



Center

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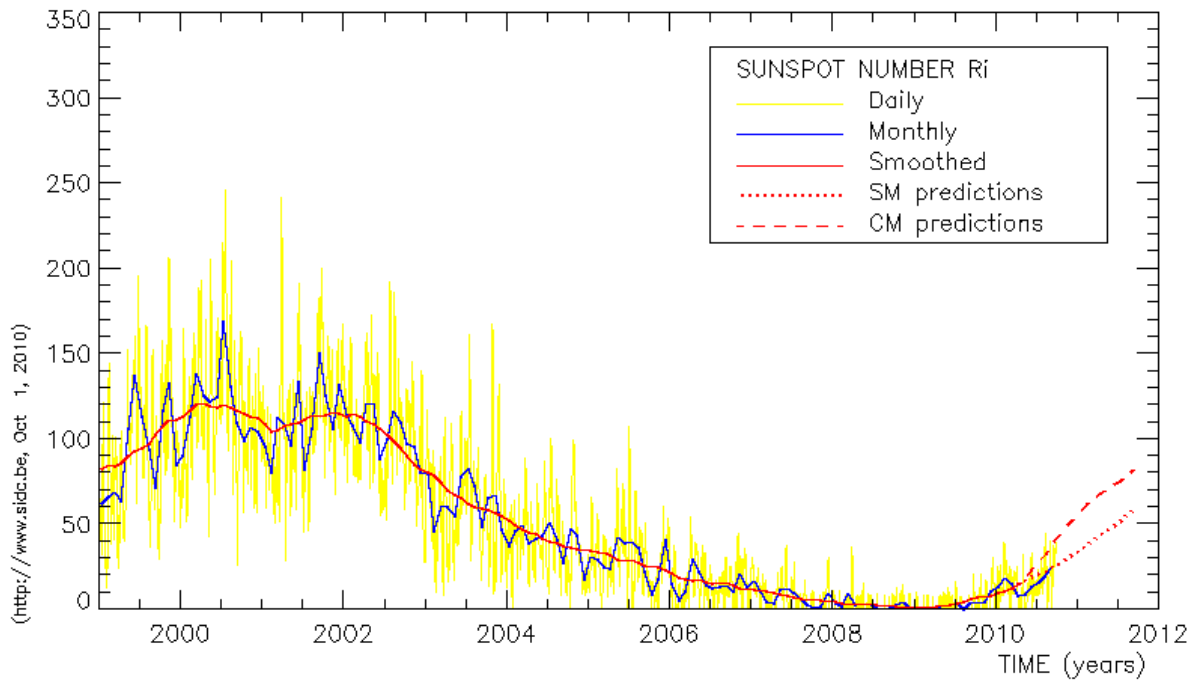
SUNSPOT BULLETIN

2010 n° 9

Provisional international and normalized hemispheric daily sunspot numbers for September 2010

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	21	0
2	40	40	0
3	34	34	0
4	40	40	0
5	30	30	0
6	20	20	0
7	10	10	0
8	0	0	0
9	0	0	0
10	11	6	5
11	8	0	8
12	9	0	9
13	18	0	18
14	19	0	19
15	19	0	19
16	30	0	30
17	37	0	37
18	35	0	35
19	34	0	34
20	27	0	27
21	26	0	26
22	25	11	14
23	27	17	10
24	27	18	9
25	27	18	9
26	34	26	8
27	39	31	8
28	38	30	8
29	38	38	0
30	33	33	0
Monthly mean	25.2	14.1	11.1
Cooperating stations	68	62	62



Predictions of the monthly smoothed Sunspot Number
 using the last provisional value, calculated for March 2010: 12. ($\pm 5\%$)

	SM	CM		SM	CM		SM	CM			
2010	Apr	14	15	2010	Oct	21	44	2011	Apr	35	68
	May	15	19		Nov	23	49		May	38	71
	Jun	14	23		Dec	25	53		Jun	41	73
	Jul	16	28	2011	Jan	28	57		Jul	44	75
	Aug	17	33		Feb	30	62		Aug	47	79
	Sep	19	39		Mar	33	65		Sep	50	82

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	20	39	-	75	////	0	0/0	4	
1	21	30	-	76	////	0	0/0	6	
2	40	23	-	77	////	0	0/0	7	
3	34	21	-	77	////	0	0/0	2	
4	40	21	-	82	////	4	0/0	2	
5	30	18	-	82	////	3	0/0	6	
6	20	10	-	80	////	0	0/0	11	
7	10	2	-	76	////	1	0/0	14	
8	0	0	-	75	////	0	0/0	16	
9	0	0	-	74	////	0	0/0	6	
10	11	2	-	75	////	0	0/0	2	
11	8	1	-	78	////	0	0/0	1	
12	9	4	-	78	////	0	0/0	1	
13	18	8	-	80	////	0	0/0	3	
14	19	14	-	81	////	0	0/0	12	
15	19	16	-	81	////	0	0/0	7	
16	30	19	-	83	////	0	0/0	8	
17	37	25	-	82	////	1	0/0	9	
18	35	33	-	82	////	0	0/0	5	
19	34	43	-	81	////	0	0/0	3	
20	27	36	-	83	////	0	0/0	4	
21	26	35	-	85	////	0	0/0	5	
22	25	40	-	85	////	0	0/0	3	
23	27	49	-	84	////	2	0/0	7	
24	27	60	-	83	////	0	0/0	19	
25	27	67	-	83	////	0	0/0	9	
26	34	80	-	84	////	3	0/0	10	
27	39	84	-	83	////	1	0/0	11	
28	38	63	-	83	////	2	0/0	12	
29	38	64	-	91	////	2	0/0	5	
30	33	41	-	90	////	2	0/0	2	

- 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 SEPTEMBER 2010

DATE	UT	NUMBER		RELATIVE SUNSPOT NUMBERS			PPSI 10-5	QUAL	OBS	
		OF GROUPS	OF SPOTS	TOTAL	NORTH	SOUTH				CENTRAL
1	1500	4	10	50	50	0	37	7.0	3	AE
2	945	4	10	50	50	0	14	5.3	2	AE
3	1115	3	13	43	43	0	17	22.7	2	AE
4	1100	4	24	64	64	0	11	19.8	3	AE
5	845	2	20	40	40	0	0	15.3	2	AE
6	655	1	7	17	17	0	0	2.9	1	SV
8	1107	0	0	0	0	0	0	0.0	3	OB
9	1100	0	0	0	0	0	0	0.0	3	SV
11	800	1	1	11	0	11	0	0.3	2	SV
13	1400	1	7	17	0	17	0	2.8	2	AE
15	800	1	7	17	0	17	0	27.8	3	AE
16	800	2	15	35	0	35	24	5.4	2	AE
17	800	2	26	46	0	46	29	11.2	3	AE
18	1000	2	12	32	0	32	16	43.3	2	AE
20	1130	2	13	33	0	33	0	22.6	3	OL
21	945	2	9	29	0	29	0	26.2	3	OL
22	705	2	11	31	15	16	0	23.6	3	OL
23	1120	2	25	45	25	20	0	46.1	4	OL
24	1150	2	19	39	26	13	0	57.4	3	OL
25	705	2	20	40	28	12	0	65.1	3	OL
27	755	2	14	34	23	11	23	66.3	2	OB
30	1300	3	20	50	50	0	0	18.9	4	OB

The relative mean sunspot number is 32.9.

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

$$K' = 0.844 (*)$$

1	42	7	***	13	14	19	***	25	34
2	42	8	0	14	***	20	28	26	***
3	36	9	0	15	14	21	24	27	29
4	54	10	***	16	30	22	26	28	***
5	34	11	9	17	39	23	38	29	***
6	14	12	***	18	27	24	33	30	42

The normalised relative monthly mean sunspot number is 28.

(*) 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 SEPTEMBER 2010
E AND F BRUNNER'S TYPE GROUPS

Uccle Nø	East Limb Date	Date and type			West Limb Date
		1st obs	CMP	Last obs	
7-2101	9 21.2	22 C	9 27.9	30 G	10 4.7

PROBABLE RETURN OF MAJOR GROUPS FOR OCTOBER 2010
NONE

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Solar activity was moderate: only a few C-flares and 3 eruptive filaments were observed.

A remarkable flare was the C3.3 flare of Sep 08, peaking at 23:33UT. On Sep 08 and 09, the Sun was considered as spotless. The responsible active region, AR 1105 was situated at the very west limb. The photospheric counterpart of this coronal magnetic structure, i.e. the sunspot group was not visible any more. The magnetic arcades extend to the corona and are, in this way, visible above the limb, while a sunspot is restricted to the solar surface. During this event, a dark structure next to the active region visible in SDO/AIA 193 erupted. Bright post-flare loops started to rise above the limb. This extra radiation is seen in an X-ray flux time line as a long duration event. The X-ray flux intensity stays for an extended period after the flare peak at a high level and decreases slowly compared to the rising phase of the flare. The erupting filament was captured in SDO/AIA 304. This plasma eruption had no influence on the Earth since it was ejected towards the west.

On Sep 10, at 23:49UT, a filament in the NE hemisphere started to rise and was ejected. The event was visible in SDO/AIA 304. In a series of SDO/AIA 193 images, a coronal dimming, i.e. evacuated plasma, occurred along the filament line. A magnetic arcade formed following the evacuation of plasma. The CME was classified as a partial halo CME.

The Sun had another C-flaring period on Sep 20 and 21, this time from behind the east limb. The source region was NOAA AR 1109/Catania 42 and 43. Rotating on the solar disk, its activity decreased to the B-level.

Two confined C-flares occurred on Sep 28. One peaked at 09:48UT. NOAA AR 1110 was the source region, located at N17W16, next to NOAA AR 1109. This event was followed by a coronal dimming around 17UT at the same latitude, 45° to the west. The second event was associated with a very faint CME visible in STEREO Ahead as a partial halo CME.

One day later, Sep 29, a filament in the northeast erupted. The coronal dimming was visible from 08UT onwards in SDO/AIA 193. It was a very faint event in STEREO Ahead/Behind - COR2.

We identified 4 coronal holes (CH) in SDO/AIA-193:

- Thin, longitudinal oriented with a small tilt, from south to above the equator, reaching the central meridian (CM) on Sep 01,
- Two tiny CH's in the northern hemisphere, at the CM on Sep 07,
- A strong northern hemispheric CH, reaching the CM on Sep 19,
- A northern polar CH, near the CM on Sep 24.

II. Geomagnetic Activity

The overall geomagnetic activity was low. The planetary K index was 4 during only one 3-hour period.

In the beginning of the month, the Earth was still under the influence of a fast stream emanating from a northern CH that passed the central meridian the previous month. The influence was limited, with K_p rising to 3.

The next feature in solar wind data from ACE was seen on Sep 05. In the solar wind speed, three bumps were present spanning the time period from Sep 05 to roughly Sep 11. Again, the planetary geomagnetic response was small with a maximum K_p value of 3 from Sep 05 until Sep 08.

Oct 14, the magnetic field strength of the interplanetary magnetic field (IMF) rose to 10nT. On Sep 15, the B_z component decreased from positive values to a slightly negative value, to jump suddenly early Sep 16 to +10nT. It stayed on that value for half a day. This behavior of the magnetic field might be linked to the partial halo CME of Sep 10. The K_p became once 4 on Sep 14.

During the second part of Sep 20, ACE shows an increased IMF. During Sep 21, the solar wind speed was slightly elevated. These changes could be due to the fact that the Earth crossed a sector boundary.

Kp became 3.

The co-rotating interaction region linked with the Sep 19 CH, arrived on Sep 23. The Bz was predominantly positive. On Sep 24, the geomagnetic conditions were unsettled.