Solar Influences Data analysis Center

Data Analysis Service supported by the FAGS

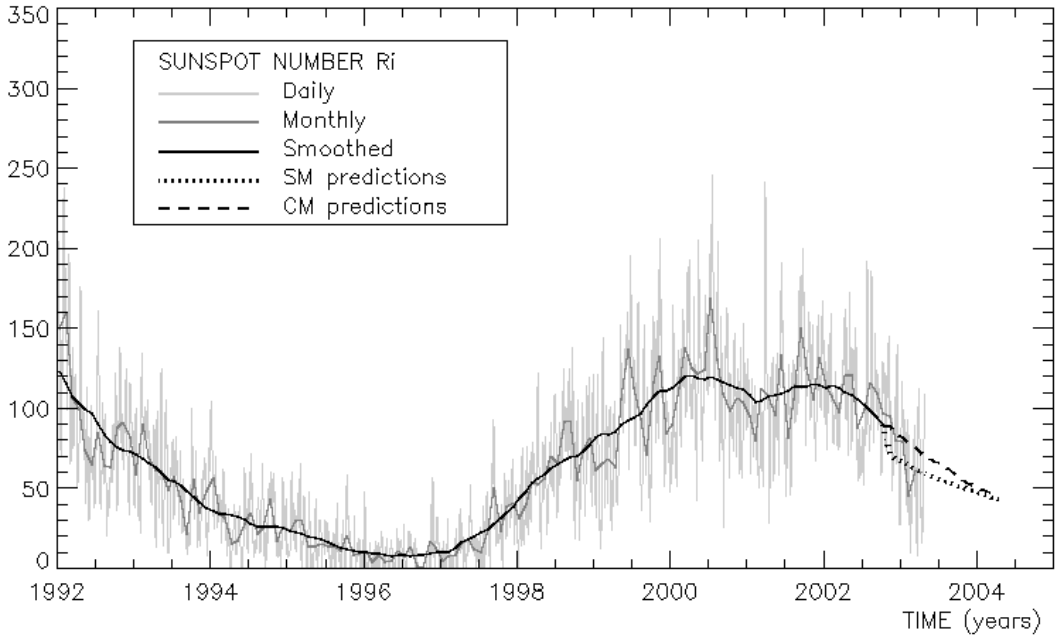
SUNSPOT BULLETIN

2003 n° 4

Provisional international and normalized hemispheric daily sunspot numbers for April 2003

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	93	35	58
2	103	43	60
3	90	43	47
4	72	36	36
5	60	30	30
6	52	22	30
7	48	23	25
8	34	26	8
9	42	25	17
10	38	21	17
11	25	15	10
12	37	23	14
13	38	21	17
14	35	18	17
15	29	13	16
16	16	0	16
17	19	0	19
18	27	13	14
19	34	17	17
20	45	24	21
21	58	35	23
22	75	43	32
23	73	50	23
24	73	49	24
25	89	66	23
26	86	51	35
27	103	38	65
28	100	27	73
29	109	26	83
30	98	22	76
Monthly mean	**60.0**	**28.5**	**31.5**
Cooperating stations	**40**	**37**	**37**



Predictions of the monthly smoothed Sunspot Number
using the last provisional value, calculated for October 2002 : 90.5 (± 5%)

	SM	CM		SM	CM		SM	CM
2002 Nov	86	89	2003 May	65	70	2003 Nov	54	54
Dec	82	85	Jun	63	67	Dec	53	52
2003 Jan	74	82	Jul	61	66	2004 Jan	52	50
Feb	72	79	Aug	59	63	Feb	51	49
Mar	69	76	Sep	57	60	Mar	49	48
Apr	67	72	Oct	56	57	Apr	48	47

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, May 1, 2003 08:55 UT

Ed. Pierre Cugnon, avenue Circulaire, 3 B-1180 BRUXELLES - BELGIUM
Fax 32-(0)2-373 02 24 Tel 32-(0)2-373 02 76
e-mail : arille@oma.be, pierrec@oma.be
ftp anonymous : omaftp.oma.be, directory dist/astro/sidcdata

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

Date	R'_i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	102	132	-	160	831	2	0/0	39	
1	93	156	55	153	837	2	0/0	19	
2	103	157	56	158	842	4	0/0	30	
3	90	140	56	156	847	15	0/0	20	
4	72	133	53	153	845	10	2/0	26	
5	60	107	51	137	842	2	0/0	30	
6	52	89	49	126	849	1	0/0	12	
7	48	73	46	116	853	0	0/0	7	
8	34	70	46	112	849	0	0/0	22	
9	42	80	47	109	842	12	1/0	17	
10	38	77	-	104	830	0	0/0	25	
11	25	61	-	103	822	0	0/0	17	
12	37	59	-	102	826	0	0/0	10	
13	38	51	-	102	833	1	0/0	8	
14	35	32	-	102	830	0	0/0	22	
15	29	18	-	101	833	0	0/0	16	
16	16	18	-	99	837	0	0/0	28	
17	19	13	-	101	842	0	0/0	23	
18	27	15	44	108	////	0	1/0	22	
19	34	24	44	112	842	0	0/0	12	
20	45	44	43	119	843	3	0/0	14	
21	58	61	46	126	841	16	1/0	20	
22	75	90	50	132	837	3	0/0	24	
23	73	300	55	133	839	21	2/0	19	
24	73	106	53	128	838	12	1/0	25	
25	89	124	51	144	////	5	1/0	28	
26	86	158	53	144	////	19	4/0	20	
27	103	170	56	154	////	105	1/0	14	
28	100	205	51	152	843	2	0/0	16	
29	109	227	54	155	842	13	1/0	26	
30	98	224	52	154	837	0	0/0	41	

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 2003

DATE	UT	NUMBER OF GROUPS	NUMBER OF SPOTS	RELATIVE SUNSPOT NUMBERS TOTAL	NORTH	SOUTH	CENTRAL	PPSI 10-3 WM-2	QUAL	OBS
1	1030	9	65	155	61	94	83	159.8	4	OB
3	1000	9	60	150	71	79	84	119.2	4	OB
4	900	7	53	123	57	66	35	112.7	3	OB
5	722	5	22	72	40	32	11	88.5	2	VI
7	945	6	10	70	34	36	14	50.8	3	OB
8	1230	3	7	37	24	13	12	39.1	3	OB
9	1030	4	8	48	35	13	13	34.5	2	OB
11	1445	2	14	34	19	15	19	28.6	2	OB
14	1000	4	13	53	27	26	14	17.6	3	OB
15	1105	3	4	34	11	23	11	12.0	3	OB
16	1040	3	3	33	22	11	11	31.6	2	OB
17	1320	1	2	12	0	12	12	5.8	2	JY
18	1325	2	3	23	12	11	11	1.9	2	JY
20	1221	4	9	49	24	25	13	32.4	3	ST
21	920	4	12	52	38	14	13	39.2	3	ST
22	1530	6	47	107	58	49	44	122.1	3	OB
23	1000	6	44	104	72	32	34	123.5	3	OB
24	950	6	56	116	77	39	53	129.4	3	OB
25	930	6	48	108	74	34	19	134.3	3	OB
27	840	8	81	161	53	108	38	153.5	2	ST
28	1035	8	90	170	48	122	74	196.4	4	OB
29	920	7	98	168	38	130	108	196.0	4	OB

The relative mean sunspot number is 85.4.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS U'=K'U FOR APRIL 2003

K'= 0.784 (*)

1	122	7	55	13	***	19	***	25	85
2	***	8	29	14	42	20	38	26	***
3	118	9	38	15	27	21	41	27	126
4	96	10	***	16	26	22	84	28	133
5	56	11	27	17	9	23	82	29	132
6	***	12	***	18	18	24	91	30	***

The normalised relative monthly mean sunspot number is 67.

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

The Sun has been observed 22 days on 30 possible.

http://sidc.oma.be

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Activity on the sun showed a strong variation during April 2003. The month started with a fairly low level of solar activity, despite a relatively high sunspot number. Although both NOAA 0319 and NOAA 0323 had a beta-gamma magnetic configuration, they proved only capable of producing occasional C-flares. From April 2 onwards, region NOAA0324 started a rapid development and became the dominant centre of solar activity. In the following days it unleashed many C-flares and also, on April 4, the first M-class solar flare since quite a few days. This flare was also accompanied by a partial halo CME. This sunspot group continued producing C-class flares until it rotated out of view on April 8, but by then its activity was already decreasing.

The Sun remained quiet on April 8, but the next day, NOAA 0326 pushed up the activity to moderate level with several C-class flares, followed by an M2.5/1F. This active region rotated behind the limb on April 10, and the Sun remained then mostly quiet (with some isolated C-flares) for a long period. On April 11, a filament erupted at the NW limb, followed by a CME. In the following days, the X-ray background from the sun dropped to the bottom level of the B-scale. Also the sunspot number became very low; Ri reached its lowest value of 16 on April 16.

On April 17, EIT195 images clearly indicated the presence of an active sunspot group behind the east limb of the sun. Even before this group (later labelled Catania sunspot group 71, corresponding to NOAA 0337) rotated onto the visible side of the solar disk, it pushed up the X-ray background to double its previous value, and produced its first significant flare, a C4.4 late on April 17, followed the next day, April 18, by an M1.1 flare peaking at UT 19:58. In the next few days, this sunspot group remained the dominant activity centre on the sun and continued to grow, but generated no more M-class flares until April 29, a few days before it rotated over the west limb. Yet another region, however, started growing very rapidly on April 20 and soon demonstrated it was destined to become the most flare-productive region of April. This was Catania sunspot group 72 / NOAA 0338, which produced many C-flares and a total of 9 M-class flares, included this month's largest event: an M7.0 on April 26. This region remained very active until it reached the solar limb on April 28; by then it had developed a complex beta-gamma-delta magnetic configuration.

Proton flux enhancements were recorded following every M-flare produced by CAT72/NOAA0338, until April 24 when the active region - at 40 degrees west on the solar disc at that time - was apparently no longer magnetically connected to the Earth environment. The event/alert thresholds for proton flux enhancements were however not exceeded. At least two of the M-flares (M2.8 on April 21 and M5.1 on April 23) were associated with partial halo CMEs, but none of the two produced a clear signature in the solar wind recorded at L1.

A large eruptive prominence was observed by EIT in the NE quadrant around 21h50 UT on April 26.

II. Geomagnetic Activity

In terms of geomagnetic activity, once more the influence of coronal holes dominated the scene, leading to active geomagnetic conditions for most of the month.

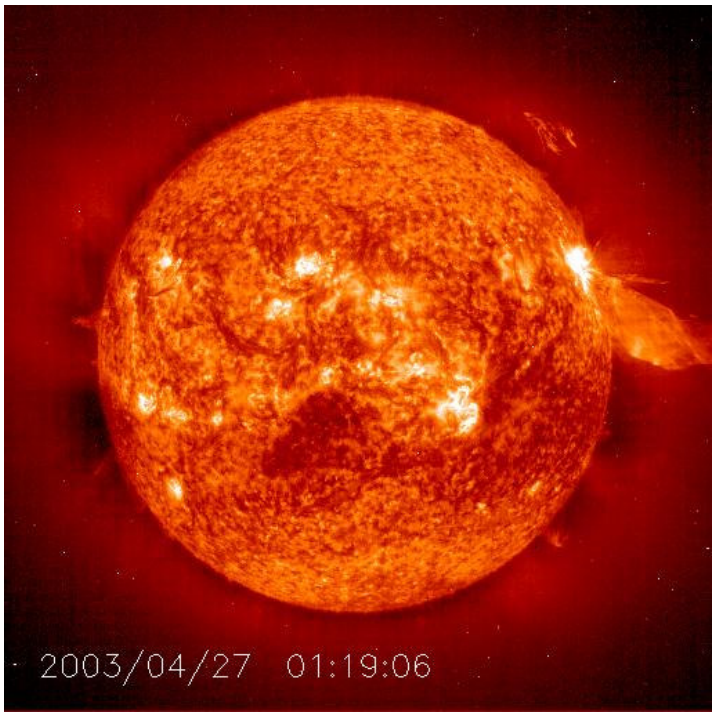
Although the beginning of the month saw a decrease of the solar wind speed, marking the end of the influence of a coronal hole, the geomagnetic conditions remained unsettled during the first week, with frequent brief excursions to minor storm levels. This was related to the fact that the solar wind remained mostly above 450km/s, and there were frequent intervals of southwards oriented interplanetary magnetic field.

Towards the end of the first week, geomagnetic conditions became quiet, but then reached active conditions again from April 8 due to a small shock arrival and the effect of a recurrent coronal hole. The high-speed stream associated with this coronal hole (700 km/sec on April 10-11) caused geomagnetic perturbations from active to minor storm level until April 11, followed by quiet conditions for some days (April 12-14). Then, yet another coronal hole made its influence felt. In the course of a few days the solar wind speed gradually rose to a peak of nearly 800 km/s on April 17. Then it started to decline and was down to about 550 km/s on April 20. Another coronal hole caused enhanced solar wind speeds (up till 600 km/s) and a fluctuating Bz from roughly April 24, noon till late April 25. Towards the end of the month, the solar wind speed was elevated due to a coronal hole yet again. The north-south orientation of the interplanetary magnetic field was very variable, with many short periods of mild southwards orientation. In all, this caused active geomagnetic conditions for the rest of the month, with the K-index in Wingst frequently at the value 4, and occasionally reaching up to 5. The latter was the case in particular on April 30, when minor storm conditions persisted for most of the day.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	Cat.	NOAA	NOTE
04	1905	2019	2038	S11W40	M1.9	1F	66	III/1		0324	
09	2323	2329	2334	S10W78	M2.5	1F	140	III/1		0326	
18	1950	1958	2002	S12E91	M1.1		41		71	0337	EIT derived location
21	1254	1307	1314	N18E02	M2.8	1N	300	III/1,IV/3, II/3	72	0338	
23	0039	0106	0115	N22W25	M5.1	1N	380	II/2	72	0338	EIT derived location
23	1536	1556	1611	N20W22	M2.0	1F	66		72	0338	
24	1245	1253	1303	N21W39	M3.3	1N	89	II/2, III/2, IV/1	72	0338	
25	0523	0540	0558	N14E79	M1.2	SF	82	II/2, III/2	80	0346	
26	0051	0058	0100	N20W65	M2.1	SF	55	V/2, III/2	72	0338	
26	0301	0306	0312	N20W69	M2.1	SN		III/2	72	0338	
26	0801	0807	0809		M7.0			III/3	72	0338	
26	2337	2340	2342		M2.5		71	II/1	72	0338	
27	1527	1532	1535	N21W85	M1.7	SF	65	III/3	72	0338	
29	0432	0459	0510	S12W55	M1.1	1F			71	0337	CME

IV. Picture of the month



A beautiful eruption in Catania sunspot group 72 (NOAA 0338) on April 27. This image was taken by the EIT telescope in the 304 Å passband. *(The EIT instrument is onboard SOHO, a joint ESA-NASA/ESA mission.)*