| 05 December | 9.5E+6 | 8.7E+4 | 3.3E+3 | | 6.2E+6 | |
| 06 December | 3.7E+6 | 2.4E+4 | 3.2E+3 | | 5.9E+7 | |
| 07 December | 1.3E+6 | 1.5E+4 | 3.6E+3 | | 1.0E+8 | |

Daily Geomagnetic Data

| Date | Middle Latitude Fredericksburg | | High Latitude College | | Estimated Planetary | |
|-------------|-----------------------------------|-----------------|--------------------------|-----------------|------------------------|-----------------|
| | A | K-indices | A | K-indices | A | K-indices |
| | 01 December | 9 | 2-2-2-2-2-1-4-2 | 11 | 3-2-4-3-2-2-2-1 | 10 |
| 02 December | 6 | 2-1-2-2-1-1-3-0 | 3 | 2-1-2-2-0-0-0-1 | 9 | 3-2-3-2-3-2-3-1 |
| 03 December | 4 | 0-0-1-0-1-2-3-1 | 1 | 0-0-1-1-0-1-0-0 | 7 | 1-2-2-2-2-3-2-2 |
| 04 December | 3 | 1-0-0-1-1-1-1-2 | 4 | 0-0-1-3-0-1-1-2 | 9 | 2-1-2-3-3-3-3-3 |
| 05 December | 21 | 1-4-5-3-4-3-3-3 | 68 | 3-5-7-6-7-6-4-3 | 43 | 2-5-6-5-5-5-4-4 |
| 06 December | 14 | 5-3-3-2-2-2-2-2 | 34 | 3-3-5-6-5-4-4-3 | 22 | 4-4-4-4-3-4-4-3 |
| 07 December | 7 | 1-2-3-1-2-2-2-2 | 41 | 2-1-3-5-6-6-6-3 | 15 | 2-2-3-3-3-4-4-3 |

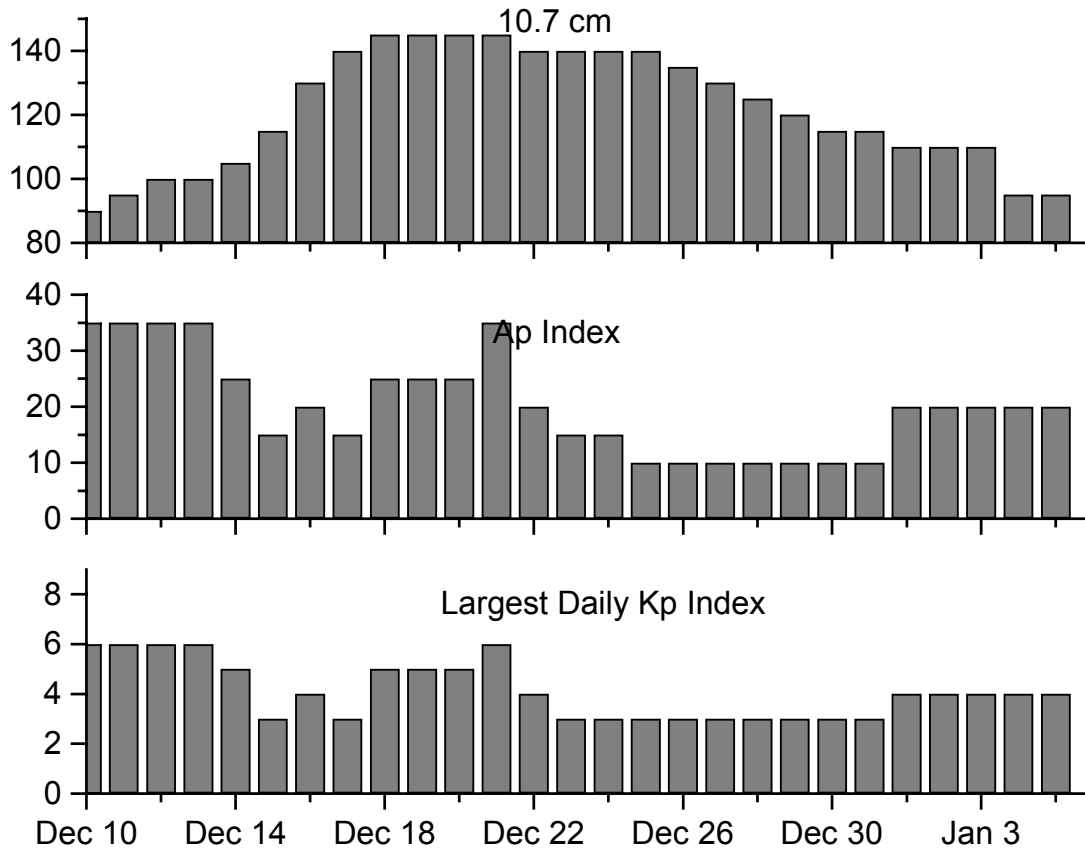


Alerts and Warnings Issued

| <u>Date & Time of Issue</u> | <u>Type of Alert or Warning</u> | <u>Date & Time of Event UT</u> |
|---------------------------------|---|------------------------------------|
| 02 Dec 0811 | WARNING: Geomagnetic K= 4 | 02 Dec 0812 - 1500 |
| 02 Dec 1517 | WARNING: Proton 10MeV Integral Flux > 10pfu | 02 Dec 1517 - 2359 |
| 02 Dec 1558 | ALERT: Proton Event 10MeV Integral Flux > 10pfu | 02 Dec 1505 |
| 04 Dec 0847 | SUMMARY: Proton Event 10MeV Integral Flux > 10pfu | 02 Dec 1505 |
| 04 Dec 1839 | ALERT: Electron 2MeV Integral Flux > 1000pfu | 04 Dec 1755 |
| 04 Dec 2007 | WATCH: Geomagnetic A \geq 20 | 06 Dec |
| 04 Dec 2012 | WATCH: Geomagnetic A \geq 20 | 07 Dec |
| 05 Dec 0235 | WARNING: Geomagnetic K= 4 | 05 Dec 0235 - 1500 |
| 05 Dec 0250 | WARNING: Geomagnetic K= 5 | 05 Dec 0250 - 1500 |
| 05 Dec 0445 | ALERT: Geomagnetic K = 4 | 05 Dec 0444 |
| 05 Dec 0533 | ALERT: Geomagnetic K =5 | 05 Dec 0532 |
| 05 Dec 0540 | WARNING: Geomagnetic K = 6 | 05 Dec 0540 - 1500 |
| 05 Dec 1454 | EXT WARNING: Geomagnetic K = 4 | 05 Dec 0235 - 06 Dec 1500 |
| 05 Dec 1458 | EXT WARNING: Geomagnetic K = 5 | 05 Dec 0250 - 2359 |
| 05 Dec 2354 | EXT WARNING: Geomagnetic K =5 | 05 Dec 0250 - 06 Dec 1500 |
| 06 Dec 1221 | ALERT: Electron 2MeV Integral Flux > 1000pfu | 06 Dec 1200 |
| 06 Dec 1455 | EXT WARNING: Geomagnetic K = 5 | 05 Dec 0250 - 07 Dec 1500 |
| 06 Dec 2004 | WATCH: Geomagnetic A \geq 20 | 09 Dec |
| 07 Dec 0004 | 1 - 245 MHz Radio Noise Storm | 06 Dec |
| 07 Dec 1322 | ALERT: Electron 2MeV Integral Flux > 1000pfu | 07 Dec 1300 |
| 07 Dec 1739 | ALERT: Geomagnetic K = 4 | 07 Dec 1737 |
| 07 Dec 1749 | WARNING: Geomagnetic K = 4 | 07 Dec 1750 - 08 Dec 1500 |
| 07 Dec 1954 | ALERT: Geomagnetic K = 4 | 07 Dec 1952 |
| 07 Dec 2123 | WATCH: Geomagnetic A \geq 30 | 10 Dec |



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 |
|--------|--------------------|-------------------|------------------|--------|--------------------|-------------------|------------------|
| 10 Dec | 90 | 35 | 6 | 24 Dec | 140 | 15 | 3 |
| 11 | 95 | 35 | 6 | 25 | 140 | 10 | 3 |
| 12 | 100 | 35 | 6 | 26 | 135 | 10 | 3 |
| 13 | 100 | 35 | 6 | 27 | 130 | 10 | 3 |
| 14 | 105 | 25 | 5 | 28 | 125 | 10 | 3 |
| 15 | 115 | 15 | 3 | 29 | 120 | 10 | 3 |
| 16 | 130 | 20 | 4 | 30 | 115 | 10 | 3 |
| 17 | 140 | 15 | 3 | 31 | 115 | 10 | 3 |
| 18 | 145 | 25 | 5 | 01 Jan | 110 | 20 | 3 |
| 19 | 145 | 25 | 5 | 02 | 110 | 20 | 3 |
| 20 | 145 | 25 | 5 | 03 | 110 | 20 | 3 |
| 21 | 145 | 35 | 6 | 04 | 95 | 20 | 3 |
| 22 | 140 | 20 | 4 | 05 | 95 | 20 | 3 |
| 23 | 140 | 15 | 3 | | | | |



Energetic Events

| Date | Time | | X-ray | | Optical Information | | | Peak | | Sweep Freq | | |
|--------|-------|------|----------|-------|---------------------|---------------|---------------------|----------|------------|------------|-----------|----|
| | Begin | Max | ½ Max | Class | Integ Flux | Imp/ Brtns | Location Lat CMD | Rgn # | Radio Flux | | Intensity | |
| | | | | | | | | | 245 | 2695 | II | IV |
| 02 Dec | 1247 | 1308 | 1322 | M1.4 | .024 | | | | | | | |
| 02 Dec | 2250 | 2300 | 2307 | M1.5 | .009 | | | | | | | |
| 06 Dec | 1058 | 1120 | 1128 | M1.3 | .013 | | | | | | | |
| 06 Dec | 1539 | 1546 | 1553 | M2.0 | .011 | | | | | | | |

Flare List

| Date | Time | | | X-ray Class. | Optical | | Rgn |
|-------------|-------|------|------|-----------------|----------------|---------------------|-----|
| | Begin | Max | End | | Imp / Brtns | Location Lat CMD | |
| 01 December | 0139 | 0144 | 0208 | B9.6 | | | 508 |
| | 0446 | 0449 | 0452 | C1.3 | | | 508 |
| | 1451 | 1503 | 1506 | C1.3 | | | 508 |
| | 1838 | 1843 | 1854 | C1.1 | | | 510 |
| | 2204 | 2209 | 2211 | B9.4 | | | |
| 02 December | 0339 | 0343 | 0347 | C1.0 | | | |
| | 0717 | 0720 | 0723 | C1.3 | | | |
| | 0757 | 0807 | 0817 | C3.9 | | | 508 |
| | 0940 | 0948 | 0954 | C7.2 | | | 508 |
| | 1247 | 1308 | 1322 | M1.4 | | | 508 |
| | 1921 | 1922 | 1929 | C2.0 | Sf | S13W63 | 511 |
| | 2101 | 2109 | 2115 | C5.0 | | | |
| 03 December | 2250 | 2300 | 2307 | M1.5 | | | 508 |
| | 0505 | 0635 | 0651 | C1.6 | | | |
| | 1029 | 1033 | 1037 | C1.0 | | | |
| | 2003 | 2007 | 2017 | C2.3 | | | |
| 04 December | 2023 | 2034 | 2040 | C1.8 | | | |
| | 0118 | 0121 | 0129 | C2.2 | Sf | S18W59 | 510 |
| 05 December | 0011 | 0016 | 0020 | B8.4 | | | |
| | 0733 | 0733 | 0738 | | Sf | S23W75 | 510 |
| | 0800 | 0804 | 0807 | B6.2 | | | |
| | 1011 | 1019 | 1028 | C1.8 | | | 513 |
| | 1302 | 1305 | 1308 | B5.3 | | | |
| | 1343 | 1347 | 1357 | C1.1 | | | |
| | 1519 | 1527 | 1531 | C1.5 | | | |
| | 2045 | 2112 | 2122 | C1.8 | | | |
| 06 December | 0006 | 0027 | 0112 | C2.2 | | | |
| | 0742 | 0747 | 0753 | C1.1 | | | |
| | 0808 | 0824 | 0841 | C2.5 | | | |
| | 0951 | 1002 | 1010 | C4.1 | | | |
| | 1032 | 1036 | 1040 | B7.5 | | | |
| | 1058 | 1120 | 1128 | M1.3 | | | |
| | 1417 | 1422 | 1426 | C1.0 | | | |
| | 1539 | 1546 | 1553 | M2.0 | | | |



Flare List - continued.

| Date | Time | | | X-ray Class. | Optical | | Rgn |
|-------------|-------|------|------|-----------------|----------------|---------------------|-----|
| | Begin | Max | End | | Imp / Brtns | Location Lat CMD | |
| 06 December | 1633 | 1638 | 1644 | C1.5 | | | |
| | 1727 | 1730 | 1733 | C1.0 | | | |
| | 1752 | 1757 | 1802 | C1.2 | | | |
| | 1807 | 1811 | 1813 | C1.4 | | | |
| | 1923 | 1939 | 1952 | C4.1 | | | |
| 07 December | 0246 | 0254 | 0301 | C3.1 | | | |
| | 0609 | 0627 | 0633 | C1.1 | | | |

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 | | |
| <i>Region 507</i> | | | | | | | | | | | | | | | | | |
| 18 Nov | N10E78 | 293 | 0360 | 05 | Eko | 004 | Bd | 1 | | | 1 | | | | | | |
| 19 Nov | N10E62 | 295 | 0890 | 11 | Eki | 011 | Bgd | | | | | | | | | | |
| 20 Nov | N07E49 | 295 | 0840 | 10 | Dki | 022 | Bgd | 1 | | | 1 | | | | | | |
| 21 Nov | N09E36 | 296 | 0800 | 11 | Eki | 028 | Bg | | | | 2 | | | | | | |
| 22 Nov | N09E22 | 297 | 0810 | 12 | Eki | 029 | Bg | 2 | | | 1 | | | | | | |
| 23 Nov | N09E10 | 296 | 0810 | 12 | Ekc | 042 | Bgd | 1 | | | | | | | | | |
| 24 Nov | N09W03 | 296 | 0740 | 12 | Ekc | 040 | Bgd | | | | | | | | | | |
| 25 Nov | N09W14 | 293 | 0660 | 14 | Ekc | 041 | Bgd | | | | | | | | | | |
| 26 Nov | N08W30 | 296 | 0650 | 13 | Ekc | 044 | Bgd | | | | | | | | | | |
| 27 Nov | N07W43 | 295 | 0540 | 08 | Dki | 014 | Bg | | | | | | | | | | |
| 28 Nov | N07W56 | 295 | 0570 | 08 | Dko | 015 | Bg | 1 | | | | | | | | | |
| 29 Nov | N07W69 | 295 | 0460 | 08 | Dko | 011 | Bgd | 1 | | | | | | | | | |
| 30 Nov | N07W82 | 294 | 0320 | 07 | Dao | 008 | Bgd | | | | | | | | | | |
| 01 Dec | N07W95 | 294 | 0150 | 05 | Dao | 002 | B | | | | | | | | | | |
| | | | | | | | | 7 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |

Crossed West Limb.

Absolute heliographic longitude: 296



Region Summary - continued.

| 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 | | | |
| <i>Region 508</i> | | | | | | | | | | | | | | | | | | |
| 19 Nov | S17E75 | 282 | 0700 | 11 | Eko | 005 | B | | | | | | | | | | | |
| 20 Nov | S20E58 | 286 | 0680 | 10 | Dko | 018 | Bg | 1 | | | | 1 | | | | | | |
| 21 Nov | S18E47 | 285 | 0510 | 16 | Fai | 027 | Bg | 1 | | | | | | | | | | |
| 22 Nov | S17E34 | 285 | 0520 | 12 | Eki | 025 | Bg | | | | | | | | | | | |
| 23 Nov | S17E20 | 286 | 0480 | 12 | Ekc | 047 | Bg | 1 | | | | 2 | | | | | | |
| 24 Nov | S17E08 | 285 | 0450 | 13 | Ekc | 041 | Bg | 3 | | | | 1 | | | | | | |
| 25 Nov | S16W06 | 285 | 0270 | 11 | Eac | 052 | Bg | 2 | | | | 1 | | | | | | |
| 26 Nov | S18W18 | 284 | 0360 | 11 | Eki | 040 | Bg | 2 | | | | 2 | | | | | | |
| 27 Nov | S19W31 | 283 | 0180 | 07 | Dao | 016 | Bg | 4 | | | | 3 | | | | | | |
| 28 Nov | S19W44 | 283 | 0200 | 08 | Dai | 021 | Bg | 2 | | | | 1 | | | | | | |
| 29 Nov | S19W57 | 283 | 0260 | 11 | Eac | 022 | Bg | 4 | | | | | | | | | | |
| 30 Nov | S19W71 | 283 | 0230 | 08 | Dai | 015 | Bg | 3 | | | | | | | | | | |
| 01 Dec | S19W84 | 283 | 0140 | 06 | Cso | 008 | B | 2 | | | | | | | | | | |
| | | | | | | | | 25 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | | |

Crossed West Limb.

Absolute heliographic longitude: 285

| | | | | | | | | | | | | | | | | | | |
|-------------------|--------|-----|------|----|-----|-----|---|---|---|---|---|---|---|---|---|---|--|--|
| <i>Region 509</i> | | | | | | | | | | | | | | | | | | |
| 24 Nov | S10E56 | 237 | 0110 | 05 | Cso | 002 | B | 1 | | | | 1 | | | | | | |
| 25 Nov | S10E43 | 236 | 0120 | 06 | Cso | 010 | B | 1 | | | | | | | | | | |
| 26 Nov | S11E28 | 238 | 0080 | 05 | Cao | 007 | B | | | | | | | | | | | |
| 27 Nov | S11E15 | 237 | 0050 | 03 | Dso | 006 | B | 1 | | | | 1 | | | | | | |
| 28 Nov | S11E02 | 237 | 0070 | 04 | Dao | 004 | B | | | | | | | | | | | |
| 29 Nov | S11W11 | 237 | 0070 | 06 | Dso | 004 | B | | | | | | | | | | | |
| 30 Nov | S11W24 | 236 | 0040 | 02 | Hax | 002 | A | | | | | | | | | | | |
| 01 Dec | S11W37 | 236 | 0040 | 05 | Cso | 004 | B | | | | | | | | | | | |
| 02 Dec | S11W52 | 238 | 0030 | 01 | Hsx | 002 | A | | | | | | | | | | | |
| 03 Dec | S11W67 | 240 | 0010 | 01 | Axx | 001 | A | | | | | | | | | | | |
| 04 Dec | S10W80 | 240 | 0020 | 00 | Hrx | 001 | A | | | | | | | | | | | |
| 05 Dec | S10W93 | 240 | | | | | | | | | | | | | | | | |
| | | | | | | | | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | | |

Crossed West Limb.

Absolute heliographic longitude: 237



Region Summary - continued.

| 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 510</i> | | | | | | | | | | | | | | | | | | |
| 24 Nov | S22E62 | 231 | 0060 | 02 | Hsx | 001 | A | | | | | | | | | | | |
| 25 Nov | S22E50 | 229 | 0080 | 07 | Dso | 007 | B | | | | | | | | | | | |
| 26 Nov | S23E36 | 230 | 0110 | 07 | Dao | 019 | B | | | | | | | | | | | |
| 27 Nov | S23E24 | 228 | 0080 | 08 | Cso | 013 | B | | | | | | | | | | | |
| 28 Nov | S23E11 | 228 | 0150 | 10 | Dai | 026 | B | | | | | | | | | | | |
| 29 Nov | S23W02 | 228 | 0100 | 11 | Eai | 028 | B | 3 | | | | 2 | 1 | | | | | |
| 30 Nov | S23W16 | 228 | 0090 | 10 | Dai | 027 | B | | | | | | | | | | | |
| 01 Dec | S23W29 | 229 | 0040 | 11 | Cro | 022 | B | 1 | | | | | | | | | | |
| 02 Dec | S22W45 | 231 | 0020 | 07 | Bxo | 010 | B | | | | | | | | | | | |
| 03 Dec | S23W58 | 231 | 0030 | 06 | Bxo | 005 | B | | | | | | | | | | | |
| 04 Dec | S24W69 | 229 | 0110 | 09 | Cso | 006 | B | 1 | | | | 1 | | | | | | |
| 05 Dec | S24W81 | 227 | 0070 | 02 | Hax | 001 | A | | | | | 1 | | | | | | |
| 06 Dec | S23W96 | 229 | 0010 | 05 | Bxo | 005 | B | | | | | | | | | | | |
| | | | | | | | | 5 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | |

Crossed West Limb.

Absolute heliographic longitude: 228

| | | | | | | | | | | | | | | | | | | |
|-------------------|--------|-----|------|----|-----|-----|---|---|---|---|---|---|---|---|---|---|---|--|
| <i>Region 511</i> | | | | | | | | | | | | | | | | | | |
| 25 Nov | S14E24 | 255 | 0040 | 06 | Dso | 006 | B | | | | | | | | | | | |
| 26 Nov | S14E11 | 255 | 0060 | 07 | Dao | 022 | B | | | | | | | | | | | |
| 27 Nov | S15W02 | 254 | 0050 | 07 | Dso | 006 | B | | | | | | | | | | | |
| 28 Nov | S15W15 | 254 | 0050 | 08 | Dso | 006 | B | | | | | | | | | | | |
| 29 Nov | S15W30 | 256 | 0030 | 06 | Cso | 007 | B | | | | | | | | | | | |
| 30 Nov | S15W44 | 256 | 0030 | 05 | Bxo | 006 | B | | | | | | | | | | | |
| 01 Dec | S15W57 | 256 | 0040 | 09 | Dso | 006 | B | | | | | | | | | | | |
| 02 Dec | S14W71 | 257 | 0040 | 06 | Bxo | 006 | B | 1 | | | | 1 | | | | | | |
| 03 Dec | S14W84 | 257 | | | | | | | | | | | | | | | | |
| 04 Dec | S14W97 | 257 | | | | | | | | | | | | | | | | |
| | | | | | | | | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | |

Crossed West Limb.

Absolute heliographic longitude: 254



Region Summary - continued.

| 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 |

Region 512

| | | | | | | | | | | | | | | | | | | |
|---------------|-----|------|----|-----|-----|---|--|--|--|--|--|--|--|--|--|--|--|--|
| 25 Nov N06E31 | 248 | 0020 | 03 | Cso | 003 | B | | | | | | | | | | | | |
| 26 Nov N06E18 | 248 | 0020 | 05 | Cso | 006 | B | | | | | | | | | | | | |
| 27 Nov N06E04 | 248 | 0030 | 07 | Cso | 006 | B | | | | | | | | | | | | |
| 28 Nov N06W09 | 248 | 0300 | 06 | Bxo | 008 | B | | | | | | | | | | | | |
| 29 Nov N06W22 | 248 | 0010 | 01 | Axx | 002 | A | | | | | | | | | | | | |
| 30 Nov N06W36 | 248 | 0010 | 01 | Hsx | 001 | A | | | | | | | | | | | | |
| 01 Dec N06W54 | 253 | | | | | | | | | | | | | | | | | |
| 02 Dec N06W67 | 253 | | | | | | | | | | | | | | | | | |
| 03 Dec N06W80 | 253 | | | | | | | | | | | | | | | | | |
| 04 Dec N06W93 | 253 | | | | | | | | | | | | | | | | | |

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 248

Region 513

| | | | | | | | | | | | | | | | | | | |
|---------------|-----|------|----|-----|-----|---|---|--|--|--|--|--|--|--|--|--|--|--|
| 26 Nov N09E71 | 195 | 0040 | 03 | Hsx | 001 | A | | | | | | | | | | | | |
| 27 Nov N13E58 | 194 | 0050 | 02 | Hsx | 001 | A | | | | | | | | | | | | |
| 28 Nov N13E45 | 194 | 0050 | 02 | Hsx | 001 | A | | | | | | | | | | | | |
| 29 Nov N13E32 | 194 | 0080 | 02 | Hsx | 001 | A | | | | | | | | | | | | |
| 30 Nov N13E18 | 194 | 0070 | 02 | Hsx | 002 | A | | | | | | | | | | | | |
| 01 Dec N13E05 | 194 | 0070 | 02 | Hsx | 001 | A | | | | | | | | | | | | |
| 02 Dec N12W07 | 193 | 0060 | 02 | Hsx | 001 | A | | | | | | | | | | | | |
| 03 Dec N12W21 | 194 | 0060 | 02 | Hsx | 001 | A | | | | | | | | | | | | |
| 04 Dec N12W34 | 194 | 0040 | 12 | Hsx | 001 | A | | | | | | | | | | | | |
| 05 Dec N12W47 | 193 | 0070 | 02 | Hsx | 001 | A | 1 | | | | | | | | | | | |
| 06 Dec N11W62 | 195 | 0060 | 02 | Hsx | 001 | A | | | | | | | | | | | | |
| 07 Dec N11W75 | 195 | 0060 | 01 | Hax | 001 | A | | | | | | | | | | | | |

1 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 194

Region 514

| | | | | | | | | | | | | | | | | | | |
|---------------|-----|------|----|-----|-----|---|--|--|--|--|--|--|--|--|--|--|--|--|
| 27 Nov S16W46 | 298 | 0000 | 01 | Axx | 001 | A | | | | | | | | | | | | |
| 28 Nov S15W59 | 298 | 0010 | 01 | Axx | 001 | A | | | | | | | | | | | | |
| 29 Nov S15W72 | 298 | | | | | | | | | | | | | | | | | |
| 30 Nov S15W85 | 298 | | | | | | | | | | | | | | | | | |
| 01 Dec S15W98 | 298 | | | | | | | | | | | | | | | | | |

0 0 0 0 0 0 0 0

Crossed West Limb.

Absolute heliographic longitude: 298



Region Summary - continued.

| Date | Location | | Sunspot Characteristics | | | | Flares | | | | | | | |
|------|----------------|--------------|---------------------------------|-------------------|---------------|---------------|--------------|-------|---|---|---------|---|---|---|
| | (° Lat ° CMD) | Helio Lon | Area (10 ⁻⁶ hemi) | Extent (helio) | Spot Class | Spot Count | Mag Class | X-ray | | | Optical | | | |
| | | | | | | | | C | M | X | S | 1 | 2 | 3 |

Region 515

| | | | | | | | | | | | | | | | | | | | |
|---------------|-----|------|----|-----|-----|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 28 Nov S02E68 | 171 | 0050 | 01 | Hrx | 002 | A | | | | | | | | | | | | | |
| 29 Nov S02E55 | 171 | 0080 | 05 | Dso | 007 | B | | | | | | | | | | | | | |
| 30 Nov S02E42 | 171 | 0030 | 06 | Bxo | 008 | B | | | | | | | | | | | | | |
| 01 Dec S02E28 | 171 | 0050 | 04 | Dso | 009 | B | | | | | | | | | | | | | |
| 02 Dec S02E13 | 173 | 0040 | 04 | Dso | 009 | B | | | | | | | | | | | | | |
| 03 Dec S03W01 | 174 | 0040 | 03 | Cro | 006 | B | | | | | | | | | | | | | |
| 04 Dec S03W16 | 176 | 0010 | 01 | Axx | 001 | A | | | | | | | | | | | | | |
| 05 Dec S03W29 | 176 | | | | | | | | | | | | | | | | | | |
| 06 Dec S03W42 | 176 | | | | | | | | | | | | | | | | | | |
| 07 Dec S03W55 | 176 | | | | | | | | | | | | | | | | | | |

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 174

Region 516

| | | | | | | | | | | | | | | | | | | | |
|---------------|-----|------|----|-----|-----|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 28 Nov S17E70 | 169 | 0050 | 02 | Hsx | 001 | A | | | | | | | | | | | | | |
| 29 Nov S17E57 | 169 | 0070 | 03 | Cso | 005 | B | | | | | | | | | | | | | |
| 30 Nov S17E44 | 168 | 0090 | 05 | Dao | 007 | B | | | | | | | | | | | | | |
| 01 Dec S17E31 | 168 | 0060 | 07 | Dso | 012 | B | | | | | | | | | | | | | |
| 02 Dec S16E18 | 168 | 0050 | 07 | Dso | 015 | B | | | | | | | | | | | | | |
| 03 Dec S16E04 | 169 | 0060 | 06 | Dso | 009 | B | | | | | | | | | | | | | |
| 04 Dec S16W11 | 171 | 0040 | 05 | Cso | 005 | B | | | | | | | | | | | | | |
| 05 Dec S17W24 | 170 | 0090 | 05 | Dao | 010 | B | | | | | | | | | | | | | |
| 06 Dec S17W37 | 170 | 0100 | 06 | Dao | 011 | B | | | | | | | | | | | | | |
| 07 Dec S17W52 | 172 | 0090 | 05 | Dao | 006 | B | | | | | | | | | | | | | |

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 169

Region 517

| | | | | | | | | | | | | | | | | | | | |
|---------------|-----|------|----|-----|-----|---|---|--|--|--|--|--|--|--|--|--|--|--|--|
| 30 Nov S07E67 | 145 | 0160 | 07 | Cao | 002 | B | 1 | | | | | | | | | | | | |
| 01 Dec S07E60 | 139 | 0260 | 10 | Dko | 005 | B | | | | | | | | | | | | | |
| 02 Dec S06E47 | 139 | 0350 | 09 | Dao | 006 | B | | | | | | | | | | | | | |
| 03 Dec S06E33 | 140 | 0270 | 08 | Dso | 007 | B | | | | | | | | | | | | | |
| 04 Dec S06E20 | 140 | 0290 | 10 | Dao | 012 | B | | | | | | | | | | | | | |
| 05 Dec S06E07 | 139 | 0260 | 10 | Dao | 018 | B | | | | | | | | | | | | | |
| 06 Dec S07W06 | 139 | 0220 | 10 | Dso | 019 | B | | | | | | | | | | | | | |
| 07 Dec S08W20 | 140 | 0160 | 10 | Dao | 016 | B | | | | | | | | | | | | | |

1 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 139



Region Summary - continued.

| 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 |

Region 518

| | | | | | | | | | | | | | | | | | |
|--------|--------|-----|------|----|-----|-----|---|--|--|--|--|--|--|--|--|--|--|
| 03 Dec | S22E10 | 163 | 0000 | 01 | Axx | 001 | A | | | | | | | | | | |
| 04 Dec | S21W03 | 163 | 0000 | 01 | Axx | 001 | A | | | | | | | | | | |
| 05 Dec | S21W16 | 163 | | | | | | | | | | | | | | | |
| 06 Dec | S21W29 | 163 | | | | | | | | | | | | | | | |
| 07 Dec | S21W42 | 163 | | | | | | | | | | | | | | | |

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 163

Region 519

| | | | | | | | | | | | | | | | | | |
|--------|--------|-----|------|----|-----|-----|---|--|--|--|--|--|--|--|--|--|--|
| 04 Dec | S08W15 | 175 | 0070 | 05 | Cao | 008 | B | | | | | | | | | | |
| 05 Dec | S08W28 | 174 | 0010 | 04 | Bxo | 008 | B | | | | | | | | | | |
| 06 Dec | S05W45 | 178 | 0010 | 01 | Axx | 001 | A | | | | | | | | | | |
| 07 Dec | S05W58 | 178 | | | | | | | | | | | | | | | |

0 0 0 0 0 0 0 0

Still on Disk.

Absolute heliographic longitude: 175

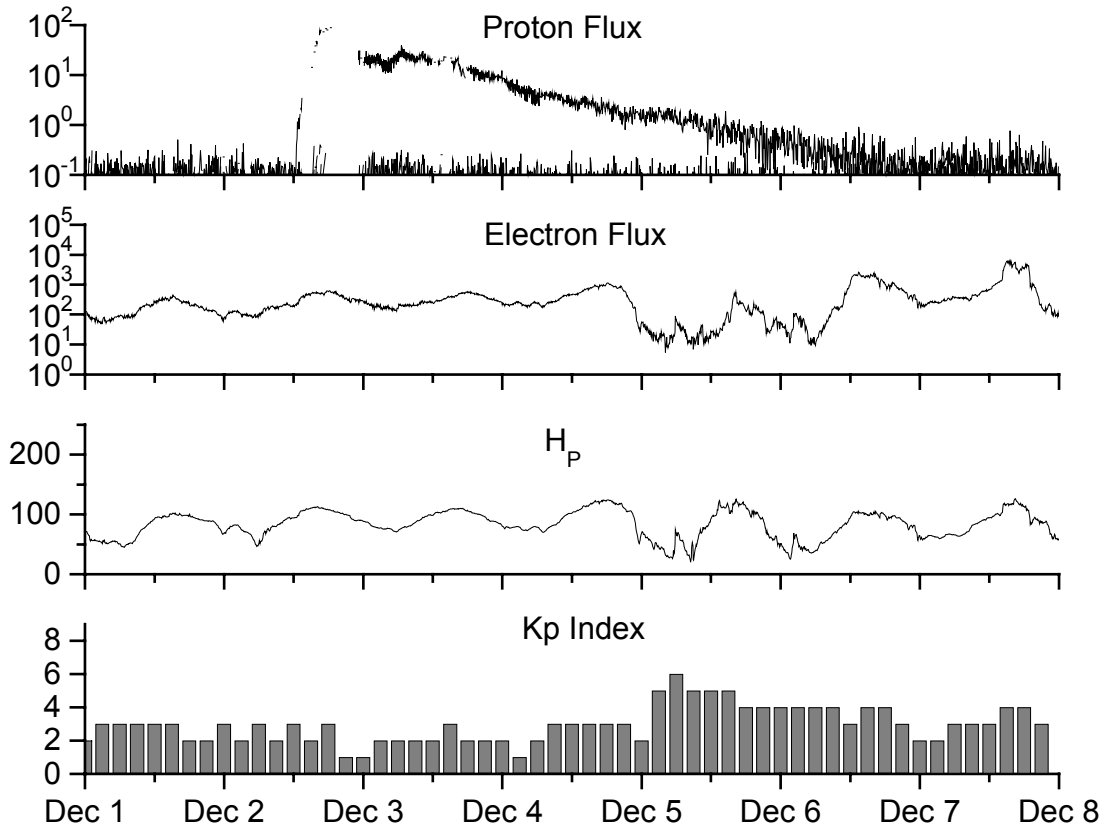


**Recent Solar Indices (preliminary)
of the observed monthly mean values**

| Month | Sunspot Numbers | | | Radio Flux | | Geomagnetic | | | |
|-------------|------------------------|-------------|-----------------|----------------------|---------------------|-----------------------|-----------------|-----------------|-----------------|
| | Observed values SWO | Ratio RI | Ratio RI/SWO | Smooth values SWO | Smooth values RI | *Penticton 10.7 cm | Smooth Value | Planetary Ap | Smooth Value |
| 2001 | | | | | | | | | |
| December | 217.5 | 132.2 | 0.61 | 184.5 | 114.6 | 235.6 | 193.9 | 09 | 12.2 |
| 2002 | | | | | | | | | |
| January | 189.0 | 114.1 | 0.60 | 184.8 | 113.5 | 227.3 | 194.6 | 08 | 12.3 |
| February | 194.5 | 107.4 | 0.55 | 188.6 | 114.7 | 205.0 | 197.2 | 10 | 12.8 |
| March | 153.1 | 98.4 | 0.64 | 188.9 | 113.3 | 180.3 | 195.7 | 10 | 12.9 |
| April | 194.9 | 120.7 | 0.62 | 186.2 | 110.5 | 189.8 | 191.5 | 15 | 13.2 |
| May | 204.1 | 120.8 | 0.59 | 183.6 | 108.9 | 178.4 | 188.0 | 15 | 13.3 |
| June | 146.0 | 88.3 | 0.60 | 179.9 | 106.3 | 148.7 | 183.0 | 11 | 13.5 |
| July | 183.5 | 99.6 | 0.54 | 175.4 | 102.7 | 173.5 | 176.3 | 11 | 13.7 |
| August | 191.0 | 116.4 | 0.61 | 169.2 | 98.7 | 183.9 | 169.5 | 16 | 14.2 |
| September | 206.4 | 109.6 | 0.53 | 163.4 | 94.6 | 175.8 | 164.1 | 14 | 15.0 |
| October | 153.9 | 97.5 | 0.63 | 158.8 | 90.5 | 167.0 | 159.4 | 23 | 15.6 |
| November | 159.8 | 95.5 | 0.60 | 150.9 | 85.2 | 168.7 | 154.8 | 16 | 16.3 |
| December | 147.9 | 80.8 | 0.55 | 144.6 | 82.1 | 158.6 | 150.9 | 13 | 17.0 |
| 2003 | | | | | | | | | |
| January | 149.3 | 79.7 | 0.53 | 141.7 | 81.0 | 144.0 | 149.2 | 13 | 18.2 |
| February | 87.0 | 46.0 | 0.53 | 136.4 | 78.5 | 124.5 | 144.7 | 17 | 18.9 |
| March | 119.7 | 61.1 | 0.51 | 128.1 | 74.2 | 132.2 | 139.5 | 21 | 19.4 |
| April | 119.7 | 60.0 | 0.50 | 121.5 | 70.3 | 126.3 | 136.3 | 20 | 20.0 |
| May | 89.6 | 55.2 | 0.62 | 118.3 | 67.8 | 129.3 | 135.0 | 26 | 21.0 |
| June | 118.4 | 77.4 | 0.65 | | | 129.4 | | 24 | |
| July | 132.8 | 85.0 | 0.64 | | | 127.8 | | 20 | |
| August | 114.3 | 72.7 | 0.64 | | | 122.1 | | 23 | |
| September | 82.6 | 48.8 | 0.59 | | | 112.3 | | 19 | |
| October | 118.9 | 65.6 | 0.55 | | | 153.1 | | 32 | |
| November | 118.9 | 67.2 | 0.57 | | | 153.1 | | 31 | |

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.





Weekly Geosynchronous Satellite Environment Summary

Week Beginning 01 December 2003

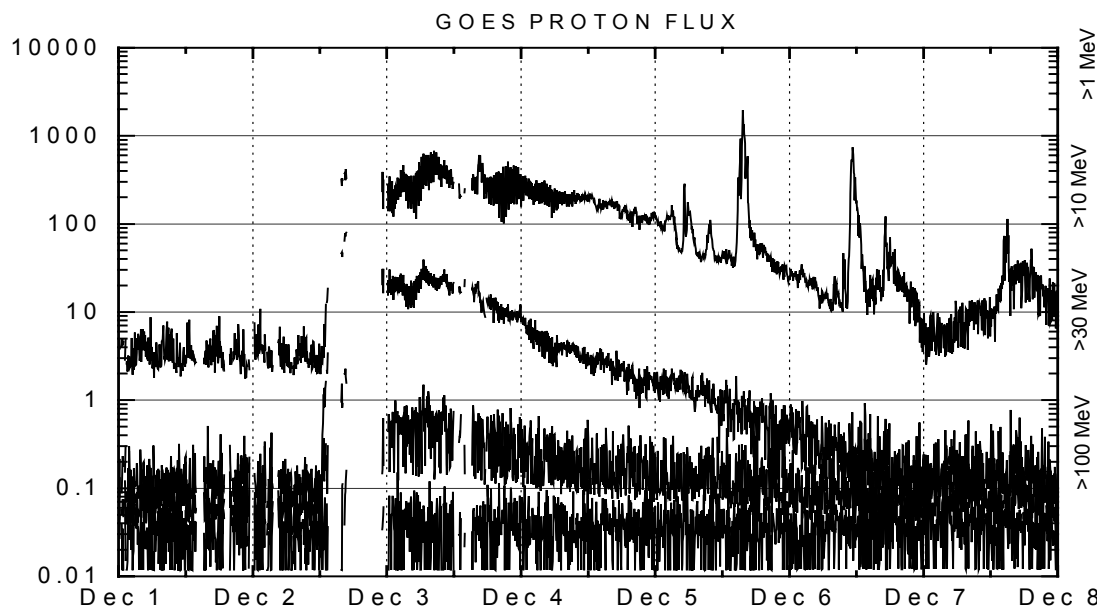
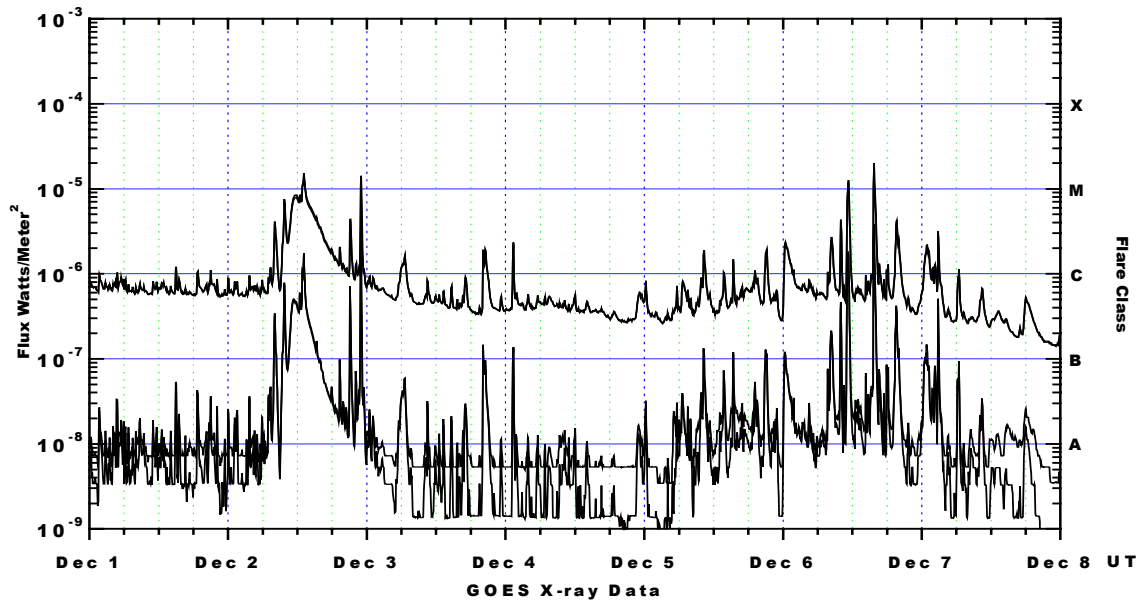
Protons plot contains the five-minute averaged integral proton flux (protons/cm²-sec -sr) as measured by GOES-11 (W113) for each of three energy thresholds: greater than 10, 50, and 100 MeV.

Electrons plot contains the five-minute averaged integral electron flux (electrons/cm²-sec -sr) with energies greater than 2 MeV at GOES-12.

H_p 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.

K_p 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 Heartland, UK. These data are made available through cooperation from the Geological Survey of Canada (GSC) and the US Geological Survey. These may differ from the final K_p values derived from a more extensive network of magnetometers. The data included here are those now available in real time at the SWO 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 K_p are "global" parameters that are applicable to a first order approximation over large areas. H_p 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 12 and 10 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 (W113) 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.

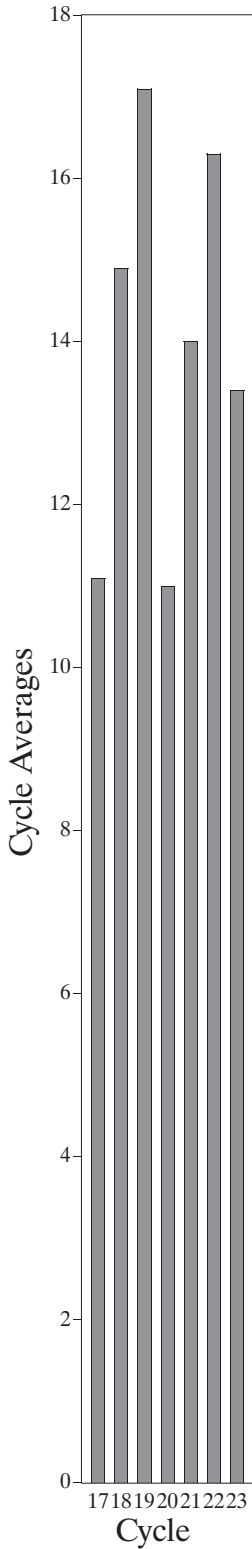


Geomagnetic Activity (A_p)



Space Environment Center

Comparison of Cycles at current month in cycle



November 2003
(Month 86)

█ Preliminary data

