

# QUARTERLY BULLETIN ON SOLAR ACTIVITY

Published by the Tokyo Astronomical Observatory

with financial support from UNESCO

## I. SUNSPOTS

### Sunspot Relative-Numbers and Sunspot-Areas

Cooperating Observatories for Sunspot Relative-Numbers: Ankara, Arosa, Athens (National Observatory), Athens (Eugenides Planetarium), Bucarest, Catania, Helwan, Hurbanovo, Istanbul, Kandilli, Kanzelhöhe, Kiev, Kislovodsk, Locarno, Madrid, Manila, Mitaka - Tokyo, Potsdam, Quezon - City, Roma - Monte Mario, Roquetas - Tortosa, Santiago de Chile, Skalnaté Pleso, Taipei, Tashkent, Tokyo (Science Museum), Uccle, Zürich.

The first column gives the Relative-Numbers for the whole disk of the sun ( $R$ ), the second that for the central zone ( $R_C$ ). The diameter of the central zone is half that of the sun's disk.

The Sunspot-Areas  $A$  are based upon measurements made at Catania  $A_C$ , Roma - Monte Mario  $A_R$ , and at Locarno and Zürich (combined values)  $A_Z$ . The apparent total area of the umbra plus penumbra is uncorrected for foreshortening and expressed in millionths of the solar disk.

1977	Jan.	$R$	$R_C$	$A_C$	$A_R$	$A_Z$
	1	20	0	147	--	--
	2	32	0	180	--	225
	3	25	0	184	--	--
	4	25	0	127	--	--
	5	24	0	53	--	--
	6	13	7	5	--	4
	7	0	0	0	--	0
	8	0	0	--	--	0
	9	0	0	--	--	0
	10	0	0	0	--	--
	11	14	14	42	--	--
	12	22	22	110	--	--
	13	23	23	252	464	570
	14	22	0	462	--	--
	15	24	0	378	--	--
	16	18	0	252	--	--
	17	30	17	252	309	215
	18	26	9	84	--	40
	19	7	0	0	16	--
	20	0	0	0	--	0
	21	15	0	21	--	18
	22	24	0	84	--	--
	23	34	7	--	--	--
	24	35	8	131	--	229
	25	20	7	126	127	--
	26	14	7	63	--	--
	27	0	0	0	--	0
	28	13	0	53	--	--
	29	11	0	47	--	--
	30	8	0	5	--	--
	31	10	0	42	--	11
	Mean	16.4	3.9	111	229	101

1977	Feb.	R	R <sub>C</sub>	A <sub>C</sub>	A <sub>R</sub>	A <sub>Z</sub>
	1	15	0	74	--	--
	2	19	0	105	239	152
	3	19	0	95	--	84
	4	16	0	95	--	20
	5	18	0	32	--	10
	6	7	0	5	--	4
	7	7	0	0	--	--
	8	26	0	84	128	55
	9	21	0	315	--	216
	10	25	0	336	--	--
	11	28	0	294	525	441
	12	48	14	793	837	366
	13	68	15	--	--	837
	14	61	14	421	795	488
	15	45	13	431	668	529
	16	49	0	384	--	451
	17	47	0	395	--	354
	18	37	9	430	--	407
	19	25	9	210	--	--
	20	14	14	226	--	--
	21	9	9	105	--	159
	22	9	9	137	--	114
	23	9	0	95	--	112
	24	8	0	42	--	69
	25	8	0	42	--	45
	26	8	0	21	--	22
	27	0	0	0	--	0
	28	0	0	0	0	0
	Mean	23.1	3.8	191	456	215

  

1977	Mar.	R	R <sub>C</sub>	A <sub>C</sub>	A <sub>R</sub>	A <sub>Z</sub>
	1	0	0	0	0	--
	2	8	0	0	--	11
	3	8	0	32	70	44
	4	8	0	53	--	71
	5	8	0	21	80	92
	6	9	0	63	--	77
	7	8	8	21	--	61
	8	20	20	--	--	90
	9	20	20	100	--	200
	10	19	0	147	--	145
	11	19	0	63	--	120
	12	14	0	47	--	--
	13	8	0	37	--	28
	14	7	0	0	0	2
	15	0	0	0	0	0
	16	0	0	0	0	0
	17	8	0	0	--	1
	18	0	0	0	--	0
	19	0	0	0	--	--
	20	0	0	0	--	--
	21	0	0	0	0	0
	22	10	0	47	70	--
	23	9	0	32	--	12
	24	7	0	16	--	0
	25	14	0	0	0	8
	26	8	0	5	--	6
	27	9	0	5	--	4
	28	16	8	37	--	14
	29	16	0	16	--	--
	30	8	0	--	--	3
	31	8	0	--	0	--
	Mean	8.7	1.8	27	22	41

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financially supported by the Federation of Astronomical and Geophysical Services (FAGS),  
established by the International Council of Scientific Unions (ICSU).

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The Sunspot-Areas A are based upon measurements made at Catania  $A_C$ , Roma-Monte Mario  $A_R$ , and at Locarno and Zürich (combined values)  $A_Z$ . The apparent total area of the umbra plus penumbra is uncorrected for foreshortening and expressed in millionths of the solar disk.

1977	Apr.	R	$R_C$	$A_C$	$A_R$	$A_Z$
	1	7	0	--	0	2
	2	11	0	--	--	20
	3	10	0	21	--	4
	4	7	0	5	0	3
	5	7	0	0	0	2
	6	8	0	11	0	4
	7	7	0	--	0	--
	8	0	0	--	--	--
	9	0	0	--	--	--
	10	0	0	0	--	0
	11	8	0	0	--	16
	12	12	0	74	--	96
	13	16	0	147	213	--
	14	22	0	231	--	--
	15	29	7	200	399	375
	16	31	25	252	420	342
	17	32	32	331	--	314
	18	29	21	289	287	298
	19	22	22	247	--	--
	20	12	0	--	--	258
	21	20	0	--	169	187
	22	19	0	126	111	113
	23	18	0	84	96	61
	24	8	0	58	--	--
	25	0	0	0	--	--
	26	14	0	42	48	31
	27	8	0	32	70	66
	28	11	0	21	80	59
	29	10	0	21	80	--
	30	9	9	26	70	--
Mean		12.9	3.9	96	120	113

1977	May	R	R <sub>C</sub>	A <sub>C</sub>	A <sub>R</sub>	A <sub>Z</sub>
	1	15	8	21	--	--
	2	14	7	42	--	46
	3	22	8	74	165	--
	4	23	7	126	--	--
	5	18	0	84	159	105
	6	16	0	110	143	122
	7	12	0	105	143	117
	8	19	0	84	--	86
	9	25	0	42	95	88
	10	29	0	158	191	179
	11	34	7	147	179	162
	12	35	10	158	--	161
	13	26	10	99	--	112
	14	33	11	106	--	124
	15	26	18	63	--	59
	16	25	25	79	--	59
	17	20	20	63	--	50
	18	12	0	5	--	--
	19	0	0	0	--	--
	20	11	11	32	0	11
	21	14	0	21	0	12
	22	7	0	5	--	2
	23	7	0	0	0	1
	24	7	0	0	0	3
	25	0	0	0	0	0
	26	7	0	0	0	3
	27	13	0	0	0	6
	28	16	16	32	--	14
	29	20	20	37	--	10
	30	30	21	152	--	145
	31	40	0	384	--	389
	Mean	18.6	6.4	72	77	79
1977	June	R	R <sub>C</sub>	A <sub>C</sub>	A <sub>R</sub>	A <sub>Z</sub>
	1	44	0	514	--	338
	2	43	0	358	--	275
	3	43	12	289	--	314
	4	49	17	247	--	285
	5	40	15	331	--	353
	6	39	0	389	669	--
	7	41	0	735	--	--
	8	38	19	756	--	693
	9	33	21	578	--	693
	10	29	0	494	568	554
	11	27	0	546	--	545
	12	22	9	452	--	462
	13	20	9	410	--	416
	14	25	9	320	--	378
	15	8	0	273	--	--
	16	8	0	252	--	247
	17	8	0	126	--	172
	18	21	0	63	--	117
	19	33	0	95	--	98
	20	21	0	105	--	69
	21	28	0	168	--	256
	22	40	7	347	--	370
	23	57	25	420	--	471
	24	60	45	1071	--	876
	25	74	44	1323	--	1545
	26	71	39	1937	--	1878
	27	74	0	1628	--	1900
	28	65	39	1706	1733	1595
	29	50	32	1418	--	1462
	30	45	28	1218	--	1052
	Mean	38.5	12.3	619	990	645

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1977	July	R	$R_C$	$A_C$	$A_R$	$A_Z$
	1	42	23	798	--	875
	2	45	0	641	--	626
	3	42	0	520	--	533
	4	39	0	620	--	578
	5	40	0	315	--	361
	6	40	7	284	--	240
	7	25	0	221	--	387
	8	20	0	158	--	303
	9	17	0	179	--	181
	10	23	8	105	--	173
	11	9	9	74	--	82
	12	8	0	63	--	53
	13	10	0	47	--	36
	14	7	0	0	0	2
	15	0	0	0	--	0
	16	0	0	0	0	0
	17	0	0	0	--	0
	18	0	0	0	0	0
	19	7	0	0	0	2
	20	8	0	0	0	5
	21	8	0	32	--	--
	22	23	8	42	--	83
	23	30	9	121	--	131
	24	38	8	184	--	182
	25	42	22	141	--	165
	26	42	15	205	--	180
	27	37	25	152	--	164
	28	26	15	137	--	73
	29	16	0	68	--	43
	30	10	0	21	--	--
	31	8	0	0	--	--
Mean		21.4	4.8	165	0	195

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1977	Aug.	R	R <sub>C</sub>	A <sub>C</sub>	A <sub>R</sub>	A <sub>Z</sub>
	1	17	0	47	--	59
	2	15	0	32	57	59
	3	24	8	84	--	90
	4	19	0	105	223	174
	5	23	0	378	--	420
	6	26	0	483	605	634
	7	28	0	504	--	530
	8	25	25	483	668	428
	9	30	24	462	638	421
	10	25	15	315	--	394
	11	23	15	295	--	260
	12	29	0	215	303	210
	13	40	0	142	--	204
	14	40	7	132	--	204
	15	42	9	237	--	195
	16	38	22	95	--	77
	17	36	20	111	--	75
	18	40	11	158	--	66
	19	35	17	121	--	69
	20	33	9	100	128	--
	21	33	0	131	--	--
	22	38	0	178	--	73
	23	15	0	64	--	9
	24	19	0	85	--	25
	25	25	0	106	--	201
	26	34	0	305	--	267
	27	38	0	341	429	--
	28	36	0	320	--	--
	29	40	0	183	--	--
	30	36	0	158	--	--
	31	31	7	79	--	57
	Mean	30.1	6.1	208	381	208

1977	Sep.	R	R <sub>C</sub>	A <sub>C</sub>	A <sub>R</sub>	A <sub>Z</sub>
	1	22	0	74	--	83
	2	29	7	95	--	122
	3	29	15	232	382	360
	4	25	12	147	--	165
	5	20	20	210	--	172
	6	26	15	179	--	155
	7	25	11	178	187	132
	8	18	10	158	--	120
	9	30	0	263	--	--
	10	40	7	782	748	--
	11	45	7	1271	--	--
	12	51	0	1654	1524	1439
	13	48	48	1706	1654	1563
	14	47	47	1618	--	1396
	15	53	53	1617	1617	1367
	16	56	50	1554	--	--
	17	53	34	1470	--	1283
	18	60	0	1187	--	1189
	19	59	0	1029	--	798
	20	60	7	1040	--	719
	21	58	7	877	922	969
	22	42	7	809	--	738
	23	41	0	620	700	781
	24	48	12	452	739	462
	25	46	14	630	--	540
	26	49	16	473	822	538
	27	54	13	488	704	541
	28	61	8	600	726	704
	29	64	18	610	789	593
	30	60	16	530	534	645
	Mean	44.0	15.1	752	861	676

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1977	Oct.	$R$	$R_C$	$A_C$	$A_R$	$A_Z$
	1	43	13	820	803	738
	2	37	17	699	--	--
	3	47	41	682	--	--
	4	47	18	877	1063	817
	5	48	20	777	--	--
	6	55	9	646	--	--
	7	57	0	589	--	--
	8	52	0	404	811	--
	9	47	0	494	--	--
	10	38	15	493	559	--
	11	28	17	630	653	550
	12	33	22	651	--	569
	13	53	30	862	1117	698
	14	48	37	631	--	653
	15	54	29	787	890	724
	16	53	37	636	--	569
	17	51	27	495	882	472
	18	50	28	416	828	342
	19	54	10	567	726	634
	20	54	8	683	--	697
	21	42	17	762	497	717
	22	35	0	614	583	495
	23	30	0	389	--	312
	24	29	0	305	289	280
	25	28	0	279	341	242
	26	30	7	157	--	178
	27	38	0	152	--	87
	28	37	13	100	--	--
	29	42	26	173	--	126
	30	45	24	304	--	215
	31	52	21	657	605	477
	Mean	43.8	15.7	540	710	481

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1977	Nov.	R	R <sub>C</sub>	A <sub>C</sub>	A <sub>R</sub>	A <sub>Z</sub>
	1	44	0	578	--	515
	2	40	0	577	504	454
	3	25	25	588	495	448
	4	22	22	331	430	391
	5	25	15	295	--	228
	6	27	18	211	--	--
	7	34	0	215	175	185
	8	27	0	116	166	111
	9	31	0	116	143	44
	10	25	0	80	172	60
	11	26	0	116	--	71
	12	27	18	152	--	101
	13	28	18	169	--	--
	14	31	8	316	--	--
	15	39	0	253	--	--
	16	49	0	153	--	--
	17	51	0	337	--	--
	18	54	21	1066	--	--
	19	52	31	972	--	--
	20	38	21	683	--	--
	21	32	0	220	--	--
	22	28	7	69	--	108
	23	24	11	26	--	--
	24	18	0	--	--	--
	25	10	0	--	--	--
	26	9	0	21	--	--
	27	14	0	0	--	--
	28	9	0	--	--	2
	29	10	0	--	--	--
	30	23	0	--	--	--
	Mean	29.1	7.2	306	298	209
1977	Dec.	R	R <sub>C</sub>	A <sub>C</sub>	A <sub>R</sub>	A <sub>Z</sub>
	1	20	7		--	405
	2	20	0		--	570
	3	31	8		--	--
	4	47	20		--	--
	5	58	29		--	707
	6	58	18		--	--
	7	55	13		--	1084
	8	45	0		--	--
	9	58	0		--	--
	10	75	39		--	--
	11	71	28		--	1039
	12	62	19		1067	--
	13	44	10		--	--
	14	37	12		--	187
	15	41	10		--	86
	16	39	20		--	99
	17	29	20		--	47
	18	33	21		--	109
	19	40	20		389	250
	20	23	0		265	220
	21	23	7		321	259
	22	17	0		385	311
	23	23	10		--	330
	24	31	9		--	--
	25	35	0		--	--
	26	41	0		--	--
	27	50	7		461	381
	28	45	8		--	407
	29	58	28		--	551
	30	64	30		--	--
	31	67	35		--	--
	Mean	43.2	13.8		481	391

NO MEASUREMENTS AVAILABLE DUE TO RECONSTRUCTION OF THE INSTRUMENTAL EQUIPMENT