

Center

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SUNSPOT BULLETIN

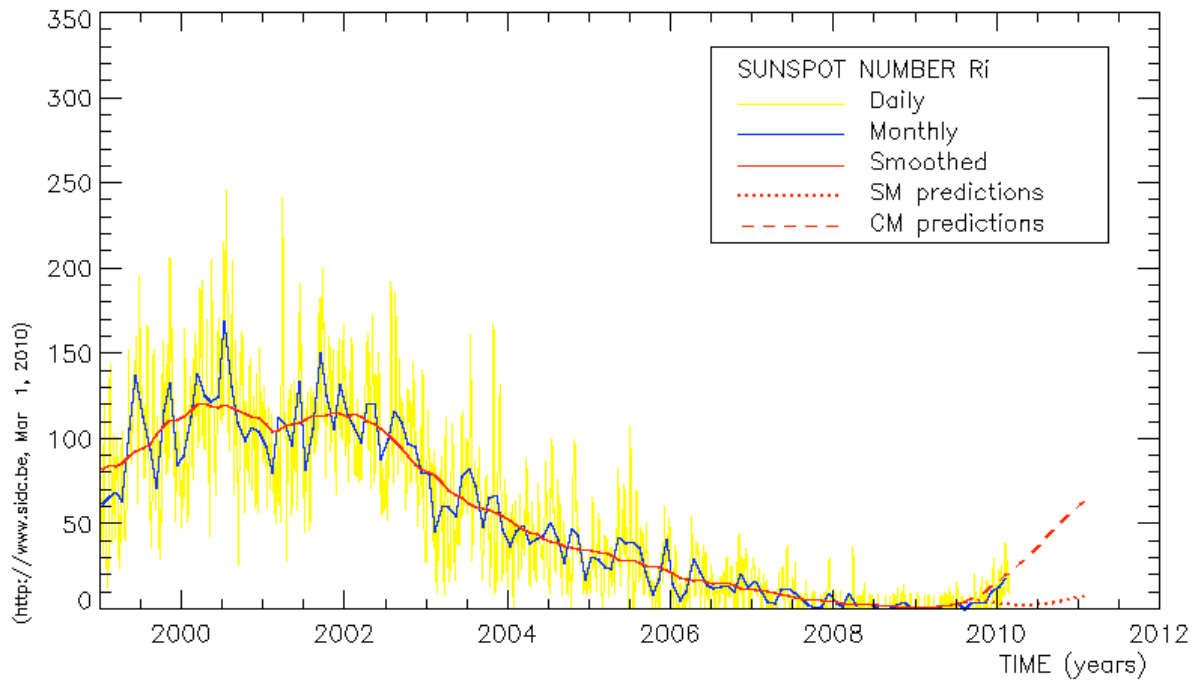
2010

n° 2

Provisional international and normalized hemispheric daily sunspot numbers for February 2010

computed at the *Royal Observatory of Belgium* using observations from an international network with the *Locarno Specola Solare* as reference station.

Date	R' ₁	R' _N	R' _s
1	11	11	0
2	9	9	0
3	9	9	0
4	8	8	0
5	8	8	0
6	24	24	0
7	21	21	0
8	39	32	7
9	37	29	8
10	33	33	0
11	29	29	0
12	27	27	0
13	28	28	0
14	22	22	0
15	20	20	0
16	20	20	0
17	28	16	12
18	15	0	15
19	13	0	13
20	13	0	13
21	11	0	11
22	11	0	11
23	10	0	10
24	20	8	12
25	19	9	10
26	18	9	9
27	9	9	0
28	9	9	0
Monthly mean	18.6	13.9	4.7
Cooperating stations	58	56	56



S

Predictions of the monthly smoothed Sunspot Number
using the last provisional value, calculated for August 2009 : 4. ($\pm 5\%$)

		SM	CM		SM	CM		SM	CM		
2009	Sep	6	7	2010	Mar	5	23	2010	Sep	3	47
	Oct	6	9		Apr	4	27		Oct	3	51
	Nov	8	11		May	4	30		Nov	4	55
	Dec	7	14		Jun	3	34		Dec	4	58
2010	Jan	6	17		Jul	3	38	2011	Jan	5	62
	Feb	6	20		Aug	3	43		Feb	6	65

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
31	11	6	-	75	////	2	0/0	5	
1	11	11	-	75	////	0	0/0	12	
2	9	12	-	75	////	0	0/0	13	
3	9	10	-	74	////	0	0/0	10	
4	8	3	-	74	////	0	0/0	3	
5	8	24	-	78	////	0	0/0	3	
6	24	20	-	88	////	5	2/0	7	
7	21	27	-	90	////	26	1/0	5	
8	39	73	-	94	////	30	4/0	5	
9	37	42	-	91	////	4	0/0	4	
10	33	52	-	91	////	4	0/0	4	
11	29	37	-	94	////	3	0/0	7	
12	27	26	-	96	////	124	2/0	6	
13	28	35	-	94	////	2	0/0	5	
14	22	12	-	89	////	0	0/0	4	
15	20	13	-	88	////	0	0/0	13	
16	20	9	-	87	////	0	0/0	11	
17	28	17	-	87	////	0	0/0	9	
18	15	13	-	85	////	0	0/0	8	
19	13	14	-	84	////	0	0/0	4	
20	13	11	-	84	////	0	0/0	1	
21	11	6	-	84	////	0	0/0	2	
22	11	2	-	84	////	0	0/0	5	
23	10	6	-	84	////	0	0/0	3	
24	20	12	-	83	////	0	0/0	4	
25	19	11	-	83	////	0	0/0	5	
26	18	10	-	81	////	0	0/0	3	
27	9	6	-	79	////	0	0/0	1	
28	9	3	-	78	////	0	0/0	3	

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/m² : 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 2010

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	945	1	4	14	14	0	0	4.7	2	AE
4	1430	1	1	11	11	0	0	0.3	1	AE
5	1345	1	1	11	11	0	0	0.2	1	AE
6	1140	2	13	33	33	0	0	18.3	3	FC
8	1420	3	28	58	47	11	36	58.0	3	SV
10	1045	2	26	46	46	0	0	47.3	1	SV
12	1510	2	15	35	35	0	21	6.9	1	SV
16	1015	2	10	30	30	0	0	4.4	2	OL
18	1128	1	9	19	0	19	19	6.1	3	OL
20	1130	1	7	17	0	17	0	18.0	2	OB
21	1210	1	8	18	0	18	0	0.9	2	OB
22	1024	1	6	16	0	16	0	0.6	2	OB
24	1600	2	14	34	15	19	19	5.8	2	OB
25	1010	2	9	29	14	15	0	1.7	2	OB
27	1210	1	6	16	16	0	0	4.2	4	OL

The relative mean sunspot number is 25.8.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS $U'=K'U$ FOR FEBRUARY 2010

$K' = 0.926$ (*)

1	13	7	***	13	***	19	***	25	27
2	***	8	54	14	***	20	16	26	***
3	***	9	***	15	***	21	17	27	15
4	10	10	43	16	28	22	15	28	***
5	10	11	***	17	***	23	***		
6	31	12	32	18	18	24	31		

The normalised relative monthly mean sunspot number is 24.

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

The Sun has been observed 15 days on 28 possible.

UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR FEBRUARY 2010
E AND F BRUNNER'S TYPE GROUPS

Uccle Nø	East Limb		Date and type			West Limb	
	Date		1st obs	CMP	Last obs	Date	
2-2093	2	1.2	6 D	2 7.9	12 C	2	14.7

PROBABLE RETURN OF MAJOR GROUPS FOR MARCH 2010

Nø	New East Limb	New CMP	New West Limb
2	2 28.5	3 7.2	3 14.0

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

According to the number of M-flares, the solar activity increased further: in January, we counted 6 M-flares, in February, 9 M-flares. February 2010 had no spotless days.

From noon Feb 05, a small structure at N25E38 started growing into an active region. In the morning, there was no sign yet of any magnetic loop system. The active region got the label NOAA1045 / Catania 40. On Feb 06, it produced a first M-flare peaking at 18:59UT. This was the first of a series of 8 M-flares. The largest one, an M6.4, occurred on Feb 07, peaking at 02:34UT. A running wave front was observed in EIT195. The event was linked to an Earth-directed partial halo CME. The projected speed of the CME was calculated to be 339 km/s by the CACTus software.

On Feb 13, three events took place. A C9.5 flare peaked at 12:39 UT. The source region was at that moment behind the east limb. At the position N30E30, a coronal dimming and a running wave front in a series of EIT-images were visible. This event started at 12:36UT. Looking at C2 and C3 movies, no clear CME is visible around that time. The third event was a partial halo CME coming into the C2 view at 20:24UT. No flare could be linked to this event. From STEREO-A/EUVI images, a plasma eruption is visible in NOAA1045 / Catania 30. None of the three events are linked.

The largest M-flare, an M8.3, originated from NOAA1046/Catania 41. It occurred on Feb 12. Further flaring activity concerned several C-flares and mostly B-flares.

Another very nice event was the polar, almost complete halo CME. The ejection from the limb is visible in both SECCHI-B and SECCHI-A EUVI 195A in the left/right top corner. The CME was backwards.

II. Geomagnetic Activity

The overall magnetic activity was low to moderate. Three periods with unsettled conditions were measured.

There was a brief period of unsettled conditions (Kp=4) on Feb 02, due to an enhancement of the solar wind speed. The solar wind parameters had a coronal hole signature.

Early Feb 11, a jump in the magnetic field strength occurred. This structure is possibly linked with the CME associated with the M6.4 flare of Feb 07. The geomagnetic response was minor: Kp became 2.

On Feb 15, another magnetic structure arrived. This can possibly be redrawn to the partial halo CME seen on Feb 13. The Kp went up to 4 late Feb 15-early Feb 16.

III. Noticeable Solar Events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	TENCM	TYPE	Cat	NOAA	NOTE
06	1847	1859	1909	N21E17	M2.9	SN		III/1	40	1045	
06	2131	2137	2142	N21E17	M1.3			III/1	40	1045	
07	0220	0234	0239	N21E10	M6.4	1N	170	III/2	40	1045	
08	0736	0743	0746	N26E05	M4.0		150	III/2	40	1045	loc based on EIT
08	1157	1203	1206	N21W07	M1.1				40	1045	loc based on EIT
08	1332	1347	1350		M2.0				40	1045	
08	2101	2123	2128	N23W12	M1.0	SN		III/1	40	1045	
12	1119	1126	1128	N26E11	M8.3	1N	350	V/3	41	1046	
12	1752	1808	1815	N28W53	M1.1	2F			40	1045	

LOC: approximate heliographic location
XRAY: X-ray flare class
OP: optical flare class
10CM: peak 10 cm radio flux

RADIO TYPE: radio burst type
Cat: Catania sunspot group number
NOAA: NOAA active region number
NOTES: **p** = proton event
CME = coronal mass ejection