Solar Influences Data analysis Center

Data Analysis Service supported by the FAGS

SUNSPOT BULLETIN

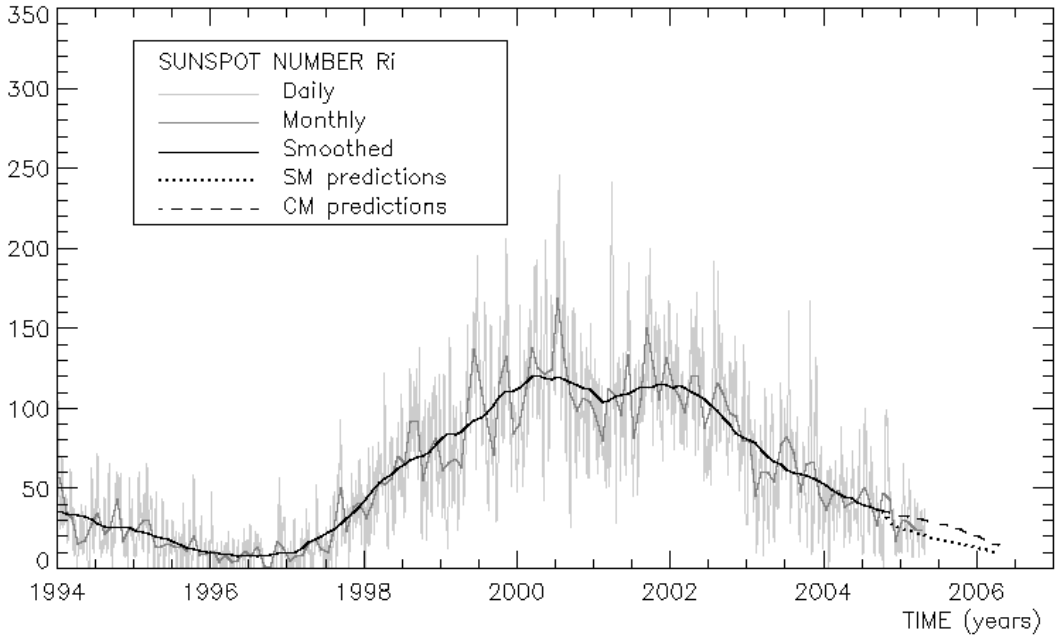
2005 n° 4

Provisional international and normalized hemispheric daily sunspot numbers for April 2005

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	16	16	0
2	20	8	12
3	28	8	20
4	33	8	25
5	35	8	27
6	29	0	29
7	28	0	28
8	27	0	27
9	27	0	27
10	27	0	27
11	13	0	13
12	21	10	11
13	29	19	10
14	35	20	15
15	36	19	17
16	28	12	16
17	26	11	15
18	26	11	15
19	26	10	16
20	25	9	16
21	16	9	7
22	16	8	8
23	14	7	7
24	9	5	4
25	13	0	13
26	11	0	11
27	17	0	17
28	30	0	30
29	35	0	35
30	37	0	37
Monthly mean	**24.4**	**6.6**	**17.8**
Cooperating stations	**42**	**36**	**36**

The definitive yearly sunspot number for 2004 is 40.4



Predictions of the monthly smoothed Sunspot Number
using the last provisional value, calculated for October 2004 : 35.9 (± 5%)

	SM	CM		SM	CM		SM	CM
2004 Nov	35	35	2005 May	25	30	2005 Nov	17	23
Dec	32	34	Jun	23	29	Dec	17	21
2005 Jan	30	34	Jul	22	28	2006 Jan	16	20
Feb	29	33	Aug	20	27	Feb	15	18
Mar	27	32	Sep	19	26	Mar	14	16
Apr	26	31	Oct	18	25	Apr	13	15

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	15	2	32	77	903	0	0/0	11	
1	16	2	33	78	906	0	0/0	5	
2	20	14	–	80	908	0	0/0	3	
3	28	21	34	81	909	0	0/0	8	
4	33	43	36	85	908	0	0/0	32	
5	35	35	36	88	904	1	0/0	37	
6	29	16	37	88	908	0	0/0	14	
7	28	19	36	88	907	0	0/0	7	
8	27	27	37	88	914	0	0/0	5	
9	27	25	39	88	913	0	0/0	4	
10	27	18	39	88	914	0	0/0	2	
11	13	19	39	88	////	0	0/0	11	
12	21	23	38	85	910	1	0/0	28	
13	29	26	38	84	908	0	0/0	32	
14	35	29	37	85	910	0	0/0	16	
15	36	34	36	85	911	0	0/0	15	
16	28	30	35	83	916	0	0/0	7	
17	26	34	35	84	920	1	0/0	4	
18	26	32	34	81	915	1	0/0	8	
19	26	29	33	78	////	10	0/0	8	
20	25	17	33	77	920	0	0/0	20	
21	16	10	34	77	916	0	0/0	3	
22	16	7	34	77	918	0	0/0	10	
23	14	3	35	79	////	0	0/0	8	
24	9	1	34	82	903	0	0/0	8	
25	13	10	34	86	908	0	0/0	8	
26	11	31	35	91	910	4	0/0	3	
27	17	70	36	95	////	0	0/0	2	
28	30	173	36	98	912	0	0/0	3	
29	35	178	36	105	917	1	0/0	12	
30	37	193	37	106	////	11	0/0	28	

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 APRIL 2005

DATE	UT	NUMBER OF GROUPS	NUMBER OF SPOTS	RELATIVE SUNSPOT NUMBERS TOTAL	NORTH	SOUTH	CENTRAL	PPSI 10-5 WM-2	QUAL	OBS
1	1630	2	3	23	11	12	12	0.6	3	ST
2	900	2	8	28	11	17	17	6.5	4	ER
3	810	3	12	42	11	31	20	23.3	4	ER
4	915	3	23	53	11	42	42	64.1	3	ST
5	820	3	20	50	11	39	11	49.4	3	OB
6	830	3	7	37	0	37	11	13.0	3	OB
7	1300	3	13	43	0	43	12	9.7	4	OB
9	645	3	14	44	0	44	28	20.5	4	OB
11	710	1	11	21	0	21	21	6.2	4	OB
12	740	2	16	36	14	22	22	24.4	4	OB
18	730	3	14	44	19	25	30	13.8	2	FC
20	920	2	4	24	12	12	0	4.9	2	OB
21	710	2	3	23	12	11	11	3.8	3	OB
22	610	3	3	33	11	22	11	2.8	3	ST
23	830	1	1	11	11	0	0	0.8	3	RV
24	830	0	0	0	0	0	0	0.0	3	RV
26	715	1	15	25	0	25	0	19.3	3	OB
27	750	2	21	41	11	30	0	36.9	3	ST
30	850	2	16	36	0	36	36	72.2	2	AB

The relative mean sunspot number is 32.3.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS U'=K'U FOR APRIL 2005

K'= 0.784 (*)

1	18	7	34	13	***	19	***	25	***
2	22	8	***	14	***	20	19	26	20
3	33	9	34	15	***	21	18	27	32
4	42	10	***	16	***	22	26	28	***
5	39	11	16	17	***	23	9	29	***
6	29	12	28	18	34	24	0	30	28

The normalised relative monthly mean sunspot number is 25.

(*) 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 APRIL 2005
E AND F BRUNNER'S TYPE GROUPS

Uccle Nø	East Limb Date	Date and type 1st obs	CMP	Last obs	West Limb Date
6-2028	3 26.9	1 A	4 2.6	7 C	4 9.4
2-2029	4 24.5	26 E	5 1.2	30 E	5 8.0

PROBABLE RETURN OF MAJOR GROUPS FOR MAY 2005

Nø	New East Limb	New CMP	New West Limb
6	4 22.2	4 29.0	5 5.8

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Once more, we had a month with very little solar activity, producing no significant X-ray flares. On many days, no real flares were recorded at all. Towards the end of the month, a large sunspot group appeared, but also this one showed little activity.

Solar activity started at extremely low level in April 2005. The GOES X-ray flux was constantly below B-level on Apr 01, while a large low latitude northern coronal hole and the lack of big active regions were also responsible for very low 10cm flux measurements (below 80). In the next few days, the rise in the 10cm and X-ray flux indicated the returning of active region NOAA 0743 (now 0749). This active region remained inert and most of the solar activity was produced by Catania sunspot group 49 (NOAA 0747), including 3 C-flares on Apr 05 and 06. On Apr 09 a new active region (NOAA 0751) quickly emerged and started to grow rapidly. It produced a few C-flares (the last one on Apr 11) and several strong B-flares.

On Apr 12, Catania sunspot group 52 (NOAA 0752) appeared at the east limb and generated a C2.0 flare. The group then stayed fairly quiet, producing only one more C-flare on Apr 17. From Apr 13 up to Apr 16, we had a flare silence, with only a few small B-flares. On Apr 16, some B-flare activity came from behind the east limb, building up to 3 C-flares on Apr 17. The sunspot group responsible for this came into view on Apr 17 as Catania 55 (NOAA 0755). It had become quieter however, so solar activity was very low during the next week, with flaring activity not even reaching the C-class level (on some days not even B-flares were recorded). The largest flare of this period was a long-duration B8.0 flare on Apr 19, which was accompanied by a large eastward CME. This flare also originated from Catania 55, the most active group at the time, even though it only consisted of a few tiny spots. Besides the CME mentioned above, two other significant CMEs were seen, both on Apr 21. Early on this day a filament eruption at the west limb (also beautifully visible in EIT 304 images) caused the first one, while the second one late in the day came from behind the east limb.

On Apr 23-24, while the surface of the sun was nearly spotless, the X-ray background increased significantly due to the appearance of the loop system of a new active region at the east limb. Sunspot group 57 (NOAA 0756) finally became visible at the east limb on Apr 25 and produced several C-flares from Apr 26 onwards. The group had a complex magnetic configuration (beta-delta) and was even visible with the naked eye. On April 30 a dimming in the neighbourhood of that group was visible around 10:00UT. This suggests that a partial halo CME visible around that time probably originated from group 57. The CME was however slow and was not really a threat for possible geomagnetic disturbances.

Coronal holes were again plentiful. A large recurrent trans-equatorial hole was visible at the disk center on Apr 01 (with an area decreased compared to the previous rotation), while the western edge of a large coronal hole in the northern hemisphere reached the central meridian on Apr 08. A small equatorial coronal hole passed the disk center on Apr 16, followed by an extended trans-equatorial hole on Apr 19. Another very small equatorial one was in this position on Apr 22, and finally the first-mentioned coronal hole returned on Apr 28.

II. Geomagnetic Activity

Once again, geomagnetic conditions were dictated by the presence (or not) of coronal holes near the solar equator. This led to various periods of active and minor storm conditions in an otherwise quiet month.

On Apr 04 the interaction region between the fast flow from the first low-latitude coronal hole in the northern hemisphere and a slower solar wind stream arrived. It contained predominantly southward interplanetary magnetic field and thus produced a minor geomagnetic storm on Apr 04-05. The K index from Dourbes reached 5 on Apr 04, IZMIRAN gave as highest value 6 (on Apr 04) and SEC/NOAA estimated 7 (early on Apr 05). Until Apr 07 the Earth was situated inside this fast flow. However, after the initial period, the interplanetary magnetic field was quite weak (less than 5 nT) and oscillated around zero. The perturbed geomagnetic conditions thus finished early on Apr 06, and the geomagnetic field remained quiet until late on Apr 11. Then the solar wind speed started to increase due to the effect of the second coronal hole to reach the maximum value of 600 km/s on Apr 13. From Apr 11 until the beginning of Apr 14, periods of active conditions alternated with (less frequent) minor storm intervals. In the beginning of this geomagnetic active period, the estimated Kp reached once the value of 6. From Apr 15 until Apr 19, geomagnetic conditions were again quiet.

On Apr 19, the small equatorial coronal hole that passed the central solar meridian on Apr 16 started to influence the earth. From the evening of Apr 19 onwards, the solar wind speed rapidly increased to about 550km/s. The highly variable IMF had short intervals of strong southwards orientation on Apr 19-20, leading to active conditions (K=4) in Niemegk. The NOAA estimated Kp index even reached 5 (minor storm) on Apr 20. The earth remained under coronal hole influence for an extended period, since the small equatorial hole was followed by a large trans-equatorial one. The solar wind speed did go down to 400 km/s late on Apr 21, but over the following days it increased again to 550km/s (by noon on Apr 23). However, the IMF was never strongly southwards after Apr 20, so the geomagnetic conditions remained mostly quiet from Apr 21 onwards.

From Apr 29, the solar wind speed started to increase, peaking on May 1 around the value of 650 km/s. This increase originated from the same recurrent northern coronal hole seen at the start of the month. It led to a minor storm starting on Apr 29-30.

III. Noticeable solar events

No M- or X-class flares occurred during April 2005.