



# Sunspot Index and Long-term Solar Observations

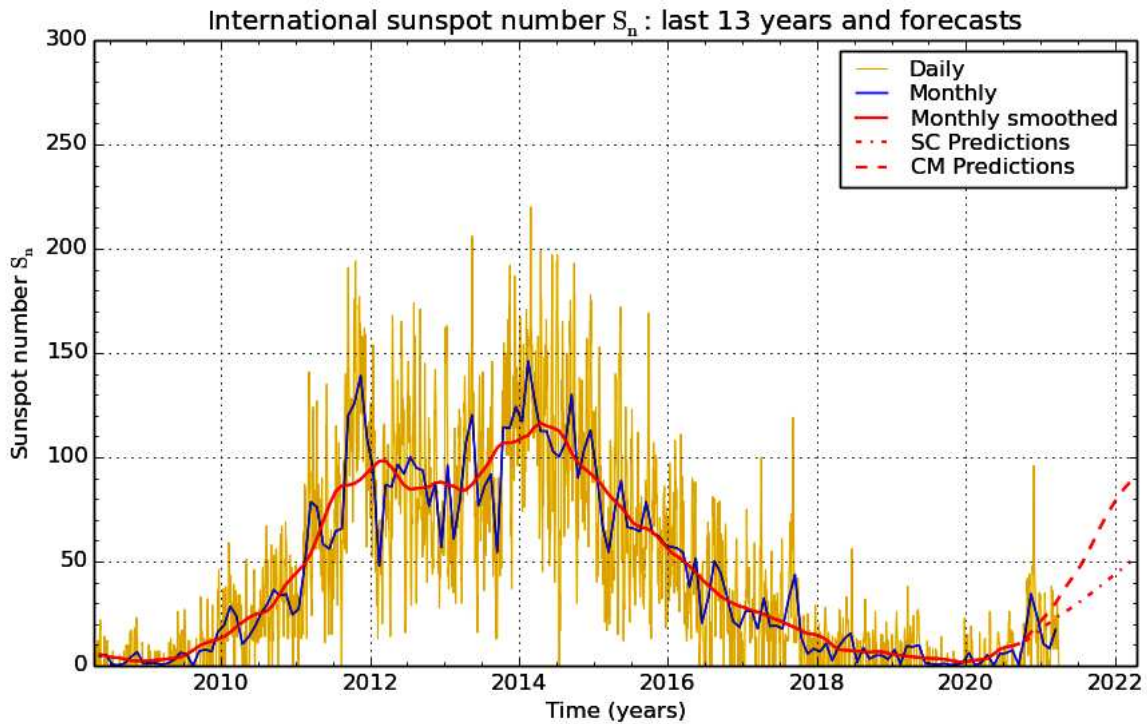
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## *SUNSPOT BULLETIN* 2021 n° 03

Provisional international and normalized hemispheric daily sunspot numbers for March 2021

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	10	0	10
2	16	0	16
3	36	0	36
4	29	0	29
5	13	0	13
6	8	0	8
7	21	0	21
8	14	0	14
9	16	9	7
10	18	11	7
11	22	11	11
12	14	14	0
13	12	12	0
14	24	11	13
15	24	7	17
16	19	19	0
17	13	13	0
18	13	13	0
19	13	13	0
20	11	11	0
21	8	8	0
22	21	21	0
23	27	27	0
24	30	30	0
25	26	26	0
26	25	25	0
27	19	19	0
28	12	12	0
29	12	12	0
30	10	10	0
31	0	0	0
Monthly mean	17.3	10.8	6.5
Cooperating stations	67	52	52



SILSO graphics (<http://sidc.be/silso>) Royal Observatory of Belgium 2021 April 1

**Predictions of the monthly smoothed Sunspot Number**  
 using the last provisional value, calculated for September 2020: 10.3 ( $\pm 5\%$ )

	SM	CM		SM	CM		SM	CM
2020 Oct	12	13	2021 Apr	25	35	2021 Oct	38	66
Nov	14	16	May	27	40	Nov	40	71
Dec	16	20	Jun	29	44	Dec	43	76
2021 Jan	19	23	Jul	31	48	2022 Jan	45	81
Feb	21	26	Aug	33	54	Feb	47	85
Mar	23	30	Sep	36	60	Mar	50	88

**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](mailto:silso.info@oma.be)

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

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

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

Date	S <sub>n</sub>	PPSI	600	2800	COS	SFI	XI	Ak
28	13	1	-	78	////	1	0/0	7
1	10	1	-	71	////	0	0/0	28
2	16	2	-	75	////	0	0/0	27
3	36	5	-	74	////	1	0/0	18
4	29	5	-	81	////	0	0/0	12
5	13	3	-	73	////	0	0/0	6
6	8	0	-	77	////	0	0/0	17
7	21	4	-	78	////	1	0/0	14
8	14	2	-	80	////	0	0/0	8
9	16	1	-	84	////	0	0/0	3
10	18	1	-	79	////	0	0/0	1
11	22	2	-	78	////	0	0/0	3
12	14	1	-	77	////	0	0/0	14
13	12	1	-	81	////	0	0/0	20
14	24	5	-	78	////	0	0/0	28
15	24	2	-	75	////	0	0/0	9
16	19	1	-	79	////	0	0/0	3
17	13	1	-	78	////	0	0/0	5
18	13	3	-	73	////	0	0/0	6
19	13	1	-	74	////	0	0/0	8
20	11	1	-	80	////	0	0/0	25
21	8	0	-	77	////	0	0/0	24
22	21	1	-	80	////	2	0/0	8
23	27	5	-	79	////	0	0/0	13
24	30	3	-	84	////	0	0/0	13
25	26	4	-	79	////	1	0/0	22
26	25	5	-	80	////	0	0/0	10
27	19	3	-	80	////	0	0/0	7
28	12	1	-	75	////	0	0/0	7
29	12	1	-	74	////	0	0/0	4
30	10	1	-	80	////	0	0/0	5
31	0	0	-	74	////	0	0/0	12

**S<sub>n</sub>** : provisional international sunspot numbers from the S.I.D.C.

**PPSI** : prompt photometric sunspot index from the S.I.D.C. in  $10^{-5} \text{ w/m}^2$  : 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 MARCH 2021

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	1015	1	1	11	0	11	11	0.3	3	OB
2	920	1	1	11	0	11	11	0.3	3	OB
3	915	2	13	33	0	33	17	2.5	3	OB
5	910	1	2	12	0	12	12	1.5	3	OB
6	1030	1	4	14	0	14	14	0.4	3	OB
7	955	1	6	16	0	16	0	9.1	3	OB
8	815	1	3	13	0	13	0	6.4	1	CB
10	915	1	1	11	11	0	0	0.6	1	CB
11	810	2	2	22	11	11	11	1.3	2	CB
12	952	1	1	11	11	0	0	1.4	1	CB
13	914	1	1	11	11	0	0	1.7	2	CB
14	1255	2	5	25	12	13	25	25.9	1	CB
15	915	3	6	36	12	24	24	6.7	3	SB
17	1415	1	2	12	12	0	0	0.8	1	SB
19	755	1	4	14	14	0	0	1.4	3	SB
20	915	1	2	12	12	0	0	1.8	3	SB
22	1613	2	4	24	24	0	0	0.7	1	GV
23	726	2	6	26	26	0	0	1.4	3	GV
24	715	2	8	28	28	0	0	2.0	3	GV
26	1008	2	6	26	26	0	14	6.9	1	GV
27	925	2	5	25	25	0	12	6.2	2	FC
28	755	1	2	12	12	0	12	1.9	3	FC
29	750	1	2	12	12	0	0	0.3	2	OL
30	742	1	3	13	13	0	0	0.3	4	OL
31	805	0	0	0	0	0	0	0.0	3	OL

The relative mean sunspot number is 17.2.

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NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS  $U'=K'U$  FOR MARCH 2021

$K'= 1.138 (*)$

1	13	7	18	13	13	19	16	25	***
2	13	8	15	14	28	20	14	26	30
3	38	9	***	15	41	21	***	27	28
4	***	10	13	16	***	22	27	28	14
5	14	11	25	17	14	23	30	29	14
6	16	12	13	18	***	24	32	30	15
								31	0

The normalised relative monthly mean sunspot number is 20.

(\*)  $K'$  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.