



Sunspot Index and Long-term Solar Observations

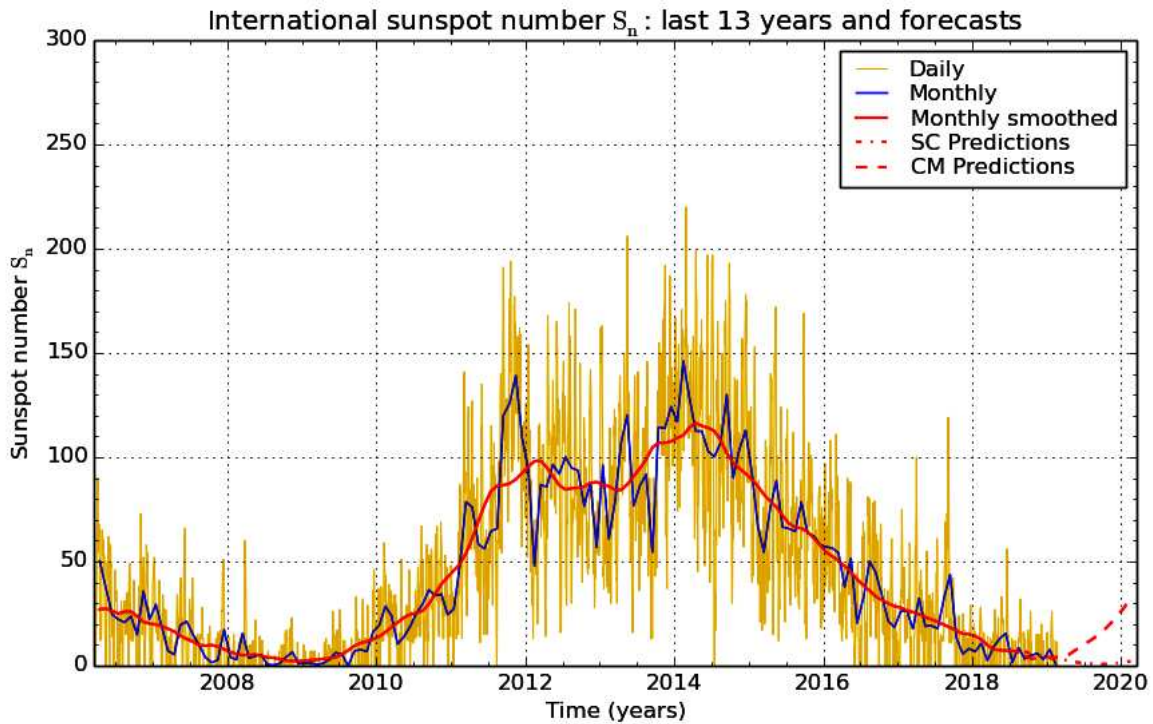
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SUNSPOT BULLETIN 2019 n° 2

Provisional international and normalized hemispheric daily sunspot numbers for February 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 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 |
| 4 | 0 | 0 | 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 | 12 | 0 | 12 |
| 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 | 11 | 11 | 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 |
| Monthly mean | 0.8 | 0.4 | 0.4 |
| Cooperating stations | 70 | 55 | 55 |



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

Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for August 2018: 6.8 ($\pm 5\%$)

| | SM | CM | | SM | CM | | SM | CM |
|----------|----|----|----------|----|----|----------|----|----|
| 2018 Sep | 7 | 5 | 2019 Mar | 3 | 4 | 2019 Sep | 1 | 15 |
| Oct | 5 | 3 | Apr | 2 | 5 | Oct | 1 | 18 |
| Nov | 5 | 4 | May | 2 | 7 | Nov | 1 | 21 |
| Dec | 5 | 4 | Jun | 1 | 9 | Dec | 1 | 24 |
| 2019 Jan | 4 | 4 | Jul | 1 | 11 | 2020 Jan | 2 | 28 |
| Feb | 3 | 4 | Aug | 1 | 13 | Feb | 2 | 32 |

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

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

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/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 : 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 FEBRUARY 2019

| DATE | UT | NUMBER | | RELATIVE SUNSPOT NUMBERS | | | PPSI | QUAL | OBS | |
|------|------|--------------|-------------|--------------------------|-------|-------|------|------|-----|---------|
| | | OF GROUPS | OF SPOTS | TOTAL | NORTH | SOUTH | | | | CENTRAL |
| 1 | 1335 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | SB | |
| 3 | 935 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | SB | |
| 7 | 1010 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OB | |
| 11 | 930 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | BB | |
| 12 | 1220 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | BB | |
| 13 | 1005 | 1 | 3 | 13 | 0 | 13 | 0.7 | 3 | OL | |
| 14 | 920 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OL | |
| 15 | 925 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | OL | |
| 16 | 935 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OL | |
| 17 | 940 | 0 | 0 | 0 | 0 | 0 | 0.0 | 2 | OL | |
| 18 | 925 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | BB | |
| 19 | 910 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | BB | |
| 20 | 1220 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | BB | |
| 21 | 915 | 1 | 1 | 11 | 11 | 0 | 11 | 0.3 | 3 | SB |
| 23 | 850 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OB | |
| 24 | 900 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OB | |
| 25 | 850 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | BB | |
| 26 | 855 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OB | |
| 27 | 830 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | BB | |
| 28 | 1145 | 0 | 0 | 0 | 0 | 0 | 0.0 | 3 | OB | |

The relative mean sunspot number is 1.2.

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

$$K' = 1.225 (*)$$

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