

Center

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SUNSPOT BULLETIN

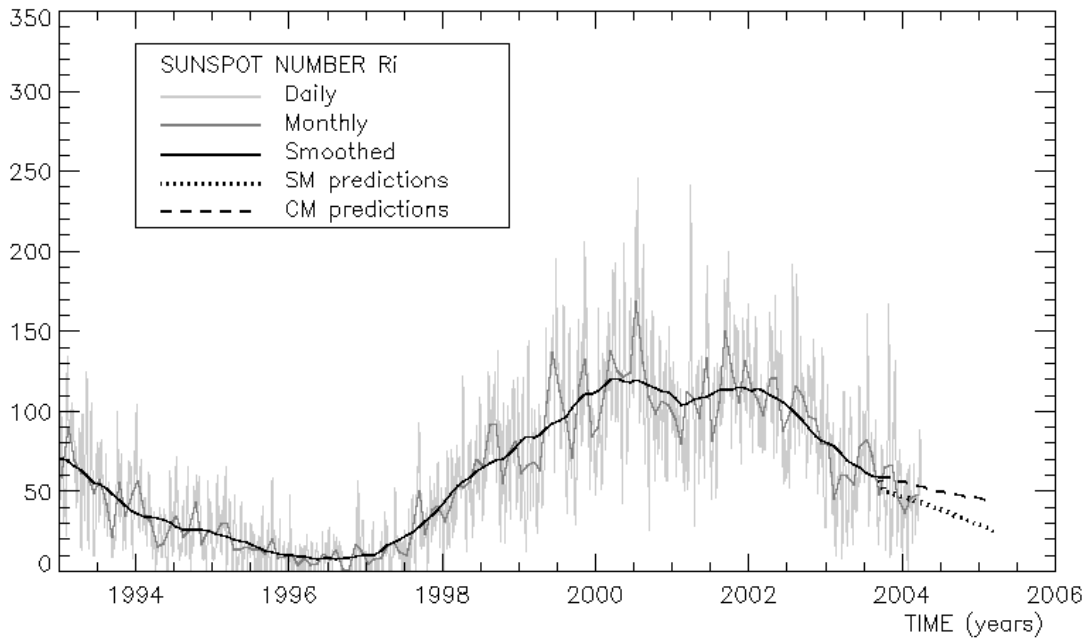
2004

n° 3

Provisional international and normalized hemispheric daily sunspot numbers for March 2004

computed at the *Observatoire Royal de Belgique* using observations from an international network with the *Locarno Specola Solare* as reference station.

Date	R' _I	R' _N	R' _S
1	44	13	31
2	31	0	31
3	26	0	26
4	23	0	23
5	35	0	35
6	39	0	39
7	40	0	40
8	35	0	35
9	38	0	38
10	38	0	38
11	38	0	38
12	48	10	38
13	40	12	28
14	38	13	25
15	32	10	22
16	37	8	29
17	48	8	40
18	49	0	49
19	58	12	46
20	50	14	36
21	48	16	32
22	57	20	37
23	61	23	38
24	57	24	33
25	83	43	40
26	84	39	45
27	88	39	49
28	76	31	45
29	66	27	39
30	54	23	31
31	56	21	35
Monthly mean	48.9	13.1	35.8
cooperating stations	45	38	38



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for September 2003 : 59.5 ($\pm 5\%$)

	SM	CM		SM	CM		SM	CM			
2003	Oct	60	59	2004	Apr	47	53	2004	Oct	39	48
	Nov	56	59		May	46	52		Nov	37	47
	Dec	52	57		Jun	44	51		Dec	36	47
2004	Jan	51	57		Jul	43	50	2005	Jan	34	46
	Feb	49	56		Aug	42	49		Feb	33	45
	Mar	48	54		Sep	40	49		Mar	31	44

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, April 1, 2004 09:29 UT

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

Date	R' _i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
29	50	78	40	110	////	0	0/0	25	
1	44	47	-	102	////	0	0/0	24	
2	31	46	-	99	////	2	0/0	28	
3	26	46	40	90	////	0	0/0	14	
4	23	42	42	98	////	0	0/0	8	
5	35	37	42	107	////	0	0/0	6	
6	39	51	42	105	////	1	1/0	3	
7	40	47	40	106	////	0	0/0	5	
8	35	72	43	108	////	0	0/0	3	
9	38	89	-	109	////	2	0/0	24	
10	38	121	48	113	////	1	0/0	34	
11	38	102	47	113	////	1	0/0	44	
12	48	128	47	108	////	2	0/0	32	
13	40	104	45	104	////	0	0/0	16	
14	38	91	44	103	////	0	0/0	18	
15	32	52	44	101	////	0	0/0	18	
16	37	35	45	110	////	0	0/0	14	
17	48	19	43	110	////	3	0/0	8	
18	49	26	44	115	////	3	1/0	14	
19	58	39	44	112	////	5	0/0	10	
20	50	48	43	114	////	1	0/0	16	
21	48	49	43	111	////	3	0/0	12	
22	57	100	44	116	////	11	0/0	17	
23	61	96	44	118	////	2	0/0	12	
24	57	101	44	120	////	1	1/0	4	
25	83	81	45	127	////	2	1/0	5	
26	84	77	44	124	////	0	0/0	26	
27	88	72	45	128	////	1	0/0	23	
28	76	85	45	129	////	1	0/0	21	
29	66	117	48	129	////	6	0/0	12	
30	54	97	44	127	////	9	0/0	12	
31	56	106	50	121	////	15	0/0	12	

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 MARCH 2004

DATE	UT	NUMBER OF		RELATIVE SUNSPOT NUMBERS			PPSI	QUAL	OBS	
		GROUPS	SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	925	4	31	71	34	37	25	76.9	3	OB
2	840	2	35	55	0	55	42	71.5	3	OB
3	950	1	30	40	0	40	40	68.9	3	OB
4	1000	1	19	29	0	29	29	64.3	2	OB
7	1300	3	24	54	0	54	17	40.3	3	FC
8	840	3	12	42	0	42	11	42.0	2	VI
9	1020	3	17	47	0	47	0	52.8	3	OB
11	1002	2	16	36	0	36	25	67.2	2	VI
13	1410	3	28	58	20	38	45	67.1	2	DB
14	900	3	22	52	19	33	0	60.6	2	DB
15	832	3	10	40	14	26	0	47.5	2	VI
16	740	4	14	54	14	40	14	37.5	1	FC
17	1404	5	17	67	12	55	12	2.0	3	VI
18	1022	4	16	56	0	56	11	2.7	1	VI
19	845	3	15	45	0	45	0	7.2	1	FC
21	1025	3	44	74	25	49	38	41.8	2	IT
22	840	3	36	66	28	38	38	127.8	2	CG
24	930	4	40	80	29	51	55	126.3	3	OB
25	1100	7	54	124	78	46	50	82.4	2	OB
26	830	8	40	120	73	47	0	84.3	3	OB
27	907	8	25	105	55	50	14	49.5	2	AK
28	1005	7	23	93	35	58	24	46.8	3	AK
29	748	5	29	79	35	44	11	86.8	3	OB
30	805	5	32	82	40	42	39	95.5	2	OB
31	733	4	30	70	28	42	53	99.8	3	VI

The relative mean sunspot number is 65.6.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS U'=K'U FOR MARCH 2004
 K'= 0.811 (*)

1	58	7	44	13	47	19	36	25	101
2	45	8	34	14	42	20	***	26	97
3	32	9	38	15	32	21	60	27	85
4	24	10	***	16	44	22	54	28	75
5	***	11	29	17	54	23	***	29	64
6	***	12	***	18	45	24	65	30	67
								31	57

The normalised relative monthly mean sunspot number is 53.
 (*) K' is the mean of the monthly K' for the last five years.

The Sun has been observed 25 days on 31 possible.

UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR MARCH 2004
 E AND F BRUNNER'S TYPE GROUPS

Uccle Nø	East Limb Date	Date and type			West Limb Date
		1st obs	CMP	Last obs	
12-2013	2 18.2	22 F	2 24.9	1 E	3 2.7
13-2013	2 19.3	23 C	2 26.0	2 C	3 3.8
16-2013	2 24.9	27 C	3 2.7	8 C	3 9.4
1-2014	3 5.5	7 E	3 12.2	17 C	3 19.0
4-2014	3 15.3	16 C	3 22.1	26 C	3 28.8
8-2014	3 17.6	21 D	3 24.4	30 A	3 31.1
13-2014	3 24.4	25 C	3 31.1	31 E	4 6.9

PROBABLE RETURN OF MAJOR GROUPS FOR APRIL 2004

Nø	New East Limb	New CMP	New West Limb
12	3 16.1	3 22.9	3 29.6
13	3 17.3	3 24.0	3 30.8
16	3 23.4	3 30.1	4 5.9
1	4 1.3	4 8.0	4 14.8
4	4 10.9	4 17.7	4 24.4
8	4 13.8	4 20.6	4 27.3
13	4 20.5	4 27.3	5 4.0

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

During the past month, solar activity was again mostly low or very low, in particular during the first half of the month. During a few isolated periods in the month, solar activity increased to moderate: this was the case on Mar 05-06, Mar 18, Mar 24-25 and Mar 29-31. The largest flare (M2.3) occurred on Mar 25, but a noteworthy event was also a long-duration C3.4 flare with sigmoid structure on Mar 31.

From Mar 01 to Mar 04, solar activity was very low. There was only one medium-sized active region, Catania sunspot group 71 (NOAA 0567), which produced a few C-flares. On Mar 05 a new active region, Catania 75 (NOAA 0570), harbouring a big sunspot, appeared at the south-east limb. In addition to several C flares, it produced an M1.3 flare on March 06, at 12:17UTC. Thereafter, it became quieter although it evolved to a beta-gamma configuration. On Mar 07, there was no significant activity at all, while during the week thereafter, Catania 75 produced occasional C-class flares.

On March 17, the activity was pushed to a higher level by sunspot groups 82 and 84 (NOAA 0574, 0576). On March 18, sunspot group 82 produced an M1.6 flare and sunspot group 87 (NOAA 0578) generated an M1.5 flare from behind the east-limb. No accompanying CMEs were detected. On Mar 19, a large number of small C-flares occurred, while the following days had fewer but occasionally larger C-flares, mainly from Catania sunspot groups 82 and 87. Both produced some C-class flares (besides many B-flares), the largest being a C8.6 from Catania 82 on Mar 22. From about UT noon on Mar 23, no more significant flaring activity occurred in these groups, and solar activity became very low for 24 hours. During this time, however, a third group on the disk was growing in size and complexity: Catania 86 (NOAA 0577) ended the quiet period with a C5.7 flare at 14:26 on Mar 24, followed by a few other C-flares. This group's activity was however soon overshadowed by a new active region that appeared at the east limb. Even before becoming visible, Catania sunspot group 93 (NOAA 0582) caused an M1.5 flare late on Mar 24, a few hours later followed by and M2.3 at 04:39 on Mar 25, the largest flare of the month. Catania 93 turned out to be a medium-sized compact group with strong magnetic fields, but its flaring activity remained initially much lower than expected. From the evening of Mar 25 until early Mar 27, no more C-flares occurred. After 9UT on Mar 27, a number of small C-flares originated from Catania 95 (NOAA 0586), which was a small group that rapidly developed near the west limb before rotating from view on Mar 28. On Mar 29, activity in Catania 93 strongly increased, and it produced a series of large C-flares in the last three days of the month, including a (very) long duration flare of magnitude C3.4 showing a clear sigmoid structure in SXI movies.

II. Geomagnetic Activity

Geomagnetic activity was mostly quiet to unsettled, except for Mar 1-3 and Mar 26-28 (minor storm periods) and Mar 09-12 (minor to major storm period). These stormy periods were due to coronal holes.

The month started under the influence of a high-speed solar wind stream, then at its peak. This stream was associated with a low-latitude coronal hole, which had started to influence the magnetosphere 2 days earlier. From Mar 01 to Mar 03, the solar wind speed ranged from 650 to 700km/s and the geomagnetic field was active with short minor storm periods ($K=5$ in Wingst). Thereafter the solar wind speed steadily decayed, to finally stabilize at 340km/s on March 07. The geomagnetic field was thus quiet from Mar 03 to Mar 09. During Mar 09, a large recurrent coronal hole started to dominate geomagnetic conditions. The solar wind speed reached a first peak on March 10, a second one (800km/s) on March 11 and a third peak on March 12 (720 km/s). On March 10 the estimated K_p index given by NOAA reached 5 and 6, while the Wingst K -index remained at 6 for a 12 hour period on Mar 11-12. Thereafter, geomagnetic conditions became mostly quiet with occasional active periods until Mar 23. Mar 24 and 25 were (very) quiet, and on Mar 24, the solar wind reached its lowest speed well below 400 km/s, but following the arrival of a small shock around midnight it started rising again, due to the influence of another large recurrent coronal hole. It first rose slowly to 700km/s, but late on Mar 27 it went up much faster to 900km/s. From the middle of Mar 28, the solar wind speed started decreasing again. All the while, the interplanetary magnetic field alternated between northwards and southwards orientation, never obtaining strong components in either direction. Therefore, the

geomagnetic influence of the high solar wind speeds remained limited. During Mar 26-28 conditions were mostly at active levels in Wingst, but K-indices reached minor storm levels occasionally. The estimated Kp index in NOAA reached minor storm level only once (on Mar 28). From Mar 29 until Mar 31, geomagnetic conditions were again mostly quiet.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO	TYPE	600 (Humain)	Cat	NOAA	NOTE
06	1208	1217	1241	S15E81	M1.3					1215	75	0570	SXI-derived location
18	0508	0517	0527	S03E51	M1.6	2B		CTM/1			82	0574	
18	2226	2236	2240	N16E78	M1.5	1F					87	0578	
24	2314	2329	2335	N15E77	M1.5	SF					93	0582	
25	0429	0439	0443	N12E82	M2.3	SF					93	0582	

loc: approximate heliographic location

Xray: X-ray flare class

op: optical flare class

10 cm: 10 cm radio flux

type: type of radio burst

600: peak time (UT) of 600 Mhz radio bursts in Humain

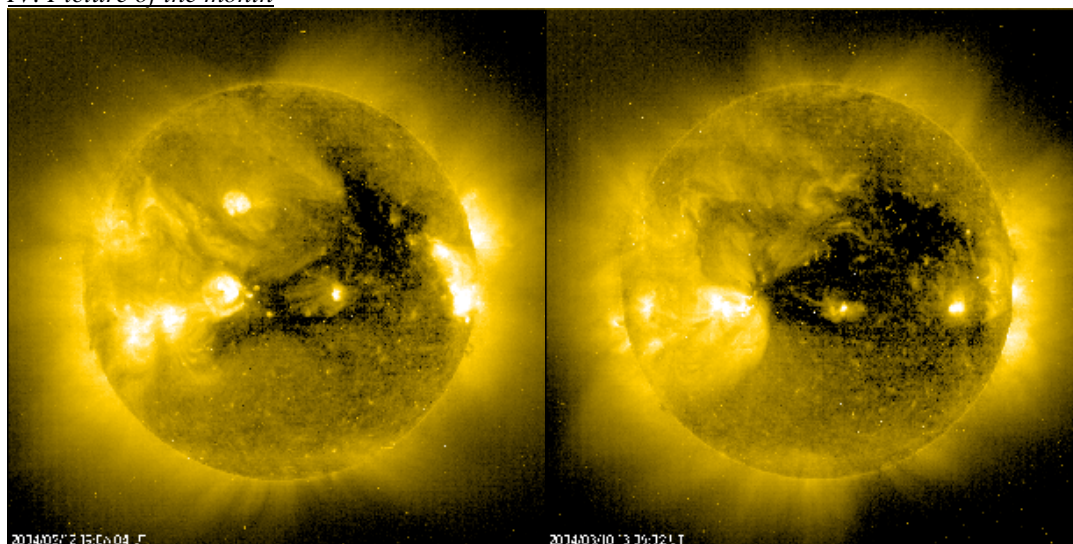
Cat: Catania sunspot group identification

NOAA: NOAA active region identification

p: proton event

CME: Coronal Mass Ejection

IV. Picture of the month



A recurrent coronal hole. The EIT 284 picture on the left dates from Feb 12, while the picture on the right was made on March 10. Both show the same coronal hole in geo-effective position on subsequent