



Sunspot Index and Long-term Solar Observations

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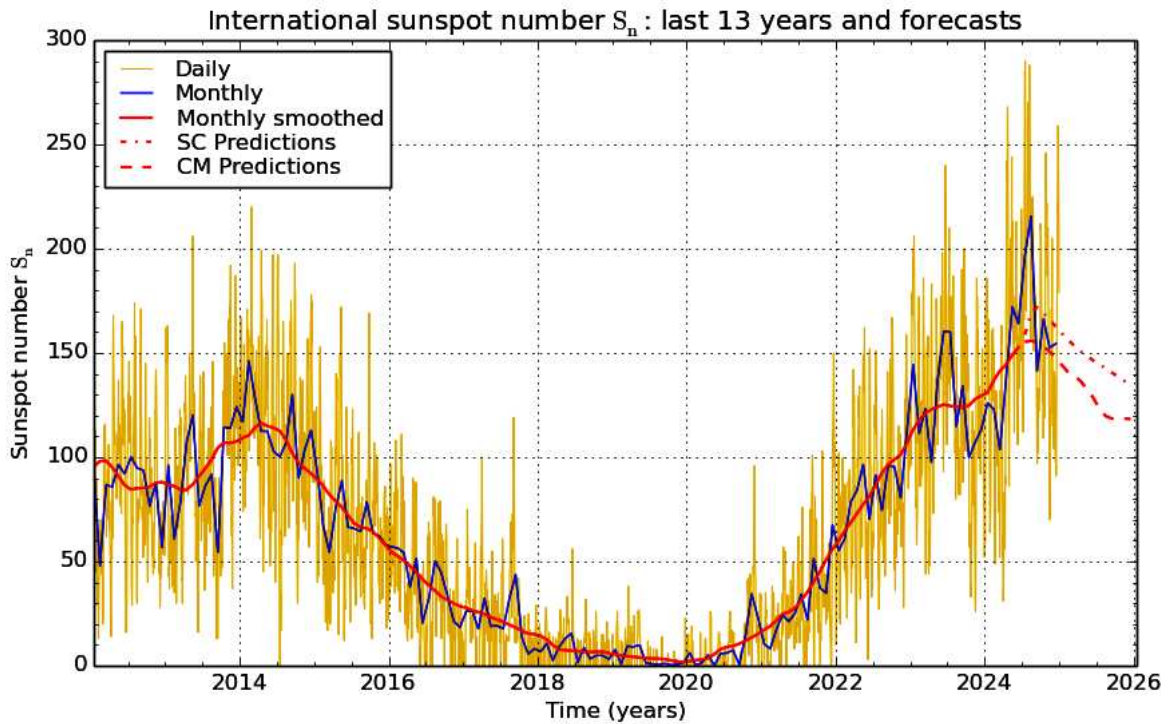
SUNSPOT BULLETIN

2024 n° 12

Provisional international and normalized hemispheric daily sunspot numbers for December 2024

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	122	22	100
2	135	35	100
3	123	28	95
4	121	33	88
5	118	36	82
6	104	28	76
7	136	31	105
8	141	31	110
9	116	17	99
10	139	38	101
11	113	31	82
12	106	29	77
13	111	30	81
14	98	35	63
15	103	27	76
16	98	17	81
17	91	24	67
18	111	43	68
19	126	34	92
20	149	39	110
21	164	40	124
22	184	42	142
23	222	46	176
24	217	66	151
25	242	75	167
26	259	91	168
27	258	92	166
28	252	99	153
29	234	84	150
30	218	66	152
31	179	52	127
Monthly mean	154.5	43.9	110.6
Cooperating stations	62	56	56



SILSO graphics (<http://sidc.be/silso>) Royal Observatory of Belgium 2025 January 1

Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for June 2024: 152.7 ($\pm 5\%$)

	SM	CM		SM	CM		SM	CM
2024 Jul	159	155	2025 Jan	159	144	2025 Jul	145	123
Aug	169	156	Feb	156	141	Aug	143	120
Sep	172	155	Mar	153	139	Sep	141	119
Oct	169	153	Apr	151	136	Oct	139	119
Nov	166	151	May	149	133	Nov	137	119
Dec	163	148	Jun	146	129	Dec	135	118

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
30	121	85	-	204	////	10	0/0	12
1	122	95	-	186	////	0	0/0	8
2	135	54	-	185	////	7	0/0	5
3	123	44	-	185	////	4	0/0	12
4	121	53	-	175	////	4	2/0	8
5	118	54	-	175	////	3	1/0	4
6	104	41	-	178	////	5	1/0	6
7	136	41	-	183	////	14	2/0	5
8	141	56	-	178	////	113	1/1	6
9	116	62	-	173	////	13	0/0	21
10	139	43	-	172	////	14	3/0	6
11	113	53	-	161	////	14	2/0	4
12	106	65	-	161	////	2	2/0	6
13	111	51	-	164	////	8	4/0	3
14	98	55	-	171	////	1	0/0	12
15	103	44	-	172	////	15	0/0	15
16	98	60	-	167	////	3	0/0	13
17	91	56	-	170	////	5	0/0	30
18	111	44	-	174	////	0	0/0	16
19	126	34	-	175	////	3	3/0	14
20	149	52	-	184	////	2	2/0	16
21	164	72	-	195	////	15	1/0	17
22	184	80	-	223	////	18	3/0	12
23	222	92	-	238	////	3	2/0	16
24	217	159	-	259	////	27	6/0	12
25	242	149	-	253	////	7	3/0	6
26	259	165	-	256	////	114	1/0	2
27	258	122	-	259	////	127	2/0	3
28	252	127	-	260	////	63	3/0	3
29	234	124	-	255	////	48	19/1	5
30	218	91	-	224	////	190	12/1	7
31	179	64	-	218	////	13	3/0	17

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 2024

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	953	9	55	145	38	107	65	143.8	2	JV
3	1405	8	40	120	26	94	62	33.1	2	OL
7	940	6	90	150	12	138	48	44.2	3	OL
19	1350	11	47	157	49	108	51	35.4	1	SB
20	930	12	45	165	45	120	34	81.7	2	SB
22	1125	12	109	229	56	173	112	100.6	3	SB
23	950	12	113	233	52	181	97	179.6	2	SB
28	1020	16	147	307	123	184	154	199.3	2	JV

The relative mean sunspot number is 188.2.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS $U'=K'U$ FOR DECEMBER 2024

$K' = 0.978 (*)$

1	142	7	147	13	***	19	154	25	***
2	***	8	***	14	***	20	161	26	***
3	117	9	***	15	***	21	***	27	***
4	***	10	***	16	***	22	224	28	300
5	***	11	***	17	***	23	228	29	***
6	***	12	***	18	***	24	***	30	***
								31	***

The normalised relative monthly mean sunspot number is 184.

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

The Sun has been observed 8 days on 31 possible.