



Sunspot Index and Long-term Solar Observations

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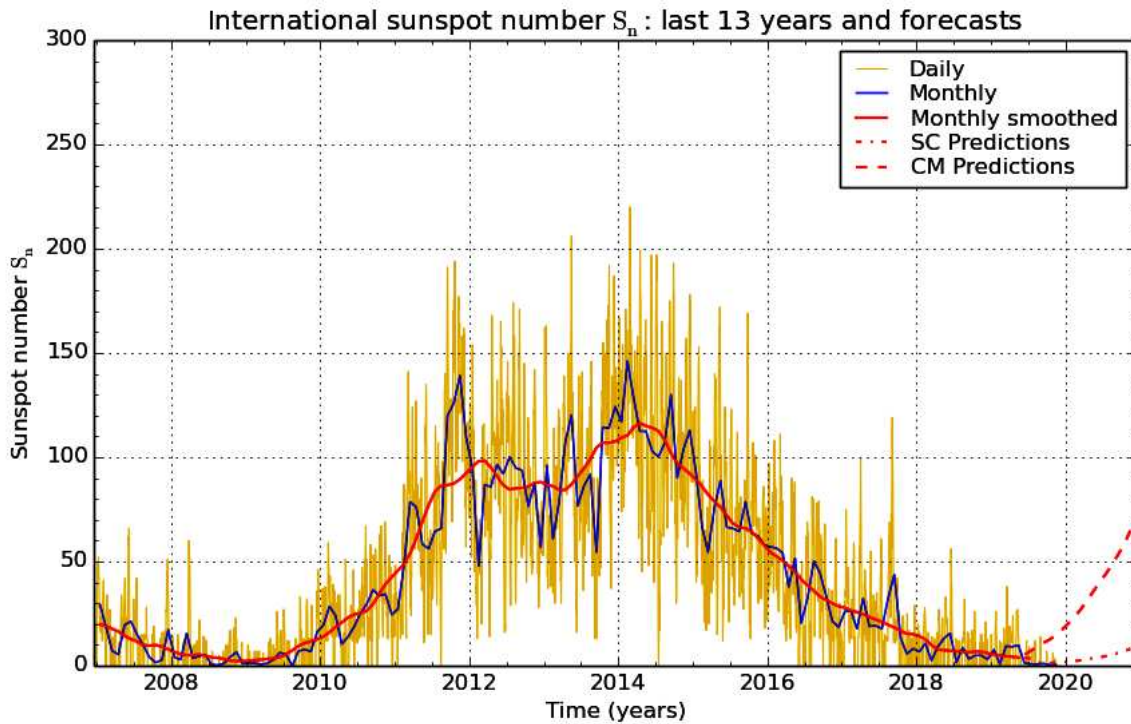
SUNSPOT BULLETIN

2019 n° 11

Provisional international and normalized hemispheric daily sunspot numbers for November 2019

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

| Date | S_n | $S_n(N)$ | $S_n(S)$ |
|----------------------|-------|----------|----------|
| 1 | 6 | 0 | 6 |
| 2 | 2 | 0 | 2 |
| 3 | 0 | 0 | 0 |
| 4 | 4 | 4 | 0 |
| 5 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 |
| 13 | 3 | 0 | 3 |
| 14 | 0 | 0 | 0 |
| 15 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 |
| 17 | 0 | 0 | 0 |
| 18 | 0 | 0 | 0 |
| 19 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 |
| 21 | 0 | 0 | 0 |
| 22 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 |
| 25 | 0 | 0 | 0 |
| 26 | 0 | 0 | 0 |
| 27 | 0 | 0 | 0 |
| 28 | 0 | 0 | 0 |
| 29 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 |
| Monthly mean | 0.5 | 0.1 | 0.4 |
| Cooperating stations | 65 | 53 | 53 |



SILSO graphics (<http://sidc.be/silso>) Royal Observatory of Belgium 2019 December 1

Predictions of the monthly smoothed Sunspot Number
using the last provisional value, calculated for May 2019: 3.9 ($\pm 5\%$)

| | SM | CM | | SM | CM | | SM | CM |
|----------|----|----|----------|----|----|----------|----|----|
| 2019 Jun | 4 | 5 | 2019 Dec | 2 | 17 | 2020 Jun | 4 | 40 |
| Jul | 4 | 7 | 2020 Jan | 2 | 20 | Jul | 5 | 44 |
| Aug | 2 | 9 | Feb | 2 | 24 | Aug | 5 | 48 |
| Sep | 1 | 11 | Mar | 3 | 27 | Sep | 6 | 53 |
| Oct | 1 | 13 | Apr | 3 | 31 | Oct | 7 | 58 |
| Nov | 2 | 15 | May | 4 | 36 | Nov | 8 | 65 |

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, designed by 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.

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Editor: Frédéric Clette

3, avenue Circulaire, B1180 Bruxelles, Belgium

Fax: .. /32/(0)2/374.98.22 Tel: .. /32/(0)2/373.02.33 Email: silso.info@oma.be

Web: <http://sidc.oma.be/silso>

FTP anonymous : omaftp.oma.be, directory: [dist/astro/sidcdata](http://omaftp.oma.be/directory)

Summary of the URSIGRAMs from S.I.D.C.

| Date | S _n | PPSI | 600 | 2800 | COS | SFI | XI | Ak |
|------|----------------|------|-----|------|------|-----|-----|----|
| 31 | 0 | 0 | - | 71 | //// | 0 | 0/0 | 9 |
| 1 | 6 | 0 | - | 71 | //// | 0 | 0/0 | 3 |
| 2 | 2 | 0 | - | 71 | //// | 0 | 0/0 | 1 |
| 3 | 0 | 1 | - | 69 | //// | 0 | 0/0 | 2 |
| 4 | 4 | 0 | - | 71 | //// | /// | /// | 4 |
| 5 | 0 | 0 | - | 70 | //// | /// | /// | 8 |
| 6 | 0 | 0 | - | 69 | //// | 0 | 0/0 | 7 |
| 7 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 4 |
| 8 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 4 |
| 9 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 6 |
| 10 | 0 | 0 | - | 71 | //// | 0 | 0/0 | 2 |
| 11 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 10 |
| 12 | 0 | 0 | - | 71 | //// | 0 | 0/0 | 4 |
| 13 | 3 | 0 | - | 71 | //// | 0 | 0/0 | 2 |
| 14 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 3 |
| 15 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 2 |
| 16 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 7 |
| 17 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 6 |
| 18 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 1 |
| 19 | 0 | 0 | - | 69 | //// | 0 | 0/0 | 2 |
| 20 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 2 |
| 21 | 0 | 0 | - | 71 | //// | 0 | 0/0 | 14 |
| 22 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 16 |
| 23 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 12 |
| 24 | 0 | 0 | - | 71 | //// | 0 | 0/0 | 14 |
| 25 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 6 |
| 26 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 2 |
| 27 | 0 | 0 | - | 72 | //// | 0 | 0/0 | 4 |
| 28 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 5 |
| 29 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 7 |
| 30 | 0 | 0 | - | 70 | //// | 0 | 0/0 | 4 |

S_n : 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/m² : 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 : Solar Flare Index from the S.I.D.C. (origin: Ursigrams - UGEOR, evaluation : $1 \times S_n + 10 \times "1" + 100 \times ">1"$).

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

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

SOLAR PHYSICS DEPARTMENT

UCCLE DAILY PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR NOVEMBER 2019

| DATE | UT | NUMBER | | RELATIVE SUNSPOT NUMBERS | | | PPSI | QUAL | OBS |
|------|------|--------------|-------------|--------------------------|-------|-------|------|------|-----|
| | | OF GROUPS | OF SPOTS | TOTAL | NORTH | SOUTH | | | |
| 2 | 1130 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OB |
| 4 | 1205 | 1 | 2 | 12 | 12 | 0 | 0.3 | 3 | OL |
| 7 | 1200 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | OB |
| 8 | 900 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | SV |
| 9 | 930 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | OL |
| 10 | 935 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | OL |
| 12 | 1135 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | SB |
| 13 | 1250 | 0 | 0 | 0 | 0 | 0 | 0.0 | 1 | SB |
| 14 | 1125 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | SB |
| 16 | 1100 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | OB |
| 17 | 940 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | SB |
| 19 | 950 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | SV |
| 20 | 1000 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | SV |
| 21 | 1315 | 0 | 0 | 0 | 0 | 0 | 0.0 | 1 | SB |
| 22 | 1010 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | SV |
| 24 | 1315 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | FC |
| 25 | 1000 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OL |
| 29 | 1000 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OL |
| 30 | 1015 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OL |

The relative mean sunspot number is 0.6.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS $U'=K'U$ FOR NOVEMBER 2019

$K' = 1.123 (*)$

| | | | | | | | | | |
|---|-----|----|-----|----|-----|----|-----|----|-----|
| 1 | *** | 7 | 0 | 13 | 0 | 19 | 0 | 25 | 0 |
| 2 | 0 | 8 | 0 | 14 | 0 | 20 | 0 | 26 | *** |
| 3 | *** | 9 | 0 | 15 | *** | 21 | 0 | 27 | *** |
| 4 | 13 | 10 | 0 | 16 | 0 | 22 | 0 | 28 | *** |
| 5 | *** | 11 | *** | 17 | 0 | 23 | *** | 29 | 0 |
| 6 | *** | 12 | 0 | 18 | *** | 24 | 0 | 30 | 0 |

The normalised relative monthly mean sunspot number is 1.

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

The Sun has been observed 19 days on 30 possible.