



Center

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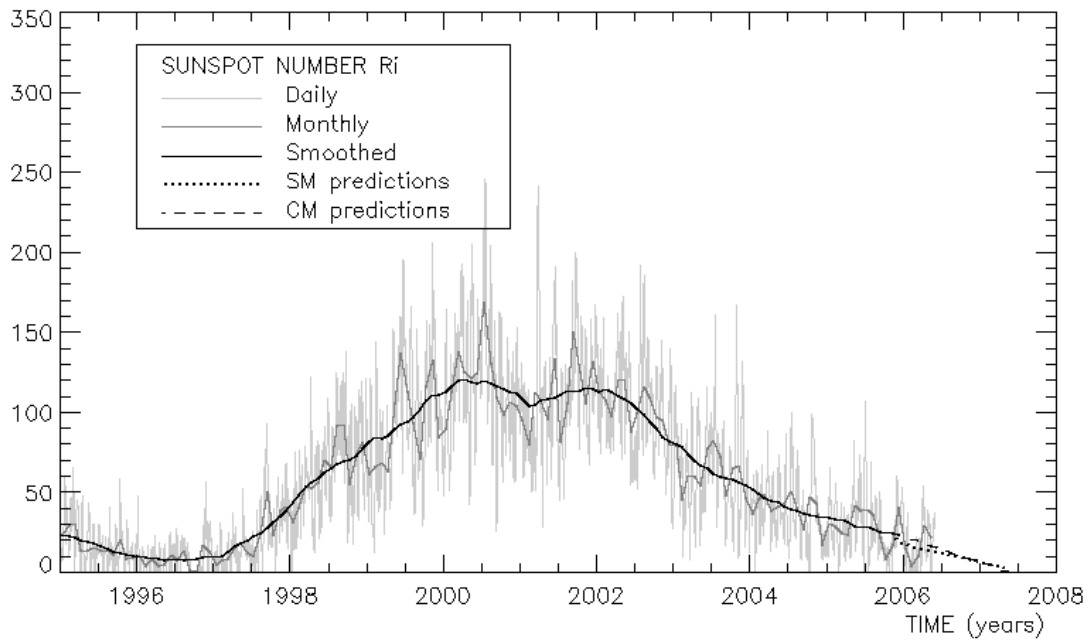
SUNSPOT BULLETIN

2006 n° 5

Provisional international and normalized hemispheric daily sunspot numbers for May 2006

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	33	8	25
2	35	17	18
3	34	18	16
4	36	19	17
5	32	17	15
6	27	8	19
7	32	0	32
8	28	0	28
9	28	0	28
10	19	0	19
11	16	0	16
12	7	0	7
13	7	0	7
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	8	4	4
19	8	0	8
20	19	0	19
21	20	0	20
22	28	7	21
23	30	9	21
24	26	10	16
25	25	12	13
26	28	11	17
27	32	17	15
28	37	8	29
29	35	7	28
30	32	7	25
31	27	7	20
Monthly mean	22.2	6.0	16.2
Cooperating stations	47	38	38



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for November 2005 : 24.9 ($\pm 5\%$)

	SM	CM		SM	CM		SM	CM
2005 Dec	22	24	2006 Jun	16	16	2006 Dec	10	8
2006 Jan	19	22	Jul	15	15	2007 Jan	10	6
Feb	20	21	Aug	14	12	Feb	9	5
Mar	19	20	Sep	13	11	Mar	8	5
Apr	18	19	Oct	12	10	Apr	7	2
May	17	17	Nov	11	9	May	6	2

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
30	37	94	-	100	////	1	0/0	0	
1	33	41	-	93	////	3	0/0	2	
2	35	36	-	89	////	0	0/0	4	
3	34	35	-	89	////	0	0/0	4	
4	36	26	-	92	////	0	0/0	17	
5	32	15	-	87	////	0	0/0	11	
6	27	14	-	87	////	0	0/0	20	
7	32	17	-	86	////	0	0/0	19	
8	28	33	-	85	////	0	0/0	6	
9	28	33	-	83	////	0	0/0	4	
10	19	15	-	78	////	0	0/0	4	
11	16	6	-	76	////	1	0/0	20	
12	7	3	-	76	////	0	0/0	15	
13	7	1	-	74	////	0	0/0	14	
14	0	1	-	72	////	0	0/0	7	
15	0	0	-	72	////	0	0/0	4	
16	0	0	-	72	////	0	0/0	3	
17	0	0	-	72	////	0	0/0	8	
18	8	0	-	73	////	0	0/0	9	
19	8	2	-	75	////	0	0/0	8	
20	19	13	-	76	////	0	0/0	8	
21	20	14	-	78	////	0	0/0	8	
22	28	20	-	83	////	0	0/0	12	
23	30	21	-	84	////	0	0/0	6	
24	26	28	-	84	////	0	0/0	6	
25	25	20	-	84	////	0	0/0	6	
26	28	20	-	82	////	0	0/0	4	
27	32	19	-	83	////	0	0/0	3	
28	37	28	-	85	////	0	0/0	7	
29	35	14	-	81	////	0	0/0	4	
30	32	12	-	80	////	0	0/0	14	
31	27	6	-	78	////	0	0/0	6	

- 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 : $1 \times \text{Sn} + 10 \times "1" + 100 \times ">1"$).
- XI** : X-flares index from the Ursigrams (M-flares/X-flares) (origin : Ursigrams – UGEOR, UGEOI).
- Ak** : geomagnetic index from Wingst, Germany (origin : Ursigrams).
- 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 MAY 2006

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
2	1350	4	18	58	27	31	28	11.7	3	OB
3	720	4	20	60	31	29	42	7.0	3	OB
4	740	4	14	54	30	24	30	13.3	3	OB
5	750	4	13	53	25	28	13	3.9	3	OB
6	1000	4	7	47	12	35	23	3.7	3	OB
8	815	2	10	30	0	30	12	19.3	1	AE
9	1100	2	11	31	0	31	12	5.4	2	AE
10	1030	2	10	30	0	30	12	9.2	2	AE
11	830	2	6	26	0	26	12	1.0	3	AE
12	1300	1	1	11	0	11	0	0.3	3	AE
13	845	1	2	12	0	12	0	0.9	3	FC
15	950	1	1	11	0	11	11	0.4	3	OB
16	1030	0	0	0	0	0	0	0.0	1	OB
17	1020	0	0	0	0	0	0	0.0	3	OB
18	1445	0	0	0	0	0	0	0.0	3	OB
20	1120	2	10	30	0	30	0	5.0	2	LR
21	900	2	19	39	0	39	23	9.3	2	AE
22	820	3	28	58	11	47	47	27.3	3	AE
23	1320	3	22	52	13	39	39	14.7	3	AE
24	1320	2	16	36	15	21	21	22.6	2	OB
28	750	4	17	57	15	42	44	33.0	2	LR
29	1420	5	11	61	11	50	12	3.0	3	OB
30	1425	4	4	44	11	33	22	1.1	2	OB
31	1010	3	3	33	11	22	22	0.9	2	OB

The relative mean sunspot number is 34.7.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS $U'=K'U$ FOR MAY 2006

$K' = 0.779$ (*)

1	***	7	***	13	9	19	***	25	***
2	45	8	23	14	***	20	23	26	***
3	47	9	24	15	9	21	30	27	***
4	42	10	23	16	0	22	45	28	44
5	41	11	20	17	0	23	41	29	48
6	37	12	9	18	0	24	28	30	34
								31	26

The normalised relative monthly mean sunspot number is 27.

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

The Sun has been observed 24 days on 31 possible.

UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR MAY 2006
E AND F BRUNNER'S TYPE GROUPS

Uccle No	East Limb Date	Date and type			West Limb Date
		1st obs	CMP	Last obs	
7-2042	4 22.6	23 C	4 29.3	3 C	5 6.1

PROBABLE RETURN OF MAJOR GROUPS FOR JUNE 2006
NONE

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Although sunspots were present during almost the whole month with the exception of a few days from May 14 until May 17, only 2 C-flares were recorded. The background X-ray radiation was situated in the A-level except for May 01, 04 and 05. During the spotless days, the X-ray radiation curve measured by GOES was even situated at the bottom of the A-level. Once again, we are forced to describe 'quiet-Sun' events.

The two C-class events were recorded in the beginning of the month. The first peaking at 15:35 UT on May 01, was a long duration (LD) C1.0 event from Catania sunspot group 31 (NOAA AR 0875) around S17W29, accompanied by a faint, slow earth-directed CME. A coronal dimming was noticed. The second, a LD C1.1 event peaking at 17:45 UT on May 04 originated right on the east limb from Catania sunspot group 36 (NOAA AR 0881). A third LD event took place on May 11: it was a B3.9 sub-flare with source region at disk center in the active region with NOAA number 0883 (former Catania sunspot group 35). This event was associated with a small filament eruption, but no corresponding halo CME was detected in LASCO coronagraph images. On May 22, a coronal dimming starting around 19:35UT was visible in EIT195 images in the neighbourhood of sunspot group 42 (the cluster of NOAA AR 0884-0885) located at that moment in the eastern hemisphere. A B6.4 flare was recorded by GOES around that time together with a type II radio burst. The corresponding CME had no earth-directed component. On May 25, two coronal dimmings and rapidly rising loop structures were visible in EIT195 in the environment of the same group. The first dimming was initiated around 18:23UT, the second one just before midnight. A LD B1.4-flare peaking at 19:05 UT and a second more confined B5.4 flare was recorded. Two small filaments located at that position disappeared as can be seen in Catania H-alpha pictures. The corresponding CME was captured by CACTus and split in at least two parts.

On May 03, a prominence at the east limb erupted. No evidence was seen in EIT195 images.

We have to mention a beautiful prominence eruption at the east limb on May 11. In a sequence of EIT304 images, you can see a lifted arcade, followed by the breaking of one of the legs and the final eruption.

Many coronal holes (CH) were seen crossing the disk. We list them with the times of passage at the central meridian:

- 1) May 03: a recurrent equatorial CH.
- 2) May 09: an equatorial CH, with a larger trailing northern part, both holes are recurrent.
- 3) May 14: an equatorial CH with a southern part in front of it. On the previous rotation, this hole was further to the south.
- 4) May 17: a recurrent southern CH.
- 5) May 22: a recurrent CH, almost not detectable in EIT284.
- 6) May 26: a northern CH. A large trailing part is located more close to the equator.

From May 26, no EIT images were available.

II. Geomagnetic Activity

All geomagnetic activity of this month was caused by fast solar wind streams emanating from coronal holes, with one exception. Apart from the Apr 30 event, none of the CMEs leaving the Sun reached Earth, or, if they did, they didn't have a clear signature in ACE-data.

A faint, slow earth-directed CME visible from early Apr 30 was observed by ACE from midway through May 4th leading to a single period of Kp=4 as a result of a significant period of a strong southward IMF (Bz ~ -10nT).

The following geomagnetic disturbances were associated with the CHs mentioned in the section 'Solar Activity'.

On May 06-07, prolonged minor storm conditions prevailed with 3 periods of Kp=5 (though not continuous) due to the arrival of the fast stream emanating from CH1. The solar wind speed peaked around 600km/s late May 07. Geomagnetic conditions became again quiet since the interplanetary magnetic field (IMF) had already weakened at that time. After a sector boundary crossing, the solar wind speed rose again, starting on May 11 around 00:00UT and reached at new maximum of 620 km/s on May 12. This recurrent stream was associated with CH2. As the associated interplanetary magnetic field (IMF) remained weak (<10nT) with limited southward excursions of Bz, this stream only induced temporarily unsettled geomagnetic conditions at low latitude, and active to minor storm conditions only at high latitudes, mainly on May 12. Another sector boundary crossing was visible in ACE-data late May 16. A new fast flow emanating from CH3 arrived on May 18. NOAA SEC has reported one interval of Kp =5 on May 18, i.e. minor storm conditions. The fast flow contained rather weak IMF, so the geomagnetic conditions quickly returned to quiet and unsettled conditions. The imprint of CH4 in ACE data could not be clearly distinguished from CH3. It is possible that the unsettled conditions following the minor storm were also caused by CH4. CH5 also did not have a clear fingerprint in the IMF data of ACE. The Co-rotating Interaction Region (CIR) of CH6 arrived late May 27. Since Bz was not strongly negative, the geomagnetic conditions stayed quiet to unsettled.

III. Noticeable solar events

No M- or X-class flare occurred

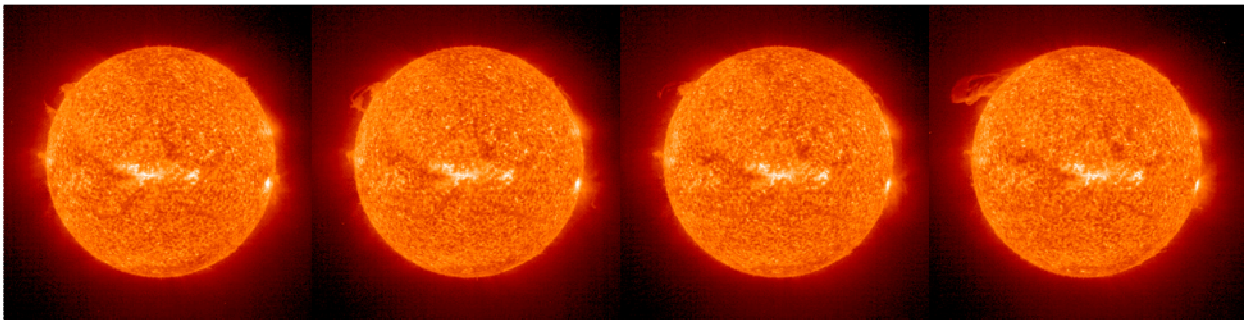
IV. Halo CME list

onset time	e-mail time CACTus	da	e-mail time LASCO	e-mail time FF	Ass. Events	consequences
05/01 15:30	-	-	05/02 14:28	05/02 19:19	LDE C1.0	May 5, active, caused by CH?
05/02 19:54	05/03 01:12	192	-	-	-	-
05/03 23:30	-	-	05/04 14:46	-	Filament. Eruption in NE at limb	-
05/25 21:30	-	-	05/26 15:13	05/26 18:42	LDE B1.4, B5.4	-
05/31 06:36	06/01 08:36	182	-	-	-	-

Onset time: Utime first visible in C2 field of view
CACTus: Computer Aided CME Tracking (software developed by the SIDC)
LASCO: SOHO-LASCO Operations, G. Stenborg

FF: Fearless Forecast (a NOAA trial service)
e-mail time CACTus/LASCO/FF: Utime alert e-mail sent by group
da: angular width of CME, measured by CACTus
Ass. Events: Associated Events, Long Duration Event, flare class

V. Picture of the Month



A sequence of four SOHO/EIT304 pictures dating from May 11, 2006, at 01:17UT, 07:16 UT, 13:16 UT and 19:16 UT respectively. The sequence shows a filament eruption at the NE limb of the solar disk. .