

## Center

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**SUNSPOT BULLETIN**

2006 n° 1

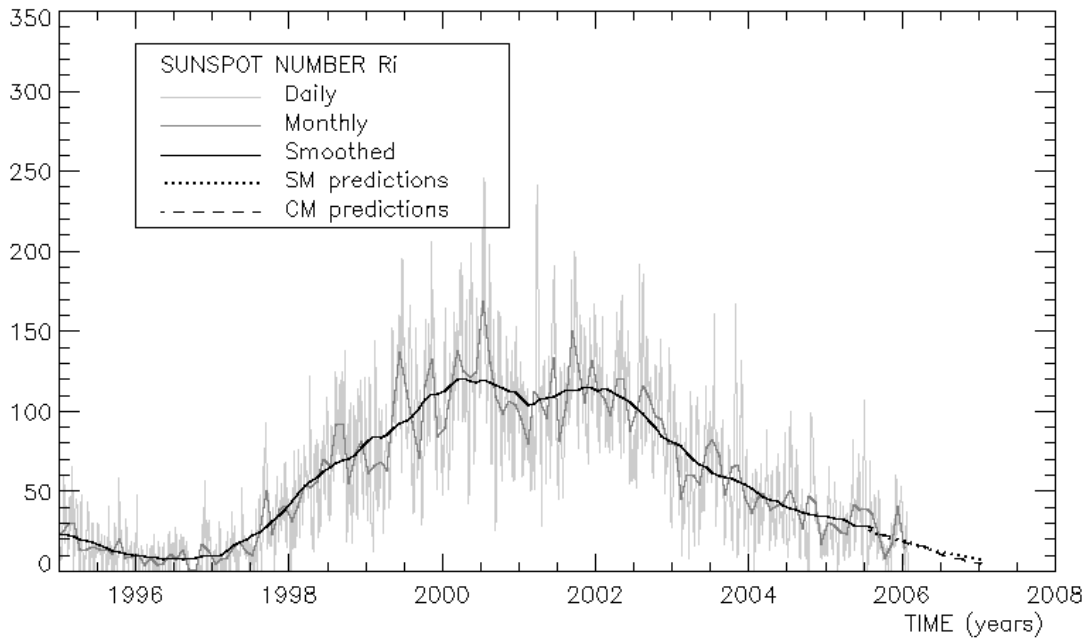
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**Provisional international and normalized hemispheric daily sunspot numbers for January 2006**


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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	25	18	7
2	24	17	7
3	19	19	0
4	17	17	0
5	15	15	0
6	15	15	0
7	8	8	0
8	7	7	0
9	8	8	0
10	8	8	0
11	8	8	0
12	8	8	0
13	0	0	0
14	8	4	4
15	20	10	10
16	24	12	12
17	22	11	11
18	28	10	18
19	24	0	24
20	16	0	16
21	19	0	19
22	31	0	31
23	37	9	28
24	30	0	30
25	19	0	19
26	14	0	14
27	9	0	9
28	7	4	3
29	7	0	7
30	0	0	0
31	0	0	0
<b>Monthly mean</b>	<b>15.4</b>	<b>6.7</b>	<b>8.7</b>
<b>Cooperating stations</b>	<b>40</b>	<b>34</b>	<b>34</b>



**Predictions of the monthly smoothed Sunspot Number**  
 using the last provisional value, calculated for July 2005 : 29.1 ( $\pm 5\%$ )

	SM	CM		SM	CM		SM	CM
2005 Aug	29	27	2006 Feb	22	18	2006 Aug	15	10
Sep	29	25	Mar	21	17	Sep	14	9
Oct	26	23	Apr	19	16	Oct	13	8
Nov	25	21	May	18	15	Nov	12	6
Dec	24	20	Jun	17	12	Dec	11	6
2006 Jan	23	19	Jul	16	11	2007 Jan	11	5

**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	41	47	-	87	853	0	0/0	14	
1	25	35	-	87	908	0	0/0	8	
2	24	24	-	85	915	0	0/0	8	
3	19	16	-	85	////	0	0/0	3	
4	17	8	-	84	923	0	0/0	2	
5	15	5	-	83	922	1	0/0	4	
6	15	2	-	82	927	0	0/0	8	
7	8	3	-	79	927	0	0/0	8	
8	7	3	-	78	929	0	0/0	4	
9	8	3	-	78	924	0	0/0	1	
10	8	3	-	78	928	0	0/0	2	
11	8	3	-	77	933	0	0/0	3	
12	8	4	-	77	932	0	0/0	4	
13	0	999	-	77	934	0	/0	3	
14	8	0	-	77	936	0	0/0	4	
15	20	10	-	81	935	0	0/0	7	
16	24	23	-	84	901	0	0/0	15	
17	22	18	-	83	936	0	0/0	8	
18	28	13	-	86	934	0	0/0	12	
19	24	27	-	89	936	0	0/0	8	
20	16	38	-	91	935	0	0/0	10	
21	19	43	-	94	915	0	0/0	3	
22	31	57	-	93	936	2	0/0	6	
23	37	46	-	92	931	0	0/0	14	
24	30	42	-	93	941	1	0/0	7	
25	19	25	-	89	////	0	0/0	11	
26	14	11	-	87	931	0	0/0	37	
27	9	4	-	84	934	0	0/0	14	
28	7	0	-	80	936	0	0/0	9	
29	7	1	-	80	////	0	0/0	3	
30	0	0	-	79	939	0	0/0	2	
31	0	0	-	///	////	///	///	(//)	

**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 atmospheric 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 2006

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
2	945	3	8	38	27	11	13	21.6	2	OB
3	950	2	10	30	30	0	0	13.8	3	OB
4	930	2	5	25	25	0	0	0.8	3	OB
6	920	2	6	26	26	0	0	0.1	3	OB
8	1050	1	1	11	11	0	0	0.2	2	OB
9	1340	1	1	11	11	0	0	0.3	3	AE
10	945	1	1	11	11	0	0	0.3	2	AE
13	945	0	0	0	0	0	0	0.0	3	AE
14	1115	1	1	11	0	11	11	0.4	3	AE
15	1115	2	17	37	19	18	37	7.0	3	AE
16	1240	2	23	43	20	23	23	2.6	3	ST
23	935	3	40	70	14	56	59	21.3	3	AE
24	1316	2	32	52	0	52	12	17.2	2	AE
25	900	1	18	28	0	28	0	14.1	2	AE
26	1015	1	12	22	0	22	0	9.0	2	AE
27	1445	1	3	13	0	13	0	1.2	1	LR
28	920	0	0	0	0	0	0	0.0	2	FC
29	940	1	2	12	0	12	12	0.3	3	FC
30	1120	0	0	0	0	0	0	0.0	2	FC
31	1055	0	0	0	0	0	0	0.0	3	FC

The relative mean sunspot number is 22.0.

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

$K' = 0.882 (*)$

1	***	7	***	13	0	19	***	25	25
2	34	8	10	14	10	20	***	26	19
3	26	9	10	15	33	21	***	27	11
4	22	10	10	16	38	22	***	28	0
5	***	11	***	17	***	23	62	29	11
6	23	12	***	18	***	24	46	30	0
								31	0

The normalised relative monthly mean sunspot number is 19.

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

The Sun has been observed 20 days on 31 possible.

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

NONE

PROBABLE RETURN OF MAJOR GROUPS FOR FEBRUARY 2006  
NONE

## MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

### I. Solar Activity

*January 2006 was a noticeable-event-less month. From Jan 06 until Jan 14, solar activity was quasi-absent. The background X-ray radiation was even below the A-level from Jan 09 until Jan 14. We had three 'spotless' days when the provisional International Sunspot Number (ISN) was zero.*

From the first day of the month, the background X-ray radiation decreased steadily until Jan 15. In that period only two C-flares occurred: one on Jan 01 (Catania group 86, NOAA AR 0838 near the west limb) and an impulsive C4.4 peak during a long duration B8.6 flare from Catania groups 89/90 (NOAA AR 0841/0843) around 60/80° west on Jan 05. A bright but narrow CME with no earthward component was observed with the latter event.

From Jan 06 until Jan 14, all activity was situated on the micro-flare level. An SIDC *all-quiet-alert* was declared from Jan 08 until Jan 13. The provisional ISN was zero on Jan 13. The other days of that period, the provisional ISN never exceeded 10.

From Jan 15, activity rose slightly, but not dramatically. Several sunspot groups emerged and grew rapidly: Catania sunspot groups 97, 98 and 99 (NOAA AR 0846, 0847 and 0848 respectively). Despite of their growth, group 97 and 98 did not produce any flaring activity stronger than the B-level. From Jan 18, they slowly decayed. That day, group 99 popped up at 45° east, grew fast and even had a  $\beta\gamma\delta$ -configuration of the photospheric magnetic field. It finally produced a series of 5 C-flares on Jan 22, one on Jan 23 and a last on Jan 24. The group was past its peak from that moment, producing flares in the B-category until Jan 28, its last day of presence on the solar disk.

Two coronal holes were visible in SOHO/EIT this month: a small trans-equatorial coronal hole, passing the central meridian on Jan 13 and a recurrent equatorial coronal hole with a tail in the south, passing the central meridian on Jan 21.

### II. Geomagnetic Activity

*CMEs did not play any role this month. The registered disturbances originated from the solar wind emerging from the coronal holes mentioned above. The most active period was the last week of the month, with minor storm conditions.*

On Jan 16, the Earth entered an interaction region between a slow and a fast solar wind flow. The source of the fast flow was probably the small equatorial coronal hole passing the central meridian on Jan 13 and at that moment situated in the Western hemisphere. The IMF north-south component  $B_z$  was fluctuating, resulting in active geomagnetic conditions ( $K_p = 4$  reported by NOAA late on Jan 16). On Jan 16-17, the actual fast solar wind speed of 450 km/s emanating from the coronal hole was measured at the L1 point by ACE. Although the 'fast' solar wind was not really fast (only 450 km/s), other characteristic features of a fast stream were present. Once the first ACE-signatures of the coronal hole passed, the IMF strength decreased down to 6nT leading to quiet geomagnetic conditions. On Jan 18, a second increase in the solar wind speed was seen: the speed went up to 550 km/s. However, the magnetic field magnitude and the density did not change. So, the quiet conditions persisted.

The signature of the second coronal hole in ACE data was seen late on Jan 22 when the total IMF and the density of the solar wind increased. The solar wind increased on Jan 23 from 350 km/s to 600 km/s. The IMF north-south component  $B_z$  went down to -10nT for a short period only. Geomagnetic conditions became active. A second disturbance related to this coronal hole, arrived on Jan 25: solar wind speed went from 400 km/s to 700 km/s.  $B_z$  was now for a longer period negative and gave rise to minor storm conditions. NOAA/Boulder estimated a  $K_p$  of 5/6.

**III. Noticeable solar events**

No M- or X-class flare occurred

**IV. Halo CME list**

No halo CMEs were reported