

## Center

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**SUNSPOT BULLETIN**

2006

n°11

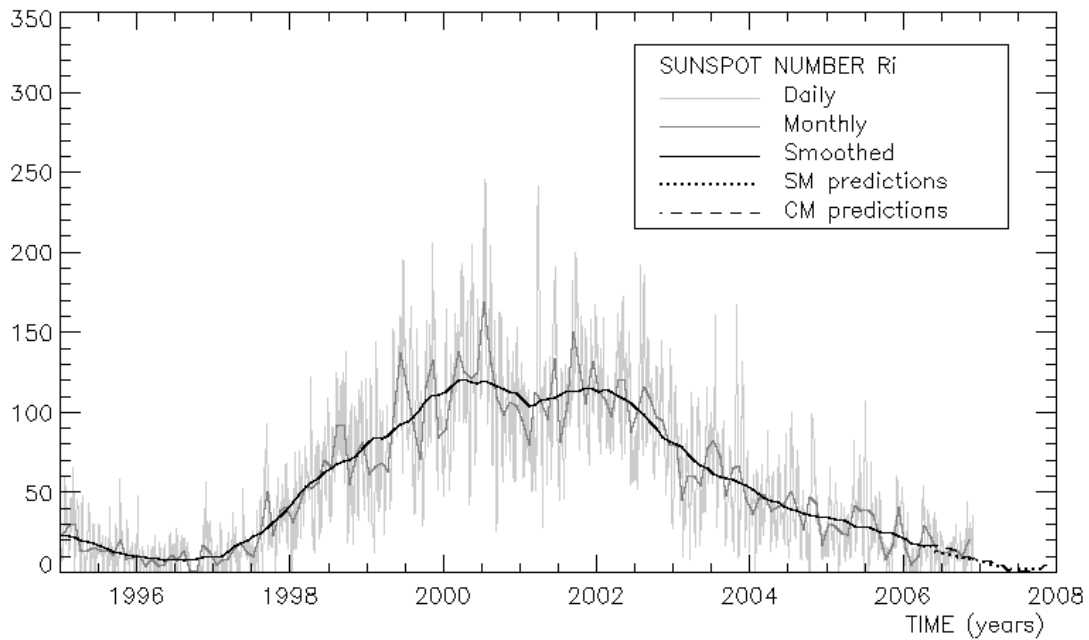
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**Provisional international and normalized hemispheric daily sunspot numbers for November 2006**


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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	32	0	32
2	42	0	42
3	44	0	44
4	39	0	39
5	32	0	32
6	24	0	24
7	19	0	19
8	26	0	26
9	18	0	18
10	9	0	9
11	11	0	11
12	13	0	13
13	21	0	21
14	28	0	28
15	27	0	27
16	31	0	31
17	28	0	28
18	28	0	28
19	27	0	27
20	21	0	21
21	0	0	0
22	0	0	0
23	7	4	3
24	0	0	0
25	8	0	8
26	9	0	9
27	20	9	11
28	23	12	11
29	24	13	11
30	35	13	22
<b>Monthly mean</b>	<b>21.5</b>	<b>1.7</b>	<b>19.8</b>
<b>Cooperating stations</b>	<b>47</b>	<b>40</b>	<b>40</b>



**Predictions of the monthly smoothed Sunspot Number**  
 using the last provisional value, calculated for May 2006 : 17.3 ( $\pm 5\%$ )

	SM	CM		SM	CM		SM	CM
2006 Jun	15	17	2006 Dec	11	9	2007 Jun	5	2
Jul	17	16	2007 Jan	10	8	Jul	4	2
Aug	14	15	Feb	9	8	Aug	4	2
Sep	13	14	Mar	9	5	Sep	3	2
Oct	12	11	Apr	8	5	Oct	3	3
Nov	12	10	May	6	2	Nov	2	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

Brussels, December 1, 2006 10:15 UT

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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	23	17	-	80	////	0	0/0	6	
1	32	42	-	87	////	0	0/0	9	
2	42	79	-	88	////	0	0/0	11	
3	44	70	-	87	////	0	0/0	8	
4	39	72	-	86	////	0	0/0	8	
5	32	64	-	85	////	2	0/0	5	
6	24	27	-	84	////	0	0/0	2	
7	19	12	-	87	////	0	0/0	0	
8	26	16	-	86	////	0	0/0	2	
9	18	20	-	89	////	0	0/0	12	
10	9	36	-	91	////	0	0/0	32	
11	11	73	-	97	////	0	0/0	24	
12	13	63	-	97	////	0	0/0	6	
13	21	106	-	95	////	0	0/0	1	
14	28	126	-	95	////	0	0/0	9	
15	27	106	-	96	////	1	0/0	8	
16	31	128	-	94	////	0	0/0	7	
17	28	78	-	90	////	2	0/0	5	
18	28	72	-	89	////	2	0/0	2	
19	27	31	-	85	////	1	0/0	5	
20	21	7	-	81	////	0	0/0	1	
21	0	0	-	78	////	0	0/0	1	
22	0	0	-	77	////	0	0/0	7	
23	7	0	-	77	////	0	0/0	18	
24	0	0	-	77	////	0	0/0	16	
25	8	3	-	79	////	0	0/0	22	
26	9	4	-	78	////	0	0/0	15	
27	20	16	-	82	////	3	0/0	10	
28	23	21	-	86	////	0	0/0	8	
29	24	52	-	85	////	0	0/0	10	
30	35	68	-	84	////	0	0/0	28	

- 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 NOVEMBER 2006

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	850	3	24	54	0	54	0	49.1	3	OB
2	1000	3	42	72	0	72	45	76.9	3	AE
3	900	3	60	90	0	90	79	87.3	3	AE
6	1510	3	9	39	11	28	22	17.9	2	OB
7	945	2	4	24	0	24	0	13.9	2	OB
8	915	3	8	38	0	38	0	13.0	3	OB
9	1140	2	12	32	0	32	0	9.5	3	OB
10	1325	1	7	17	0	17	0	16.0	3	OB
12	955	1	12	22	0	22	22	26.8	3	FC
15	1200	3	9	39	0	39	13	31.2	2	AE
17	1230	3	12	42	0	42	30	23.5	3	AE
21	1210	0	0	0	0	0	0	0.0	4	OB
22	1020	0	0	0	0	0	0	0.0	4	OB
24	1020	0	0	0	0	0	0	0.0	1	OB
26	1150	1	3	13	0	13	0	0.7	2	DB
27	1400	3	10	40	16	24	0	3.2	3	AE
28	1230	3	12	42	17	25	0	5.0	3	AE
29	1100	2	17	37	20	17	17	18.3	3	AE
30	1215	4	24	64	21	43	64	24.1	3	AE

The relative mean sunspot number is 35.0.

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

$K' = 0.876$  (\*)

1	47	7	21	13	***	19	***	25	***
2	63	8	33	14	***	20	***	26	11
3	79	9	28	15	34	21	0	27	35
4	***	10	15	16	***	22	0	28	37
5	***	11	***	17	37	23	***	29	32
6	34	12	19	18	***	24	0	30	56

The normalised relative monthly mean sunspot number is 31.

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

The Sun has been observed 19 days on 30 possible.

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

Uccle No	East Limb Date	Date and type			West Limb Date
		1st obs	CMP	Last obs	
6-2049	10 28.4	30 B	11 4.2	9 B	11 10.9

PROBABLE RETURN OF MAJOR GROUPS FOR DECEMBER 2006  
NONE

## MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

### **I. Solar Activity**

*Compared with previous months, November 2006 was a little more active with a total of 12 C-flares and 1 partial halo CME.*

In the first week, a pair of sunspot groups, Catania 93 and 94 (NOAA AR 0921 and 0922) was present. They were responsible for the C-flares on Nov 02 and Nov 05-06. On Nov 07, a new group appeared at the east limb: Catania 96 (NOAA AR 0923). The sunspot group was rather big but simple: unipolar with a penumbra; in first instance it had a magnetic  $\alpha$  configuration, later it became a  $\beta$ . The period of increased activity of Nov 05-06 initiated by the sunspot groups 93 and 94 with  $\beta$ - $\gamma$  and  $\beta$  configuration was prolonged by Catania sunspot group 96 on Nov 07. The X-ray radiation measured by GOES showed the most elevated profile of this month during that period. Sunspot group 96 was the source of more C-flares on Nov 12 and 13. Thereafter the group's activity cooled down. This period was followed by a limited revival on Nov 20 with an extended series of B-flares just before the group rotated behind the solar disk. The last C-flare of this month was measured on Nov 29. Catania 02 (NOAA AR 0926), which rotated on the disk on Nov 26, was the source.

Only two prominent coronal holes were present during the month. A southern, non-recurrent coronal hole passed the central meridian on Nov 06. A second southern, recurrent hole passed the central meridian on Nov 20. On Nov 25, a faint partial halo CME was detected by the LASCO C2 coronagraph.

### **II. Geomagnetic Activity**

*The two coronal holes and the partial halo CME could be linked to three periods of clear geomagnetic disturbances. A period with less pronounced geomagnetic disturbances gave the kick off.*

A first small disturbance on Nov 02-03 was linked with a moderate coronal hole passing the central meridian at the end of October. The geomagnetic conditions stayed quiet. The coronal hole signature was clearly present in ACE-date, but limited: solar wind speed increased only to 450 km/s.

On Nov 09 around 11:45UT, a small shock in the solar wind marked the onset of a recurrent fast solar wind stream emanating from the coronal hole passing the central meridian on Nov 06. The solar wind speed rose to a maximum of 600 km/s on Nov 10 and it started to decline on Nov 12. The disturbance triggered a minor geomagnetic storm late on Nov 09 and on Nov 10. The geomagnetic field remained unsettled to active until early Nov 12.

On Nov 16,  $K_p$  reached 5 for a single 3-hour-period following a sector boundary crossing. This disturbance was confined in time. A week later, on Nov 22, the interplanetary magnetic field carried by the solar wind increased to 10nT. The density of the solar wind increased accordingly. The solar wind sped up from early Nov 23. It was the fast wind emanating from the second southern coronal hole mentioned above. On Nov 23 and 24, we experienced minor storm conditions. The next two days, active disturbances were measured.

On Nov 29, an ICME arrived near earth. The solar wind speed did not show any clear sign of a cloud passing the L1 point. But the z-component of the magnetic field in the cloud itself rotated slowly from positive to negative values. This was a clear indicator of an ICME. It probably corresponded to the partial halo CME of Nov 25.

### **III. Noticeable solar events**

No M- or X-class flare occurred.

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

No CME alert was sent