# Solar Influences Data analysis Center

*Data Analysis Service supported by the FAGS*

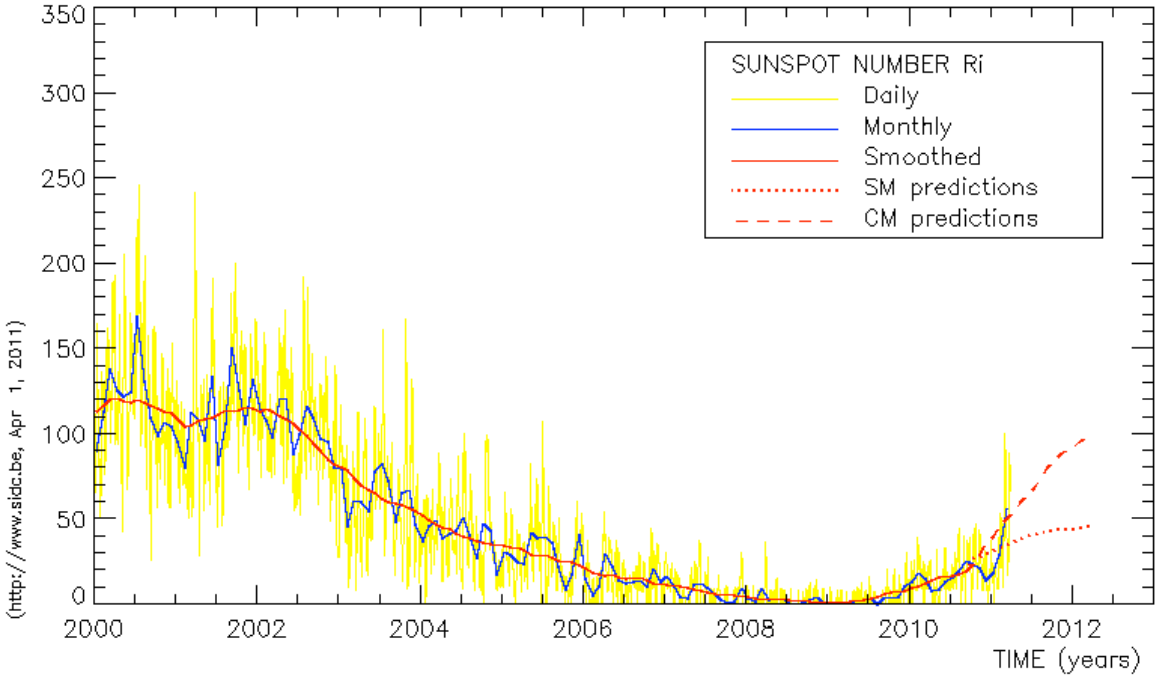
# *SUNSPOT BULLETIN*

**2011 n° 3**

**Provisional international and normalized hemispheric daily sunspot numbers for March 2011**

computed at the *Royal Observatory of Belgium* using observations from an international network with the *Locarno Specola Solare* as reference station.

| Date | $R'_I$ | $R'_N$ | $R'_S$ |
|---|---|---|---|
| 1 | 47 | 34 | 13 |
| 2 | 37 | 25 | 12 |
| 3 | 52 | 43 | 9 |
| 4 | 70 | 59 | 11 |
| 5 | 76 | 58 | 18 |
| 6 | 92 | 68 | 24 |
| 7 | 98 | 76 | 22 |
| 8 | 100 | 79 | 21 |
| 9 | 80 | 69 | 11 |
| 10 | 67 | 60 | 7 |
| 11 | 59 | 59 | 0 |
| 12 | 59 | 59 | 0 |
| 13 | 66 | 66 | 0 |
| 14 | 43 | 43 | 0 |
| 15 | 34 | 34 | 0 |
| 16 | 27 | 15 | 12 |
| 17 | 27 | 14 | 13 |
| 18 | 20 | 0 | 20 |
| 19 | 29 | 29 | 0 |
| 20 | 21 | 21 | 0 |
| 21 | 17 | 17 | 0 |
| 22 | 32 | 22 | 10 |
| 23 | 30 | 17 | 13 |
| 24 | 39 | 18 | 21 |
| 25 | 69 | 29 | 40 |
| 26 | 72 | 24 | 48 |
| 27 | 84 | 36 | 48 |
| 28 | 88 | 36 | 52 |
| 29 | 74 | 36 | 38 |
| 30 | 68 | 31 | 37 |
| 31 | 66 | 31 | 35 |
| **Monthly mean** | **56.2** | **39.0** | **17.2** |
| **Cooperating stations** | **64** | **60** | **60** |




**Predictions of the monthly smoothed Sunspot Number**
using the last provisional value, calculated for September 2010: 19.6 (± 5%)

| | SM | CM | | SM | CM | | SM | CM |
|---|---|---|---|---|---|---|---|---|
| 2010 Oct | 21 | 23 | 2011 Apr | 32 | 55 | 2011 Oct | 42 | 85 |
| Nov | 24 | 29 | May | 33 | 60 | Nov | 43 | 88 |
| Dec | 25 | 35 | Jun | 35 | 64 | Dec | 43 | 91 |
| 2011 Jan | 27 | 40 | Jul | 37 | 68 | 2012 Jan | 44 | 93 |
| Feb | 29 | 46 | Aug | 39 | 74 | Feb | 44 | 96 |
| Mar | 30 | 50 | Sep | 40 | 80 | Mar | 45 | 99 |

**SM : SIDC classical method :** based on an interpolation of Waldmeier's standard curves. The estimated error ranges from 7% (first month) to 35% (last month)
**CM : Combined method :** the combined method is a regression technique coupling a dynamo-based estimator with Waldmeier's method of standard curves, due to K. Denkmayr.
Ref. : **K. Denkmayr, P. Cugnon**, 1997 : "About Sunspot Number Medium-Term Predictions", in "Solar-Terrestrial Prediction Workshop V", eds G.Heckman et al., Hiraiso Solar Terrestrial Research Center, Japan, 103

Brussels, April 1, 2011 10:15 UT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Web: http://sidc.oma.be, "Sunspots" section in sidebar.

## S.I.D.C. SUMMARY OF THE URSIGRAMS

| Date | $R'_i$ | PPSI | 600 | 2800 | COS | SFI | XI | Ak | SEA |
|---|---|---|---|---|---|---|---|---|---|
| 28 | 31 | 32 | - | 96 | //// | 3 | 1/0 | 3 | |
| 1 | 47 | 57 | - | 111 | //// | 2 | 0/0 | 30 | |
| 2 | 37 | 66 | - | 113 | //// | 1 | 0/0 | 25 | |
| 3 | 52 | 70 | - | 121 | //// | 15 | 0/0 | 20 | |
| 4 | 70 | 102 | - | 127 | //// | 1 | 0/0 | 15 | |
| 5 | 76 | 196 | - | 135 | //// | 4 | 0/0 | 8 | |
| 6 | 92 | 118 | - | 143 | //// | 13 | 0/0 | 8 | |
| 7 | 98 | 143 | - | 153 | //// | 32 | 7/0 | 12 | |
| 8 | 100 | 164 | - | 155 | //// | 25 | 5/0 | 6 | |
| 9 | 80 | 154 | - | 143 | //// | 5 | 2/1 | 4 | |
| 10 | 67 | 162 | - | 131 | //// | 5 | 1/0 | 19 | |
| 11 | 59 | 144 | - | 123 | //// | 8 | 0/0 | 30 | |
| 12 | 59 | 121 | - | 121 | //// | 4 | 1/0 | 22 | |
| 13 | 66 | 90 | - | 113 | //// | 1 | 0/0 | 14 | |
| 14 | 43 | 45 | - | 107 | //// | 18 | 1/0 | 2 | |
| 15 | 34 | 20 | - | 102 | //// | 14 | 1/0 | 2 | |
| 16 | 27 | 10 | - | 95 | //// | 3 | 0/0 | 2 | |
| 17 | 27 | 12 | - | 90 | //// | 0 | 0/0 | 6 | |
| 18 | 20 | 9 | - | 88 | //// | 0 | 0/0 | 3 | |
| 19 | 29 | 15 | - | 89 | //// | 0 | 0/0 | 4 | |
| 20 | 21 | 16 | - | 92 | //// | 0 | 0/0 | 8 | |
| 21 | 17 | 23 | - | 101 | //// | 0 | 0/0 | 8 | |
| 22 | 32 | 23 | - | 100 | //// | 2 | 0/0 | 9 | |
| 23 | 30 | 33 | - | 105 | //// | 1 | 1/0 | 15 | |
| 24 | 39 | 40 | - | 108 | //// | 23 | 1/0 | 4 | |
| 25 | 69 | 62 | - | 113 | //// | 2 | 1/0 | 4 | |
| 26 | 72 | 85 | - | 115 | //// | 1 | 0/0 | 1 | |
| 27 | 84 | 101 | - | /// | //// | 1 | 0/0 | 2 | |
| 28 | 88 | 72 | - | 119 | //// | 2 | 0/0 | 3 | |
| 29 | 74 | 75 | - | 116 | //// | 0 | 0/0 | 4 | |
| 30 | 68 | 86 | - | 118 | //// | 0 | 0/0 | 4 | |
| 31 | 66 | 53 | - | 113 | //// | 3 | 0/0 | 3 | |

**$R'_i$** : provisional international sunspot numbers from the S.I.D.C.

**PPSI** : prompt photometric sunspot index from the S.I.D.C. in 10-5 w/m$^2$ : the quantity to be subtracted from the mean solar constant to account for the sunspot contribution.

**600** : 600 Mhz solar flux from the station at Humain (Belgium).

**2800** : 2800 Mhz solar flux from Ottawa (origin : Ursigrams - UGEOI). The 10.7cm Flux data are a service of the National Research Council of Canada.

**COS** : thousands of the cosmic ray counts (origin : Ursigrams - UCOSE Terre Adélie).

**SFI** : From October 1992, Solar Flare Index from the S.I.D.C. (origin : Ursigrams – UGEOR, evaluation : 1 x Sn+10 x "1"+100 x ">1".

**XI** : X-flares index from the Ursigrams (M-flares/X-flares) (origin : Ursigrams – UGEOR, UGEOI).

**Ak** : geomagnetic index from Wingst, Germany (origin : Ursigrams).

**SEA** : sudden enhancements of atmospherics from Uccle & Humain (Royal Observatory, Belgium).

**Note that due to problems of interferences saturating our receivers, no SEA could be detected this month.**

SOLAR PHYSICS DEPARTMENT

UCCLE DAILY PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR MARCH 2011

| DATE | UT | NUMBER OF GROUPS | NUMBER OF SPOTS | RELATIVE SUNSPOT NUMBERS TOTAL | NORTH | SOUTH | CENTRAL | PPSI 10-5 WM-2 | QUAL | OBS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1010 | 2 | 29 | 49 | 35 | 14 | 14 | 36.3 | 3 | OB |
| 2 | 1010 | 2 | 18 | 38 | 24 | 14 | 14 | 23.2 | 3 | OB |
| 3 | 930 | 2 | 21 | 41 | 41 | 0 | 0 | 19.3 | 3 | OB |
| 4 | 830 | 5 | 46 | 96 | 80 | 16 | 0 | 63.4 | 3 | OB |
| 6 | 940 | 3 | 60 | 90 | 65 | 25 | 0 | 90.4 | 3 | OB |
| 7 | 900 | 5 | 49 | 99 | 79 | 20 | 42 | 84.7 | 3 | AE |
| 8 | 900 | 6 | 54 | 114 | 88 | 26 | 41 | 88.5 | 3 | AE |
| 9 | 1615 | 4 | 46 | 86 | 74 | 12 | 38 | 87.6 | 2 | AE |
| 11 | 930 | 2 | 47 | 67 | 67 | 0 | 25 | 88.9 | 2 | AE |
| 12 | 1215 | 3 | 36 | 66 | 66 | 0 | 26 | 46.5 | 2 | AE |
| 14 | 950 | 2 | 10 | 30 | 30 | 0 | 0 | 18.7 | 1 | SV |
| 15 | 845 | 3 | 13 | 43 | 43 | 0 | 11 | 8.8 | 2 | SV |
| 16 | 1040 | 2 | 13 | 33 | 17 | 16 | 0 | 7.7 | 4 | SV |
| 19 | 930 | 2 | 16 | 36 | 23 | 13 | 36 | 5.9 | 2 | OL |
| 20 | 750 | 2 | 13 | 33 | 33 | 0 | 0 | 4.9 | 3 | OL |
| 21 | 800 | 1 | 13 | 23 | 23 | 0 | 0 | 13.8 | 4 | OL |
| 22 | 800 | 3 | 13 | 43 | 30 | 13 | 0 | 13.2 | 3 | OL |
| 23 | 835 | 2 | 8 | 28 | 12 | 16 | 0 | 8.0 | 3 | OL |
| 24 | 820 | 3 | 16 | 46 | 26 | 20 | 14 | 13.0 | 4 | OL |
| 25 | 755 | 5 | 38 | 88 | 39 | 49 | 0 | 53.0 | 3 | SV |
| 26 | 800 | 5 | 31 | 81 | 22 | 59 | 33 | 74.2 | 3 | SV |
| 27 | 800 | 7 | 42 | 112 | 45 | 67 | 48 | 84.7 | 3 | SV |
| 28 | 830 | 7 | 29 | 99 | 42 | 57 | 49 | 52.7 | 2 | OB |
| 29 | 800 | 5 | 38 | 88 | 37 | 51 | 51 | 72.9 | 2 | OB |
| 30 | 740 | 5 | 41 | 91 | 34 | 57 | 28 | 81.1 | 2 | OL |

The relative mean sunspot number is 64.8.

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NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS U'=K'U FOR MARCH 2011

K'= 0.811 (*)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 40 | 7 | 80 | 13 | *** | 19 | 29 | 25 | 71 |
| 2 | 31 | 8 | 92 | 14 | 24 | 20 | 27 | 26 | 66 |
| 3 | 33 | 9 | 70 | 15 | 35 | 21 | 19 | 27 | 91 |
| 4 | 78 | 10 | *** | 16 | 27 | 22 | 35 | 28 | 80 |
| 5 | *** | 11 | 54 | 17 | *** | 23 | 23 | 29 | 71 |
| 6 | 73 | 12 | 54 | 18 | *** | 24 | 37 | 30 | 74 |
| | | | | | | | | 31 | *** |

The normalized relative monthly mean sunspot number is 53.

(*) K' is the mean of the monthly K' for the last five years.

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The Sun has been observed 25 days on 31 possible.

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UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR MARCH 2011
E AND F BRUNNER'S TYPE GROUPS

| Uccle Nø | East Limb Date | Date and type 1st obs | CMP | Last obs | West Limb Date |
|---|---|---|---|---|---|
| 4-2107 | 2 24.8 | 1 D | 3 3.5 | 9 D | 3 10.3 |
| 5-2107 | 3 2.1 | 3 C | 3 8.8 | 14 C | 3 15.6 |
| 6-2108 | 3 21.4 | 22 D | 3 28.1 | 30 G | 4 3.9 |
| 14-2108 | 3 25.9 | 27 B | 4 1.7 | 30 E | 4 8.4 |

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PROBABLE RETURN OF MAJOR GROUPS FOR APRIL 2011

| Nø | New East Limb | New CMP | New West Limb |
|---|---|---|---|
| 4 | 3 24.6 | 3 31.4 | 4 7.1 |
| 5 | 3 29.7 | 4 5.5 | 4 12.2 |

## Notice: new "Sunspot" Director

In March 2011, Dr. Ronald Van der Linden handed over the Direction of the World Data Service "Sunspot" to Dr. Frédéric Clette, who has been involved in the WDS for many years.

***Therefore, the contact address has been updated. From now on, please send your requests or special messages to F.Clette (see full address and credits on page 2 of this Bulletin).***

There is no change for the observing reports, which must be imported as usual through the WOLF web input form.

Note also that this change of WDS Director does not modify anything to the continuing support of the Royal Observatory of Belgium to the WDS "Sunspot", which is hosted by the ROB since 1981.

F. Clette whishes to acknowledge the constant efforts of Dr. Van der Linden to keep the WDS fully alive and to ensure the quality of the output data during the last 9 years, while endorsing the parallel heavy charge of Director of the ROB.

## MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

### *I. Solar Activity*

*Solar activity was elevated: the background X-ray radiation stayed several days in the C-level, 2 proton events reached the Earth, several active regions released all together 21 M-flares, one X-flare and a series of CME's.*

On Mar 03, a plasma cloud was ejected into the direction of the Earth. According to CACTus applied on STEREO B/COR2 images, the cloud had a speed of 312 km/s. There was no clear on disk signature linked with this CME. The structure could not be clearly traced in the solar wind data at the expected time arrival.

Mar 07 - 09, the background X-ray radiation was in the C-level. Three active regions, NOAA AR 1164/Cat 18, AR 1165/Cat19, AR 1166/Cat 22 were the source of the flaring activity which was accordingly very high during this period. All three regions had a complex magnetic structure at the level of the photosphere. AR 1166/Cat 22 produced an X1.5 flare on Mar 09. On Mar 07, there were 3 CME's linked with the flaring activity that were candidates for a glancing blow at Earth.

A long duration M-flare of Mar 07 triggered by NOAA AR 1164, at that moment located near the west-limb, was associated with an EIT-wave and a CME, one of the three mentioned in the previous paragraph. This energy release in the form of radiation and kinetic energy, initiated a proton event. Only after the arrival the series of CME's on Mar 10, the >=10 MeV flux dropped below the threshold.

From Mar 10, NOAA AR 1169/Cat 26 came slowly into the running with first a few C-flares and finally an M-flare on Mar 15. From Mar 07 until Mar 15, we counted 18 M-flares and an X1.5 flare.

From Mar 23 until Mar 25, NOAA AR 1176/Cat 35 was responsible for the next M-flare period with one M-flare a day. These spiky flares did not take long to radiate and were confined in time. On Mar 23, the beta-gamma region was located at S14E56.

The proton flux was elevated on Mar 21 and 22. The curve passed slightly and for a very short time the proton event threshold. The initial increase was probably linked with a back sided CME of Mar 21, 02:54UT. The Earth is magnetically connected with the source site behind the Sun. The Parker spiral has bended magnetic field lines that guide the electrically charged protons. The Earth is near such field lines along which these protons travel. This is a rare but not an unprecedented event.

On Mar 25, a slow magnetic structure left the Sun. The coronograph STEREO A-B/COR2 could catch it in its field of view. CACTus, a software to detect CME's in coronographic images, estimated the speed to be 223 km/s.

A large extension towards the equator of a recurrent northern polar coronal hole (CH), reached the central meridian (CM) on Feb 28. From Mar 11, the southern polar CH was clearly present. It did not reach the equator. On Mar 19, a fragmented CH reached the CM: one part was located in the northern hemisphere, two smaller CHs were located near the equator.

### *II. Geomagnetic Activity*

*A strong recurrent CH and a series of CME arrivals were the cause of two major magnetic storms.*

The solar wind profile that reached Earth from Mar 01, resembled to a CH structure. Since the maximum solar wind reached the value of 700 km/s, we can assume the wind to come from the solar pole linking it to the recurrent northern polar CH mentioned in the previous section. The north-south component of the magnetic field was more than 1 day negative. The lowest value reached was -12 nT. The planetary geomagnetic conditions reached a major storm level (Kp=6) on Mar 01. By Mar 04, unsettled to quiet conditions by measured.

On Mar 10, a small shock was seen in the total magnetic field carried by the solar wind, the north-

south component of it and the solar wind speed measured by ACE. The high part of the shock had a speed less than 400 km/s, conform with the speed of the Mar 03 CME calculated by CACTus. The following two days, the magnetic field strength carried by the solar wind was near 10 nT. The solar wind profile of those days can possibly be linked with the series of CME's of Mar 07. These arrivals resulted in major geomagnetic storm conditions (Kp=6) from Mar 10 until the morning on Mar 12.

The solar wind reaching the Earth from Mar 11 until Mar 15, can be associated with the southern polar CH mentioned in the previous section. This solar wind could not produce any geomagnetic disturbance.

The unsettled conditions on Mar 22 can be associated to the fragmented CH mentioned in the previous section. The solar wind reached its maximum speed of 550 km/s on Mar 23.

Late on March 29, a weak shock and solar wind disturbance, possibly associated with the plasma structure being ejected on Mar 25, reached the Earth. The Bz rotated over the course of 1.5 day from 12 nT to -5nT. The Kp became one period 4 on Mar 30.

## *III. Noticeable solar events*

| DAY | BEGIN | MAX | END | LOC | XRAY | OP | TENCM | TYPE | Cat | NOAA |
|---|---|---|---|---|---|---|---|---|---|---|
| 07 | 0500 | 0513 | 0519 | | M1.2 | | | | 19 | 1164 |
| 07 | 0749 | 0754 | 0756 | S20W78 | M1.5 | SF | | III/1 | | 1165 |
| 07 | 0759 | 0807 | 0815 | N25W47 | M1.4 | 1F | 100 | | 19 | 1164 |
| 07 | 0914 | 0920 | 0928 | N23W50 | M1.8 | SF | 190 | | 19 | 1164 |
| 07 | 1345 | 1430 | 1456 | N10E18 | M1.9 | SF | | III/2,II/2,IV/1 | 22 | 1166 |
| 07 | 1943 | 2012 | 2058 | | M3.7 | | 23000 | II/3 | 19 | 1164 |
| 07 | 2145 | 2150 | 2155 | | M1.5 | | | III/1 | 18 | 1165 |
| 08 | 0224 | 0229 | 0232 | S18W79 | M1.3 | 1N | | | 18 | 1165 |
| 08 | 0337 | 0358 | 0420 | | M1.5 | | 130 | II/2,III/1,IV/1 | | 1171 |
| 08 | 1035 | 1044 | 1055 | S17W86 | M5.3 | 1F | | | 18 | 1165 |
| 08 | 1808 | 1828 | 1841 | | M4.4 | | | VI/2 | 18 | 1165 |
| 08 | 1946 | 2016 | 2119 | | M1.4 | | | VI/2 | 18 | 1165 |
| 09 | 1035 | 1107 | 1121 | N08W03 | M1.7 | SF | | III/2 | 22 | 1166 |
| 09 | 1317 | 1402 | 1413 | N09W06 | M1.7 | SF | | VI/1 | 22 | 1166 |
| 09 | 2313 | 2323 | 2329 | N08W09 | X1.5 | 2B | | V/1,III/1 | 22 | 1166 |
| 10 | 2234 | 2241 | 2249 | | M1.1 | | | | | |
| 12 | 0433 | 0443 | 0448 | N05W36 | M1.3 | 2N | | II/1 | 22 | 1166 |
| 14 | 1930 | 1952 | 1954 | N18W48 | M4.2 | 1N | | | 26 | 1169 |
| 15 | 0018 | 0022 | 0024 | | M1.0 | | | | 26 | 1169 |
| 23 | 0203 | 0217 | 0224 | S18E70 | M1.4 | | | III/2 | 35 | 1176 |
| 24 | 1201 | 1207 | 1211 | S16E43 | M1.0 | 1F | | V/2 | 35 | 1176 |
| 25 | 2308 | 2322 | 2330 | S12E26 | M1.0 | | 170 | II/1,IV/1 | 35 | 1176 |

**LOC**: approximate heliographic location
**XRAY**: X-ray flare class
**OP**: optical flare class
**10CM**: peak 10 cm radio flux
**RADIO TYPE**: radio burst type
**Cat**: Catania sunspot group number
**NOAA**: NOAA active region number
**NOTES**: **p** = proton event
**CME** = coronal mass ejection

## *IV. Noticeable radio bursts in Humain*

| DAY | BEGIN | END | TYPE | DESCRIPTION | BRIGHTNESS | START FREQ | STOP FREQ |
|---|---|---|---|---|---|---|---|
| 02 | 11:15:51 | 11:22:40 | III | GG | 3 | 79 | 45X |
| 03 | 14:19:20 | 14:20:03 | III | G | 3 | 80 | 45X |
| 05 | 14:56:28 | 14:56:38 | III | B | 3 | 205 | 45X |
| 05 | 15:25:28 | 15:25:45 | III | B | 3 | 208 | 45X |
| 06 | 12:15:43 | 12:17:27 | III | G | 3 | 80 | 45X |
| 06 | 12:43:21 | 12:45:27 | III | G | 3 | 80 | 46 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 06 | 13:36:34 | 13:37:15 | III | G | 3 | 159 | 45X |
| 07 | 14:15:53 | 15:33:00 | IV | FS | 3 | 375 | 45X |
| 07 | 15:22:56 | 15:25:43 | III | G | 3 | 80 | 45X |
| 07 | 15:29:29 | 15:32:39 | III | G | 3 | 80 | 45X |
| 09 | 16:34:52 | 16:35:06 | III | G | 3 | 80 | 45X |
| 09 | 17:00:33 | 17:04:11 | III | G, N | 3 | 175 | 46 |
| 10 | 06:21:45 | 06:21:56 | III | B | 3 | 158 | 46 |
| 10 | 06:52:50 | 06:54:07 | III | G | 3 | 80 | 45X |
| 10 | 07:54:12 | 07:55:25 | III | G | 3 | 205 | 46 |
| 10 | 09:42:37 | 09:42:53 | III | G | 3 | 172 | 45X |
| 10 | 12:10:46 | 12:14:54 | III | G, N | 3 | 173 | 45X |
| 10 | 13:25:55 | 13:26:22 | III | G | 3 | 173 | 45X |
| 12 | 15:26:14 | 15:31:38 | II | F, SH | 2 | 251 | 46 |
| 13 | 11:10:43 | 11:12:51 | III | G | 3 | 159 | 45X |
| 18 | 06:59:32 | 07:02:19 | III | GG | 3 | 80 | 45X |
| 18 | 08:15:47 | 08:19:28 | III | G | 3 | 80 | 45X |
| 18 | 12:00:07 | 12:02:25 | III | G | 3 | 171 | 45X |
| 18 | 14:34:15 | 14:35:47 | III | G | 3 | 79 | 45X |
| 19 | 11:20:50 | 11:21:18 | III | G | 3 | 80 | 45X |
| 21 | 15:50:51 | 15:52:23 | III | G | 3 | 79 | 45X |
| 22 | 07:57:53 | 07:59:29 | III | G | 3 | 80 | 45X |
| 22 | 08:31:28 | 08:31:47 | III | G | 3 | 79 | 45X |
| 22 | 09:06:25 | 09:07:00 | III | G | 3 | 166 | 45X |
| 22 | 09:54:56 | 09:58:24 | III | G | 3 | 79 | 45X |
| 22 | 10:15:06 | 10:20:23 | III | G | 3 | 311 | 45X |
| 22 | 12:06:52 | 12:07:01 | III | B | 3 | 205 | 45X |
| 22 | 14:07:11 | 14:10:51 | III | GG | 3 | 161 | 45X |
| 23 | 17:07:54 | 17:09:33 | III | G | 3 | 300 | 45X |
| 24 | 07:18:51 | 07:20:07 | III | G | 3 | 80 | 45X |
| 24 | 07:46:36 | 07:53:24 | III | G, N | 3 | 79 | 45X |
| 24 | 11:11:08 | 11:11:43 | III | G | 3 | 158 | 45X |
| 24 | 12:03:23 | 12:06:53 | III | GG | 3 | 388X | 45X |
| 24 | 12:43:36 | 12:44:01 | III | G | 3 | 80 | 45X |
| 24 | 13:33:41 | 13:34:47 | III | G | 3 | 80 | 45X |
| 24 | 15:34:00 | 15:38:18 | III | G | 3 | 388X | 45X |
| 24 | 16:18:06 | 16:18:33 | III | B | 3 | 79 | 45X |
| 24 | 16:57:11 | 16:59:12 | III | G | 3 | 205 | 45X |
| 24 | 17:01:46 | 17:06:45 | III | GG | 3 | 254 | 45X |
| 24 | 17:14:17 | 17:16:16 | III | G | 3 | 79 | 45X |
| 25 | 07:00:02 | 07:00:51 | III | G | 3 | 203 | 45X |
| 25 | 07:48:17 | 07:56:57 | III | G, N | 3 | 203 | 45X |
| 25 | 11:14:23 | 11:14:38 | III | B | 3 | 289 | 45X |
| 26 | 08:57:07 | 08:57:21 | III | G | 3 | 80 | 45X |
| 26 | 14:43:45 | 14:44:47 | III | G | 3 | 336 | 45X |
| 27 | 07:59:25 | 07:59:47 | III | B | 3 | 79 | 45X |
| 27 | 13:13:04 | 13:13:27 | III | G | 3 | 80 | 45X |
| 27 | 17:01:14 | 17:02:34 | III | G | 3 | 79 | 45X |
| 28 | 06:17:26 | 06:27:34 | III | GG | 3 | 78 | 45X |
| 28 | 13:13:33 | 13:15:34 | III | G | 3 | 205 | 45X |
| 28 | 14:16:54 | 14:20:00 | III | G | 3 | 79 | 45X |
| 29 | 07:09:42 | 07:11:16 | III | G | 3 | 79 | 45X |
| 29 | 11:03:07 | 11:05:26 | III | G | 3 | 309 | 45X |
| 31 | 14:33:45 | 14:34:31 | III | G | 3 | 79 | 45X |
| 31 | 15:09:41 | 15:10:28 | III | G | 3 | 79 | 45X |

**Explanations:** times are in UT. G and GG mean respectively group of less and more than 10 type III bursts; N means sporadic occurrence; B means single burst; FS means fine structure (for type IV bursts); F means fundamental, SH secondary harmonic emissions (all three refer to type II). Frequencies are expressed in MHz. An X in the frequency column means that the burst extends beyond the frequency range of the instrument. Only the brightest bursts (brightness of 3) or the ones significant for space weather are reported.