



Sunspot Index and Long-term Solar Observations

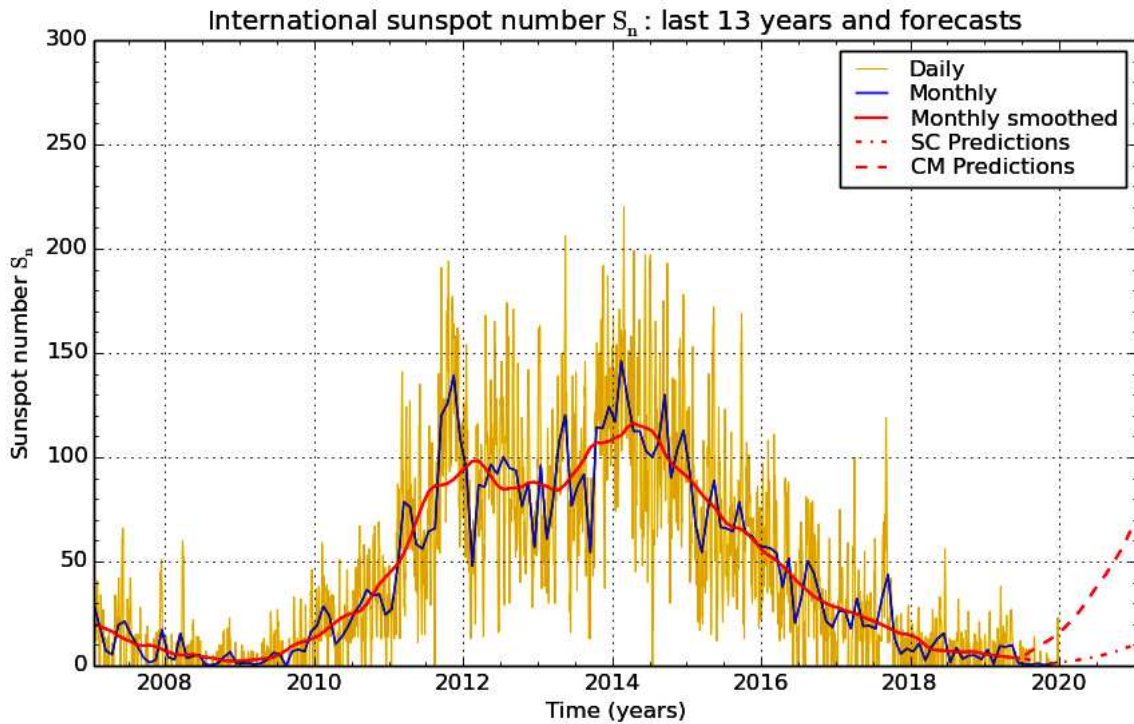
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SUNSPOT BULLETIN 2019 n° 12

Provisional international and normalized hemispheric daily sunspot numbers for December 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	0	0	0
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	16	3	13
25	23	11	12
26	10	0	10
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
31	0	0	0
Monthly mean	1.6	0.5	1.1
Cooperating stations	65	53	53



SILSO graphics (<http://sidc.be/silso>) Royal Observatory of Belgium 2020 January 1

Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for June 2019: $3.7 (\pm 5\%)$

	SM	CM		SM	CM		SM	CM
2019 Jul	3	5	2020 Jan	2	17	2020 Jul	5	40
Aug	3	7	Feb	2	20	Aug	6	44
Sep	1	9	Mar	3	23	Sep	6	48
Oct	1	11	Apr	3	27	Oct	7	53
Nov	1	13	May	4	31	Nov	8	58
Dec	1	15	Jun	4	36	Dec	9	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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The SILSO team wishes you a happy and sunny new year in 2020!

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

Date	S _n	PPSI	600	2800	COS	SFI	XI	Ak
30	0	0	-	70	////	0	0/0	4
1	0	0	-	71	////	0	0/0	3
2	0	0	-	70	////	0	0/0	1
3	0	0	-	71	////	0	0/0	2
4	0	0	-	70	////	0	0/0	4
5	0	0	-	71	////	0	0/0	2
6	0	0	-	70	////	0	0/0	3
7	0	0	-	72	////	0	0/0	2
8	0	0	-	72	////	0	0/0	3
9	0	0	-	71	////	0	0/0	5
10	0	0	-	71	////	0	0/0	4
11	0	0	-	71	////	0	0/0	6
12	0	0	-	71	////	0	0/0	4
13	0	0	-	69	////	0	0/0	4
14	0	0	-	70	////	0	0/0	2
15	0	0	-	71	////	0	0/0	6
16	0	0	-	70	////	0	0/0	2
17	0	0	-	71	////	0	0/0	2
18	0	0	-	70	////	0	0/0	17
19	0	0	-	70	////	0	0/0	12
20	0	0	-	70	////	0	0/0	8
21	0	0	-	71	////	0	0/0	5
22	0	1	-	71	////	0	0/0	4
23	0	0	-	73	////	0	0/0	3
24	16	1	-	73	////	0	0/0	1
25	23	3	-	72	////	0	0/0	4
26	10	1	-	72	////	0	0/0	5
27	0	0	-	72	////	0	0/0	2
28	0	0	-	72	////	0	0/0	2
29	0	0	-	72	////	0	0/0	0
30	0	0	-	71	////	0	0/0	2
31	0	0	-	71	////	0	0/0	3

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 DECEMBER 2019

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
2	1130	0	0	0	0	0	0.0	3	OL	
3	1200	0	0	0	0	0	0.0	3	SB	
4	1000	0	0	0	0	0	0.0	3	SV	
8	1230	0	0	0	0	0	0.0	1	SB	
10	1000	0	0	0	0	0	0.0	2	FC	
12	1010	0	0	0	0	0	0.0	2	FC	
14	955	0	0	0	0	0	0.0	1	FC	
15	1000	0	0	0	0	0	0.0	2	LL	
17	1035	0	0	0	0	0	0.0	2	OL	
18	1000	0	0	0	0	0	0.0	3	OL	
19	1020	0	0	0	0	0	0.0	2	OL	
20	1230	0	0	0	0	0	0.0	3	OL	
23	1120	0	0	0	0	0	0.0	2	SB	
24	1010	2	3	23	11	12	0	0.9	2	SB
26	1350	0	0	0	0	0	0.0	2	SV	
28	1010	0	0	0	0	0	0.0	1	SV	
29	1015	0	0	0	0	0	0.0	3	OL	
30	1050	0	0	0	0	0	0.0	3	OL	

The relative mean sunspot number is 1.3.

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

$K' = 1.166 (*)$

1	***	7	***	13	***	19	0	25	***
2	0	8	0	14	0	20	0	26	0
3	0	9	***	15	0	21	***	27	***
4	0	10	0	16	***	22	***	28	0
5	***	11	***	17	0	23	0	29	0
6	***	12	0	18	0	24	27	30	0
								31	***

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 18 days on 31 possible.