

Center

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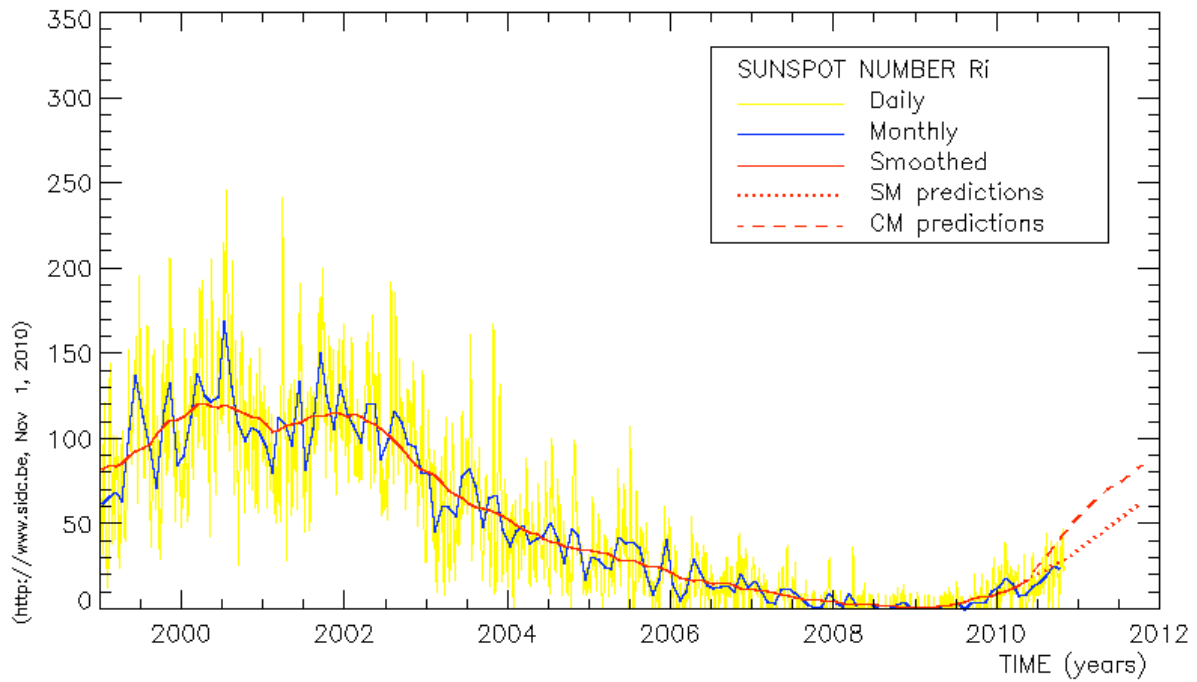
SUNSPOT BULLETIN

2010 n°10

Provisional international and normalized hemispheric daily sunspot numbers for October 2010

computed at the *Royal Observatory of Belgium* using observations from an international network with the *Locarno Specola Solare* as reference station.

Date	R' ₁	R' _N	R' _s
1	25	25	0
2	19	19	0
3	20	20	0
4	15	15	0
5	9	9	0
6	0	0	0
7	0	0	0
8	0	0	0
9	9	0	9
10	9	0	9
11	9	0	9
12	9	0	9
13	16	8	8
14	26	9	17
15	29	8	21
16	34	9	25
17	40	16	24
18	42	18	24
19	44	25	19
20	36	22	14
21	25	17	8
22	25	17	8
23	31	23	8
24	42	33	9
25	47	39	8
26	44	37	7
27	29	22	7
28	22	22	0
29	27	27	0
30	23	23	0
31	24	24	0
Monthly mean	23.5	15.7	7.8
Cooperating stations	71	64	64



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for April 2010: 14. ($\pm 5\%$)

	SM	CM		SM	CM		SM	CM			
2010	May	16	17	2010	Nov	24	47	2011	May	39	71
	Jun	16	21		Dec	26	52		Jun	42	73
	Jul	16	27	2011	Jan	29	56		Jul	45	75
	Aug	18	32		Feb	31	60		Aug	48	79
	Sep	20	37		Mar	34	64		Sep	51	82
	Oct	22	42		Apr	37	67		Oct	54	85

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	33	41	-	90	////	2	0/0	2	
1	25	30	-	87	////	2	0/0	2	
2	19	33	-	85	////	0	0/0	0	
3	20	15	-	80	////	0	0/0	1	
4	15	6	-	76	////	10	0/0	2	
5	9	///	-	75	////	0	0/0	5	
6	0	///	-	74	////	0	0/0	6	
7	0	0	-	75	////	0	0/0	5	
8	0	0	-	75	////	0	0/0	5	
9	9	1	-	76	////	0	0/0	4	
10	9	2	-	76	////	3	0/0	4	
11	9	2	-	75	////	0	0/0	18	
12	9	2	-	75	////	0	0/0	14	
13	16	4	-	78	////	0	0/0	4	
14	26	11	-	80	////	1	0/0	1	
15	29	26	-	82	////	0	0/0	8	
16	34	45	-	87	////	10	1/0	8	
17	40	69	-	84	////	3	0/0	14	
18	42	57	-	91	////	0	0/0	8	
19	44	46	-	87	////	1	0/0	7	
20	36	44	-	84	////	2	0/0	6	
21	25	40	-	84	////	0	0/0	4	
22	25	41	-	82	////	0	0/0	7	
23	31	55	-	84	////	1	0/0	29	
24	42	56	-	82	////	1	0/0	20	
25	47	68	-	86	////	4	0/0	10	
26	44	78	-	86	////	5	0/0	12	
27	29	83	-	88	////	2	0/0	7	
28	22	81	-	86	////	0	0/0	4	
29	27	68	-	86	////	0	0/0	4	
30	23	29	-	85	////	2	0/0	2	
31	24	20	-	81	////	1	0/0	6	

- 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 : $1 \times \text{Sn} + 10 \times \text{"1"} + 100 \times \text{">1"}$).
- 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 OCTOBER 2010

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5 WM-2	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	1000	2	12	32	32	0	0	4.0	3	OB
3	930	2	9	29	29	0	12	3.1	2	OB
4	1205	0	0	0	0	0	0	0.0	3	SV
5	1210	0	0	0	0	0	0	0.0	1	SV
7	1220	0	0	0	0	0	0	0.0	1	SV
8	1110	0	0	0	0	0	0	0.0	3	SV
9	755	0	0	0	0	0	0	0.0	3	SV
10	830	1	2	12	0	12	0	0.1	3	SV
11	900	1	1	11	0	11	0	1.1	2	OB
12	1000	1	2	12	0	12	0	0.3	2	OB
13	830	1	1	11	0	11	11	0.3	2	OB
15	1310	3	6	36	11	25	14	2.8	2	OB
16	1130	3	16	46	11	35	0	20.7	2	OB
18	800	4	15	55	24	31	24	6.8	3	AE
19	850	6	18	78	48	30	26	7.8	2	AE
20	1430	3	4	34	23	11	12	4.7	2	AE
21	830	3	4	34	23	11	12	4.9	2	AE
22	900	3	4	34	23	11	0	4.9	1	AE
24	930	5	17	67	56	11	45	24.9	3	AE
25	815	5	20	70	59	11	36	26.9	2	OL
26	810	4	34	74	63	11	50	25.6	3	OL
27	1125	2	20	40	40	0	40	21.9	1	OL
28	1140	2	14	34	34	0	0	18.1	3	OL
29	855	2	10	30	30	0	0	14.0	2	OL
30	1250	3	11	41	41	0	0	8.7	4	OL
31	1200	3	8	38	38	0	0	1.9	3	OL

The relative mean sunspot number is 31.5.

NORMALISED UCCLE OBSERVATIONAL SUNSPOT NUMBERS $U'=K'U$ FOR OCTOBER 2010

$K'= 0.831$ (*)

1	27	7	0	13	9	19	65	25	58
2	***	8	0	14	***	20	28	26	61
3	24	9	0	15	30	21	28	27	33
4	0	10	10	16	38	22	28	28	28
5	0	11	9	17	***	23	***	29	25
6	***	12	10	18	46	24	56	30	34
								31	32

The normalised relative monthly mean sunspot number is 26.

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

The Sun has been observed 26 days on 31 possible.

UCCLE OBSERVATIONAL MAJOR SUNSPOT GROUPS FOR OCTOBER 2010
E AND F BRUNNER'S TYPE GROUPS

NONE

PROBABLE RETURN OF MAJOR GROUPS FOR NOVEMBER 2010
NONE

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

We had some flaring activity this month, even up to the M-level. Several filament eruptions occurred. One coronal hole worth mentioning transited the solar disk.

Several C-flares and one M-flare occurred this month; The M-flare on Oct 16 was localized in NOAA AR 1112 and lasted for only 8 minutes. This M-flare initiated a slightly more turbulent flaring period up to Oct 19. On Oct 25, we had a small radiation revival lasting for only 24 hours.

A filament located in the north-east quadrant of the solar disk erupted on Oct 06. In SDO/AIA 304 movies, the plasma structure started to rise from 03:10UT. In SDO/AIA 193, the filament is seen as a very small black line that had disappeared completely by 05:23UT. After the eruption, a restructuring of magnetic field lines was visible to the west of the location of the filament. A slow CME, 260 km/s according to the CACTus software, came into the STEREO/A COR2 view at 05:24UT.

On Oct 07, a plasma bubble relatively high in the corona, in the west, near the north pole, erupted. The last SDO/AIA 304 image with the plasma at the very up-right corner is taken at 09:39UT. No flaring activity was linked with this eruption. The difference movies of STEREO A/B COR2, show two fronts following each other closely (see in the online CACTus COR2 CME list at <http://www.sidc.be/cactus>). The second front has a broad extension up to the ecliptic. According to CACTus running on the STEREO images, the speed of these CME's ranges between 330 and 350 km/s.

Nice to see is the passage of the moon in front of the Sun in the SDO/AIA images on Oct 07.

A filament located in the south-east of the solar disk erupted late on Oct 10. In SOHO/LASCO images, the CME was seen as a partial halo CME. STEREO Ahead/Behind COR2 saw the CME from the side. This side view gives the possibility of a more accurate calculation of the speed of a CME. With a front view, one sees the expansion speed of a CME which is generally underestimating the real propagation speed. The speed calculated from STEREO Ahead images was 297 km/s; from STEREO Behind images it was 328 km/s.

On Oct 21, another filament erupted from a geo-effective position near the central meridian (CM). The lift-off can be followed in SDO/AIA 304 images of that day. The restructuring of the magnetic field just beneath the location of the filament is similar to the restructuring linked with the filament eruption of Oct 07. The arcade of magnetic loops is formed on Oct 22 as visible in SDO/AIA 194.

We noticed a coronal dimming/plasma eruption at the CM in the southern hemisphere in a series of SDO/AIA 194 images taken on Oct 26. The dimming starts around 08:00UT and evolves throughout the remaining day. STEREO COR2 shows a CME directed to the south. CACTus gave a speed of 260 km/s for STEREO A COR2 and 290 km/s for STEREO B COR2.

Only one coronal hole was geo-effective: an equatorial large CH reaching the CM on Oct 20.

II. Geomagnetic Activity

The arrival of the ICMEs linked with the numerous filament eruptions described above generated disturbances in the magnetosphere of Earth twice. A recurrent coronal hole induced the strongest disturbances lasting for 2 days.

ACE data show the passage of a magnetic structure on Oct 11. This structure is probably linked with the filament erupting on Oct 06. Earth passed the shock in front of the ICME and went along a leg of the plasma cloud according to the steady (negative) Bz and the slow drift of Bz to zero. This negative Bz of the IMF is optimal for reconnection and lead to a short minor geomagnetic storm on Oct 11: Kp=5 for one interval.

ACE data showed a rather sudden enhancement of the magnetic field carried in the solar wind on Oct 15. The speed jumped at 03UT from 280 km/s to 290 km/s. The density increased slightly. This was

possibly the passage through the shock in front of the CME associated with the filament eruption of Oct 10. The IMF stayed turbulent until Oct 17. Probably, ACE passed sideways along the shock. The glancing blow of the CME lead to one period with active conditions on Oct 17.

The wind emanating from the CH mentioned in previous section was rather fast: 700 km/s. The wind leaving the Sun on Oct 20 from the position at the central meridian arrived at Earth on Nov 23. The precursor, the compressed co-rotating interaction region arrived on Nov 22. Kp became once 5 and 6 times 4 on Nov 23 and Nov 24.

The CME of Oct 26 arrived on Oct 30 but did not produce any geomagnetic disturbance.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	TENCM	TYPE	Cat	NOAA	NOTE
16	1907	1912	1915	S20W26	M2.9	1N	140	V/2,II/3,II/3	69	1069	

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