

Center

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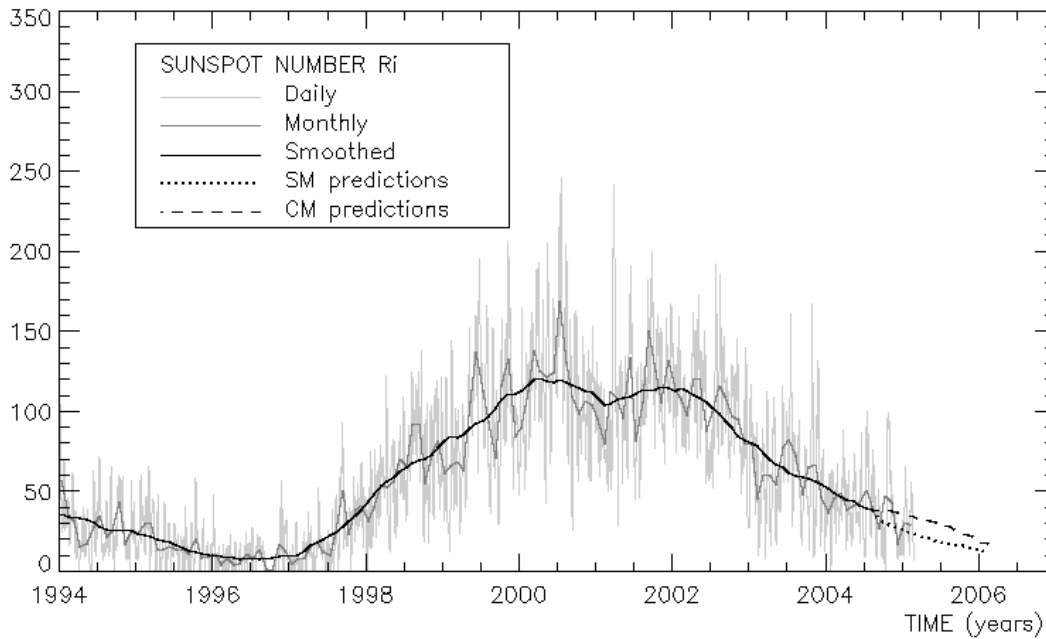
SUNSPOT BULLETIN

2005 n° 2

Provisional international and normalized hemispheric daily sunspot numbers for February 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	19	0	19
2	17	0	17
3	11	0	11
4	15	0	15
5	16	0	16
6	38	15	23
7	38	15	23
8	35	17	18
9	39	15	24
10	48	14	34
11	52	15	37
12	56	18	38
13	48	12	36
14	48	8	40
15	52	0	52
16	45	0	45
17	43	0	43
18	37	0	37
19	31	0	31
20	22	7	15
21	20	11	9
22	20	11	9
23	16	0	16
24	11	0	11
25	15	0	15
26	8	0	8
27	8	4	4
28	7	4	3
Monthly mean	29.1	5.9	23.2
Cooperating stations	46	40	40



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for August 2004 : 39.2 ($\pm 5\%$)

	SM	CM		SM	CM		SM	CM
2004 Sep	38	39	2005 Mar	28	34	2005 Sep	20	26
Oct	37	39	Apr	26	33	Oct	19	24
Nov	34	38	May	25	32	Nov	18	23
Dec	32	37	Jun	23	31	Dec	17	21
2005 Jan	31	36	Jul	22	30	2006 Jan	16	19
Feb	29	35	Aug	21	28	Feb	16	18

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

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

Date	R' _i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	23	28	35	86	895	0	0/0	22	
1	19	17	35	84	892	0	0/0	6	
2	17	15	34	82	892	0	0/0	11	
3	11	6	34	83	893	0	0/0	10	
4	15	4	34	82	895	0	0/0	4	
5	16	5	36	95	898	0	0/0	2	
6	38	15	35	97	897	0	0/0	12	
7	38	15	37	103	894	0	0/0	29	
8	35	23	38	108	890	0	0/0	34	
9	39	33	39	109	891	0	0/0	30	
10	48	51	40	114	890	0	0/0	24	
11	52	86	42	114	890	0	0/0	14	
12	56	98	41	116	900	0	0/0	5	
13	48	117	45	116	904	1	0/0	4	
14	48	145	45	118	906	0	0/0	7	
15	52	123	44	122	905	3	0/0	4	
16	45	124	-	113	////	11	0/0	16	
17	43	116	42	111	906	0	0/0	8	
18	37	73	40	104	////	1	0/0	28	
19	31	55	40	99	888	0	1/0	18	
20	22	46	37	96	////	0	0/0	18	
21	20	23	38	95	////	0	0/0	6	
22	20	10	41	92	////	0	0/0	4	
23	16	7	37	85	////	0	0/0	4	
24	11	4	36	80	1014	0	0/0	5	
25	15	4	34	78	899	0	0/0	12	
26	8	4	34	77	902	0	0/0	11	
27	8	2	34	76	902	0	0/0	9	
28	7	1	33	75	900	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/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** : From October 1992, Solar Flare Index from the S.I.D.C. (origin : Ursigrams – UGEOR, evaluation : $1 \times \text{Sn} + 10 \times \text{"I"} + 100 \times \text{">I"}$).
- XI** : X-flares index from the Ursigrams (M-flares/X-flares) (origin : Ursigrams – UGEOR, UGEOI).
- Ak** : geomagnetic index from Wingst, Germany (origin : Ursigrams).
- SEA** : sudden enhancements of atmospherics from Uccle & Humain (Royal Observatory, Belgium).

Note that due to problems of interferences saturating our receivers, no SEA could be detected this month.

SOLAR PHYSICS DEPARTMENT

UCCLE DAILY PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR FEBRUARY 2005

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	1030	2	5	25	0	25	14	8.4	2	OB
3	920	1	6	16	0	16	16	5.9	3	OB
6	1207	4	11	51	15	36	0	5.0	3	ER
7	905	3	58	88	15	73	11	6.7	2	OB
8	950	4	10	50	26	24	11	6.9	3	OB
9	850	4	17	57	14	43	17	18.8	3	OB
13	1000	6	21	81	16	65	58	81.0	3	FC
14	1040	3	30	60	0	60	60	89.5	3	OB
15	1010	3	47	77	0	77	77	95.8	3	OB
16	1015	3	36	66	0	66	48	81.8	3	OB
18	930	3	11	41	0	41	15	27.7	3	ST
19	953	3	6	36	0	36	0	8.5	2	SG
21	1520	2	13	33	17	16	0	3.7	3	OB
22	1417	2	9	29	16	13	0	1.9	2	OB
24	1330	1	3	13	0	13	0	4.2	2	OB
25	910	2	4	24	0	24	0	3.0	3	OB
27	915	1	2	12	0	12	0	0.2	2	FC
28	820	0	0	0	0	0	0	0.0	3	OB

The relative mean sunspot number is 42.2.

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

$K' = 0.926$ (*)

1	23	7	81	13	75	19	33	25	22
2	***	8	46	14	56	20	***	26	***
3	15	9	53	15	71	21	31	27	11
4	***	10	***	16	61	22	27	28	0
5	***	11	***	17	***	23	***		
6	47	12	***	18	38	24	12		

The normalised relative monthly mean sunspot number is 39.

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

The Sun has been observed 18 days on 28 possible.

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

Uccle Nø	East Limb		Date and type			West Limb		
	Date	1st obs	CMP	Last obs	Date			
14-2026	2	9.7	13 E	2	16.4	22 C	2	23.2

PROBABLE RETURN OF MAJOR GROUPS FOR MARCH 2005

Nø	New East Limb		New CMP	New West Limb		
14	3	9.3	3	16.0	3	22.8

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

As far as solar activity goes, February 2005 was one of the quietest months in recent years. Feb 01-03 had only B-flares; during the period Feb 04-Feb 19 occasional C-flares were produced, culminating in the only M-flare of the month on Feb 19. After that we returned to B-flares, except for two small C-flares on Feb 23. No proton events occurred, but a few halo CMEs were observed.

The month started with very quiet solar conditions. The X-ray background was well below the B-level. Only three sunspot groups were present, none really significant. The biggest one was Catania 14 (NOAA 0727), but it generated no significant flares. Catania 15 (NOAA 0728) consisted of a few short-lived small spots and also remained inactive. The third group was Catania 16 (NOAA 0729), which grew rapidly on Jan 31, spawned a number of small B-flares and a single short C-flare on the same day, but then started decaying again and produced no more flares. Consequently, the solar X-ray flux stayed in the A-level on Feb 01-02, with not even B-flares.

On Feb 01, a large full halo CME was detected in LASCO images at 11:06 UT. It was mostly eastwards directed and determined to be backsided. However, just before this time, a coronal dimming was clearly visible in EIT images near the remnants of former Catania sunspot group 15, which indicated that a weak front-sided CME occurred at the same time. This was due to the eruption of a filament south of this region. This CME apparently did not reach earth. Also on Feb 03 at about 04:00 UT a prominence eruption was observed, this time from the northern solar hemisphere. Again, there was no strong CME visible in LASCO images, and the eruption had no geomagnetic consequences (although it may have caused the small shock early on Feb 07 observed in solar wind data from ACE).

On Feb 03, attention shifted to the east limb, with several active regions rotating over the edge the next few days, including the return of some previously very active sunspot groups. This pushed up the X-ray background nearly linearly by an order of magnitude between early Feb 02 and late Feb 04. The first region to appear (on Feb 04) was Catania sunspot group 17 (NOAA 0730) in the south, but this turned out to be a small group generating only B-flares. Stronger activity came from the north, where the return of Catania sunspot group 05 (NOAA 0720), responsible for extreme space weather conditions mid-January, was expected for Feb 05. On Feb 04, several C-class flares originated from behind the north-east limb, including a C7.1 flare near midnight on Feb 04-05. Expectations were high therefore, but not fulfilled: activity on the following days was confined to small C-flares at most. This remained the case even when the returning group turned on disk as Catania sunspot group 19 (NOAA 0732), later renumbered to 23. Even though it was still classified as a beta-gamma region, the magnetic fields in this region were not as strong as in the previous rotation. While transiting the disk, it further decayed and its activity was restricted to mostly B- and occasional C-flares. Finally, however, while it had already disappeared from view behind the west limb, it finished its second passage across the solar disk with a long-awaited M3.3 flare on Feb 19, the only significant (and hence largest) flare of the month.

On Feb 11 and over the following days, most activity actually originated again from the east (just below the equator) where Catania sunspot groups 24, 25, and 26 (NOAA 0733, 0734 and 0735) developed into strong beta regions dominating solar activity (at small C-flare level). Initially, because of their eastward position on the disk, none of the related CMEs was earth-directed, but on Feb 13 a partial halo CME accompanied the C2.7 flare from NOAA 0733, while a full halo CME occurred on Feb 17 at 00h06, related to a C4.9 flare in NOAA AR 0734. After the M3.3 flare on Feb 19, solar activity was reduced to very low levels again, dropping further to extremely low on Feb 25. From the evening of Feb 24 until the end of the month, the solar X-ray output stayed below B-level all the time, while the solar surface was nearly void of sunspots. A giant filament, having an exceptional length of about one million km, crossed the disk in the southern hemisphere. This large filament remained stable, but another one erupted on Feb 27 at 10:00UT.

Several coronal holes crossed the solar disk during the month. The central meridian saw a small equatorial coronal hole pass on Feb 02. The leading edge of a large coronal hole in the northern hemisphere reached central meridian on Feb 04. A small northern hemispheric coronal hole passed disk center on Feb 14, followed by an elongated trans-equatorial one on Feb 19. Finally, a large low-latitude coronal hole extending over north and south hemispheres crossed the central meridian on Feb 23.

II. Geomagnetic Activity

Geomagnetic conditions showed no strong perturbations this month. Active conditions occurred on Feb 02-03, Feb 06-11, Feb 16-20 and Feb 05, with minor storm conditions on Feb 07-08 and Feb 18.

In the beginning of the month, the geomagnetic environment had just turned quiet in the wake of the influence of a trans-equatorial coronal hole. The solar wind speed was decreasing but rose again to 550km/s on Feb 02. Geomagnetic conditions reached active levels on Feb 02-03 during periods of weak southwards orientation of the IMF. The solar wind speed remained approximately constant at 550km/s until Feb 04, and then decreased to 350km/s early on Feb 06. On Feb 04 and 05, geomagnetic conditions were therefore very quiet.

On Feb 06, the earth came under the influence of a small equatorial coronal hole, which made the solar wind speed increase to just above 400km/s, leading to brief active conditions. On the following days the geomagnetic activity was dominated by the influence of the large northern coronal hole. Earlier than expected we entered the influence zone of the high wind speed from the coronal hole. From 12 UT on Feb 7 onwards, the solar wind speed rose continuously to 700-750 km/s. Bz oscillated between +10 and -10nT. This gave rise to minor storm conditions on Feb 7-8, and mostly active conditions until Feb 11. From Feb 12 until Feb 16 conditions remained very quiet.

During the second half of Feb 16 active conditions reigned, possibly related to the arrival of the (weak) partial halo CME from Feb 13. After a quiet period during Feb 17, enhanced solar wind speeds (500-600 km/s) from the small coronal hole in the northern hemisphere resulted in minor storm conditions on Feb 18, followed by active periods on Feb 19-20. Thereafter, the solar wind speed decreased to 360km/s with a positive Bz magnetic component. The geomagnetic field was thus quiet from Nov 21 until Feb 25. Late on Feb 25, the solar wind speed increased again to 550km/s, while the Bz component started to fluctuate strongly, but with a predominantly northward orientation. Therefore, this moderate-speed stream, associated with the last coronal hole mentioned above, had only a limited impact. Active geomagnetic conditions were observed late on Feb 25. Thereafter, the geomagnetic field was quiet again until the end of the month.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO	TYPE	600 (HMAIN)	CAT	NOAA	NOTE
19	1036	1101	1113	N12W90	M3.3								0732 SXI-derived loc.

loc: approximate heliographic location
Xray: X-ray flare class
op: optical flare class
10 cm: 10 cm radio flux
type: type of radio burst

600: peak time (UT) of 600 Mhz radio bursts in HMAIN
Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection