

Center

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SUNSPOT BULLETIN

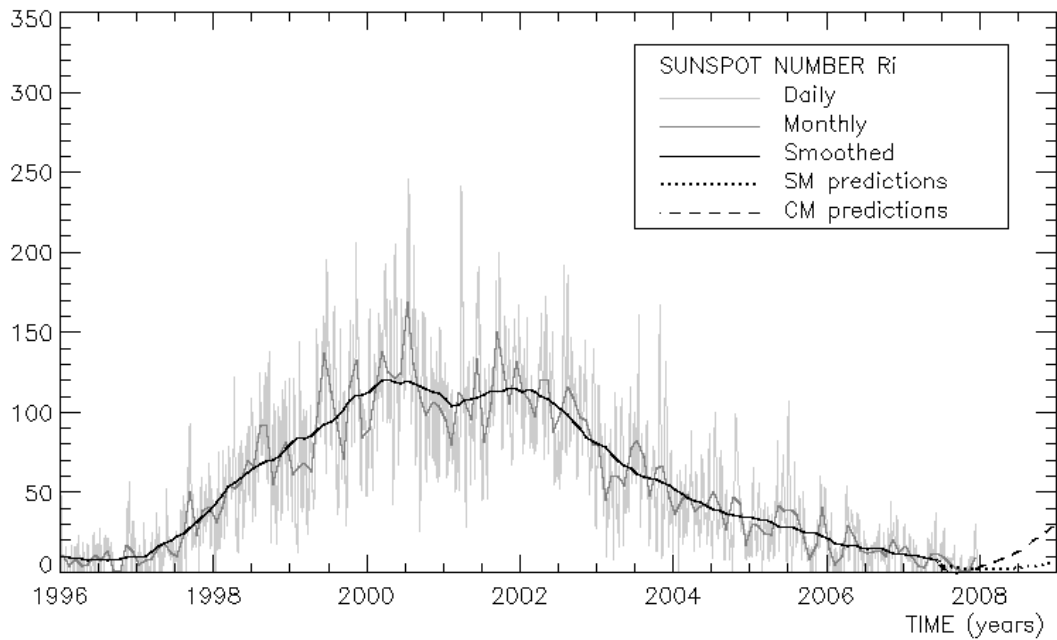
2007

n°12

Provisional international and normalized hemispheric daily sunspot numbers for December 2007

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	10	0	10
2	9	5	4
3	7	0	7
4	9	0	9
5	8	0	8
6	16	0	16
7	15	0	15
8	25	0	25
9	26	0	26
10	24	0	24
11	24	0	24
12	28	0	28
13	30	0	30
14	24	0	24
15	22	0	22
16	18	0	18
17	11	0	11
18	7	4	3
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
31	0	0	0
Monthly mean	10.1	0.3	9.8
Cooperating stations	62	53	53



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for June 2007 : $7.7 (\pm 5\%)$

		SM	CM			SM	CM			SM	CM
2007	Jul	6	3	2008	Jan	3	4	2008	Jul	3	14
	Aug	6	0		Feb	3	6		Aug	3	17
	Sep	5	0		Mar	3	7		Sep	3	20
	Oct	5	1		Apr	2	9		Oct	4	23
	Nov	4	2		May	2	11		Nov	4	26
	Dec	4	3		Jun	2	12		Dec	5	29

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, January 1, 2008 09:41 UT

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S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R' _i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
30	0	///	-	71	////	0	0/0	4	
1	10	3	-	72	////	0	0/0	3	
2	9	4	-	73	////	11	0/0	2	
3	7	3	-	73	////	0	0/0	0	
4	9	6	-	74	////	0	0/0	1	
5	8	4	-	75	////	1	0/0	2	
6	16	5	-	78	////	11	0/0	4	
7	15	9	-	82	////	113	0/0	2	
8	25	22	-	87	////	5	0/0	0	
9	26	44	-	89	////	7	0/0	5	
10	24	65	-	87	////	2	0/0	10	
11	24	50	-	93	////	114	0/0	21	
12	28	53	-	94	////	5	0/0	10	
13	30	89	-	94	////	22	0/0	8	
14	24	76	-	92	////	4	0/0	4	
15	22	40	-	89	////	0	0/0	4	
16	18	17	-	82	////	0	0/0	5	
17	11	4	-	80	////	2	0/0	18	
18	7	0	-	77	////	1	0/0	26	
19	0	///	-	75	////	0	0/0	2	
20	0	0	-	73	////	0	0/0	20	
21	0	///	-	71	////	0	0/0	6	
22	0	0	-	72	////	0	0/0	11	
23	0	0	-	71	////	0	0/0	9	
24	0	0	-	71	////	0	0/0	5	
25	0	3	-	72	////	0	0/0	2	
26	0	2	-	73	////	0	0/0	2	
27	0	///	-	72	////	0	0/0	6	
28	0	0	-	72	////	0	0/0	6	
29	0	0	-	73	////	0	0/0	3	
30	0	///	-	75	////	0	0/0	2	
31	0	///	-	77	////	0	0/0	5	

- 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, UGEOI).
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 DECEMBER 2007

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	958	1	4	14	0	14	0	1.2	2	ST
3	945	1	3	13	0	13	0	0.9	3	ST
7	1330	1	11	21	0	21	0	10.0	2	AE
9	1100	2	25	45	12	33	0	18.5	3	AE
11	950	1	22	32	0	32	32	6.1	2	OB
12	1100	1	35	45	0	45	45	6.2	2	OB
15	1100	1	30	40	0	40	0	13.9	3	FC
16	915	1	17	27	0	27	0	9.5	1	FC
17	1010	1	2	12	0	12	0	1.3	1	ST
18	1220	0	0	0	0	0	0	0.0	2	ST
19	1221	0	0	0	0	0	0	0.0	2	ST
20	1200	0	0	0	0	0	0	0.0	2	ST
21	1226	0	0	0	0	0	0	0.0	2	ST
22	1300	0	0	0	0	0	0	0.0	3	OB
23	1048	0	0	0	0	0	0	0.0	2	DB
24	954	0	0	0	0	0	0	0.0	4	DB
28	1230	0	0	0	0	0	0	0.0	2	AE
29	1205	0	0	0	0	0	0	0.0	1	ST

The relative mean sunspot number is 13.8.

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

$K' = 0.868$ (*)

1	12	7	18	13	***	19	0	25	***
2	***	8	***	14	***	20	0	26	***
3	11	9	39	15	35	21	0	27	***
4	***	10	***	16	23	22	0	28	0
5	***	11	28	17	10	23	0	29	0
6	***	12	39	18	0	24	0	30	***
								31	***

The normalised relative monthly mean sunspot number is 12.

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

The Sun has been observed 18 days on 31 possible.

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

NONE

PROBABLE RETURN OF MAJOR GROUPS FOR JANUARY 2008
NONE

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

There has been some moderate flaring excitement this month. As surplus, we saw a first glimpse of the next solar cycle.

X-ray radiation was exceptionally *not* below the measurement threshold of GOES11 satellite from Dec 05 until 19 and on Dec 30 – 31. Before Dec 05, Catania sunspot group 63 (NOAA AR 0977) at the east limb was responsible for a few spikes in the otherwise flat radiation curve. From Dec 05 onwards, Catania sunspot group 64 (NOAA AR 0978) pushed up the background X-ray radiation. This sunspot group produced 8 C-flares. The group fired off the two C-flares on Dec 18 from a position behind the west limb indicating that the measured flux would have been bigger in case of an on-disk source. The two flares were relatively closely related in time. After the release of those two C-flares, the X-ray radiation decreased reaching again a level below the measurement threshold on Dec 20.

On Dec 30, a flare outburst from a source still behind the east limb pushed the X-ray flux curve straight upwards to the C1.7 level. Early Dec 31, a C8.3 flare at 00:37UT was measured. SOHO/EIT imagery indicated that this flare was also partially masked behind the limb and was thus probably even an M-class flare. The event was associated with a large east limb CME. The responsible sunspot was former Catania sunspot group 64 (NOAA AR 0978), now labelled as Catania sunspot group 65 (NOAA AR 0980).

This month, solar magnetograms of Dec 13 indicated one of the first signs of solar cycle 24. The magnetic configuration of bipolar sunspots with leading positive/negative polarity in the northern/southern hemisphere is associated with solar cycle 23. The big spot in the MDI/magnetogram in Figure 1 of section III is such a typical example of a sunspot of cycle 23 in the southern solar hemisphere: inward magnetic field lines on the right and outward pointing field lines on the left. This spot is also located near the equator as it should according to the [butterfly diagrams](#), which picture the drift of the sunspots to the equator (0°) during a solar cycle. The magnetic flux in the red circle however belongs to cycle 24. A photospheric dark spot, concentration of magnetic field lines, a coronal active region, coronal loops, these are all characteristics of the same feature which is often the source of solar activity. Each characteristic is associated with a certain layer of the sun. The area indicated in the red ellipsis on the picture had no photospheric counterpart. In other words, there was no sunspot seen at that place.

We list the dates on which the coronal holes (CH) with a footprint in ACE solar wind data passed the central meridian:

- Dec 01: a small southern CH,
- Dec 08: an equatorial CH,
- Dec 13: an elongated southern CH with an equatorial extension in front of it.
- Dec 24: faint southern CH.

II. Geomagnetic Activity

All disturbances were linked to coronal holes. The disturbances were moderate, reaching only an estimated Kp (NOAA) of maximum 4.

The wind emanating from the first CH did not disturb the geomagnetic field at all. The Kp index had the value 0 or 1.

On Dec 10, a compressed co-rotating interaction region (CIR) in front of the actual CH wind stream arrived. The north-south component of the interplanetary magnetic field was smaller than -10nT for only a short while resulting in one period with a Kp of 4. Unsettled conditions remained until Dec 13. This disturbance is linked to the second CH hole mentioned in the list above.

On Dec 17, a solar wind emanating from the third coronal hole arrived carrying a magnetic field with a strong negative B_z component for several hours resulting in unsettled conditions ($K_p=4$) on Dec 17, 18 and the first part of Dec 19. In the aftermath of the CH, K_p equalled 3 until Dec 23.

Although the signature of the CH last mentioned in the previous section was visible in ACE-data, there were no geomagnetic consequences. The estimated K_p index was only two at the most on Dec 27 and early Dec 28.

III. Picture of the month

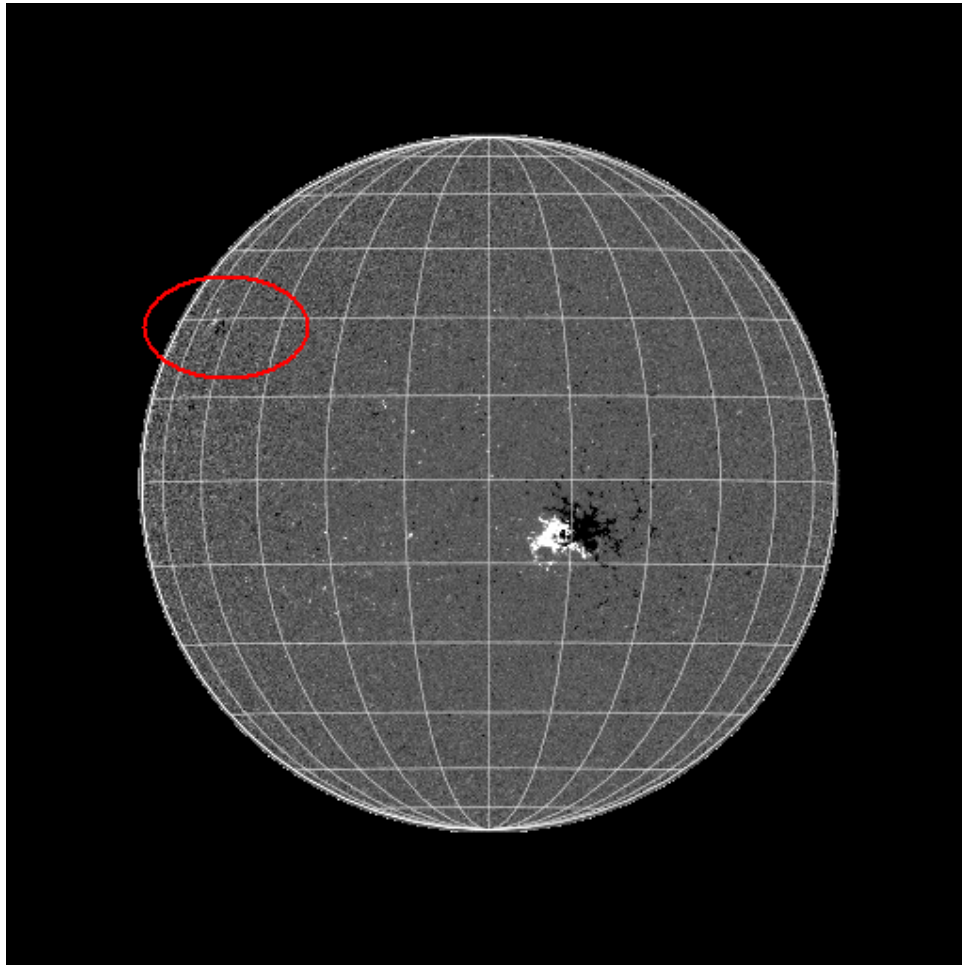


Figure 1 SOHO/MDI magnetogram of Dec 13, 2007 showing an area with a magnetic configuration typical for the next solar cycle.