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**RELATIVE SUNSPOT NUMBERS AND SOLAR
ACTIVITY 2004-2005**

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1. Mean and characteristic figures of solar activity

(numbers in parentheses refer to 2003 for comparison)

	2004	2005 (2003)
- Mean daily Sunspot Number (SIDC data)	40.4	29.8 (63.7)
- Lowest daily Sunspot Number (SIDC data)	0	0 (9)
- Highest Sunspot Number (SIDC data)	100	107 (167)
- Mean daily number of sunspot-groups*	3.6	2.7 (5.6)
- Total number of groups in the northern hemisphere*	74	54 (130)
- Total number of groups in the southern hemisphere*	138	91 (189)
- Mean latitude of the northern groups (cycle 25)*	+10.1	+10.8 (+11.5)
- Mean latitude of the southern groups (cycle 25)*	-10.7	-9.4 (-13.4)

* 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) :

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

were g is the number of observed sunspot-groups, f the total number of observed sunspots and k the reduction coefficient, 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), which 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.

Table 1 : Definitive Relative Sunspot Numbers for 2004 (Yearly mean = 40.4)

Day	Month											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	32	43	44	55	44	35	17	23	8	18	76	32
2	40	64	31	51	28	36	20	28	8	16	74	29
3	45	63	26	47	32	37	20	30	18	28	67	30
4	46	60	23	55	33	36	19	33	20	27	58	26
5	44	62	35	57	29	36	16	21	37	21	55	29
6	39	51	39	40	20	29	17	33	32	17	62	24
7	50	40	40	39	16	37	9	44	38	22	63	9
8	53	45	35	27	17	33	11	39	47	23	57	15
9	38	48	38	15	24	34	27	50	51	10	52	13
10	36	48	38	13	29	31	38	58	44	0	32	15
11	32	44	38	13	25	24	47	63	42	0	38	13
12	29	48	48	25	40	18	54	68	43	12	38	22
13	35	48	40	35	37	28	88	76	39	20	42	16
14	34	38	38	42	54	35	90	68	32	20	48	14
15	43	50	32	34	58	44	82	61	39	16	44	8
16	50	41	37	31	73	64	65	54	38	18	41	10
17	49	18	48	50	69	62	79	44	36	44	41	24
18	43	22	54	58	60	67	93	41	33	54	38	21
19	54	18	58	63	58	69	100	36	34	60	35	12
20	61	26	50	59	59	86	91	50	27	66	33	11
21	61	30	48	59	52	87	88	57	24	76	26	15
22	49	30	57	57	47	76	84	66	17	80	29	26
23	42	55	61	43	59	61	74	56	10	93	28	18
24	34	47	57	38	62	52	69	38	10	99	34	22
25	16	53	83	31	55	37	57	31	10	90	34	12
26	13	53	84	34	43	34	64	24	15	91	34	10
27	0	67	88	26	32	31	55	21	15	94	37	10
28	8	66	76	23	30	30	39	20	8	96	29	17
29	16	50	66	24	31	26	24	16	25	89	28	12
30	27	--	54	34	35	22	24	10	31	96	32	20
31	38	--	56	--	34	--	23	9	--	91	--	22
Mean	37.3	45.8	49.1	39.3	41.5	43.2	51.1	40.9	27.7	48.0	43.5	17.9

From January 1, 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 method which hardly differs from that used in Zürich, in order to preserve the homogeneity of the series. For the years 2004 and 2005 the daily definitive data are reported in Tables 1 and 2.

Table 2 : Definitive Relative Sunspot Numbers for 2005 (Yearly mean = 29.8)

Day	Month											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1	32	19	0	16	42	53	78	63	17	9	18	49
2	32	17	8	20	42	40	95	69	14	8	19	54
3	24	11	9	28	47	33	101	48	9	10	11	60
4	14	15	8	33	43	49	107	40	9	14	12	55
5	11	16	9	35	40	62	103	40	8	17	12	55
6	12	38	10	29	45	64	84	33	8	15	14	45
7	11	38	18	28	37	73	75	39	14	14	25	23
8	10	35	33	27	46	68	64	37	20	12	8	25
9	14	39	38	27	63	67	57	34	28	10	8	23
10	19	48	41	27	77	70	42	16	35	16	0	39
11	27	52	43	13	82	55	41	22	34	14	0	38
12	40	56	42	21	80	52	38	27	37	14	10	33
13	41	48	42	29	62	31	41	22	50	0	12	38
14	54	48	40	35	51	33	30	26	41	8	19	38
15	59	52	37	36	39	40	21	27	39	8	20	36
16	65	45	28	28	43	43	11	24	33	8	23	31
17	64	43	25	26	33	48	8	20	35	8	24	28
18	61	37	25	26	26	32	0	19	33	8	26	28
19	45	31	26	26	23	29	9	44	26	16	26	43
20	42	27	25	24	15	31	0	48	14	9	33	39
21	45	20	30	16	13	34	0	39	13	8	27	42
22	31	20	28	16	24	27	8	38	14	7	27	41
23	26	16	32	14	25	11	16	36	19	8	24	36
24	28	11	41	9	25	11	11	42	17	0	27	53
25	32	8	34	10	30	12	12	41	16	0	20	43
26	23	12	26	11	44	0	15	37	22	0	15	52
27	20	8	22	17	44	8	11	42	16	0	16	51
28	20	7	10	30	37	9	18	46	15	0	17	44
29	19	--	9	35	43	28	34	43	14	8	16	45
30	22	--	7	34	46	67	43	37	7	9	30	46
31	26	--	15	--	58	--	69	29	--	12	--	41
Mean	31.3	29.2	24.5	24.2	42.7	39.3	40.1	36.4	21.9	8.7	18.0	41.1

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 monthly values in table 3.

Table 3: Monthly k coefficient of the Locarno Station for 2004-2005 (SIDC values)

Month	Nr. of observation		k	
	2004	2005	2004	2005
Jan.	24	29	0.600	0.632
Feb.	24	25	0.611	0.607
Mar.	25	27	0.610	0.601
Apr.	24	25	0.609	0.586
May	26	28	0.615	0.609
June	28	28	0.615	0.639
July	28	30	0.606	0.592
Aug.	29	29	0.593	0.617
Sep.	28	27	0.589	0.602
Oct.	21	22	0.617	0.583
Nov.	25	22	0.602	0.595
Dec.	25	25	0.583	0.616
Total	307	317	0.604	0.607
Average quadratic error			± 0.011	± 0.017

Our observations are made with the Zeiss coude-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 49 years by our observation station.

References

- Wolf, R. : 1851, Mittheilungen der Naturforschenden Ges. in Bern, N°206/207
 1858, Astronomische Mittheilungen Sternwarte Zuerich, N°6.
 Waldmeier, M.: 1961, The Sunspot Activity in the Years 1610-1960, Schulthess, Zh. p.7
 Cortesi, S. : 1983, Astronomische Mitt. N°377 (Comunicaz. Specola Solare Ticinese N°1)
 1985, Astronomische Mitt. N°378 (Comunicaz. Specola Solare Ticinese N°2)
 1987, Astronomische Mitt. N°379 (Comunicaz. Specola Solare Ticinese N°3)
 1988, Astronomische Mitt. N°380 (Comunicaz. Specola Solare Ticinese N°4)
 1989, Astronomische Mitt. N°381 (Comunicaz. Specola Solare Ticinese N°5)
 1991, Astronomische Mitt. N°382 (Comunicaz. Specola Solare Ticinese N°6)
 1992, Astronomische Mitt. N°384 (Comunicaz. Specola Solare Ticinese N°8)
 1994, Astronomische Mitt. N°385 (Comunicaz. Specola Solare Ticinese N°9)
 1996, Astronomische Mitt. N°386 (Comunicaz. Specola Solare Ticinese N°10)
 1998, Astronomische Mitt. N°387 (Comunicaz. Specola Solare Ticinese N°11)
 2000, Astronomische Mitt. N°388 (Comunicaz. Specola Solare Ticinese N°12)
 2002, Astronomische Mitt. N°389 (Comunicaz. Specola Solare Ticinese N°13)
 2004, Astronomische Mitt. N°390 (Comunicaz. Specola Solare Ticinese N°14)

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