

Center

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SUNSPOT BULLETIN

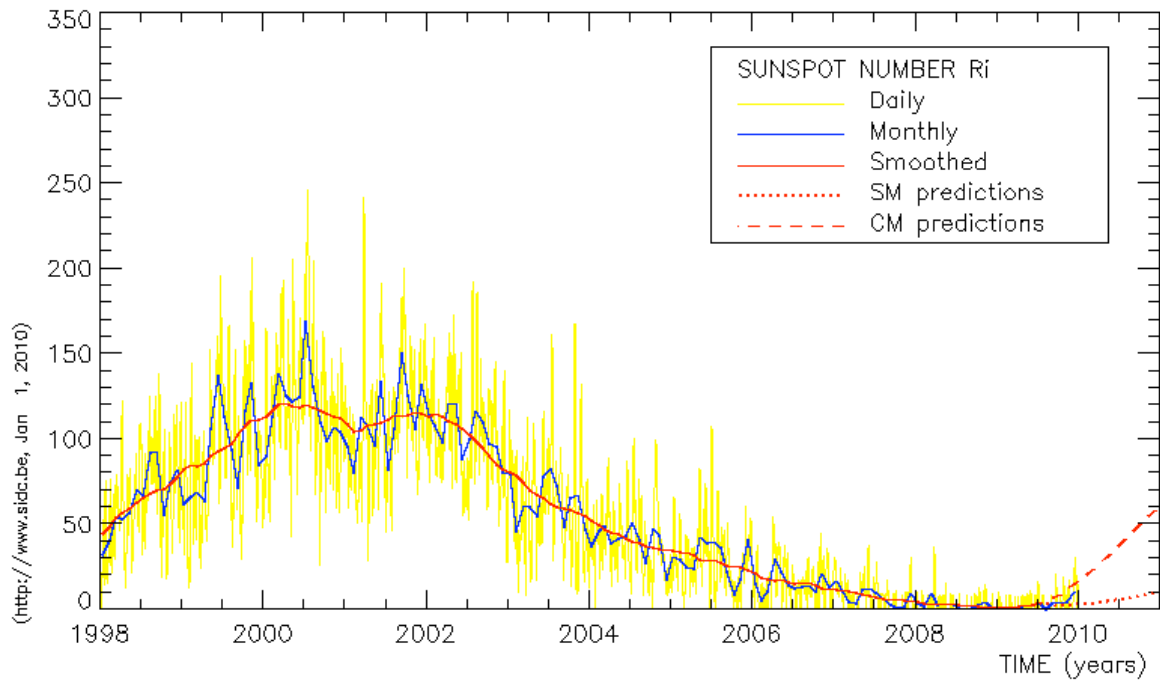
2009

n°12

Provisional international and normalized hemispheric daily sunspot numbers for December 2009

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	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	8	8	0
11	7	7	0
12	8	8	0
13	9	9	0
14	20	20	0
15	24	24	0
16	23	23	0
17	20	20	0
18	15	15	0
19	15	15	0
20	30	20	10
21	29	18	11
22	23	12	11
23	16	7	9
24	12	6	6
25	0	0	0
26	9	0	9
27	10	0	10
28	12	0	12
29	13	0	13
30	11	0	11
31	14	0	14
Monthly mean	10.6	6.9	3.7
Cooperating stations	58	53	53



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for June 2009 : 2. ($\pm 5\%$)

		SM	CM			SM	CM			SM	CM
2009	Jul	3	4	2010	Jan	3	18	2010	Jul	5	39
	Aug	3	5		Feb	3	21		Aug	5	43
	Sep	4	7		Mar	3	24		Sep	6	47
	Oct	3	9		Apr	3	28		Oct	6	51
	Nov	3	12		May	4	31		Nov	7	55
	Dec	3	15		Jun	4	35		Dec	8	58

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' _i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
30	0	///	-	72	////	0	0/0	2	
1	0	///	-	72	////	0	0/0	0	
2	0	0	-	71	////	0	0/0	1	
3	0	0	-	72	////	0	0/0	0	
4	0	///	-	72	////	0	0/0	0	
5	0	///	-	72	////	0	0/0	4	
6	0	///	-	72	////	0	0/0	4	
7	0	///	-	71	////	0	0/0	4	
8	0	///	-	72	////	0	0/0	1	
9	0	1	-	73	////	0	0/0	0	
10	8	1	-	74	////	0	0/0	1	
11	7	2	-	72	////	0	0/0	0	
12	8	4	-	75	////	0	0/0	3	
13	9	5	-	76	////	0	0/0	2	
14	20	7	-	79	////	0	0/0	4	
15	24	24	-	82	////	0	0/0	3	
16	23	23	-	83	////	3	0/0	6	
17	20	37	-	87	////	1	0/0	3	
18	15	33	-	84	////	0	0/0	3	
19	15	25	-	82	////	2	0/0	2	
20	30	30	-	84	////	0	0/0	3	
21	29	16	-	83	////	0	0/0	4	
22	23	6	-	82	////	2	0/0	5	
23	16	3	-	78	////	1	0/0	4	
24	12	2	-	77	////	0	0/0	2	
25	0	///	-	76	////	0	0/0	5	
26	9	3	-	76	////	0	0/0	4	
27	10	13	-	77	////	0	0/0	2	
28	12	15	-	76	////	0	0/0	2	
29	13	16	-	75	////	0	0/0	0	
30	11	14	-	77	////	0	0/0	0	
31	14	30	-	80	////	0	0/0	0	

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, evaluation : $1 \times \text{Sn} + 10 \times \text{"1"} + 100 \times \text{">1"}$).
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 2009

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH			
1	1100	0	0	0	0	0	0.0	2	AE
7	1050	0	0	0	0	0	0.0	1	OB
10	1115	1	1	11	11	0	0.1	1	OL
13	1005	1	5	15	15	0	1.2	2	FC
14	855	2	11	31	31	0	6.1	2	OL
15	900	2	21	41	41	0	19.2	2	OL
16	1300	1	25	35	35	0	18.0	3	OL
18	1230	1	14	24	24	0	38.7	3	OL
19	900	3	11	41	29	12	18.5	2	OL
23	1110	1	2	12	0	12	0.5	1	SV
24	1030	0	0	0	0	0	0.0	2	SV
26	1000	0	0	0	0	0	0.0	1	SV
28	1300	1	10	20	0	20	18.1	2	OL

The relative mean sunspot number is 17.7.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS $U'=K'U$ FOR DECEMBER 2009

$$K' = 0.868 (*)$$

1	0	7	0	13	13	19	36	25	***
2	***	8	***	14	27	20	***	26	0
3	***	9	***	15	36	21	***	27	***
4	***	10	10	16	30	22	***	28	17
5	***	11	***	17	***	23	10	29	***
6	***	12	***	18	21	24	0	30	***
								31	***

The normalised relative monthly mean sunspot number is 15.

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

The Sun has been observed 13 days on 31 possible.

UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR DECEMBER 2009
E AND F BRUNNER'S TYPE GROUPS

Uccle Nø	East Limb		Date and type			West Limb	
	Date		1st obs	CMP	Last obs	Date	
2-2091	12	8.8	14 C	12 15.5	19 G	12	22.3

PROBABLE RETURN OF MAJOR GROUPS FOR JANUARY 2010

Nø	New East Limb		New CMP		New West Limb	
2	1	5.1	1	11.9	1	18.6

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

The sunspot cycle revives. A moderate increase is seen in the Monthly International Sunspot Number, which equals 10.6.

A first bout of flaring activity occurred on Dec 9-10. Catania 29/NOAA AR 1034 fired off a C-flare from the east limb on Dec 10. The next active period started on Dec 13. The background X-ray flux increased from below the A-level to the B-level on Dec 16. This increase was linked with the emergence on Dec 15 of Catania 30/NOAA AR 1035 in the neighborhood of NOAA AR 1034. This sunspot group was responsible for three C-class flares on Dec 16, a C7.6-flare late on Dec 18 and one C-flare early on Dec 19. One of the 4 flares of Dec 16, a C5.6 flare, was associated with a non-geo-effective partial halo CME.

A southern sunspot group emerging on Dec 19 in the western part of the solar disk, Catania 32 (NOAA AR 1036) produced a C7.2 flare on Dec 22 and a C6.4 flare on Dec 23. Four other C-flares occurred on Dec 22. The source region was not identified.

Another southern sunspot group, Catania 34/NOAA AR 1039, emerged on Dec 27 at 45° east. The region showed a significant growth on Dec 31.

II. Geomagnetic Activity

The Earth's magnetic field was almost undisturbed during Dec 2009.

Each day is divided in 8 three-hour intervals for which the Kp index is calculated. Kp scales from zero (no geomagnetic activity) to 9 (maximal geomagnetic activity). Kp was zero during 197 on a total of 248 periods in December 2009. It was once 3 on Dec 14. Such absence of geomagnetic activity is remarkable.

The solar wind speed was at most 450 km/s. During a large time span, the speed was below 300 km/s.

III. News item: Jan 26, 2010 - PROBA2 - 3 months in orbit

The PROBA2 consortium holds a press conference announcing the first achievements of the satellite PROBA2 on Jan 26, 2010. The Royal Observatory of Belgium and the Solar-Terrestrial Centre of Excellence host the event.

The satellite was launched on Nov 02, 2009. PROBA2 is the result of a successful European collaboration with major participation of Belgian industry. The first objective of the mission is to test new spacecraft and instrument technology in space, but scientific objectives are achieved as a bonus. The satellite is equipped with a quartet of new science instruments focusing on solar and space weather observations. For the two 'state of the art' solar telescopes SWAP and LYRA, the scientific responsibility lies in Belgium.

Keep track of the website: <http://proba2.sidc.be>.