

Center

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SUNSPOT BULLETIN

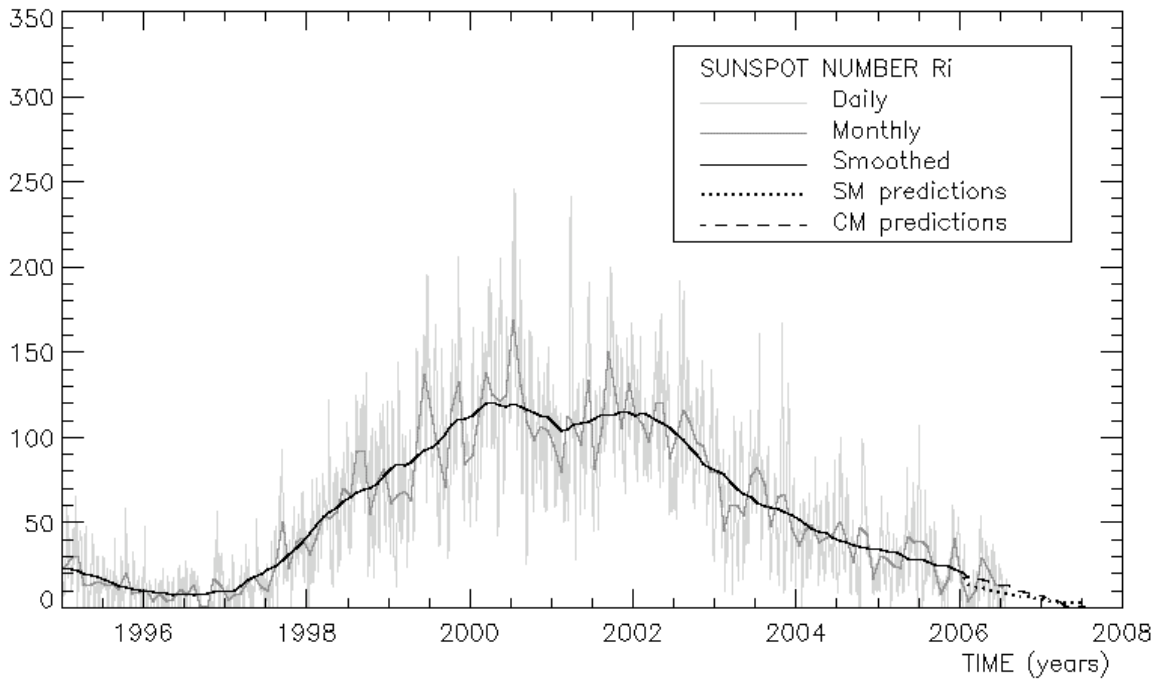
2006

n° 7

Provisional international and normalized hemispheric daily sunspot numbers for July 2006

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	21	10	11
2	17	7	10
3	19	8	11
4	20	7	13
5	19	0	19
6	20	0	20
7	20	0	20
8	19	0	19
9	17	0	17
10	8	0	8
11	8	0	8
12	7	0	7
13	0	0	0
14	8	0	8
15	9	0	9
16	11	0	11
17	12	0	12
18	12	0	12
19	13	0	13
20	8	0	8
21	0	0	0
22	8	8	0
23	10	10	0
24	11	11	0
25	10	10	0
26	10	10	0
27	10	10	0
28	9	9	0
29	9	9	0
30	17	9	8
31	15	8	7
Monthly mean	12.2	4.1	8.1
Cooperating stations	58	48	48



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for January 2006 : 20.8 ($\pm 5\%$)

	SM	CM		SM	CM		SM	CM
2006 Feb	18	19	2006 Aug	11	13	2007 Feb	7	5
Mar	19	18	Sep	10	11	Mar	6	5
Apr	16	17	Oct	10	10	Apr	5	2
May	15	16	Nov	9	9	May	5	2
Jun	14	15	Dec	8	8	Jun	4	2
Jul	13	14	2007 Jan	7	7	Jul	4	2

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
30	25	46	-	86	////	0	0/0	9	
1	21	42	-	86	////	0	0/0	6	
2	17	48	-	87	////	0	0/0	3	
3	19	64	-	86	////	0	0/0	4	
4	20	67	-	88	////	0	0/0	16	
5	19	69	-	85	////	0	0/0	20	
6	20	61	-	85	////	100	1/0	10	
7	20	52	-	80	////	0	0/0	8	
8	19	26	-	77	////	0	0/0	4	
9	17	18	-	75	////	0	0/0	5	
10	8	5	-	73	////	0	0/0	12	
11	8	3	-	71	////	0	0/0	9	
12	7	2	-	71	////	0	0/0	20	
13	0	1	-	70	////	0	0/0	8	
14	8	2	-	71	////	0	0/0	19	
15	9	6	-	70	////	0	0/0	6	
16	11	5	-	71	////	0	0/0	4	
17	12	8	-	71	////	0	0/0	5	
18	12	15	-	71	////	0	0/0	4	
19	13	13	-	71	////	0	0/0	2	
20	8	3	-	72	////	0	0/0	4	
21	0	1	-	73	////	0	0/0	2	
22	8	1	-	74	////	0	0/0	4	
23	10	10	-	77	////	0	0/0	6	
24	11	13	-	77	////	0	0/0	8	
25	10	15	-	76	////	0	0/0	10	
26	10	14	-	75	////	0	0/0	6	
27	10	10	-	74	////	0	0/0	10	
28	9	10	-	73	////	0	0/0	18	
29	9	6	-	73	////	0	0/0	5	
30	17	6	-	74	////	0	0/0	4	
31	15	4	-	72	////	0	0/0	17	

- 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 : $1 \times \text{Sn} + 10 \times "1" + 100 \times ">1"$).
- 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 JULY 2006

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	800	2	17	37	17	20	17	46.2	3	LR
2	1112	2	14	34	13	21	34	28.5	4	ST
3	800	2	20	40	15	25	40	30.8	4	OB
4	820	2	29	49	13	36	36	30.9	3	OB
5	1020	2	24	44	0	44	28	28.2	3	OB
6	1000	2	21	41	0	41	0	31.0	3	OB
8	1045	2	13	33	0	33	0	27.6	4	OB
9	950	2	11	31	0	31	14	25.6	3	OB
10	800	1	6	16	0	16	16	1.5	3	OB
11	910	1	2	12	0	12	12	0.4	3	OB
12	830	1	1	11	0	11	11	0.4	3	OB
13	920	0	0	0	0	0	0	0.0	3	OB
14	1330	1	2	12	0	12	0	0.2	3	OB
15	915	1	11	21	0	21	0	1.1	3	AE
16	1025	1	10	20	0	20	20	1.4	3	AE
17	715	1	11	21	0	21	21	1.5	3	LR
18	730	1	13	23	0	23	23	1.5	3	LR
19	1315	1	15	25	0	25	25	1.4	3	AE
21	704	1	2	12	0	12	0	0.3	3	GL
22	1155	1	1	11	0	11	0	0.2	3	GL
23	1400	1	4	14	14	0	0	9.0	3	GL
24	1415	1	11	21	21	0	0	13.7	3	AE
25	1200	1	11	21	21	0	0	17.9	3	AE
26	1300	1	15	25	25	0	25	5.7	3	AE
27	900	1	11	21	21	0	21	6.2	2	AE
28	845	1	7	17	17	0	17	6.3	2	AE
29	900	1	9	19	19	0	19	5.9	3	AE
30	1030	2	5	25	11	14	14	3.0	2	AE
31	1130	2	5	25	14	11	0	1.2	3	AE

The relative mean sunspot number is 23.5.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS $U'=K'U$ FOR JULY 2006

$$K' = 0.755 (*)$$

1	28	7	***	13	0	19	19	25	16
2	26	8	25	14	9	20	***	26	19
3	30	9	23	15	16	21	9	27	16
4	37	10	12	16	15	22	8	28	13
5	33	11	9	17	16	23	11	29	14
6	31	12	8	18	17	24	16	30	19
								31	19

The normalised relative monthly mean sunspot number is 18.

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

The Sun has been observed 29 days on 31 possible.

UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR JULY 2006
E AND F BRUNNER'S TYPE GROUPS

NONE

PROBABLE RETURN OF MAJOR GROUPS FOR AUGUST 2006
NONE

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

NOAA active region AR 898 (Catania sunspot group 60) was the most flare productive region of the period. In the first few days of the month it approached the solar central meridian as a big, beautifully symmetric sunspot. It produced a number of C-flares between July 3 and July 7. The largest flare event of the month was a long duration M2.5 event, which erupted from NOAA AR898 on July 6, and was associated with a CME, a dimming, a weak proton event and beautiful post-eruptive-arcades as observed in EIT. The CME was partial halo with a principal angle directed SW and a median speed around 600 km/s. Proton flux levels increased slightly but did not pass the event threshold of 10 sfu for >10 MeV events.

NOAA AR898 rotated over the solar west limb as a beta-gamma-delta region and was undoubtedly the source of several back-sided limb CMEs on July 13. The only other C-flare of the period (a C1.1 flare on July 24) erupted from the same active region when it returned over the solar East limb. After that, this region decayed, did not exhibit any more significant activity, and even did not get a new NOAA number. After July 8, the X-ray background stayed below A5, a clear signature that all other active regions were non-significant.

On July 20th a wide bright CME was observed filling the SE quadrant of the LASCO field of view and more. This was due to the eruption of a portion of a large filament visible in the SE and extended almost up to disk centre. The apparent span was about 160 deg with a potentially Earth-directed component, though its projected speed was rather slow at ~375km/s.

The passage of coronal holes is described in the section below.

II. Geomagnetic Activity

The CME that erupted on July 6th in conjunction with the M2.5 flare arrived at L1 late on July 9th. A shock was recorded in ACE data around 20:40 UT. The solar wind speed jumped from 350 to ~420 km/s and the magnetic field was intensified to ~10 nT with southward excursions. It triggered active geomagnetic conditions at several latitudes. Besides this CME driven geomagnetic activity, all other geomagnetic activity was driven under the influence of coronal holes.

A trans-equatorial coronal hole was present in between the NOAA AR 898 and AR 897 and reached central meridian around July 2. The corresponding high speed wind stream reached the ACE spacecraft on July 4th. On July 5th a solar wind speed of 600 km/s was reached (this is 100 km/s less compared to previous rotation) and the magnetic field was intense (+/- 20 nT) for several hours. This induced a ~24hr period of geomagnetic active to minor storm conditions on July 4-5. In a next rotation, the same coronal hole reached central meridian again around July 29 and pushed the solar wind speed up to ~600km/s towards the very end of the month.

A small coronal hole reached the central meridian on July 8th. A small shock on Jul 11 (5:30 UT) marked the entry into the coronal hole influence, which made the wind speed increase to more than 500km/h on July 12. On this day, active conditions were reported. From the middle of July 13 onwards, the solar wind speed started decreasing. On July 14, active conditions were observed again following a short period of southwards IMF.

A coronal hole was present in the Northern hemisphere at central meridian around July 24. This coronal hole triggered an enhanced solar wind speed from July 27 onwards, which reached 700km/s early on July 28. This resulted in a magnetic storm early on July 28 with NOAA's estimated Kp reaching k=6 during a 6-hours episode.

III. Noticeable solar events

DAY BEGIN MAX END LOC XRAY OP 10CM RADIO TYPE Cat NOAA NOTE
 06 0813 0836 0851 S11W32 M2.5 2F 350 III/2,II/2,IV/1 60 0898 CME, arcades, dimming

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. Halo CME list

onset time	e-mail time CACTus	da	e-mail time LASCO	e-mail time FF	Ass. Events	consequences
Jul 6 8:54	Jul 6 15:36	184	-	Jul 7 20:51	LDE M2.5 @ 08:11	shock @ Jul 9, 20:40. K=4
Jul 20 13:54	-	144	Jul 20 20:18	-	filament eruption @ 12:36	
Jul 30 7:54	Jul 31 18:25	352	-	-		

Onset time: Utime first visible in C2 field of view

CACTus: Computer Aided CME Tracking (software developed by the SIDC)

LASCO: SOHO-LASCO Operations, G. Stenborg

FF: Fearless Forecast (a NOAA trial service)

e-mail time CACTus/LASCO/FF: Utime alert e-mail sent by group

da: angular width of CME, measured by CACTus

Ass. Events: Associated Events, Long Duration Event (LDE), flare class