Solar Influences Data analysis Center

Data Analysis Service supported by the FAGS

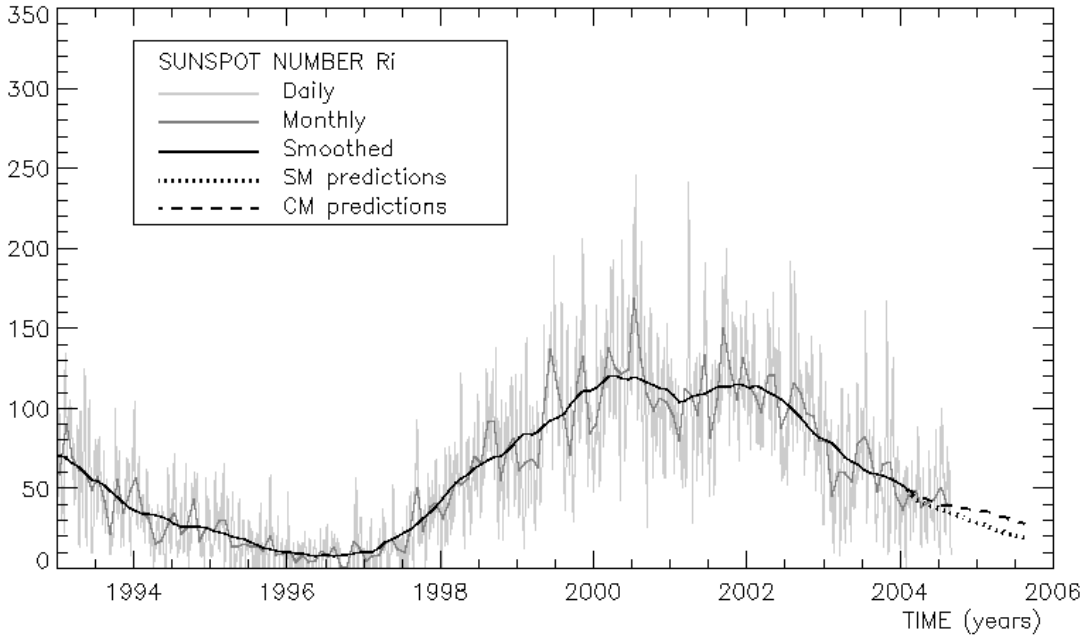
SUNSPOT BULLETIN

2004 n° 8

Provisional international and normalized hemispheric daily sunspot numbers for August 2004

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	23	11	12
2	28	12	16
3	30	10	20
4	33	8	25
5	21	0	21
6	33	0	33
7	44	8	36
8	39	8	31
9	50	15	35
10	58	16	42
11	63	16	47
12	68	16	52
13	76	24	52
14	68	17	51
15	61	17	44
16	54	13	41
17	44	14	30
18	41	28	13
19	36	36	0
20	50	41	9
21	57	41	16
22	66	46	20
23	56	41	15
24	38	21	17
25	31	21	10
26	24	11	13
27	21	13	8
28	20	12	8
29	16	9	7
30	10	10	0
31	9	9	0
Monthly mean	**40.9**	**17.5**	**23.4**
Cooperating stations	**46**	**41**	**41**



Predictions of the monthly smoothed Sunspot Number
using the last provisional value, calculated for February 2004 : 49.3 (± 5%)

	SM	CM		SM	CM		SM	CM
2004 Mar	47	47	2004 Sep	39	40	2005 Mar	30	35
Apr	44	45	Oct	38	39	Apr	29	34
May	45	43	Nov	36	38	May	27	33
Jun	43	42	Dec	35	37	Jun	26	31
Jul	42	41	2005 Jan	33	37	Jul	25	30
Aug	41	40	Feb	32	36	Aug	23	28

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, September 1, 2004 08:27 UT

Ed. Ronald Van der Linden, avenue Circulaire, 3 B-1180 BRUXELLES - BELGIUM
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
31	23	22	37	86	////	0	0/0	8	
1	23	25	35	83	////	0	0/0	12	
2	28	33	36	85	862	0	0/0	7	
3	30	37	37	88	854	3	0/0	4	
4	33	47	37	85	855	0	0/0	3	
5	21	46	37	89	////	0	0/0	6	
6	33	44	37	91	864	0	0/0	6	
7	44	59	38	95	868	0	0/0	15	
8	39	53	39	105	880	3	0/0	3	
9	50	65	41	114	892	22	0/0	17	
10	58	123	44	121	893	2	0/0	19	
11	63	177	44	131	899	11	0/0	14	
12	68	276	48	147	906	19	1/0	10	
13	76	215	50	149	907	47	4/1	7	
14	68	174	49	149	901	235	7/0	8	
15	61	150	47	139	901	116	5/0	5	
16	54	133	46	134	898	32	2/0	8	
17	44	110	47	135	883	8	4/0	13	
18	41	110	45	140	////	11	0/1	10	
19	36	117	45	121	902	1	2/0	6	
20	50	118	44	121	915	0	0/0	20	
21	57	120	43	120	904	0	0/0	20	
22	66	128	43	115	897	0	0/0	18	
23	56	117	41	110	893	0	0/0	6	
24	38	106	41	105	892	0	0/0	5	
25	31	72	41	100	906	0	0/0	4	
26	24	44	40	98	899	1	0/0	18	
27	21	26	38	91	902	0	0/0	18	
28	20	20	36	87	902	0	0/0	10	
29	16	9	36	86	901	0	0/0	6	
30	10	8	37	90	897	0	0/0	27	
31	9	1	37	88	896	0	1/0	25	

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 AUGUST 2004

DATE	UT	NUMBER OF GROUPS	NUMBER OF SPOTS	RELATIVE SUNSPOT NUMBERS TOTAL	NORTH	SOUTH	CENTRAL	PPSI 10-3 WM-2	QUAL	OBS
1	1310	3	13	43	24	19	0	12.2	3	OB
2	745	2	16	36	16	20	0	29.1	3	OB
3	915	2	25	45	14	31	31	28.6	3	OB
4	945	2	31	51	12	39	39	68.1	3	OB
5	950	1	27	37	0	37	37	67.1	3	OB
6	920	3	27	57	11	46	32	73.4	2	OB
7	950	3	25	55	11	44	0	73.4	3	OB
8	820	3	25	55	11	44	0	68.5	3	OB
9	855	3	38	68	12	56	0	56.9	3	OB
11	820	3	93	123	23	100	111	72.4	3	OB
13	1240	4	98	138	23	115	112	72.7	2	OB
14	1215	4	82	122	24	98	24	68.2	1	FC
15	920	4	88	128	26	102	12	63.3	2	AZ
16	800	3	75	105	25	80	12	79.1	3	OB
17	755	2	48	68	20	48	20	75.5	2	OB
18	720	3	15	45	30	15	17	82.1	2	OB
19	915	3	31	61	61	0	50	77.4	3	OB
20	850	5	25	75	62	13	44	59.8	3	OB
21	1105	4	63	103	72	31	43	69.7	1	AZ
22	1020	5	58	108	76	32	64	142.3	3	AZ
23	920	5	29	79	59	20	31	156.7	3	OB
24	855	3	28	58	34	24	44	152.9	3	OB
25	1110	3	18	48	33	15	32	108.0	2	OB
26	1039	3	12	42	22	20	22	45.8	2	VI
28	908	3	5	35	24	11	13	23.8	2	DB
29	732	3	4	34	23	11	0	16.9	2	DB
30	751	1	4	14	14	0	0	8.8	2	SG
31	908	1	1	11	11	0	0	0.3	2	DB

The relative mean sunspot number is 65.9.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS U'=K'U FOR AUGUST 2004

K'= 0.747 (*)

1	32	7	41	13	103	19	46	25	36
2	27	8	41	14	91	20	56	26	31
3	34	9	51	15	96	21	77	27	***
4	38	10	***	16	78	22	81	28	26
5	28	11	92	17	51	23	59	29	25
6	43	12	***	18	34	24	43	30	10
								31	8

The normalised relative monthly mean sunspot number is 49.

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

The Sun has been observed 28 days on 31 possible.

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

Uccle Nø	East Limb Date	Date and type 1st obs	CMP	Last obs	West Limb Date
8-2019	7 29.1	30 C	8 4.9	9 D	8 11.6
9-2019	8 5.1	6 E	8 11.9	18 E	8 18.6
1-2020	8 12.4	13 D	8 19.1	25 E	8 25.9
3-2020	8 19.3	19 E	8 26.1	31 J	9 1.8
5-2020	8 17.2	20 B	8 23.9	29 C	8 30.7

PROBABLE RETURN OF MAJOR GROUPS FOR SEPTEMBER 2004

Nø	New East Limb	New CMP	New West Limb
8	8 25.1	8 31.9	9 7.6
9	9 2.1	9 8.8	9 15.6
1	9 9.2	9 15.9	9 22.7
5	9 12.8	9 19.5	9 26.3

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

During August, the asymmetric distribution of the sources of solar activity was highlighted once more. The month started with a week of very low activity, but from Aug 08 onwards activity increased, culminating in high activity in the period Aug 12-Aug 19. This shift was entirely due to the growth of Catania sunspot group 90 (NOAA 0656), which also produced nearly all of this month's large solar flares. The largest event was an X1.8 flare on Aug 18. From Aug 19 until Aug 29 activity was very low again, picking up to moderate on Aug 30-31. On Aug 01 and 02, the >10MeV proton flux was enhanced, but remained well below the event threshold.

On Aug 01, only two sunspot groups were visible on the solar disk: Catania 86 (NOAA 0654) in the northwest was a small group in its decay phase, while Catania 87 (NOAA 0655) in the southeast was slowly growing. Although Catania 86 had a beta-gamma magnetic configuration, it remained quiet. During the first week of the month, only one C-class flare occurred, viz. a C3.9 from Catania 87 on Aug 02. Although after this event the group still grew in sunspot number and area and developed a clear beta-gamma magnetic configuration, its level of activity dropped after Aug 02 and for the next 5 days, only B-class flares were observed. From noon UT on Aug 03 until early on Aug 07, the solar X-ray output did not even reach the B4 level. On Aug 06, attention shifted to a new kid on the block: at the east limb, Catania 90 (NOAA 0656) showed up, probably the return of Catania sunspot group 78 (NOAA 0649), which produced several X-flares on its previous rotation. Initially, this group remained rather quiet, but early on Aug 08, the solar X-ray output began to rise strongly and more flaring activity developed in Catania 90, leading to 2 C-class flares on this day. At 08:54 on Aug 08 a splendid full halo CME was visible in the LASCO images but this event was determined to be back-sided.

In the following days, Catania 90 experienced a fast growth, acquiring a beta-gamma-delta magnetic configuration and reaching an area of about 1350 millionths of the solar disk. It became the source of virtually all observed flares. These consisted of many C-flares up to Aug 11, which was followed by the first M-flare of the month on Aug 12. Solar activity then became high, with many more M-flares during the following days (see list below). It also produced 2 X-class flares. The first one was an X1.0 on Aug 13 at 18:12 UT and was accompanied by a partial halo CME; the second one and also the largest flare of the month followed on Aug 18: an X1.8 peaking at 17:40 UT. At this time, Catania sunspot group 90 was already situated at the west limb, but on Aug 19 it still produced two more M-flares. As the active region was already behind the limb, these flares were observed as high bright loop systems above the limb.

With the disappearance of Catania 90, Catania sunspot group 96 became the dominant group. It was half the size of Catania 90, and also developed a beta-gamma configuration, but was quiet. Thus, solar activity dropped sharply after Aug 19. The X-ray background gradually decreased to the low B-level, and most flares also peaked in the B-level. In the period Aug 21-Aug 29, the only C-flares recorded by GOES12 were a C1.3 and C1.8 flares on Aug 25 and 26, respectively from Catania sunspot groups 96 (NOAA 0661) and 01 (NOAA 0633). To make up for this lack of activity, two nice prominence eruptions occurred, accompanied by a CME. The first eruption took place on 26/08 with an accompanying CME first visible in C2 at 11:06 UT. The second prominence eruption on the west limb on 27/08 was visible at 07:36 UT in EIT images and at 09:30 UT in C2.

On the last two days of the month, only one sunspot group worth mentioning remained on the solar disk: Catania 01, situated close to the western limb. This group had rotated into view on Aug 19 and grew to about 20 spots while transiting the disk. Most of this time it was inactive, but on Aug 30 its level of activity increased and it produced a few C-class flares, followed by an M1.4 flare on Aug 31.

II. Geomagnetic Activity

Geomagnetic conditions were mostly quiet throughout the month, with occasional short periods of active conditions, except Aug 9-11 when active to minor storm conditions were observed, and Aug 30-31 with major storm conditions.

The month started with quiet geomagnetic conditions, despite the arrival of two interplanetary shocks: the first one was registered by ACE around 20:40 UT on July 30 and the second one around 01:50 UT on August 1. These shocks were probably produced by the partial halo CMEs detected in SOHO/LASCO data at 03:54 UT on July 28 and at 11:54 UT on July 29 correspondingly. The interplanetary magnetic field in both post-shock sheaths was predominantly northward, so they did not produce any significant geomagnetic disturbance. The solar wind speed was at about 500km/s on Aug 01, but decreased for several days to 300 km/s on Aug 05. It then increased a bit to 360 km/s, but the IMF remained mainly northwards and geomagnetic conditions stayed quiet. On Aug 07, however, the solar wind speed rose to more then 450 km/s during the second half of the UT day, and the IMF pointed mostly southwards for most of that day, with short periods of values below -10nT. These conditions were caused by a small coronal hole. The geomagnetic response was mixed: some geomagnetic observatories reported K-indices up to 4 or even 5, and also NOAA's estimated Kp index reached 5, but in Niemegk and Izmiran K-indices stayed at quiet values. Early on Aug 08, the solar wind speed started a linear decline and quiet geomagnetic conditions reigned everywhere.

On Aug 09-11, active to minor storm conditions were observed (the highest K-vales reported were K=4 or 5, depending on the station). These events were associated with sector boundary crossings and the entrance of the Earth into a high-speed solar wind stream (due to a coronal hole) on Aug 10 with southward fluctuations of the interplanetary magnetic field. The solar wind speed reached a peak of 600km/s on Aug 11 at midnight and then steadily decayed down to 350km/s on Aug 15. As the Bz component of the IMF was predominantly northward, the geomagnetic field remained quiet from Aug 12 until Aug 16.

A long-lasting and slow ICME arrived late on Aug 16, producing two intervals with estimated Kp=4 on Aug 17-18. This ICME was probably associated with a CME observed by SOHO/LASCO in the evening of Aug 12 above the southern limb. A low-latitude coronal hole was situated close to the central meridian on August 16. An interaction region between the slow and fast solar wind flows arrived at the end of Aug 19. The fast flow itself arrived on Aug 21. Although the north-south interplanetary magnetic field component Bz was predominantly negative, this solar wind structure produced only a weak geomagnetic disturbance (Kp index reached 4 several times on Aug 20-22) due to the fairly low solar wind speed: this reached a maximum around 500 km/s on Aug 21 and then decreased to 300-350km/s by Aug 25.

Geomagnetic conditions remained quiet from Aug 22 until early on Aug 30. On that day ACE and SOHO/CELIAS recorded the arrival of a small shock in the solar wind (at 0528 and 0522 UT respectively), probably due to the partial halo CME that was detected in LASCO images

of Aug 27 at 09:54 UT. Upon arrival of this event, the interplanetary magnetic field turned strongly southwards, with values near -10nT. A few hours after the shock arrival, perturbations in the geomagnetic field were observed, indicating the onset of a geomagnetic storm. This storm lasted for about 24 hours; the K-index in Niemegk and the estimated Kp-index in NOAA reached 6 (major storm level). By the end of Aug 31, geomagnetic conditions returned to quiet status.

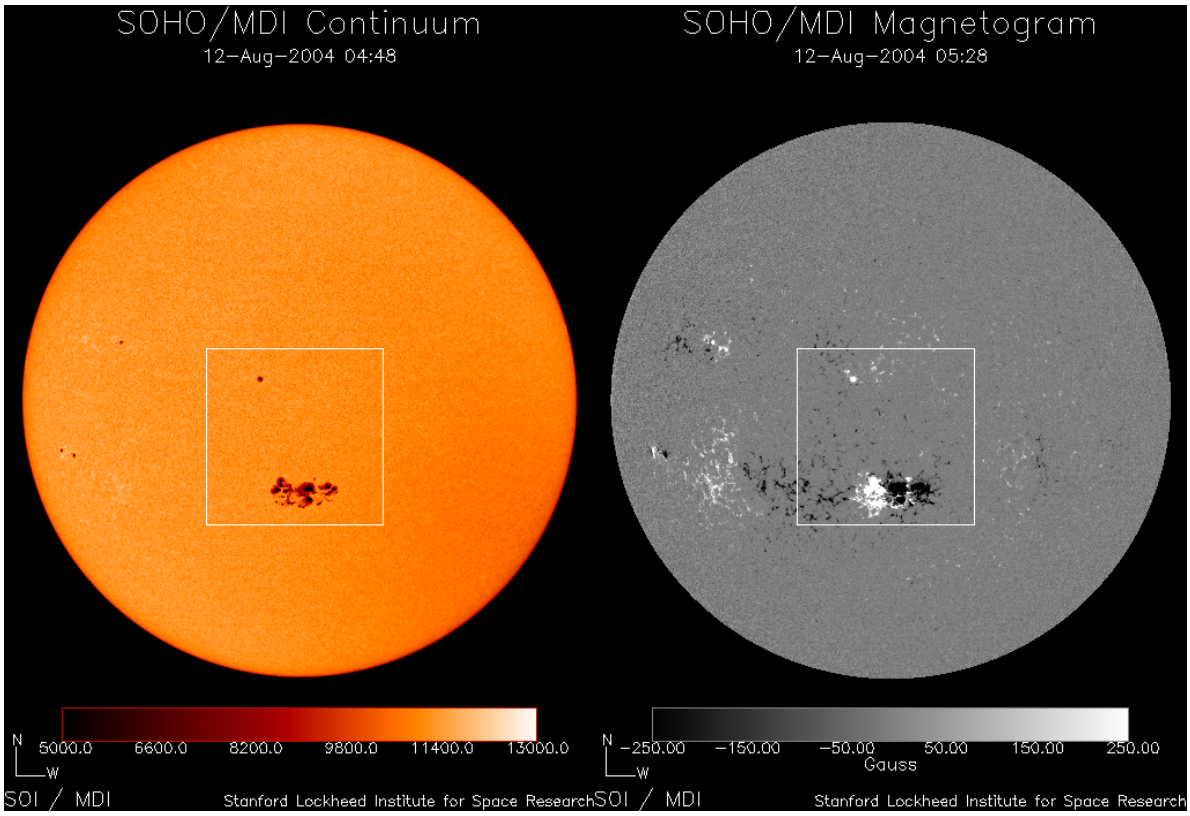
III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	600 (Humain)	Cat	NOAA	NOTE
12	0438	0505	0520	S14E02	M1.2	1F				90	0656	
13	0636	0729	0738	S15W12	M1.2	1F			0657	90	0656	
13	1202	1209	1212	S13W19	M1.1	1F			1209	90	0656	
13	1807	1812	1815	S13W24	X1.0	1N	180		1810,1812	90	0656	Semi-halo CME
13	2314	2343	2346	S13W26	M3.0					90	0656	SXI derived location
13	2346	2350	2354	S12W27	M2.8	SF				90	0656	
14	0410	0414	0417	S13W30	M2.4	SF	98			90	0656	
14	0536	0544	0552	S11W28	M7.4	2N	96			90	0656	
14	0751	0756	0759	S13W32	M2.3	1F				90	0656	
14	0952	1007	1017	S14W30	M3.2	1F	25			90	0656	
14	1331	1343	1350	S14W34	M5.6	2N	77			90	0656	
14	1809	1818	1832	S13W36	M1.3					90	0656	SXI derived location
14	2009	2016	2059	S13W39	M1.3				90	0656		SXI derived location
15	0445	0506	0522	S12W44	M1.2	SF		III/3		90	0656	
15	0554	0600	0604	S12W42	M1.2	SF				90	0656	
15	1123	1132	1148	S15W47	M2.6	2F	52			90	0656	
15	1234	1241	1243	S15W45	M9.4	1N				90	0656	
15	1837	1845	1850	S13W50	M1.2			III/2		90	0656	SXI derived location
16	0331	0347	0415	S12W54	M1.1	SF		III/3		90	0656	
16	2229	2244	2252	S12W62	M1.1	1F				90	0656	
17	0459	0506	0514	S12W66	M1.1	SF		CTM/1		90	0656	
17	1926	1937	1948	S15W90	M2.4			CTM/1		90	0656	SXI derived location
17	2112	2121	2139	S15W90	M1.8					90	0656	SXI derived location
17	2212	2228	2237	S15W90	M1.3				90	0656		SXI derived location
18	1729	1740	1754	S12W83	X1.8	SF	150	II/2		90	0656	
19	0635	0701	0718	S13W90	M3.0			III/1		90	0656	SXI derived location
19	1329	1351	1416	S13W90	M2.1				90	0656		SXI derived location
31	0524	0538	0547	N06W82	M1.4			II/2,III/1		01	0663	SXI-derived location

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



MDI images of this month's main actor: Catania sunspot group 90 (NOAA 0656). On the left, a continuum image showing its appearance in visible light; on the right a magnetogram highlights its complex magnetic structure at the start of its period of high activity .