RELATIVE SUNSPOT NUMBERS AND SOLAR ACTIVITY 2008-2009

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Locarno, Switzerland   **September 2010**

1. Mean and characteristic figures of solar activitiy

(numbers in parentheses refer to 2007 for comparison)

	2008	2009	(2007)
- Mean daily Sunspot Number (SIDC data)	2.9	3.1	(7.6)
- Lowest daily Sunspot Number (SIDC data)	0	0	(0)
- Highest Sunspot Number (SIDC data)	36	30	(37)
- Mean daily number of sunspot-groups*	0.28	0.27	(0.7)
- Total number of groups in the northern hemisphere*	9	12	(11)
- Total number of groups in the southern hemisphere*	16	14	(33)
- Mean latitude of the northern groups (cycle 23)*	+11.0	-	(+6.3)
- Mean latitude of the southern groups (cycle 23)*	-7.9	-7.3	(-7.7)
- Mean latitude of the northern groups (cycle 24)*	+28.4	+19.7	-
- Mean latitude of the southern groups (cycle 24)*	- 30.0	- 25.4	-

* observations at Locarno Station.

2. Relative Sunspot Numbers

The very simple definition of the Relative Sunspot Number **R**, given by Rudolf Wolf (1851 and 1858) is :

$$R = k(10g + f)$$

were **g** is the number of observed sunspot-groups, **f** the total number of observed sunspots and   **k**   the reduction coefficient; this definition contrasts with the relative complexity of their determination. The contrast is due to the precaution needed to preserve the calibration defined by Rudolf Wolf. Several criteria for the control of this calibration have been enounced by Max Waldmeier (1968, 1971).
At the level of the basic visual observation, a thorough experience is required to determine correctly the number of groups (g), wich is **not necessarily concordant with the physical grouping based on magnetic field polarities**, and in wich, moreover, the limits set between A1 groups and pores may depend upon seeing quality and instrumental parameters. As to f , the weighting of large umbrae (e.g. M.Waldmeier, 1961), must be applied self consistently, even after minimum periods, in order to keep the link to the sunspot areas unchanged.

1 . Definitive Relative Sunspot Numbers for 2008 **(Yearly mean 2.9)**

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	7	11	0	16	7	0	0	0	0	0	9	0
2	7	9	0	9	0	0	0	0	0	0	11	0
3	7	9	7	9	0	0	0	0	0	0	11	0
4	10	8	0	7	7	0	0	0	0	7	10	0
5	8	0	0	0	8	9	0	0	0	0	8	0
6	11	0	8	**0**	0	0	0	0	0	0	7	0
7	11	0	0	0	0	0	0	0	0	0	0	0
8	9	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	8	0	9	0	0	9	0	0	0	7	0	9
11	8	0	0	0	0	8	0	0	7	9	12	8
12	0	0	0	0	0	7	0	0	0	11	14	9
13	0	0	0	7	8	8	0	0	0	9	9	0
14	0	0	0	7	0	0	0	0	0	9	8	0
15	0	0	7	0	9	7	0	0	0	8	8	0
16	0	0	7	0	14	7	0	0	0	12	8	0
17	0	0	7	0	12	7	0	0	0	8	7	0
18	0	0	0	0	15	8	8	0	0	0	0	0
19	0	0	0	8	11	7	9	0	0	0	0	0
20	0	0	0	0	7	8	8	0	0	0	0	0
21	0	0	0	0	0	8	0	7	0	0	0	0
22	0	0	0	8	0	8	0	8	8	0	0	0
23	0	0	0	8	0	0	0	0	9	0	0	0
24	0	0	19	7	0	0	0	0	0	0	0	0
25	0	8	32	0	0	0	0	0	0	0	0	0
26	0	8	**36**	0	0	0	0	0	0	0	0	0
27	0	8	35	0	0	0	0	0	0	0	0	0
28	0	0	34	0	0	0	0	0	0	0	0	0
29	0	0	30	0	0	0	0	0	8	0	0	0
30	8	-	31	0	0	0	0	0	0	0	0	0
31	8	-	25	-	0	-	0	0	-	9	-	0
Mean	3.3	2.1	9.3	2.9	3.2	3.4	0.8	0.5	1.1	2.9	4.1	0.8

From January1,1981, the relative numbers are being calculated at the Royal Belgian Observatory and edited by the Sunspot Index Data Center, (now Solar Influences Data analysis Center, SIDC), according to a metod wich hardly differs from that used in Zürich, in order to preserve the omogeneity of the series.

For the years 2008 and 2009 the daily definitive data are reported in Tables 1 and 2.

2 . Definitive Relative Sunspot Numbers for 2009 **(Yearly mean 3.1)**

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	11	0	0	8	7	0	0
2	0	0	0	0	0	12	0	0	0	0	0	0
3	0	0	0	0	0	11	0	0	0	0	0	0
4	0	0	0	0	7	9	14	0	0	0	0	0
5	0	0	0	0	0	8	16	0	0	0	7	0
6	0	0	8	0	0	0	14	0	0	0	8	0
7	0	0	8	0	0	0	11	0	0	0	0	0
8	0	0	0	0	0	0	12	0	0	0	0	0
9	7	0	0	0	0	0	10	0	0	0	8	7
10	9	0	0	0	0	0	9	0	0	0	7	8
11	10	8	0	0	0	0	0	0	0	8	7	8
12	8	7	0	0	0	0	0	0	0	0	0	8
13	0	7	0	0	7	0	0	0	0	0	7	9
14	0	0	0	0	10	0	0	0	0	0	8	20
15	0	0	0	0	9	0	0	0	0	0	7	24
16	0	0	0	0	8	0	0	0	0	0	8	22
17	0	0	0	0	9	7	0	0	0	0	0	17
18	0	0	0	0	8	0	0	0	0	0	7	15
19	7	0	0	0	7	0	0	0	0	0	17	16
20	0	0	0	0	0	0	0	0	0	0	15	29
21	0	0	0	7	0	7	0	0	8	0	9	**30**
22	0	0	0	0	8	8	0	0	13	0	8	22
23	0	0	0	0	8	7	7	0	20	11	0	17
24	0	8	0	0	0	8	0	0	20	16	0	13
25	0	8	0	0	0	0	0	0	17	19	0	0
26	0	0	7	0	0	0	0	0	9	20	0	9
27	0	0	0	0	0	0	0	0	7	20	0	10
28	0	0	0	0	0	0	0	0	10	20	0	12
29	0	-	0	8	0	0	0	0	9	16	0	12
30	0	-	0	8	0	0	7	0	7	11	0	12
31	0	-	0	-	10	-	0	10	-	0	-	14
Mean	1.3	1.4	0.7	0.8	2.9	2.9	3.2	0.0	4.3	4.8	4.1	10.8

The reduction factors (k) effective at Locarno station, resulting from the comparison with the observations of more than 70 collaborating stations of SIDC over the world, are reported at their average montly values in table 3.

Table 3: Monthly k coefficient of the Locarno Station for 2008-2009 (SIDC values)

Month	Nr. of observation		k	
	2008	2009	2008	2009
Jan .	21	23	0.641	0.337
Feb.	27	22	0.674	0.682
Mar.	28	26	0.614	0.615
Apr.	22	24	0.602	0.667
May	25	30	0.650	0.636
June	26	27	0.639	0.585
July	31	31	0.727	0.564
Aug .	29	30	-	-
Sep .	26	27	0.661	0.624
Oct .	22	25	0.647	0.604
Nov.	20	21	0.606	0.604
Dec .	21	24	-	0.584
Total	298	310	0.646	0.588

Standard error (rms) of monthly mean   ± 0.04   ± 0.09

Our observations are made with the Zeiss coudé-refractor (D=150 mm) on projected image . The drawing of the sunspots and the determination of the relative numbers are carried out with the projection of the solar disk of 250 mm in diameter, with the same method utilized in these last 52 years by our observation station.

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