

## Center

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**SUNSPOT BULLETIN**

2007

n° 2

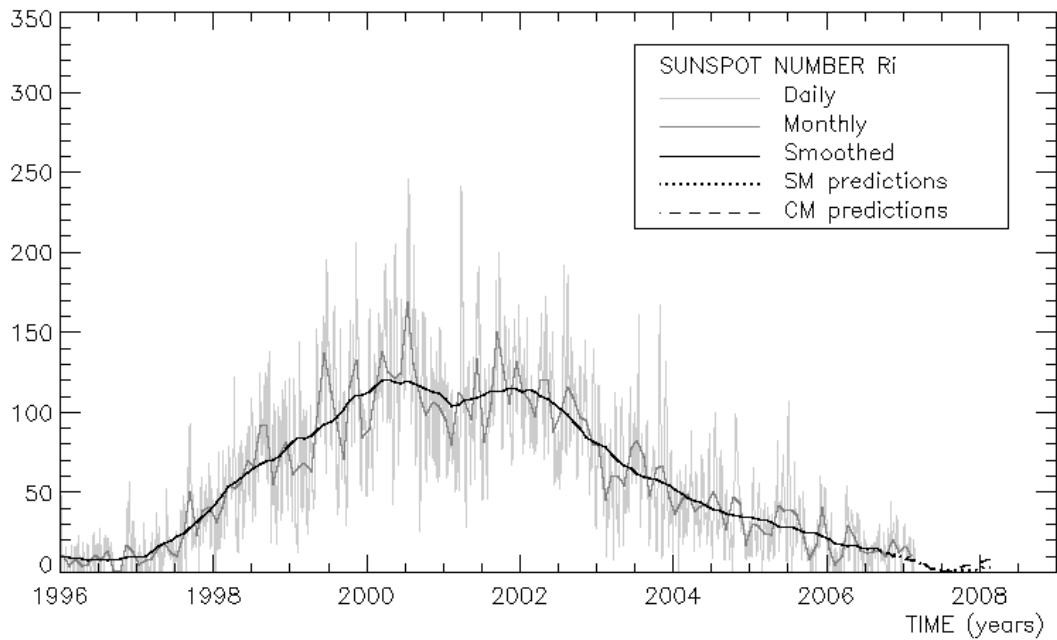
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**Provisional international and normalized hemispheric daily sunspot numbers for February 2007**


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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	0	22
2	22	0	22
3	21	0	21
4	17	0	17
5	16	0	16
6	15	0	15
7	15	0	15
8	8	0	8
9	7	0	7
10	7	0	7
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	8	0	8
18	8	0	8
19	20	0	20
20	17	0	17
21	10	0	10
22	16	0	16
23	15	0	15
24	8	0	8
25	8	0	8
26	15	0	15
27	15	0	15
28	8	0	8
<b>Monthly mean</b>	<b>10.6</b>	<b>0.0</b>	<b>10.6</b>
<b>Cooperating stations</b>	<b>54</b>	<b>47</b>	<b>47</b>



**Predictions of the monthly smoothed Sunspot Number**  
using the last provisional value, calculated for August 2006 : 15.6 ( $\pm 5\%$ )

		SM	CM			SM	CM			SM	CM
2006	Sep	16	15	2007	Mar	12	8	2007	Sep	3	2
	Oct	14	14		Apr	10	5		Oct	2	4
	Nov	15	11		May	9	3		Nov	2	5
	Dec	14	10		Jun	7	3		Dec	2	6
2007	Jan	13	9		Jul	5	2	2008	Jan	2	7
	Feb	13	8		Aug	4	2		Feb	2	9

**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	20	76	-	89	////	0	0/0	24	
1	22	76	-	90	////	1	0/0	8	
2	22	72	-	90	////	0	0/0	6	
3	21	57	-	87	////	0	0/0	2	
4	17	40	-	84	////	0	0/0	2	
5	16	44	-	83	////	0	0/0	6	
6	15	37	-	82	////	0	0/0	6	
7	15	14	-	82	////	0	0/0	16	
8	8	12	-	78	////	0	0/0	10	
9	7	4	-	77	////	0	0/0	6	
10	7	3	-	76	////	0	0/0	6	
11	0	0	-	75	////	0	0/0	3	
12	0	0	-	74	////	0	0/0	0	
13	0	0	-	73	////	0	0/0	4	
14	0	0	-	73	////	0	0/0	3	
15	0	0	-	74	////	0	0/0	6	
16	0	1	-	75	////	0	0/0	0	
17	8	1	-	75	////	0	0/0	10	
18	8	7	-	76	////	0	0/0	6	
19	20	25	-	75	////	0	0/0	2	
20	17	9	-	75	////	0	0/0	2	
21	10	8	-	75	////	0	0/0	1	
22	16	3	-	76	////	0	0/0	4	
23	15	4	-	75	////	0	0/0	4	
24	8	10	-	76	////	0	0/0	4	
25	8	15	-	77	////	0	0/0	5	
26	15	19	-	75	////	0	0/0	6	
27	15	24	-	75	////	0	0/0	15	
28	8	18	-	76	////	0	0/0	25	

- 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 w/m<sup>2</sup> : 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).
- 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 2007

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
3	900	2	12	32	0	32	32	4.4	3	OB
4	1240	2	5	25	0	25	11	4.0	3	OB
7	1520	2	2	22	0	22	0	1.7	1	OB
9	845	1	1	11	0	11	0	0.6	3	OB
12	900	0	0	0	0	0	0	0.0	3	AE
15	900	0	0	0	0	0	0	0.0	3	AE
16	915	0	0	0	0	0	0	0.0	2	AE
17	1455	1	2	12	0	12	0	0.1	2	DB
20	915	2	8	28	0	28	28	1.7	4	OB
22	820	1	4	14	0	14	14	0.4	2	OB
23	1345	1	1	11	0	11	0	0.6	3	OB
28	1115	1	1	11	0	11	11	2.4	2	AE

The relative mean sunspot number is 13.8.

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

$K' = 0.926$  (\*)

1	***	7	20	13	***	19	***	25	***
2	***	8	***	14	***	20	26	26	***
3	30	9	10	15	0	21	***	27	***
4	23	10	***	16	0	22	13	28	10
5	***	11	***	17	11	23	10		
6	***	12	0	18	***	24	***		

The normalised relative monthly mean sunspot number is 13.

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

The Sun has been observed 12 days on 28 possible.

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

NONE

PROBABLE RETURN OF MAJOR GROUPS FOR MARCH 2007

NONE

## MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

### I. Solar Activity

*Flaring activity was nearly negligible in February 2007. We can cover the complete month in but a few sentences.*

In the first few days of the month the X-ray radiation, as measured by GOES, showed some small-scale activity reaching the B-level. From Feb 04, the X-ray background decreased. After an isolated C1.2 flare on Feb 08, X-ray radiation output went down still further to bottom level from Feb 10 until Feb 14. The Sun had a small revival on Feb 15 which resulted in a spiked C-flare on Feb 16. For both C-flares mentioned, no source region was identified. The rest of the month, there was no flaring activity except for another isolated C1.1 flare early Feb 19 from Catania sunspot group 23 (NOAA 0942), which had a magnetic  $\beta$  configuration. The group was located at the equator on the eastern part of the solar disk.

A really small coronal hole situated between Catania sunspot groups 19 (NOAA 0940) and 21 (NOAA 0941) reached the central meridian on Feb 03. The first part of a second, large, southern coronal hole with a northern trailing extension passed the central meridian on Feb 09. EIT had a CCD bake-out from Feb 14 onwards. From recurrence, we suspected the existence of another coronal hole. This would be the return of a low-latitude coronal hole in the southern hemisphere which passed the central meridian on Jan 26.

A partial halo CME was detected on Feb 17, 14:48UT by the CACTus software. The CME had an angular width of  $240^\circ$  and a median speed of 504 km/s. The plasma cloud was ejected mainly to the east. EIT was not available and GOES showed no flaring activity at that moment. So, the source region could not be determined and there was no possibility for NEMO to detect an associated EIT wave. The cloud was however not directed to earth.

### II. Geomagnetic Activity

*There were three periods of some geomagnetic disturbances. All three were induced by coronal holes.*

The first disturbance was rather small. During the period from Feb 05 – Feb 08, ACE data showed a coronal hole signature. The arrival of a co-rotating interaction region (CIR) on Feb 05 could be recognized because of the elevated strength of the interplanetary magnetic field (IMF), the oscillating z-component of the IMF and the slight density enhancement. The solar wind speed rose only from 350 to 450 km/s. The geomagnetic disturbances were limited; the K<sub>p</sub> estimated by Boulder was maximum 3.

The second period of geomagnetic disturbances was initiated on Feb 12 by the arrival of a compressed CIR. The solar wind speed rose to 700 km/s on Feb 14 and 15. Together with the increase in solar wind speed, the geomagnetic conditions became active. Boulder estimated one period of K<sub>p</sub> equal 5. From mid Feb 15, geomagnetic conditions became quiet.

The third coronal hole became geo-effective on Feb 27. When the CIR arrived on Feb 26, the B<sub>z</sub> component was mainly positive. A second jump in the density and IMF strength was seen in ACE data on Feb 27. During the time in between the CIR arrival and the second jump, we probably shifted temporarily to another sector, out of the solar wind stream emanating from the coronal hole. From Feb 27, the B<sub>z</sub> component of the IMF was predominantly negative leading to minor storm conditions on Feb 28 and active conditions on March 01. Compared to previous rotations, this stream arrived with a delay of almost two days and proved less geo-effective.

### III. Noticeable solar events

No M- or X-class flares occurred.

#### ***IV. Halo CME list***

<b>onset time</b>	<b>e-mail time CACTus</b>	<b>da</b>	<b>e-mail time LASCO</b>	<b>Ass. Events</b>	<b>onset time NEMO</b>	<b>consequences</b>
02/17 14:48	02/18 04:26	240	-	-	-	-

**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