

Center

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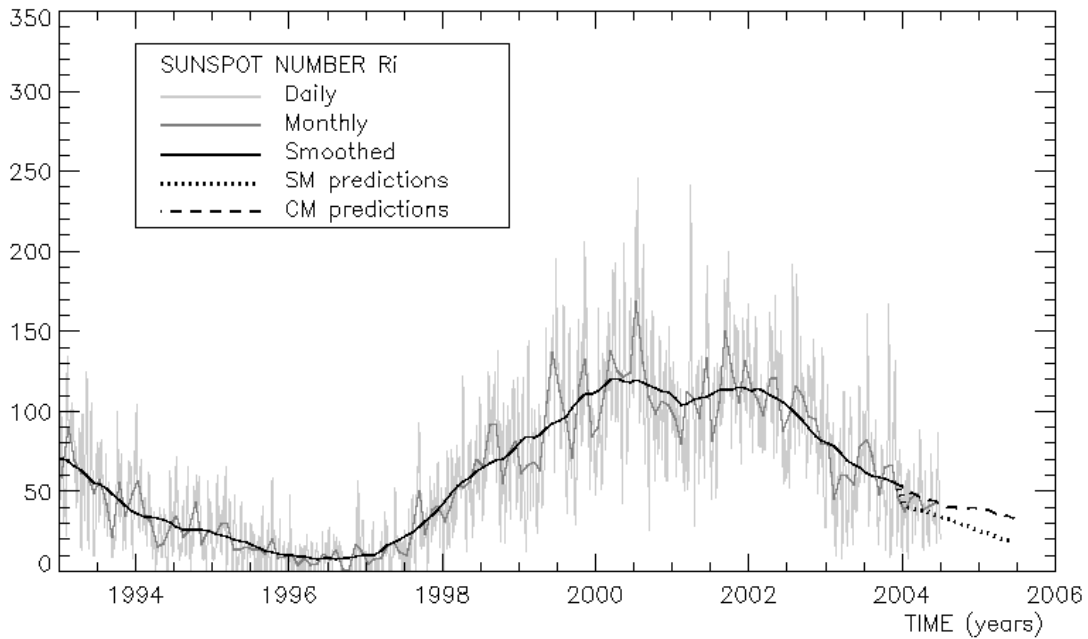
SUNSPOT BULLETIN

2004 n° 6

Provisional international and normalized hemispheric daily sunspot numbers for June 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	35	0	35
2	36	7	29
3	37	0	37
4	36	0	36
5	36	8	28
6	29	11	18
7	37	0	37
8	33	0	33
9	34	0	34
10	31	0	31
11	26	0	26
12	18	0	18
13	28	9	19
14	35	14	21
15	44	16	28
16	64	18	46
17	62	21	41
18	67	21	46
19	69	18	51
20	86	17	69
21	87	15	72
22	76	11	65
23	61	10	51
24	52	17	35
25	37	16	21
26	34	14	20
27	31	16	15
28	30	21	9
29	26	15	11
30	20	12	8
Monthly mean	43.2	10.2	33.0
Cooperating stations	46	39	39



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for December 2003 : 54.8 ($\pm 5\%$)

		SM	CM			SM	CM			SM	CM
2004	Jan	50	53	2004	Jul	39	42	2005	Jan	30	40
	Feb	48	50		Aug	37	41		Feb	29	39
	Mar	43	48		Sep	36	41		Mar	27	37
	Apr	42	47		Oct	35	40		Apr	26	36
	May	41	45		Nov	33	40		May	24	35
	Jun	40	44		Dec	32	41		Jun	23	34

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	34	26	36	95	////	1	0/0	//	
1	35	13	36	90	////	0	0/0	18	
2	36	24	-	90	////	0	0/0	15	
3	37	23	37	90	////	0	0/0	9	
4	36	17	37	89	////	0	0/0	10	
5	36	17	36	85	////	0	0/0	14	
6	29	11	38	88	////	0	0/0	14	
7	37	18	40	89	////	1	0/0	14	
8	33	15	40	86	////	1	0/0	14	
9	34	11	39	85	887	0	0/0	18	
10	31	11	37	83	889	0	0/0	10	
11	26	13	36	84	888	0	0/0	7	
12	18	15	37	88	893	0	0/0	4	
13	28	15	38	95	895	0	1/0	7	
14	35	28	39	100	903	0	0/0	10	
15	44	64	41	109	903	10	0/0	18	
16	64	96	42	112	901	0	0/0	10	
17	62	128	41	111	900	2	0/0	10	
18	67	155	41	108	902	1	0/0	12	
19	69	166	40	113	895	5	0/0	5	
20	86	208	40	119	891	2	0/0	5	
21	87	163	-	116	891	3	0/0	6	
22	76	121	-	117	898	2	0/0	3	
23	61	104	-	113	900	2	0/0	4	
24	52	75	-	108	898	2	0/0	5	
25	37	36	-	103	902	1	0/0	5	
26	34	19	-	99	902	2	0/0	12	
27	31	9	-	97	902	1	0/0	4	
28	30	9	-	89	906	0	0/0	18	
29	26	14	-	85	903	0	0/0	21	
30	20	14	-	82	900	2	0/0	//	

- 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 JUNE 2004

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-3	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	945	2	11	31	0	31	0	5.0	2	OB
3	750	3	25	55	0	55	32	23.1	2	OB
5	905	3	16	46	14	32	34	26.5	2	SG
6	625	4	13	53	13	40	38	11.8	3	FC
7	650	3	10	40	0	40	28	22.9	3	FC
8	655	3	13	43	0	43	43	8.1	3	OB
9	940	3	9	39	0	39	39	12.5	3	OB
12	712	2	4	24	0	24	13	17.8	2	VI
14	758	3	13	43	18	25	14	34.3	3	OB
15	850	3	20	50	19	31	11	73.7	3	OB
16	650	5	35	85	24	61	22	100.6	2	FC
17	730	4	42	82	30	52	11	123.9	3	OB
19	935	3	72	102	31	71	91	149.3	3	FC
20	745	5	94	144	29	115	115	152.6	3	FC
23	910	4	47	87	13	74	14	129.7	3	OB
24	810	3	37	67	11	56	0	91.3	3	OB
25	647	3	16	46	23	23	12	32.9	2	VI
26	859	3	13	43	16	27	16	19.1	3	OB
27	950	3	9	39	14	25	14	6.9	2	OB
28	955	3	15	45	33	12	17	2.2	2	OB
29	915	3	9	39	25	14	0	3.4	3	OB
30	1005	3	12	42	27	15	0	9.0	3	OB

The relative mean sunspot number is 56.6.

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

$$K' = 0.741 (*)$$

1	23	7	30	13	***	19	76	25	34
2	***	8	32	14	32	20	107	26	32
3	41	9	29	15	37	21	***	27	29
4	***	10	***	16	63	22	***	28	33
5	34	11	***	17	61	23	64	29	29
6	39	12	18	18	***	24	50	30	31

The normalised relative monthly mean sunspot number is 42.

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

The Sun has been observed 22 days on 30 possible.

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

Uccle Nø	East Limb Date	Date and type			West Limb Date
		1st obs	CMP	Last obs	
13-2017	6 12.5	14 D	6 19.3	16 E	6 26.0
14-2017	6 13.5	14 C	6 20.2	26 E	6 27.0
17-2017	6 8.6	77 E	6 15.4	17 E	6 22.1
18-2017	6 12.8	19 E	6 19.5	25 E	6 26.3
21-2017	6 14.6	23 E	6 21.3	27 E	6 28.1

PROBABLE RETURN OF MAJOR GROUPS FOR JULY 2004

Nø	New East Limb	New CMP	New West Limb
14	7 10.4	7 17.2	7 23.9
18	7 9.5	7 16.3	7 23.0
21	7 11.5	7 18.3	7 25.0

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

June was again a quiet month for solar activity. The X-ray flaring activity barely made it to the M-level, with a single M1.0 flare on Jun 13. By contrast, a large number of prominence eruptions and CMEs were observed. During the second half of the month, solar monitoring was seriously degraded, as SOHO passed through its 3-monthly telemetry keyhole (2004/06/16 - 2004/07/03).

The month started with the disappearance at the west limb of Catania sunspot group 34 (NOAA 0618), which had been the dominating sunspot group at the end of May. The only significant sunspot group left on the disk after Jun 01 was Catania 37 (NOAA 0621). This group only consisted of some 20 small sunspots with a beta magnetic class and it produced very little activity. The solar X-ray background fell to a low level, and until Jun 06, not even C-class flares were observed. Only at the end of this day we finally saw the onset of a long-duration C2.5, which peaked at 00:45UT on Jun 07. Thereafter, again, solar activity was on minimal level.

From Jun 11 at noon the background X-ray started to rise continuously to B-level, due to the appearance of new sunspot group Catania 55 (NOAA 0634) on the north-east limb. This region immediately started to show flaring activity: on Jun 13 a C8.9 and an M1.0 were produced in this region. In all, however, its activity remained much lower than could be expected from its beta-gamma magnetic class. The group reached an area of 300-400 millionths of the visible solar disk. It developed a small delta configuration on Jun 19. In the same period, a very similar story can be told about Catania sunspot group 56 (NOAA0635) in the southern hemisphere. This group also developed a complex beta-gamma-delta configuration and grew into double the size of group 55. It experienced a significant growth on Jun 18 and 19, with a simultaneous increase in the flaring rate. However, the most active period of Catania 55 actually started when it was at the edge of the solar disk: on Jun 27-28 it produced a number of C-flares although the sunspot group itself was no longer visible. With the disappearance of Catania 55 behind the limb, the solar X-ray output decreased dramatically by an order of magnitude on Jun 28-29. Therefore, although new Catania sunspot groups 64 and 65 in the east produced some flares on Jun 29-30, only one of these reached the C-level.

To compensate for the absence of X-ray flaring activity, the Sun offered a display of some spectacular prominence eruptions and CMEs. On Jun 01, at about 07UT, a long thin prominence erupted near the central meridian, but this event did not generate a detected CME signature. Some time later, a partial halo CME was detected by our CACTus software just after 10UT. It probably originated from Catania sunspot group 34 just behind the west limb. On Jun 02, a prominence erupted again near central meridian, generating a partial halo CME first seen at 19:56 at the west limb. On Jun 03 a prominence eruption was observed near the west limb, resulting in a magnificent partial halo CME at 16:50 UT. The most spectacular event occurred on Jun 04: a partial halo CME at 07:50 UT, probably back-sided. And finally, on Jun 05, CACTus picked up another partial halo CME at 09:06, this time northwards directed, while a prominence eruption from the northeast quadrant at about 18:00 UT on the same day generated another small CME to the north. On Jun 07 a very faint halo CME with a complex structure was reported by the LASCO operators. Also during the following week, several CMEs were recorded by LASCO, including a rare double event on Jun 15.

II. Geomagnetic Activity

Geomagnetic conditions reached active levels for a few short intervals at the beginning of the month, due to a high-speed solar wind originating from a coronal hole. On Jun 01, the solar wind speed stood at 550km/s. Then it started decreasing, reaching 450km/s early on Jun 05, after which it again increased a little bit. However, the IMF was mostly northwards or oscillated between -5nT and +5nT, so these elevated solar wind speed conditions generated no strong perturbations to the geomagnetic field, which remained quiet from Jun 02 until Jun 05. Due to a CME related to the long duration C-flare of Jun 07 and some more small coronal hole activity, the K-index reached active levels of K=4 several times between Jun 05 and Jun 10. Then again, conditions became quiet for Jun 11-13.

On Jun 14, the Earth entered into a high speed solar wind stream originating in a fragmented low-latitude coronal hole. A shock was recorded by ACE on Jun 14, 15:11UT, which was followed by a steep rise to 550km/s. The simultaneous southward excursion of the Bz component of the IMF (-10nT) produced active conditions on Jun 14 and even a minor storm period on Jun 15. After reaching its peak on Jun 15, the solar wind speed declined slowly down to 400km/s, which marked the end of that stream. As Bz experienced only small fluctuations around 0, the geomagnetic field remained mostly quiet from Jun 16 to Jun 18. During the following week, geomagnetic activity was very low with only Kp=3 episodes as isolated, strongest disturbances. A small shock was observed by ACE in the solar wind on Jun 24 and a (probable) sector boundary crossing on Jun 25. None of these had any geomagnetic consequence.

By the end of the month, a recurrent equatorial coronal hole moved in geo-effective position. During the second half of Jun 28, the solar wind speed increased from 300km/s to more than 500km/s and stayed near that value for the rest of the month. The interplanetary magnetic field showed no strong southwards component, however, so the influence of this high-speed solar wind stream was limited, as on the previous rotation. Active conditions (K=4) were observed on Jun 28-29, with a return to quiet conditions on Jun 30.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO	TYPE	600 (Humain)	Cat	NOAA	NOTE
13	1127	1156	1215	N12E90	M1.0						55	0634	

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