

## Center

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**SUNSPOT BULLETIN**

2007 n° 1

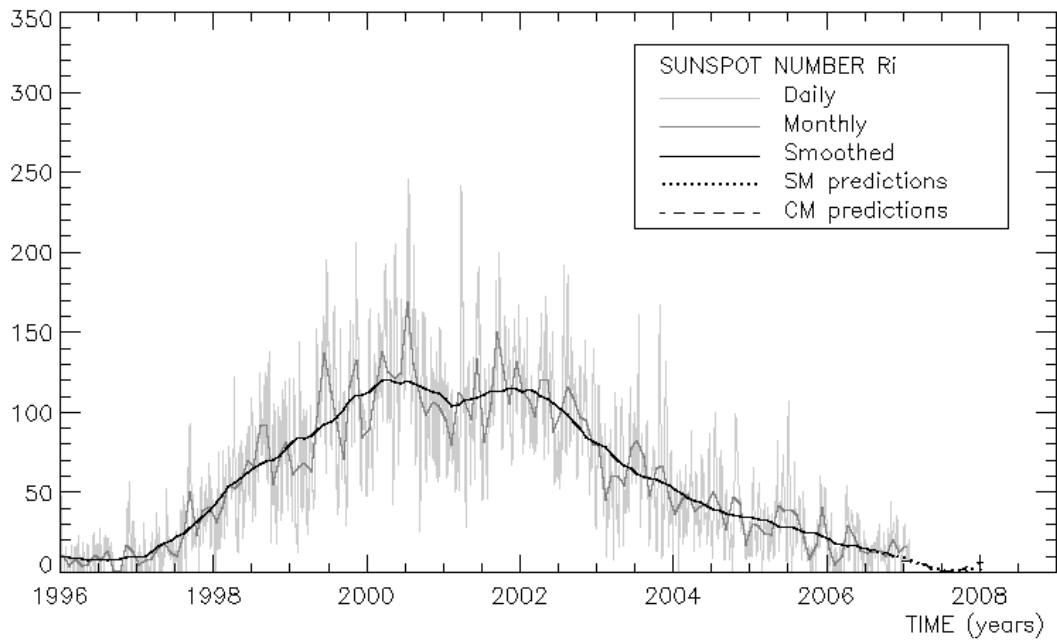
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**Provisional international and normalized hemispheric daily sunspot numbers for January 2007**


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

Date	R' <sub>I</sub>	R' <sub>N</sub>	R' <sub>S</sub>
1	22	6	16
2	24	7	17
3	25	8	17
4	25	8	17
5	28	8	20
6	27	12	15
7	26	11	15
8	30	6	24
9	27	0	27
10	24	0	24
11	23	0	23
12	16	0	16
13	17	9	8
14	11	11	0
15	11	11	0
16	11	11	0
17	9	9	0
18	10	10	0
19	8	8	0
20	18	7	11
21	11	0	11
22	12	0	12
23	10	0	10
24	11	0	11
25	8	0	8
26	7	0	7
27	7	0	7
28	8	0	8
29	18	0	18
30	20	0	20
31	20	0	20
<b>Monthly mean</b>	<b>16.9</b>	<b>4.6</b>	<b>12.3</b>
<b>Cooperating stations</b>	<b>48</b>	<b>44</b>	<b>44</b>



**Predictions of the monthly smoothed Sunspot Number**  
using the last provisional value, calculated for July 2006 : 15.3 ( $\pm 5\%$ )

	SM	CM		SM	CM		SM	CM
2006 Aug	17	15	2007 Feb	12	8	2007 Aug	4	2
Sep	15	14	Mar	11	7	Sep	3	2
Oct	15	13	Apr	9	5	Oct	2	3
Nov	14	11	May	8	3	Nov	2	5
Dec	13	9	Jun	6	2	Dec	2	6
2007 Jan	12	8	Jul	5	2	2008 Jan	2	7

**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' <sub>i</sub>	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	17	5	-	83	////	1	0/0	2	
1	22	21	-	87	////	0	0/0	12	
2	24	47	-	90	////	0	0/0	27	
3	25	81	-	81	////	0	0/0	20	
4	25	83	-	89	////	0	0/0	18	
5	28	104	-	89	////	0	0/0	11	
6	27	95	-	87	////	0	0/0	8	
7	26	79	-	87	////	0	0/0	2	
8	30	74	-	88	////	0	0/0	4	
9	27	93	-	92	////	0	0/0	3	
10	24	46	-	86	////	2	0/0	7	
11	23	31	-	84	////	0	0/0	7	
12	16	18	-	84	////	1	0/0	4	
13	17	9	-	81	////	0	0/1	0	
14	11	9	-	82	////	122	0/0	5	
15	11	9	-	82	////	101	0/0	19	
16	11	10	-	79	////	12	0/0	15	
17	9	3	-	78	////	0	0/0	29	
18	10	9	-	77	////	0	0/0	24	
19	8	-	76	////	0	0/0	15		
20	18	18	-	79	////	0	0/0	10	
21	11	16	-	79	////	0	0/0	9	
22	12	29	-	79	////	0	0/0	4	
23	10	21	-	79	////	0	0/0	3	
24	11	8	-	80	////	2	0/0	2	
25	8	1	-	80	////	0	0/0	4	
26	7	0	-	80	////	0	0/0	4	
27	7	6	-	81	////	0	0/0	4	
28	8	16	-	82	////	0	0/0	6	
29	18	37	-	87	////	2	0/0	42	
30	20	66	-	88	////	1	0/0	29	
31	20	76	-	89	////	0	0/0	24	

- R'<sub>i</sub>** : provisional international sunspot numbers from the S.I.D.C.
- PPSI** : prompt photometric sunspot index from the S.I.D.C. in  $10^{-5} \text{ w/m}^2$  : 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 JANUARY 2007

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
2	930	3	7	37	12	25	0	20.3	2	AE
4	945	3	9	39	11	28	27	48.7	3	AE
7	1100	2	3	23	0	23	23	59.2	2	AE
8	1220	3	11	41	0	41	26	32.9	2	OB
10	1000	3	6	36	0	36	11	26.8	1	FC
15	1145	1	12	22	22	0	0	1.0	3	DB
17	950	1	5	15	15	0	15	1.4	2	OB
21	1145	1	9	19	0	19	19	1.4	3	OB
23	1330	1	5	15	0	15	0	3.3	1	AE
24	1230	2	4	24	11	13	11	2.4	2	AE
25	1400	1	1	11	0	11	0	0.0	2	AE
26	1000	1	1	11	0	11	0	0.2	1	AE
27	930	1	1	11	0	11	0	0.6	2	LR
31	910	2	13	33	0	33	22	31.0	2	OB

The relative mean sunspot number is 24.1.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS  $U'=K'U$  FOR JANUARY 2007

$K' = 0.882$  (\*)

1	***	7	20	13	***	19	***	25	10
2	33	8	36	14	***	20	***	26	10
3	***	9	***	15	19	21	17	27	10
4	34	10	32	16	***	22	***	28	***
5	***	11	***	17	13	23	13	29	***
6	***	12	***	18	***	24	21	30	***
								31	29

The normalised relative monthly mean sunspot number is 21.

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

The Sun has been observed 14 days on 31 possible.

UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR JANUARY 2007  
E AND F BRUNNER'S TYPE GROUPS

NONE

PROBABLE RETURN OF MAJOR GROUPS FOR FEBRUARY 2007  
NONE

## MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

### I. Solar Activity

*Contrary to previous month, solar activity was low during January 2007.*

At the location of the former Catania sunspot group 06 (NOAA 0930), responsible for the turbulent space weather in Dec 2006, two sunspot groups, Catania 09 and 11 (NOAA 0933 and 0935 respectively), were formed. On Jan 10, 11 and 12, Catania group 09 was responsible for 3 C-flares. The group was at that time located at the west limb. From Jan 13, flaring activity shifted to the east. The sunspot group with Catania number 14 (NOAA 0938) was responsible for the slightly higher flaring activity on Jan 15-16. After Jan 16, the group fell silent producing only a few B-flares. On Jan 20, a new sunspot group was born next to Catania group 14. This group, Catania 16 (NOAA 0939) was the source of 2 confined C-flares on Jan 21.

On Jan 24 and 25, GOES recorded two long duration flares: a B9.0 and a C6.3. The source was the returning former Catania group 09 (NOAA 0933). Some post flare loops visible from behind the east limb announced the active region. Each flare was accompanied by a full halo CME. Due to the source region position behind the east limb, they did not arrive at the Earth. The long duration events had all the signs of more activity for the future. But, it was only a promise for some moderate activity on Jan 29-30 from Catania group 19 (NOAA 0940).

For the sake of completeness, we mention a back-sided halo CME observed on Jan 19. This event was without any consequence for the Earth. One can assume Catania group 09 (NOAA 0933), located at that moment on the backside, to be the source region.

All three halo CME's were detected by the CACTus software. The alerts were delayed because of a technical failure.

Three coronal holes were visible in EIT images this month. A recurrent southern coronal hole passed the central meridian on Dec 31. The second coronal feature was a long-lived southern hole, already present since July 2006. The front edge crossed the central meridian on Jan 12. The third low-latitude coronal hole in the southern hemisphere reached the central meridian on Jan 26.

### II. Geomagnetic Activity

*The magnetic field of the Earth was disturbed three times corresponding to the three coronal holes visible this month in SOHO/EIT.*

The co-rotating interaction region (CIR) linked with the first coronal hole arrived at Earth on Jan 01. The increased magnetic field strength carried by this CIR was responsible for a slightly elevated Kp-index of 3 on Jan 01. The solar wind with elevated speed following the CIR was responsible for the active conditions and one minor storm period from Jan 02 to Jan 04.

On Jan 09, a sector boundary change was seen in ACE data. We passed from outward polarity associated with the previous coronal hole to inward polarity associated with the north pool coronal hole. As there was no low latitude extension of this coronal hole, we only scratched the boundary of the fast stream on Jan 12. Geomagnetic situation remained quiet with maximal Kp equal 3.

The second disturbed period lasted from Jan 15 until Jan 19. The wide longitudinal extent of the second hole was the cause of this long time slot of disturbances. ACE data indicated first a heliospheric sector boundary crossing on Jan 15, followed by a steep increase of the solar wind speed reaching a maximum of 650 km/s on Jan 16. Geomagnetic conditions remained unsettled to active, with short-lived minor storm periods and one major storm period. Only from Jan 19 onwards, the solar wind speed started to decline.

The third period of geomagnetic disturbances started on Jan 29 when the fast flow emanating from the third coronal hole reached Earth. The disturbance was intense with Kp reaching 6 and 7 but this lasted only 2 days until Jan 30.

### III. Noticeable solar events

No M- or X-class flares occurred.

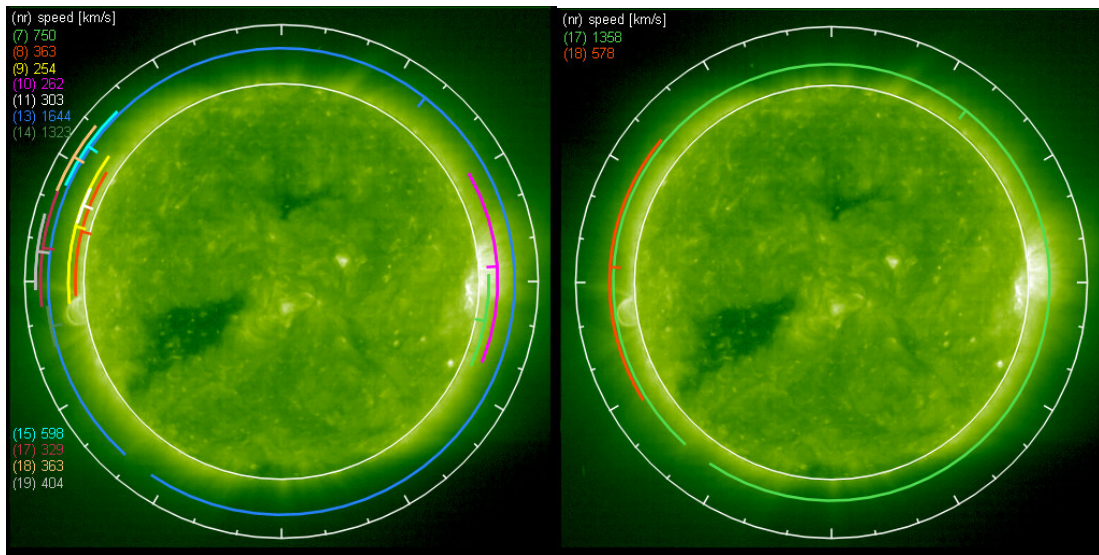
### IV. Halo CME list

onset time	e-mail time CACTus	da	e-mail time LASCO	Ass. Events	onset time NEMO	consequences
01/19 04:06	02/06 12:42	218	01/19 15:35	Backsided	-	-
01/24 14:54	02/06 12:42	352	-	Loop opening at 13:42UT, E limb	01/24 13:42	-
01/25 07:31	02/06 12:42	352	01/25 17:15	C6.3 (06:33UT), post flare loops	01/25 03:48	-
01/26 11:30	02/06 12:42	274	-	B3.7 (09:51UT), loop opening, E limb event	-	-

**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  
**NEMO:** Novel EIT wave Machine Observing (software developed by the SIDC)

**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 (LDE), flare class

### V. Picture of the Month



The Figure above shows two SOHO/EIT images in 195Å taken on Jan 24 and Jan 25 together with the CACTus CME detections. Each arch corresponds to a CME detected by the software CACTus. On both days, a full halo CME was seen, represented by a blue and green circle around the solar disk.