

Center

Data Analysis Service supported by the FAGS

SUNSPOT BULLETIN

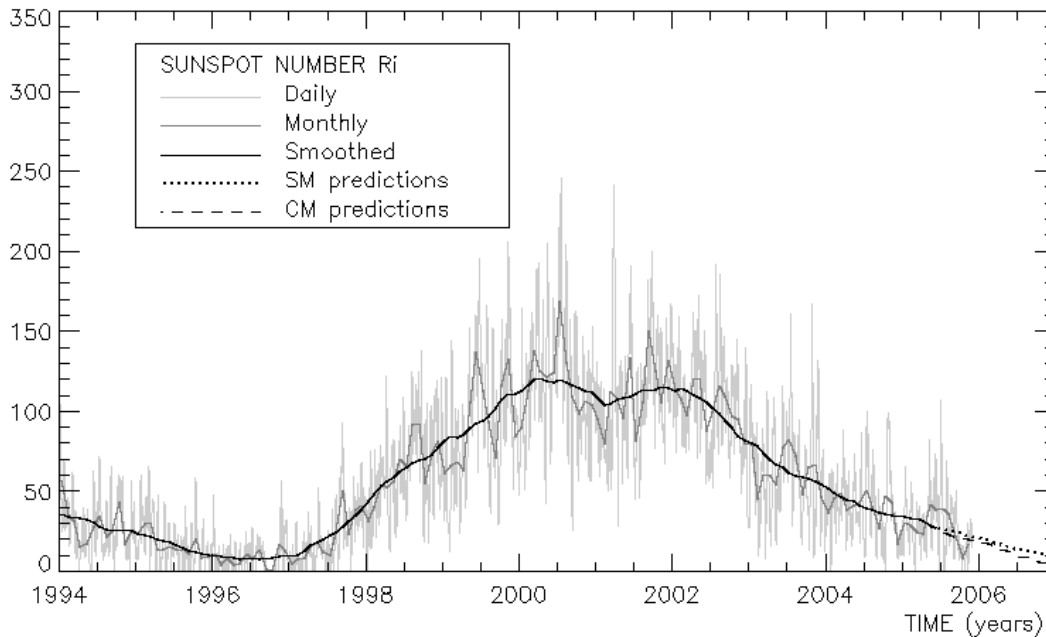
2005

n°12

Provisional international and normalized hemispheric daily sunspot numbers for December 2005

computed at the *Royal Observatory of Belgium* using observations from an international network with the *Locarno Specola Solare* as reference station.

Date	R' _I	R' _N	R' _S
1	49	10	39
2	54	13	41
3	60	21	39
4	55	17	38
5	55	10	45
6	45	10	35
7	23	10	13
8	25	8	17
9	23	10	13
10	39	19	20
11	38	21	17
12	33	23	10
13	38	21	17
14	38	15	23
15	36	12	24
16	31	10	21
17	26	9	17
18	28	9	19
19	43	11	32
20	39	14	25
21	42	16	26
22	41	23	18
23	36	25	11
24	53	31	22
25	43	24	19
26	52	36	16
27	51	51	0
28	48	30	18
29	45	28	17
30	46	27	19
31	41	22	19
Monthly mean	41.2	18.9	22.3
Cooperating stations	40	38	38



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for June 2005 : 28.8 ($\pm 5\%$)

	SM	CM		SM	CM		SM	CM
2005 Jul	29	27	2006 Jan	24	19	2006 Jul	17	10
Aug	30	26	Feb	22	18	Aug	16	10
Sep	28	24	Mar	21	17	Sep	15	9
Oct	27	23	Apr	20	16	Oct	14	6
Nov	25	22	May	19	13	Nov	13	6
Dec	24	21	Jun	18	12	Dec	12	6

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 idea of standard curves, due to 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, January 1, 2006 10:24 UT

Reproduction permitted if source mentioned.
 Ed. Ronald Van der Linden, Ass. Ed. Petra Vanlommel
 editing contributions from various members of the SIDC team

avenue Circulaire, 3 B-1180 BRUXELLES - BELGIUM
 Fax 32-(0)2-373 02 24 Tel 32-(0)2-373 04 91
 e-mail : arille@oma.be, ronald@oma.be
 ftp anonymous : omaftp.oma.be, directory dist/astro/sidcdata
 http://sidc.oma.be

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R' _i	PPSI	600	2800	COS	SFI	XI	Ak
30	30	20	-	95	919	0	1/0	14
1	49	66	-	98	923	1	0/0	19
2	54	140	-	106	922	10	3/0	17
3	60	136	-	101	918	12	0/0	18
4	55	124	-	95	920	11	0/0	8
5	55	82	-	92	922	0	0/0	2
6	45	48	-	89	924	0	0/0	3
7	23	20	-	89	922	1	0/0	0
8	25	16	-	90	925	0	0/0	2
9	23	13	-	89	927	0	0/0	6
10	39	20	-	91	929	0	0/0	16
11	38	31	-	93	922	0	0/0	24
12	33	37	-	88	920	0	0/0	16
13	38	56	-	88	918	0	0/0	6
14	38	49	-	90	912	0	0/0	3
15	36	68	-	87	909	0	0/0	2
16	31	47	-	86	916	0	0/0	8
17	26	46	-	85	916	0	0/0	4
18	28	33	-	86	916	0	0/0	4
19	43	71	-	90	920	0	0/0	14
20	39	64	-	88	917	0	0/0	19
21	42	37	-	87	918	0	0/0	12
22	41	28	-	88	917	0	0/0	5
23	36	46	-	93	919	0	0/0	0
24	53	38	-	92	////	0	0/0	6
25	43	29	-	92	921	2	0/0	6
26	52	41	-	93	926	0	0/0	9
27	51	48	-	92	925	0	0/0	26
28	48	49	-	89	919	1	0/0	20
29	45	58	-	90	920	0	0/0	16
30	46	47	-	90	918	0	0/0	11
31	41	47	-	87	853	0	0/0	14

R'_i : 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/m² : 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 : From October 1992, 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 DECEMBER 2005

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	1400	4	38	78	13	65	40	66.4	2	OB
8	1130	3	7	37	11	26	11	4.2	3	OB
9	1140	3	6	36	12	24	12	2.9	2	OB
10	1038	4	10	50	25	25	12	5.0	2	DB
14	1115	3	25	55	20	35	34	21.3	3	OB
18	1345	3	14	44	14	30	19	7.4	3	FC
25	940	4	18	58	35	23	21	9.8	2	AZ
26	900	6	12	72	50	22	24	8.7	2	AB

The relative mean sunspot number is 53.8.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS $U'=K'U$ FOR DECEMBER 2005

$$K' = 0.868 (*)$$

1	68	7	***	13	***	19	***	25	50
2	***	8	32	14	48	20	***	26	62
3	***	9	31	15	***	21	***	27	***
4	***	10	43	16	***	22	***	28	***
5	***	11	***	17	***	23	***	29	***
6	***	12	***	18	38	24	***	30	***
								31	***

The normalised relative monthly mean sunspot number is 47.

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

The Sun has been observed 8 days on 31 possible.

UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR DECEMBER 2005
E AND F BRUNNER'S TYPE GROUPS

Uccle Nø	East Limb Date	Date and type			West Limb Date
		1st obs	CMP	Last obs	
6-2037	11 26.5	1 E	12 3.2	8 C	12 10.0

PROBABLE RETURN OF MAJOR GROUPS FOR JANUARY 2006
NONE

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Only on the first days of the month GOES measured some M-flaring activity. The rest of the month, X-ray radiation peaks only reached the C-level. No CACTus alert and only 4 presto messages were sent, while we had 2 periods with an 'all-quiet-alert'. All this indicates that December 2005 was rather quiet.

Most attention this month is attributed to Catania sunspot group 70 (NOAA 0826) which started to grow very rapidly from Nov 30 onwards. At that time, the group was located near the equator, 40° to the East. It produced a confined M1.4 flare. On Dec 02, Catania 70 had a $\beta\gamma\delta$ -configuration yielding a high probability for enhanced flaring activity. And it did: 4 M-flares occurred that day. The strongest flare (M7.8) was accompanied by a type II outburst, a coronal dimming and an EIT wave indicating the initiation of a CME. A very weak CME with angular width about 100° was indeed observed by LASCO. On Dec 03 the central part of group 70 had weakened both in the photospheric field and in sunspot number and area. On Dec 04, it became a $\beta\gamma$. Even with this configuration, the group was quiet and only able to produce some B-flares on Dec 08 and 09 before rotating off the solar disk on Dec 10.

During the ensuing period, 3 C-flares were registered on Dec 14 and 16 coming from Catania sunspot group 80 (NOAA 0836), which popped up in the West on Dec 14. Some unknown flaring source at the east limb produced a C-flare on Dec 13. The background X-ray radiation stayed the whole time in the A-level. From Dec 22 onwards, the background X-ray radiation flashed up again from A5 to B1.1 heralding a period of a little enhanced flaring activity. A series of two C-flares was fired on Dec 22 by sunspot group 86 (NOAA 838) located at 40° east of central meridian. A trailing bunch of Catania sunspot groups, 87 (NOAA 0842), 90 (NOAA 0843) and 89 (NOAA 0841) all yielded C1.2 flares, on Dec 25, 28 and 29, respectively, but only the third was associated with a significant CME. This CME was mainly due to an eruptive prominence in the SE with the flare occurring relatively late during the event.

We also note two other CMEs, both probably related to a prominence eruption. On Dec 13, CACTus detected a slow CME coming out of the occulting disk at 12:12UT. The plasma cloud was directed westward, had an angular width of 90° and a slow speed around 250 km/s. No flaring activity was noticed during that period. On H-alpha images of Dec 12, taken by the observatory in Catania, a prominence is visible at the west limb, near the equator. EIT-images were not available during that time because of a CCD-bakeout. On Dec 19, (07:18 UT) there was a clear and beautiful prominence eruption in the NW quadrant best seen in the 304 bandpass of the EIT instrument.

II. Geomagnetic Activity

Halo CMEs are becoming rare and coronal holes common since we approach solar minimum. Solar wind measurements show clearly the influence of 4 holes. Some ICME-like structures were noticed. They were however hard to link to a solar event and had less/no influence.

A large low-latitude coronal hole reached the central meridian on Nov 28. The interaction region between the slow and fast solar wind flows arrived on Nov 29 in the evening. The solar wind speed reached a maximum of 700 km/s and decreased again to a minimum of 300 km/s on Dec 09. The southward interplanetary magnetic field, however, did not last long. From Nov 30 until Dec 03, NOAA reported few intervals of active conditions.

Another high speed wind stream from a coronal hole arrived at the L1 point on Dec 10 inducing active to minor storm periods on Dec 10 and 11. The solar wind speed peaked now at 500 km/s on Dec 11. The Bz component of the IMF was globally more negative compared with the Bz imbedded in the solar wind emanating from the previous coronal hole (crossing the central meridian on Nov 28).

A small coronal hole half-way between group 81 (NOAA 0837) and 79 (NOAA 0835) increased the solar wind temporary up to 600 km/s on Dec 20. Three intervals of active conditions were measured on late Dec 19 and 20.

The last hole of this month was a major recurrent equatorial one. The Western edge of it reached the central meridian on Dec 25. On Dec 27, Boulder estimated a Kp of 5 for 6 hrs.

Two small jumps were seen in solar wind speed early on Dec 16 and 18. The latter jump may possibly be the glancing blow of the slow westward directed CME of Dec 13. ACE data showed a temperature depression and an increased density. No geomagnetic disturbances were measured. On Dec 24 and 25 some ICME-like structures in the slow solar wind were registered (no halo CME was reported in the previous days). Although the interplanetary magnetic field was directed predominantly southward, it was rather weak (less than 5 nT). These structures did not produce any significant geomagnetic disturbance. The maximal value of the Kp-index was 3 during this period. It is possible that this event can be linked to the prominence eruption of Dec 19.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO	TYPE	Cat	NOAA	NOTE
02	2057	2119	2137	S03E05	M2.0					70	0826	
02	2001	2030	2052	S03E07	M1.0	1N				70	0826	
02	1005	1012	1025	S04E13	M7.8	1N	490	II/2		70	0826	
02	0242	0252	0300	S03E19	M6.5		460			70	0826	GOES-12/SXI derived loc

LOC: approximate heliographic location

XRAY: X-ray flare class

OP: optical flare class

10CM: peak 10 cm radio flux

RADIO TYPE: radio burst type

Cat: Catania sunspot group number

NOAA: NOAA active region number

NOTES: p = proton event

CME = coronal mass ejection

IV. Halo CME list

Nothing to report