Sunspot Index and Long-term Solar Observations

World Data Center supported by the ICSU - WDS

SUNSPOT BULLETIN

2016 n° 7

WARNING OF MAJOR DATA CHANGE

Over the past 4 years a community effort has been carried out to **revise entirely the historical sunspot number series**. A good overview of the analyses and identified corrections is provided in the recent review paper: *Clette, F., Svalgaard, L., Vaquero, J.M., Cliver, E. W. (2014), "Revisiting the Sunspot Number. A 400-Year Perspective on the Solar Cycle", 2014, Space Science Reviews, Volume 186, Issue 1-4, pp. 35-103.*

Now that the new data series has been finalized, **we replaced the original version of our sunspot data by an entirely new data set on July 1st**. On this occasion, we decided to simultaneously introduce changes in several conventions in the data themselves and also in the distributed data files.

The most prominent change in the sunspot number is the choice of a new reference observer, A. Wolfer (pilot observer from 1876 to 1928) instead of R. Wolf himself. This means **we dropped the conventional 0.6 Zürich scale factor**, thus raising the scale of the entire sunspot number time series to the level of modern sunspot counts. This major scale change may thus strongly affect some user applications: keep an eye out for eventual problems.

Regarding data files, various files have been replaced by new ones, with new more homogeneous names and new internal column formats. The included information sometimes changes: combining data (e.g. hemispheric numbers together with total numbers), separating data (monthly smoothed numbers in a separate file) or adding new values that were not provided previously (standard errors on values).

All those changes are explained in the information accompanying our data. While the core files have been replaced in early July, some other changes will still occur over the next months. During this transitory phase, we thus invite you to visit the main SILSO Web site to follow the possible changes: http://www.sidc.be/silso.

For specific technical questions, in particular, if you need to adapt automated data import software used for operational purposes, please contact us by e-mail at silso.info@oma.be

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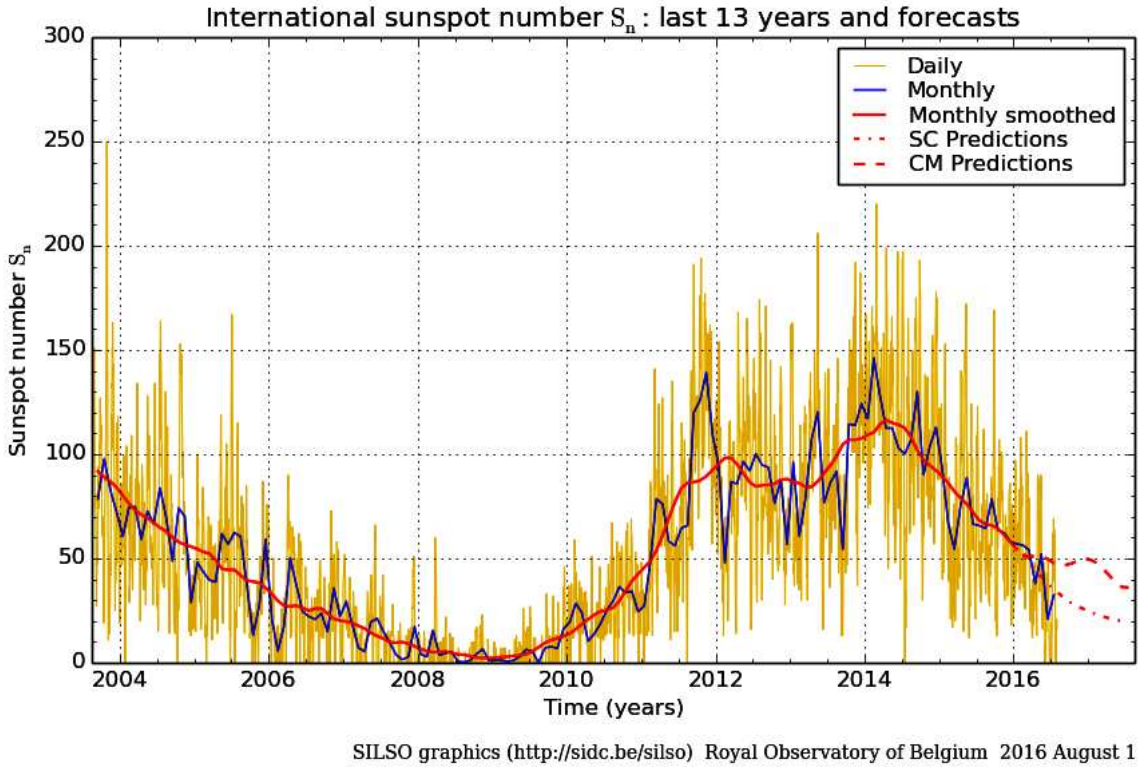
Provisional international and normalized hemispheric daily sunspot numbers for July 2016

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	12	12	0
3	19	10	9
4	0	0	0
5	13	0	13
6	13	0	13
7	25	0	25
8	42	14	28
9	55	28	27
10	50	32	18
11	62	46	16
12	59	44	15
13	53	39	14
14	58	44	14
15	69	45	24
16	61	42	19
17	39	39	0
18	64	64	0
19	59	59	0
20	57	57	0
21	52	52	0
22	39	39	0
23	28	28	0
24	13	13	0
25	0	0	0
26	0	0	0
27	0	0	0
28	13	13	0
29	16	16	0
30	21	21	0
31	16	16	0
Monthly mean	32.5	24.9	7.6
Cooperating stations	78	61	61



Predictions of the monthly smoothed Sunspot Number

using the last provisional value, calculated for January 2016: 54.5 (± 5%)

	SM	CM		SM	CM		SM	CM
2016 Feb	52	52	2016 Aug	33	47	2017 Feb	23	48
Mar	48	51	Sep	30	47	Mar	22	45
Apr	44	51	Oct	28	48	Apr	21	42
May	41	51	Nov	27	49	May	21	38
Jun	38	50	Dec	26	50	Jun	20	36
Jul	35	48	2017 Jan	24	49	Jul	19	36

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.

Brussels, August 1, 2016 08:24 UT

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

Date	S_n	PPSI	600	2800	COS	SFI	XI	Ak
30	0	999	-	73	////	0	0/0	9
1	0	999	-	72	////	0	0/0	10
2	12	1	-	71	////	0	0/0	9
3	19	2	-	72	////	0	0/0	12
4	0	1	-	74	////	0	0/0	8
5	13	1	-	72	////	0	0/0	3
6	13	1	-	77	////	0	0/0	6
7	25	4	-	83	////	2	0/0	26
8	42	5	-	87	////	2	0/0	23
9	55	10	-	92	////	9	0/0	17
10	50	19	-	94	////	102	0/0	14
11	62	19	-	95	////	1	0/0	14
12	59	29	-	92	////	4	0/0	21
13	53	32	-	97	////	3	0/0	10
14	58	42	-	95	////	0	0/0	15
15	69	66	-	102	////	9	0/0	13
16	61	104	-	107	////	13	0/0	10
17	39	139	-	105	////	5	0/0	6
18	64	135	-	107	////	4	0/0	4
19	59	129	-	101	////	19	0/0	11
20	57	129	-	108	////	10	0/0	23
21	52	69	-	100	////	18	2/0	8
22	39	32	-	90	////	4	0/0	12
23	28	12	-	86	////	112	3/0	10
24	13	3	-	82	////	2	2/0	18
25	0	0	-	74	////	0	0/0	17
26	0	0	-	74	////	0	0/0	6
27	0	999	-	72	////	0	0/0	4
28	13	1	-	70	////	0	0/0	17
29	16	3	-	71	////	0	0/0	16
30	21	3	-	71	////	0	0/0	8
31	16	1	-	72	////	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/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 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).

SOLAR PHYSICS DEPARTMENT

UCCLE DAILY PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR JULY 2016

DATE	UT	NUMBER OF GROUPS	NUMBER OF SPOTS	RELATIVE SUNSPOT NUMBERS TOTAL	NORTH	SOUTH	CENTRAL	PPSI 10-5 WM-2	QUAL	OBS
2	710	0	0	0	0	0	0	0.0	3	FC
3	730	0	0	0	0	0	0	0.0	3	FC
4	1345	0	0	0	0	0	0	0.0	3	AE
5	1215	1	2	12	12	0	12	0.4	3	AE
6	615	0	0	0	0	0	0	0.0	2	AE
7	1230	2	5	25	0	25	0	1.3	2	AE
8	1500	4	11	51	24	27	0	2.8	2	AE
9	845	3	12	42	26	16	0	4.1	2	RA
10	920	3	19	49	33	16	0	7.4	3	RA
11	900	4	23	63	47	16	33	7.0	2	OB
12	1000	4	15	55	40	15	43	17.4	2	OB
13	1430	3	11	41	28	13	28	17.7	2	OB
14	920	4	7	47	36	11	34	22.0	3	OB
15	1040	3	19	49	23	26	37	58.7	3	OB
16	1310	2	22	42	30	12	30	67.3	2	OB
17	915	1	21	31	31	0	31	70.0	2	OB
18	720	2	40	60	60	0	40	86.4	4	OL
19	740	2	26	46	46	0	46	70.0	2	OL
20	730	2	29	49	49	0	13	60.8	3	OL
21	725	2	21	41	41	0	13	42.2	3	OL
22	1240	1	23	33	33	0	0	24.1	3	OL
23	1015	1	3	13	13	0	0	13.4	2	AE
24	815	1	3	13	13	0	0	2.2	2	AE
26	830	0	0	0	0	0	0	0.0	2	OB
27	1230	0	0	0	0	0	0	0.0	1	OB
28	930	0	0	0	0	0	0	0.0	2	OB
29	1300	1	2	12	12	0	0	0.2	2	OB
30	1035	1	1	11	11	0	0	0.2	2	OL
31	1205	1	2	12	12	0	0	0.3	3	OL

The relative mean sunspot number is 27.5.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS U'=K'U FOR JULY 2016

K'= 1.021 (*)

1	***	7	26	13	42	19	47	25	***
2	0	8	52	14	48	20	50	26	0
3	0	9	43	15	50	21	42	27	0
4	0	10	50	16	43	22	34	28	0
5	12	11	64	17	32	23	13	29	12
6	0	12	56	18	61	24	13	30	11
								31	12

The normalised relative monthly mean sunspot number is 28.

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

The Sun has been observed 29 days on 31 possible.