Sunspot Index and Long-term Solar Observations

World Data Center supported by the ICSU - WDS

SUNSPOT BULLETIN

2016 n° 9

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Regarding data files, various files have been replaced by new ones, with new more homogeneous names and new internal column formats.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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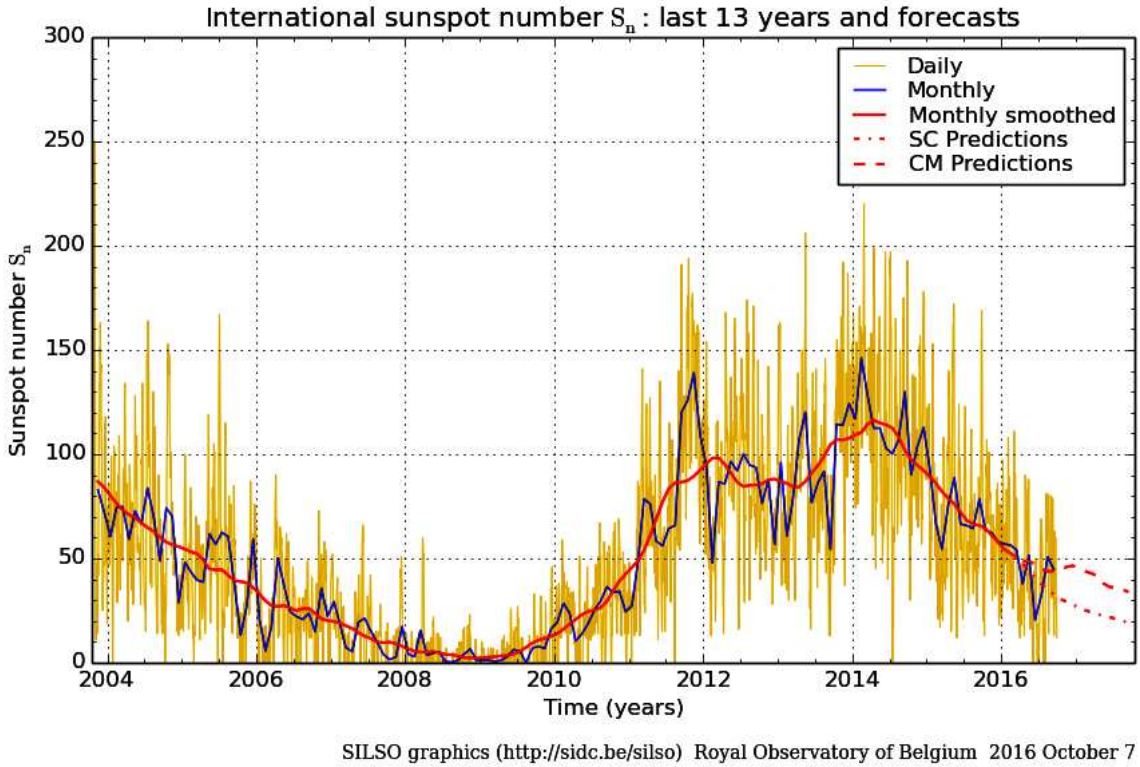
Provisional international and normalized hemispheric daily sunspot numbers for September 2016

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	78	54	24
2	67	67	0
3	65	65	0
4	50	50	0
5	31	31	0
6	42	42	0
7	58	58	0
8	54	54	0
9	79	79	0
10	77	77	0
11	67	67	0
12	59	59	0
13	39	39	0
14	27	27	0
15	15	15	0
16	13	13	0
17	14	14	0
18	39	39	0
19	63	63	0
20	53	53	0
21	54	54	0
22	36	36	0
23	60	38	22
24	55	28	27
25	31	6	25
26	28	0	28
27	26	0	26
28	31	10	21
29	17	0	17
30	12	0	12
Monthly mean	44.7	37.9	6.8
Cooperating stations	73	61	61



Predictions of the monthly smoothed Sunspot Number

using the last provisional value, calculated for March 2016: 50.6 (± 5%)

	SM	CM		SM	CM		SM	CM
2016 Apr	47	49	2016 Oct	31	45	2017 Apr	23	42
May	44	49	Nov	29	46	May	23	38
Jun	41	47	Dec	28	47	Jun	22	36
Jul	38	45	2017 Jan	26	46	Jul	21	36
Aug	35	44	Feb	25	44	Aug	20	35
Sep	33	44	Mar	24	43	Sep	19	34

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, October 1, 2016 09:16 UT

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

Date	S_n	PPSI	600	2800	COS	SFI	XI	Ak
31	80	23	-	98	////	0	0/0	6
1	78	27	-	95	////	3	0/0	30
2	67	55	-	95	////	8	0/0	37
3	65	65	-	99	////	2	0/0	38
4	50	85	-	97	////	2	0/0	30
5	31	72	-	94	////	1	0/0	19
6	42	80	-	92	////	0	0/0	19
7	58	78	-	93	////	0	0/0	14
8	54	65	-	95	////	1	0/0	14
9	79	56	-	91	////	3	0/0	4
10	77	48	-	93	////	2	0/0	4
11	67	30	-	86	////	0	0/0	4
12	59	10	-	87	////	0	0/0	6
13	39	8	-	86	////	0	0/0	4
14	27	4	-	85	////	0	0/0	12
15	15	1	-	84	////	0	0/0	6
16	13	1	-	84	////	0	0/0	3
17	14	2	-	80	////	1	0/0	3
18	39	6	-	83	////	22	0/0	8
19	63	21	-	83	////	1	0/0	10
20	53	14	-	85	////	6	0/0	21
21	54	17	-	86	////	5	0/0	10
22	36	15	-	85	////	0	0/0	3
23	60	14	-	86	////	0	0/0	3
24	55	11	-	85	////	3	0/0	6
25	31	8	-	85	////	4	0/0	27
26	28	8	-	87	////	3	0/0	22
27	26	12	-	86	////	4	0/0	36
28	31	8	-	84	////	1	0/0	40
29	17	3	-	83	////	0	0/0	31
30	12	0	-	81	////	0	0/0	26

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 SEPTEMBER 2016

DATE	UT	NUMBER OF GROUPS	NUMBER OF SPOTS	RELATIVE SUNSPOT NUMBERS TOTAL	NORTH	SOUTH	CENTRAL	PPSI 10-5 WM-2	QUAL	OBS
1	820	5	30	80	55	25	18	12.7	3	OL
2	804	3	23	53	53	0	15	36.4	3	OL
3	1200	4	30	70	70	0	11	53.8	2	OL
4	1015	3	29	59	59	0	35	62.2	3	OL
5	1130	2	14	34	23	11	23	69.2	3	AE
7	750	4	22	62	62	0	51	70.5	3	AE
8	745	3	18	48	48	0	48	61.7	2	AE
9	715	5	27	77	77	0	39	51.8	3	AE
12	820	3	6	36	36	0	11	5.4	3	OB
13	910	2	7	27	27	0	14	5.2	3	OB
14	800	1	1	11	11	0	0	0.1	3	OB
15	805	1	2	12	12	0	0	0.1	3	OB
16	830	1	2	12	12	0	0	0.1	2	AE
17	1510	1	2	12	12	0	0	0.2	2	OB
18	1215	2	5	25	25	0	12	2.7	2	OB
19	805	4	16	56	56	0	56	25.5	3	OL
20	750	3	17	47	47	0	30	8.7	3	OL
21	1325	3	17	47	47	0	33	21.7	3	OL
22	1120	2	13	33	33	0	0	19.8	2	OL
23	805	3	27	57	38	19	19	11.0	3	OL
24	850	3	17	47	25	22	22	6.5	3	RA
25	850	1	12	22	0	22	22	5.1	3	RA
26	1145	1	12	22	0	22	0	1.1	1	OB
27	820	1	10	20	0	20	0	13.2	3	OB
28	900	1	8	18	0	18	0	8.6	2	OB
29	926	1	6	16	0	16	0	1.1	1	OB
30	950	0	0	0	0	0	0	0.0	1	OB

The relative mean sunspot number is 37.1.

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

K'= 1.164 (*)

1	93	7	72	13	31	19	65	25	26
2	62	8	56	14	13	20	55	26	26
3	81	9	90	15	14	21	55	27	23
4	69	10	***	16	14	22	38	28	21
5	40	11	***	17	14	23	66	29	19
6	***	12	42	18	29	24	55	30	0

The normalised relative monthly mean sunspot number is 43.

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

The Sun has been observed 27 days on 30 possible.