Solar Influences Data analysis Center

Data Analysis Service supported by the FAGS

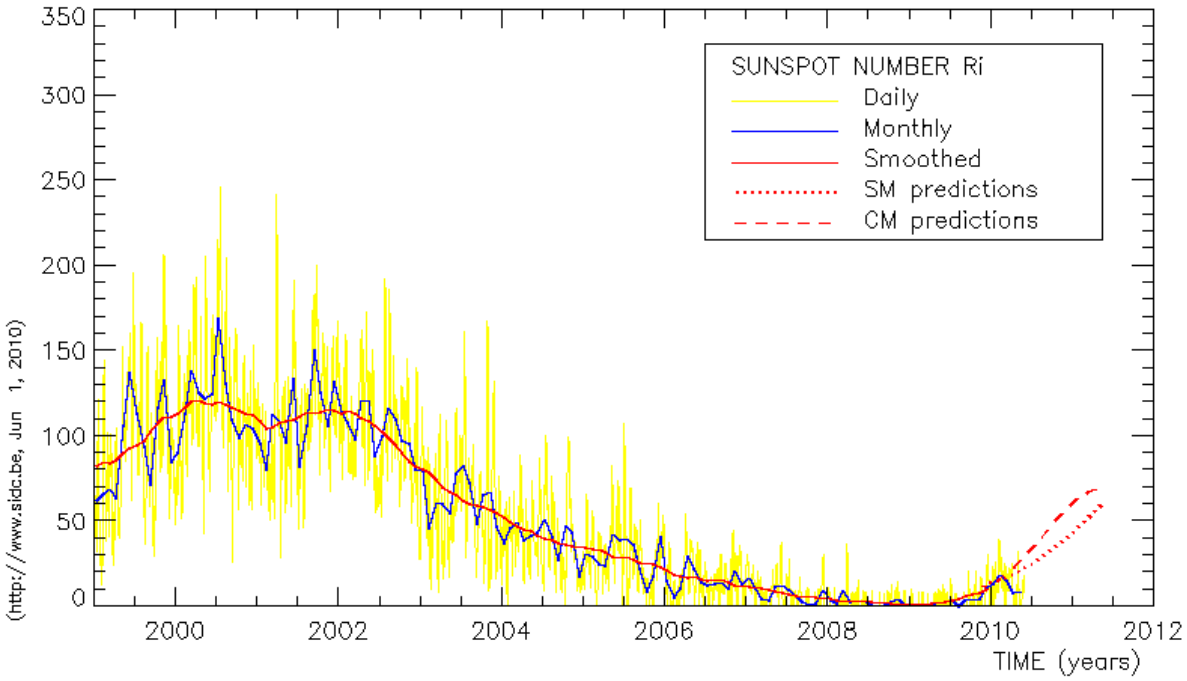
SUNSPOT BULLETIN

2010 n° 5

Provisional international and normalized hemispheric daily sunspot numbers for May 2010

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	8	8	0
2	13	13	0
3	25	16	9
4	32	16	16
5	29	29	0
6	12	12	0
7	10	10	0
8	10	10	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	9	0	9
22	13	0	13
23	14	0	14
24	12	0	12
25	15	0	15
26	10	0	10
27	8	0	8
28	8	0	8
29	16	8	8
30	18	10	8
31	11	6	5
Monthly mean	**8.8**	**4.5**	**4.3**
Cooperating stations	**66**	**60**	**60**



Predictions of the monthly smoothed Sunspot Number

using the last provisional value, calculated for November 2009 : 7. (± 5%)

	SM	CM		SM	CM		SM	CM
2009 Dec	9	10	2010 Jun	18	31	2010 Dec	32	58
2010 Jan	10	13	Jul	20	35	2011 Jan	35	62
Feb	12	16	Aug	22	40	Feb	38	65
Mar	13	20	Sep	24	45	Mar	42	67
Apr	15	23	Oct	26	50	Apr	45	69
May	16	27	Nov	29	54	May	49	72

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

Ed. Ronald Van der Linden, Ass. Ed. Petra Vanlommel
Editing contributions from various members of the SIDC team

Fax 32-(0)2-373 02 24 Tel 32-(0)2-373 04 91
e-mail : arille@oma.be, ronald@oma.be
ftp anonymous : omaftp.oma.be, directory dist/astro/sidcdata
http://sidc.oma.be

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

Date	R'_i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
30	7	2	-	79	////	0	0/0	4	
1	8	3	-	78	////	0	0/0	4	
2	13	4	-	80	////	0	0/0	34	
3	25	9	-	80	////	0	0/0	22	
4	32	9	-	82	////	1	0/0	13	
5	29	15	-	83	////	1	1/0	11	
6	12	10	-	79	////	0	0/0	12	
7	10	3	-	79	////	2	0/0	11	
8	10	2	-	79	////	10	0/0	7	
9	0	0	-	75	////	0	0/0	3	
10	0	///	-	74	////	0	0/0	5	
11	0	0	-	74	////	0	0/0	9	
12	0	0	-	71	////	0	0/0	8	
13	0	0	-	69	////	0	0/0	4	
14	0	0	-	70	////	0	0/0	5	
15	0	///	-	70	////	0	0/0	3	
16	0	0	-	69	////	0	0/0	4	
17	0	///	-	69	////	0	0/0	9	
18	0	///	-	69	////	0	0/0	8	
19	0	///	-	69	////	0	0/0	11	
20	0	2	-	69	////	0	0/0	16	
21	9	4	-	71	////	0	0/0	5	
22	13	21	-	73	////	1	0/0	4	
23	14	26	-	75	////	0	0/0	2	
24	12	19	-	73	////	0	0/0	3	
25	15	13	-	73	////	2	0/0	6	
26	10	9	-	72	////	0	0/0	6	
27	8	6	-	73	////	0	0/0	3	
28	8	2	-	73	////	0	0/0	14	
29	16	8	-	74	////	0	0/0	25	
30	18	6	-	73	////	0	0/0	26	
31	11	2	-	72	////	0	0/0	22	

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 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 MAY 2010

DATE	UT	NUMBER OF GROUPS	NUMBER OF SPOTS	RELATIVE SUNSPOT NUMBERS TOTAL	NORTH	SOUTH	CENTRAL	PPSI 10-5 WM-2	QUAL	OBS
1	745	1	1	11	11	0	11	0.3	2	AE
4	1200	5	13	63	39	24	13	3.5	4	SV
5	1200	3	11	41	41	0	23	13.2	1	SV
6	1115	1	5	15	15	0	0	8.9	1	SV
9	845	0	0	0	0	0	0	0.0	1	SV
10	856	0	0	0	0	0	0	0.0	2	OL
15	700	0	0	0	0	0	0	0.0	4	OL
16	1100	0	0	0	0	0	0	0.0	2	OL
17	740	0	0	0	0	0	0	0.0	3	OB
18	725	0	0	0	0	0	0	0.0	3	OB
19	820	0	0	0	0	0	0	0.0	4	OB
20	720	0	0	0	0	0	0	0.0	3	OB
21	1330	1	5	15	0	15	15	1.3	4	OB
22	705	1	8	18	0	18	18	5.8	4	OB
23	900	1	13	23	0	23	23	6.0	4	OB
24	815	1	10	20	0	20	20	5.8	2	AE
25	740	2	4	24	0	24	0	1.9	2	AE
26	740	1	1	11	0	11	0	1.0	1	AE
28	745	1	1	11	0	11	0	0.5	2	AE
29	800	1	2	12	0	12	12	1.4	2	AE

The relative mean sunspot number is 13.2.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS U'=K'U FOR MAY 2010

K'= 0.779 (*)

1	9	7	***	13	***	19	0	25	19
2	***	8	***	14	***	20	0	26	9
3	***	9	0	15	0	21	12	27	***
4	49	10	0	16	0	22	14	28	9
5	32	11	***	17	0	23	18	29	9
6	12	12	***	18	0	24	16	30	***
								31	***

The normalised relative monthly mean sunspot number is 10.

(*) 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 MAY 2010
E AND F BRUNNER'S TYPE GROUPS

NONE

PROBABLE RETURN OF MAJOR GROUPS FOR JUNE 2010
NONE

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

May 2010 had 12 spotless days. On most of the other days, there was some solar activity in the form of flares, long duration flares associated with a CME and one filament eruption.

On May 04, a bundle of magnetic field lines at 45°N lit up in EUV-images of SOHO. The area grew and became Catania 69/NOAA AR 1069 with a beta-gamma configuration. The sunspot group produced an M1.2 flare on May 05. A small plasma eruption in the NW direction was visible in LASCO images.

The next noticeable event was a filament disappearance between May 21 and May 22 in the northern hemisphere. This is evident from H-alpha images from Kanzelhoehe solar observatory (Austria). The signatures on disk in SOHO/EIT were faint. STEREO.B/SECCHI COR2 showed a cloud ejected to the NW from the point of view of STEREO.B, this is well above the ecliptic.

A B1.4 long duration flare peaked at 18:01UT on May 23. A coronal dimming and post-flare loops were visible in the neighborhood of the filament channel from where the filament disappeared on May 21-22. A halo CME came into view of SOHO/LASCO-C3 at 19:42 UT. STEREO.B/SECCHI COR2 indicated that the cloud intersected with the ecliptic. It was a slow CME, however, with a projected estimated speed of 220 km/s.

Another long duration B1.1 flare peaking at 14:46UT was initiated in the same solar environment on May 24. The typical coronal dimming and post-flare loops were observed by SOHO/EIT. A partial halo CME (angular width around 245°) came into the SOHO/LASCO-C2 field of view at 14:06UT.

The source region of both long duration events was not identified as a sunspot or active region. On May 23, the source region was situated near the central meridian. On May 24, the region was located around N20W30.

We list the coronal holes (CH) transiting the solar disk and indicate when the leading edge touched the central meridian (CM):

- A long stretched northern CH reached the CM on Apr 30.
- A northern CH reached the CM on May 15
- A southern CH reached the CM on May 16.
- A low-latitude extension of the northern polar CH reached the CM on May 28.

II. Geomagnetic Activity

Two events catch the eye: a very strong coronal hole and the arrival of a halo CME. This CME is a schoolbook example: a shock followed by a magnetic cloud in which one magnetic component clearly rotates.

On May 02, a very fast solar wind reached Earth. Because of the high speed (700 km/s) the fast stream arrived a day earlier then foreseen. The interplanetary magnetic field (IMF) carried by the solar wind was exceptionally strong and reached values up to 20 nT. The Bz was strong and, above all, negative for a long period. It caused a major geomagnetic storm with a Kp of 6 and 5 on May 02 and 03. The solar wind speed dropped gradually thereafter. The geomagnetic conditions stayed unsettled up to May 07.

The co-rotating interaction region linked with the duo of coronal holes mentioned in the section ‘Solar Activity’ arrived on May 19. The influence was limited: the conditions became unsettled, Kp reached only once the value of 4. Earth stayed probably in the sector in which only the influence of the northern coronal hole was felt. The signature of the southern coronal hole was not visible in ACE data.

On May 28, around 02:05UT, a shock was seen in the ACE data: the solar wind speed and the strength of the IMF increased suddenly. The discontinuity in the IMF and Bz was weak, so that the

shock did not lead to a geomagnetic disturbance. The trailing magnetic cloud driving the shock arrived in the evening of May 28. The Bz component became negative (up to -14 nT) and rotated to positive values late on May 29. The kinetic pressure of the solar wind was small. The cloud had a speed of only 360 km/s. This resulted in minor geomagnetic storm conditions on May 29 and 30. The magnetic cloud was most probably associated with the halo CME of May 23. Another small discontinuity in the IMF around 21:20UT on May 29 marked the end of the magnetic cloud. At that moment, the solar wind speed was still low (400-450 km/s) but the IMF was again slightly elevated. This structure is possibly linked with the partial halo CME of May 24. The ACE data indicated that a fast solar wind stream followed this arrival. This fast stream was emanating from the low-latitude extension of the northern polar CH. Geomagnetic conditions became active during a few periods on May 31 and June 01.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	TENCM	TYPE	Cat	NOAA	NOTE
05	1713	1719	1722	N42W37	M1.2	SF			69	1069	

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

IV. Picture of the month

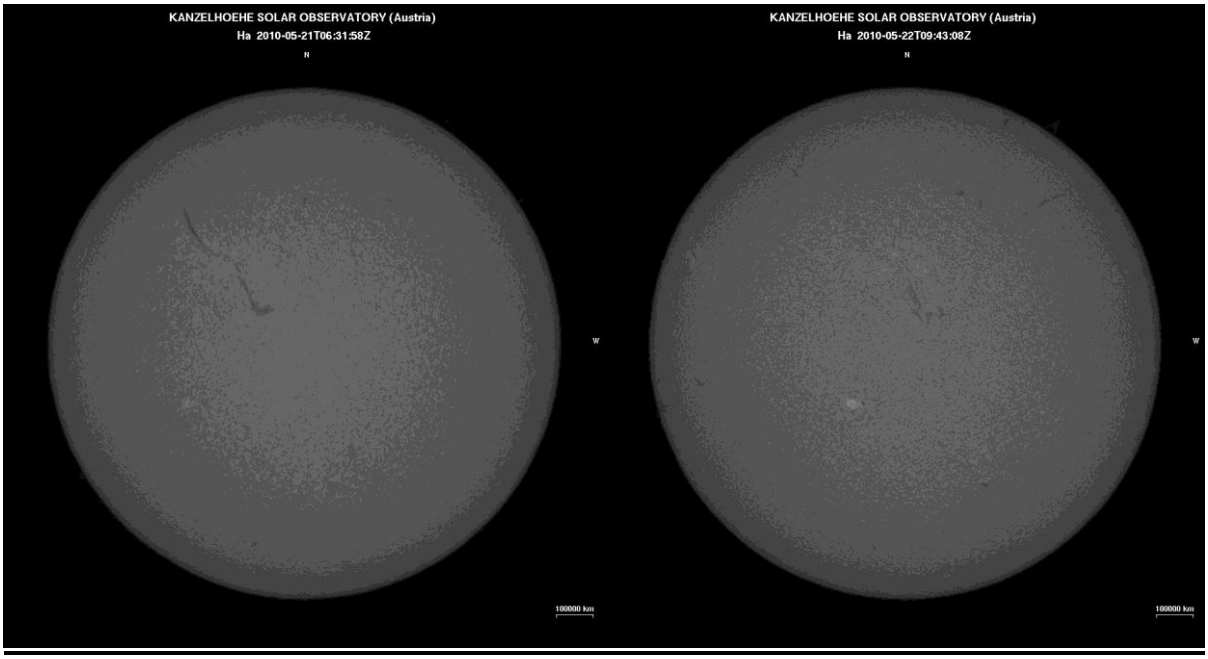


Figure 1 *In the above pictures we show H-alpha pictures taken by a ground based observatory, Kanzelhoehe. The black line represents a filament: a cloud of plasma floating above the solar disk. This black feature 'disappeared' in the image taken on May 22.*