Bulletin Werkgroep Zon — Januari 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr60	Groe	Jn 9	Jn40	Kroe	vSlo	Son	Spa	Stam	Zans	Uccle groups	Uccle spots
1														
2									27				2	9
3	76												7	33
4	96		93					97			47			
5			98					86					5	54
6	124			66	50	50		124				86	7	63
7					49			130	121					
8		91		61				126	128	138	61		8	53
9	136	86			63			120	113			83	8	93
10					52			136	162		69	98	8	63
11	178	92			74			144	156	173		104	8	68
12					64	64		124				110		
13														
14														
15		74		84	56			114	111		34	100		
16	128	83		83	56			131	120		34	96	9	24
17					69			105	126				9	35
18											32			
19	123													
20														
21				77	45	45	85	90			30		10	39
22		76							109	119				
23														
24	120	87	134	76	63		136	122	103	99			7	61
25	80	63			50			86	68	87			4	33
26	89				48									
27				75	46						24			
28				93	45	46								
29					58			133		137				
30					45			82		96				
31	51	48	60	45	34		55	64	47	65				
observ	11	9	4	9	18	4	3	18	13	8	8	7		
k	0,73	1,07	0,66	1,10	1,55	1,68	0,70	0,74	0,80	0,69	2,22	1,04		
st.dev.	0,08	0,16	0,06	0,28	0,28	0,14	0,13	0,09	0,10	0,06	0,61	0,17		
st.d./ k	0,11	0,15	0,09	0,26	0,18	0,09	0,18	0,12	0,13	0,09	0,27	0,17		

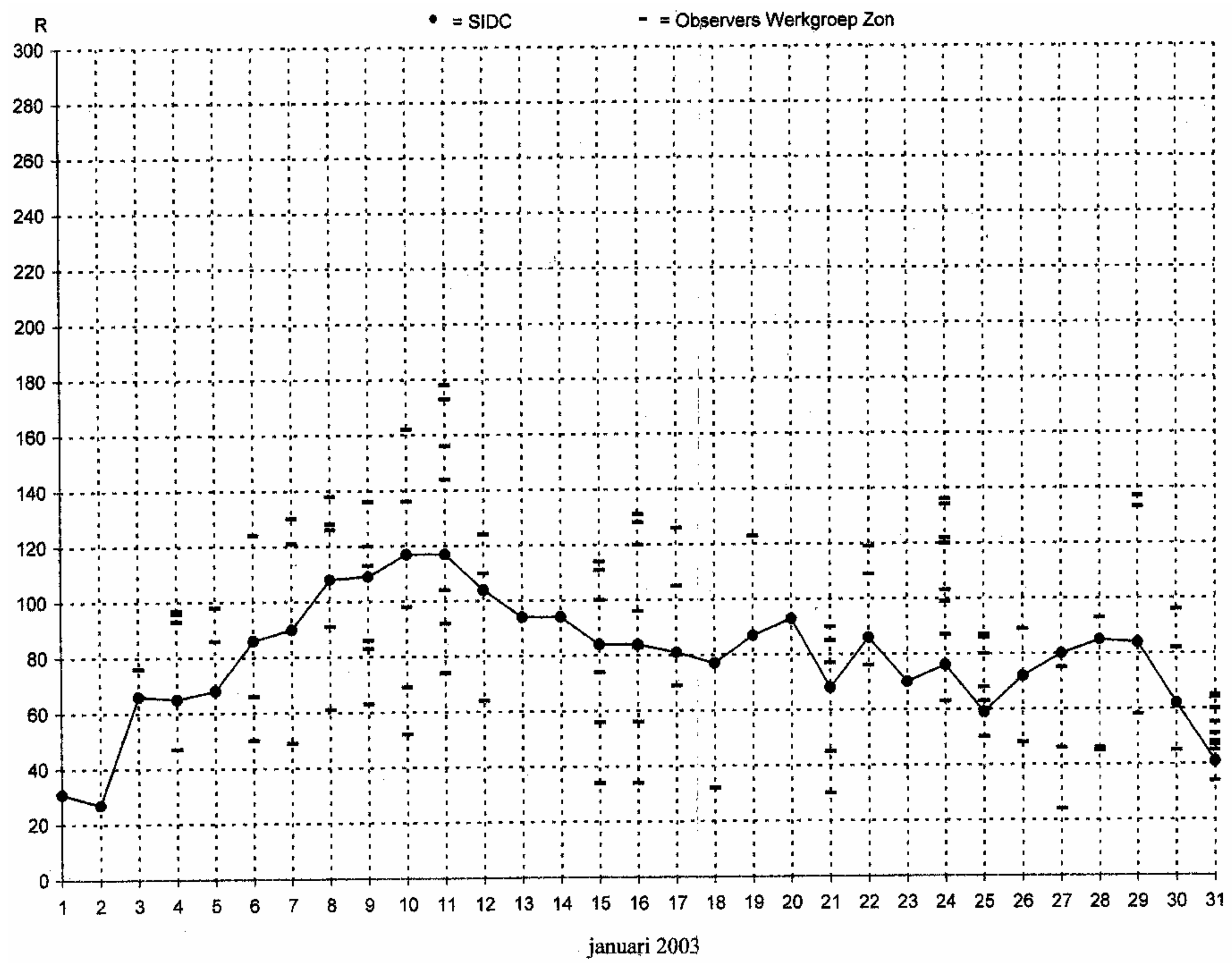
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Son = A.T. Son [Rf 150 Kutter]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Spa = T. Spaninks [75]
Gr60 = Mw G. Gravers [60]	Kroe = K. Kroesen [102]	Stam = R.Stammes [100]
Groe = A.Groenewegen [102]	vSlo = B. van Slooten [90]	Zans = W. Zanstra [Rf 155]

S.I.D.C. SUMMARY OF THE URSIGRAMS

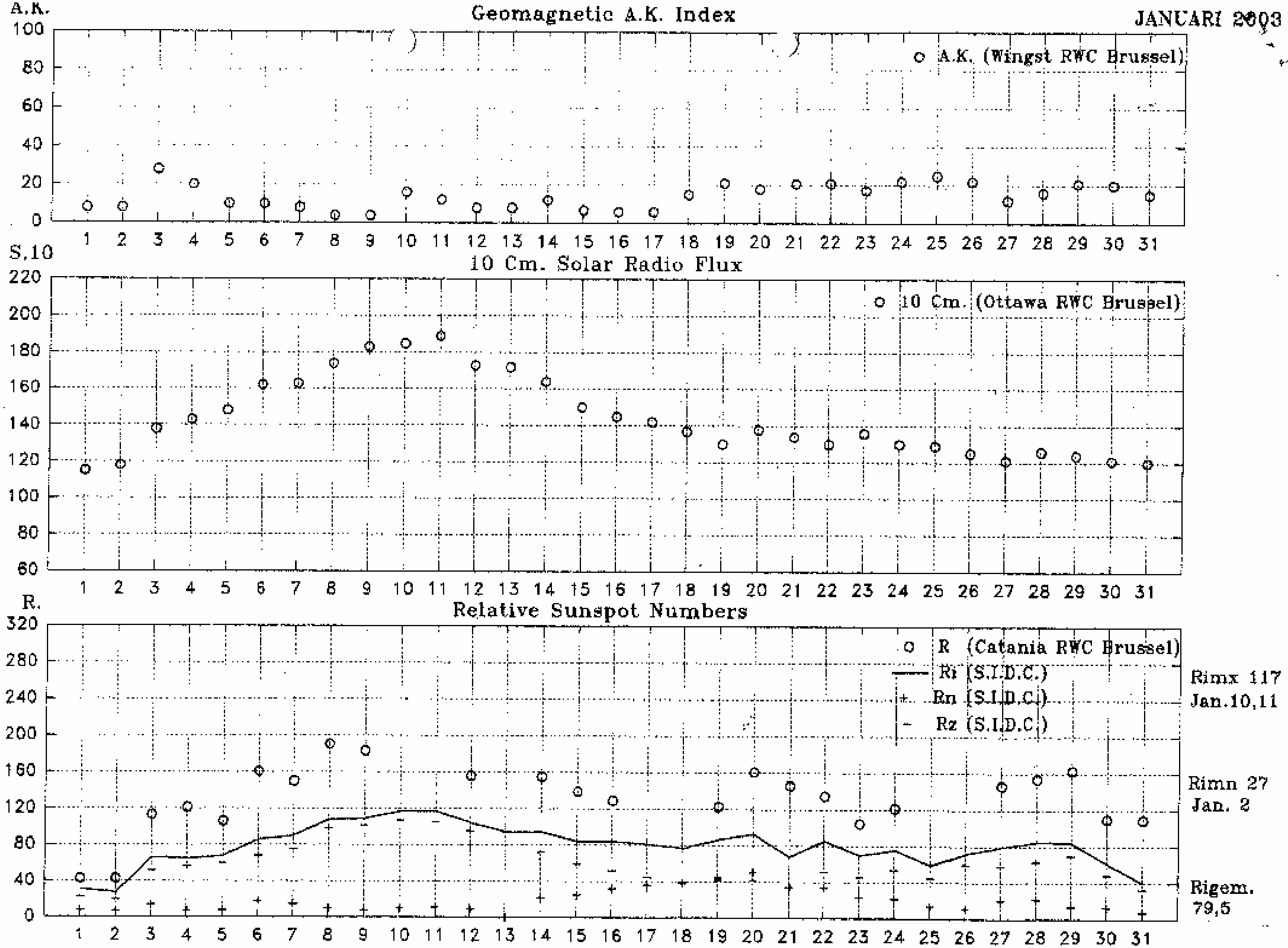
Date	R'_i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	33	35	54	115	847	0	0/0	7	
1	31	25	47	115	-	0	0/0	8	
2	27	25	-	118	847	1	0/0	8	
3	66	33	-	138	840	8	0/0	28	
4	65	76	59	143	843	12	0/0	20	
5	68	98	63	148	844	7	0/0	10	
6	86	108	58	162	846	2	0/0	(10)	
7	90	108	61	163	845	17	2/0	8	
8	108	130	-	174	847	22	0/0	4	
9	109	138	-	183	848	39	1/0	4	
10	117	143	-	185	842	2	0/0	16	
11	117	176	-	189	845	11	0/0	12	
12	104	159	-	173	845	2	0/0	8	
13	94	128	-	172	852	4	0/0	8	
14	94	163	59	164	847	0	0/0	12	
15	84	123	59	150	849	1	0/0	7	
16	84	99	57	145	835	20	0/0	6	
17	81	82	57	142	855	1	0/0	6	
18	77	75	-	137	855	0	0/0	15	
19	87	72	54	130	855	1	0/0	21	
20	93	55	51	138	851	4	0/0	18	
21	68	105	-	134	851	5	1/0	21	
22	86	54	53	130	850	13	1/0	21	
23	70	74	-	136	844	29	2/0	17	
24	76	91	53	130	832	23	1/0	22	
25	59	93	53	129	826	1	0/0	25	
26	72	84	51	125	-	1	0/0	22	
27	80	71	50	121	819	2	0/0	12	
28	85	70	-	126	827	0	0/0	16	
29	84	67	52	124	830	1	0/0	21	
30	62	44	52	121	833	10	0/0	20	
31	41	29	50	120	837	0	0/0	15	

- **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 x Sn+10 x "1"+100 x ">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.


R
• = SIDC
- = Observers Werkgroep Zon
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
januari 2003

JANUARI 2003



Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

Januari 2003

	S.I.D.C.		Balster		Groenew		Jannink40		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	8	23														
2	7	20									27	0				
3	14	52	11	65												
4	8	57	12	84					11	86						
5	8	60							12	74						
6	18	68	25	99	23	43	11	39	25	99					25	61
7	15	75							14	116	46	75				
8	10	98			0	61			15	111	13	115	15	123		
9	8	101	12	124					12	108	44	69			0	83
10	10	107							12	124	54	108			0	98
11	12	105	26	152					28	116	26	130	28	145	0	104
12	9	95					0	64	14	110					0	110
13	0	94														
14	22	72														
15	25	59			34	50			34	80	33	78			24	76
16	32	52	52	76	33	50			54	77	46	74			35	61
17	36	45							43	62	62	64				
18	38	39														
19	45	42	64	59												
20	51	42														
21	34	34			27	50	22	23	28	62						
22	34	52									57	52	43	76		
23	24	46														
24	22	54	27	93	23	53			25	97	26	77	24	75		
25	14	45	17	63					24	62	26	42	24	63		
26	12	60	17	72												
27	21	59			25	50										
28	22	63			15	78	13	33								
29	14	70							20	113			22	115		
30	13	49							18	64			18	78		
31	8	33	15	36	11	34			27	37	47	0	27	38		

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Solar activity was low beginning of the month but increased from Jan 3, with C-flares originated from two new sunspot groups Cat 02 (NOAA 0242) and Cat 03 (NOAA 0244). A non-earth directed CME on Jan 3 was associated with an erupting solar filament. Solar activity became then moderate on Jan 7, with some isolated M-Class flares, produced by active regions Cat 03 (NOAA 0244) and Cat 13 (NOAA 0251). Solar activity remained then low to moderate with Cat regions 02 (NOAA242) and 13 (NOAA0251). The 10.7 cm flux, which has been growing constantly since Jan 1, started to decrease on Jan 13. Solar activity became the low to very low. There was a flareless filament eruption near central meridian on Jan 17 which triggered a semi-halo CME. From Jan 21 to 24, the activity became moderate. Several active regions (Cat 30-NOAA 0269, Cat20-NOAA 0260 and Cat 25- NOAA 0266) produced M class flares. Solar activity remained then low until the end of the month. However, two spectacular prominence eruptions were observed on Jan 27 and 30, the second followed by a full-halo CME.

II. Geomagnetic Activity

A small trans-equatorial coronal produced active conditions on Jan 3 and 4, with a peak at minor storm level. Similar conditions were observed on Jan 10. From Jan 18 to 25, The field index reached often minor storm levels, also due to coronal hole activity. Two other minor geomagnetic storms were also recorded, on Jan 29-30 and Jan 31 the latter being probably due to CME material arrival. Outside of these activity periods, the field was quiet to unsettled.

III. noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA	NOTE
07	0729	0750	0811	S24E07	M1.0	1F		III/1	03	0244	
07	2325	2333	2340	S1 E89	M4.9	SF	81		13	0251	EIT deriv. location
09	0127	0139	0203	S07W24	C9.8	1F		III/1	02	0242	
09	0532	0537	0544	S14E64	M1.0	1N			13	0251	
21	1459	1526	1552	S07E90	M1.9		380		30	0269	EIT deriv. location
22	0435	0444	0450	N15W05	M1.2	1F			20	0260	
23	0442	0448	0456		M1.0				25	0266	
23	1228	1243	1249	S22E17	M2.5	1N	76	II/2	25	0266	
24	0312	0327	0340	S22E10	M1.9	1N	97	II/3,III/2	25	0266	

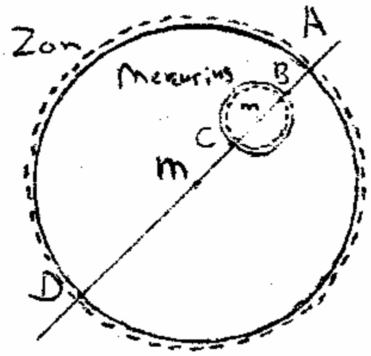
Xray: Xray flare class
op: optical flare class
10 cm: radio flux on 10 cm
type: type of radio-burst
Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection

Waarnemingsactie

Bepaal zelf nauwkeurig de diameter van de zon aan de hand van foto's van de Mercuriusovergang op 7 mei 2003.

Maak gedurende de overgang zoveel mogelijk opnamen in het primaire focus van een grote telelens of telescoop. Geen oculairprojectie; dit geeft vertekening. Noteer bij elke opname nauwkeurig het tijdstip.

Bepaal op elke opname nauwkeurig het midden van de zonneschijf en het midden van het Mercuriusschijfje; zie figuur.



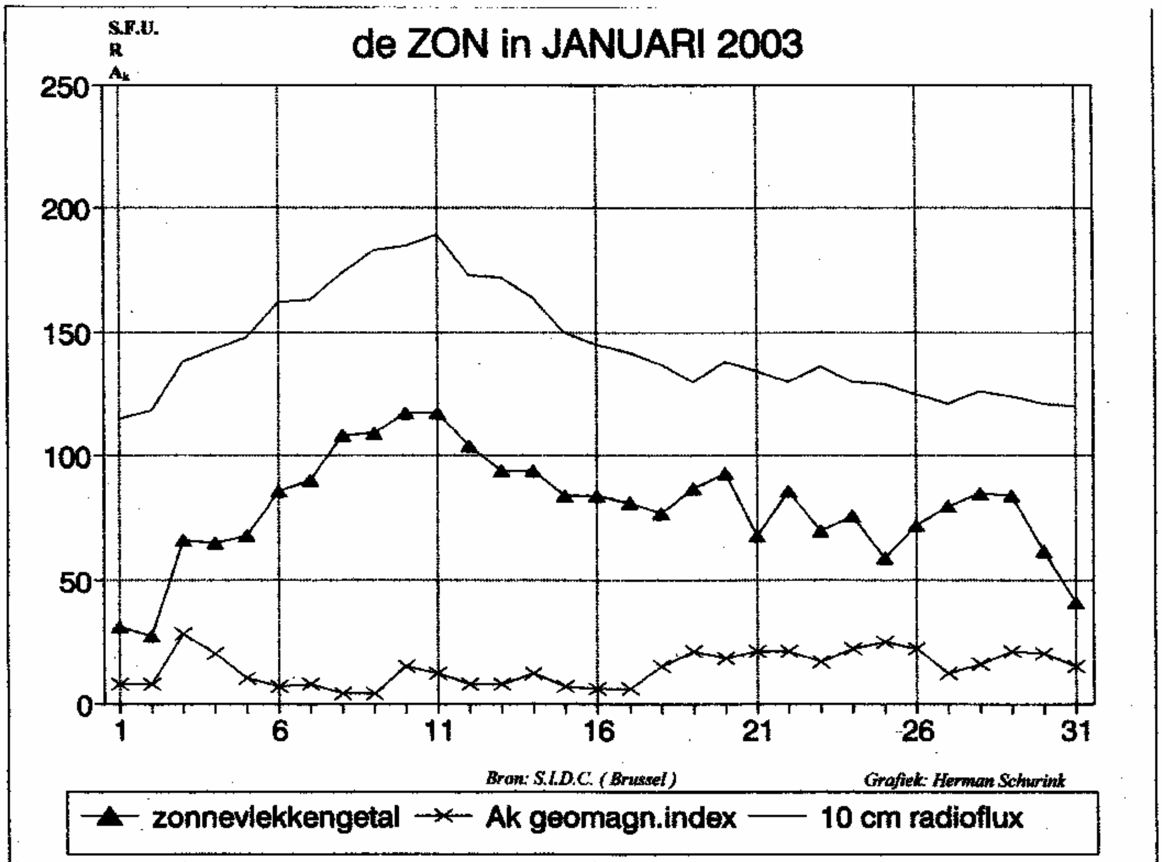
Meet op elke foto b.v. in mm de afstanden Mm (afst.midden zonneschijf-midden Merc.sch.), DB en CA. Bereken bij elke foto Mm/(DB+CA).
Zet de waarden van dit quotiënt uit in een grafiek tegen de tijd. (Merk op dat DB+CA is gelijk aan de zonnediameter + 2x diameter Mercurius). Bepaal grafisch of met een regressieparabool de minimumwaarde van Mm/(DB+CA). Dit is wanneer Mercurius het midden van de zon het dichtst is genaderd. Volgens de Sterrengids is dit 703" ; het Mercuriusschijfje is volgens dezelfde Sterrengids 12". Dan wordt Mm/(DB+CA) = 703 / (Diam.zon + 2x12).
De zonsdiameter komt dan nauwkeurig uit deze vergelijking rollen. Vergelijk dit met de officiële waarde voor 7 mei: 1902,3".

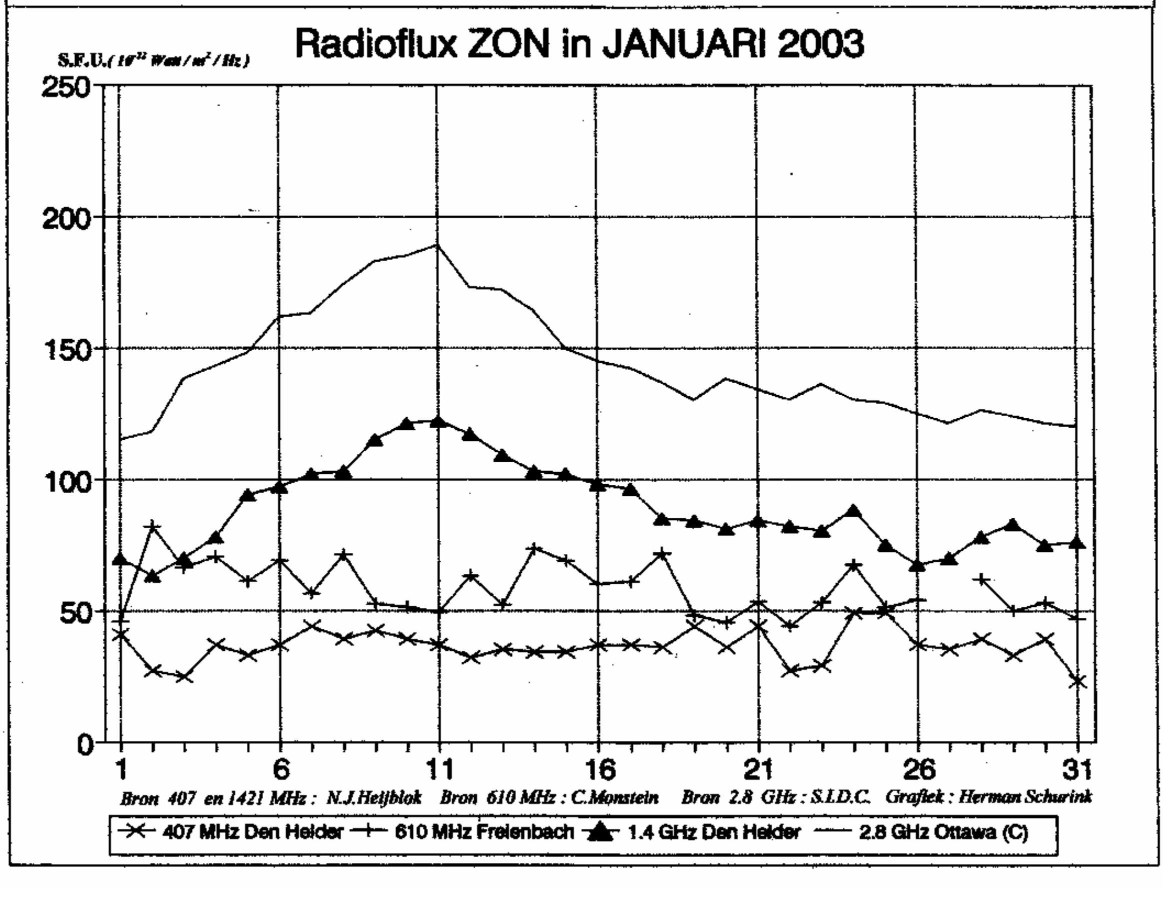
Waarom meten we op zo'n manier? Door de breking in de dampkring wordt de zon afgeplat afgebeeld. De stukken Mm, DB en CA liggen alle op eenzelfde lijn, zodat alle op dezelfde manier zijn vertekend. De onderlinge verhoudingen blijven gelijk; het quotiënt Mm/(DB+CA) wordt er niet door aangetast. Verder hebben we te maken met overstraling. Door het felle zonlicht wordt de zonneschijf op de foto te groot en die van Mercurius daardoor weer te klein afgebeeld (zie fig.). Door de afstanden DB en CA te meten valt de overstraling aan de zonsrand weg tegen de overstraling aan de Mercuriusrand. Dit is niet het geval als we de diameter DA rechtstreeks zouden meten.

Laat mij jouw uitkomsten weten of meld het aan de waarnemingsleider, zodat het in het Bulletin kan worden opgenomen.

D.W.Jannink
Francois Mauriacweg 117
3731 BB De Bilt

P.S. Die minimumafstand van 703" geldt strikt genomen voor een waarnemer in Utrecht. Voor een andere plaats in Nederland zal dat niet zoveel uitmaken omdat de zon en Mercurius zo ver weg staan.


S.F.U.
R
Ak
de ZON in JANUARI 2003
250
200
150
100
50
0
1
6
11
16
21
26
31
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux


Radioflux ZON in JANUARI 2003
250
200
150
100
50
0
1
6
11
16
21
26
31
Bron 407 en 1421 MHz : N.J.Heijblok
Bron 610 MHz : C.Monstein
Bron 2.8 GHz : S.I.D.C.
Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon   Februari 2003

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Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr60	Groe	Jn 9	Jn40	Kroe	vSlo	Son	Spa	Stam	Zans	Zijle	Uccle groups	Uccle spots
1	50				34										
2															
3				34	27			38							
4		33			28			36	44					2	23
5	104	44			27		71	86	103						
6		68			38	51		94	94						
7															
8															
9															
10		87		71	56		82	112	139	92	28		113	8	35
11				86									132	8	28
12															
13	85	61	90	55	33	33		75		80				7	10
14	72	45	60	35	11			62	84	62		35	80	6	16
15										26				1	4
16	37	11	28	0	0			24	35	36	0	12		7	16
17	16	14		0	0			14	14	14	12	15		1	7
18	27	26		23	22			28	29	27	12			2	6
19	56	41		38	34	35		44	49	44	27			3	7
20	62	47			25			63	51	71	37	61		4	24
21	70	53	56	26	25			70			32	47		4	43
22	54	39	47	29	27		45	46		42	29	35		3	34
23	40	32	50	31	25		40	31		35		34	43	2	35
24	37	35		30	24		43	38	46	40	29	32	49	2	24
25	44	39		40	35	34	49	44	44	41	15	41	54	3	13
26	51	33		22	22			60				37	53	3	5
27	77			47	22			66	64	51		36		5	15
28		39	58	35	22		47	55	43	44	22	39	50	4	15
observ	16	18	7	17	21	4	7	20	14	15	11	12	8		
k	0,66	0,96	0,70	1,08	1,55	1,25	0,73	0,74	0,68	0,77	1,48	0,98	0,60		
st.dev.	0,08	0,29	0,10	0,26	0,71	0,40	0,08	0,12	0,10	0,13	0,54	0,32	0,05		
st.d./ k	0,12	0,30	0,14	0,24	0,45	0,32	0,11	0,16	0,15	0,17	0,37	0,33	0,06		

Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Son = A.T. Son [Rf 150 Kutter]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Spa = T. Spaninks [75]
Gr60 = Mw G. Gravers [60]	Kroe = K. Kroesen [102]	Stam = R.Stammes [100]
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		Zijle = W.A. Zijlema [90]

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	41	29	50	120	837	0	0/0	15	
1	40	27	-	126	843	3	1/0	21	
2	43	28	-	127	840	5	0/0	48	
3	36	48	-	133	830	0	0/0	29	
4	35	50	-	135	848	1	0/0	31	
5	54	49	-	140	855	3	0/0	16	
6	68	53	-	150	854	26	1/0	14	
7	82	47	-	147	856	2	0/0	15	
8	87	43	-	139	862	0	0/0	18	
9	93	51	-	141	862	2	0/0	24	
10	73	35	-	136	857	0	0/0	16	
11	73	37	-	135	853	2	0/0	10	
12	71	39	-	132	856	14	0/0	20	
13	59	21	-	131	852	3	0/0	11	
14	45	17	-	131	850	0	1/0	20	
15	31	9	-	124	845	1	0/0	24	
16	22	7	-	119	846	0	0/0	21	
17	10	3	-	112	842	0	0/0	13	
18	20	4	-	110	829	0	0/0	24	
19	33	29	-	116	822	7	0/0	15	
20	44	71	-	118	826	2	0/0	21	
21	46	73	-	120	829	3	0/0	16	
22	34	70	-	107	841	5	0/0	13	
23	28	63	-	104	840	0	0/0	12	
24	28	43	-	102	845	1	0/0	7	
25	32	27	-	102	846	2	0/0	5	
26	30	18	-	109	849	1	0/0	12	
27	43	14	-	118	851	0	0/0	32	
28	34	20	-	125	851	2	0/0	(//)	

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/m²: the quantity to be subtracted from the mean solar constant to account for the sunspot contribution.
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Ak : geomagnetic index from Wingst, Germany (origin : Ursigrams).
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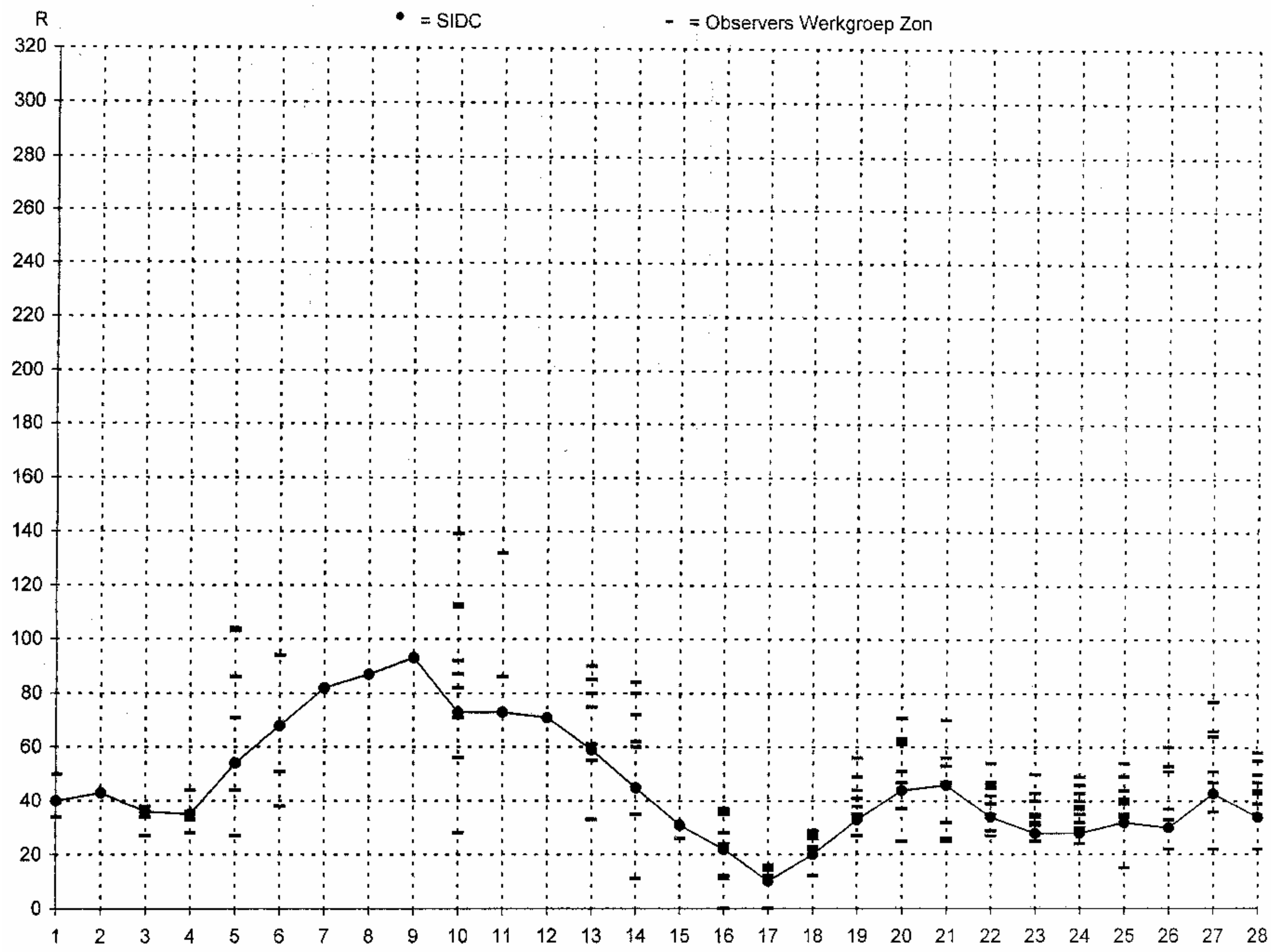
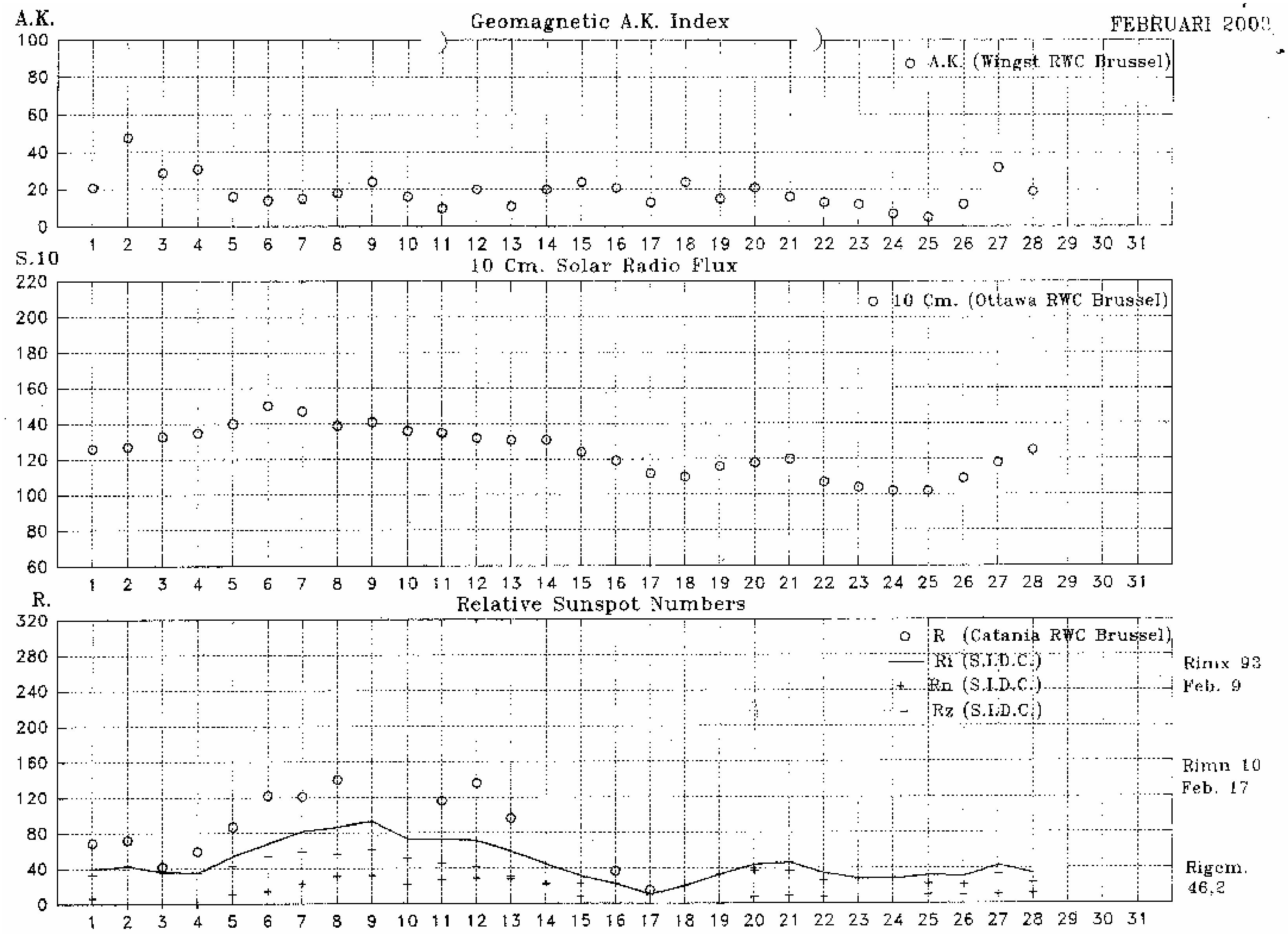


Februari 2003


FEBRUARI 2009
Geomagnetic A.K. Index
A.K.
A.K. (Wingst RWC Brussel)
10 Cm. Solar Radio Flux
S.10
10 Cm. (Ottawa RWC Brussel)
Relative Sunspot Numbers
R.
R (Catania RWC Brussel)
Ri (S.I.D.C.)
Rn (S.I.D.C.)
Rz (S.I.D.C.)
Rimx 93
Feb. 9
Rimn 10
Feb. 17
Rigem.
46,2

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

Februari 2003

	S.I.D.C.		Balster		Groenew		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	7	33	13	37												
2	0	43														
3	0	36			0	34			0	38						
4	0	35							0	36	0	44				
5	11	43	25	79					15	71	77	26				
6	14	54					11	40	17	78	22	72				
7	23	59														
8	31	56														
9	32	61														
10	22	51			12	59			27	85	57	82	25	67		
11	27	46			24	62										
12	29	42														
13	28	31	36	49	22	33	0	33	30	45			24	56		
14	22	23	35	37	13	22			28	34	50	34	28	34	0	35
15	23	8											26	0		
16	22	0	14	23	0	0			24	0	24	11	25	11	12	0
17	10	0	16	0	0	0			14	0	14	0	14	0	15	0
18	20	0	27	0	23	0			28	0	29	0	27	0		
19	33	0	56	0	38	0	35	0	44	0	49	0	44	0		
20	37	7	50	12					50	13	51	0	57	14	47	14
21	37	9	55	15	26	0			54	16					33	14
22	26	8	54	0	29	0			34	12			42	0	35	0
23	28	0	40	0	31	0			31	0			35	0	34	0
24	28	0	37	0	30	0			38	0	46	0	40	0	32	0
25	22	10	30	14	26	14	22	12	29	15	44	0	28	13	27	14
26	21	9	27	24	11	11			25	35					25	12
27	10	33	14	63	11	36			14	52	38	26	12	39	13	23
28	11	23			11	24			23	32	11	32	11	33	11	28

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Solar activity was very low to low during the whole month, with some isolated peaks at moderate level. The large Catania sunspot group 39 (NOAA 0276) reached a beta-gamma configuration but produced only a significant C4.5 limb event on Feb 15, before disappearing.
Catania group 44 (NOAA0278) produced a M-flare on Feb 6, but showed no other significant activity. Two other groups of some importance were Catania 45 (NOAA0280) and 51 (NOAA0284). The first produced a C8.7 on Feb 12 accompanied by a CME partly earth-directed. On Feb 14 a few C-flares due to the second occurred in at the western solar limb, culminating in a M1.2 flare. The last significant event was a beautiful prominence eruption observed by EIT from the SW limb on Feb 26.

II. Geomagnetic Activity

The most prominent geomagnetic event (Kp = 5-6) was a storm that started on Feb 1 and was ongoing the following day. This storm was caused by the full halo CME that left the Sun on Jan 30. During the whole month, several peaks at active to minor storm levels were observed, essentially due to coronal hole activity (on Feb 3-4, 9, 12, 14, 19, 26-28). A small shock due to the arrival of the Feb 12 CME contributed also to the geomagnetic activity on Feb 14.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA	NOTE
01	0848	0905	0938	S15E71	M1.2				39	0276	
06	0330	0349	0401	N19E63	M1.2				44	0278	EIT-location
14	0908	0918	0921	N13W86	M1.2	SF			51	0284	

Xray: Xray flare class
op: optical flare class
10 cm: radio flux on 10 cm
type: type of radio-burst

Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection

S I D C - *News*

2003 n° 1

SIDC DEFINITIVE INTERNATIONAL AND HEMISPHERIC SUNSPOT NUMBERS FOR 2002

	OCTOBER			NOVEMBER			DECEMBER		
Date	Ri	Rn	Rs	Ri	Rn	Rs	Ri	Rn	Rs
1	58	39	19	124	98	26	72	24	48
2	70	44	26	115	77	38	66	32	34
3	67	41	26	123	78	45	64	37	27
4	60	39	21	107	62	45	80	51	29
5	76	41	35	122	64	58	82	53	29
6	81	41	40	137	76	61	82	54	28
7	79	40	39	145	70	75	79	49	30
8	101	57	44	122	48	74	98	53	45
9	106	51	55	129	51	78	107	53	54
10	129	76	53	126	43	83	94	24	70
11	121	79	42	114	29	85	74	26	48
12	122	78	44	100	9	91	65	18	47
13	119	70	49	94	9	85	75	25	50
14	114	61	53	104	24	80	124	48	76
15	116	54	62	102	34	68	119	54	65
16	128	52	76	89	23	66	129	69	60
17	110	42	68	91	23	68	140	71	69
18	118	40	78	83	24	59	134	59	75
19	120	46	74	74	10	64	134	51	83
20	122	62	60	94	22	72	124	50	74
21	93	52	41	82	23	59	112	41	71
22	88	52	36	79	19	60	104	32	72
23	77	51	26	77	16	61	75	19	56
24	73	55	18	67	19	48	57	18	39
25	77	61	16	56	19	37	35	18	17
26	81	59	22	49	23	26	32	15	17
27	84	59	25	68	35	33	29	14	15
28	87	53	34	70	37	33	27	20	7
29	114	66	48	61	36	25	31	20	11
30	120	81	39	61	25	36	29	14	15
31	110	86	24				33	9	24
MEAN :	97.5	55.7	41.8	95.5	37.5	58.0	80.8	36.2	44.6

The Definitive yearly Sunspot Number for 2002 is 104.0

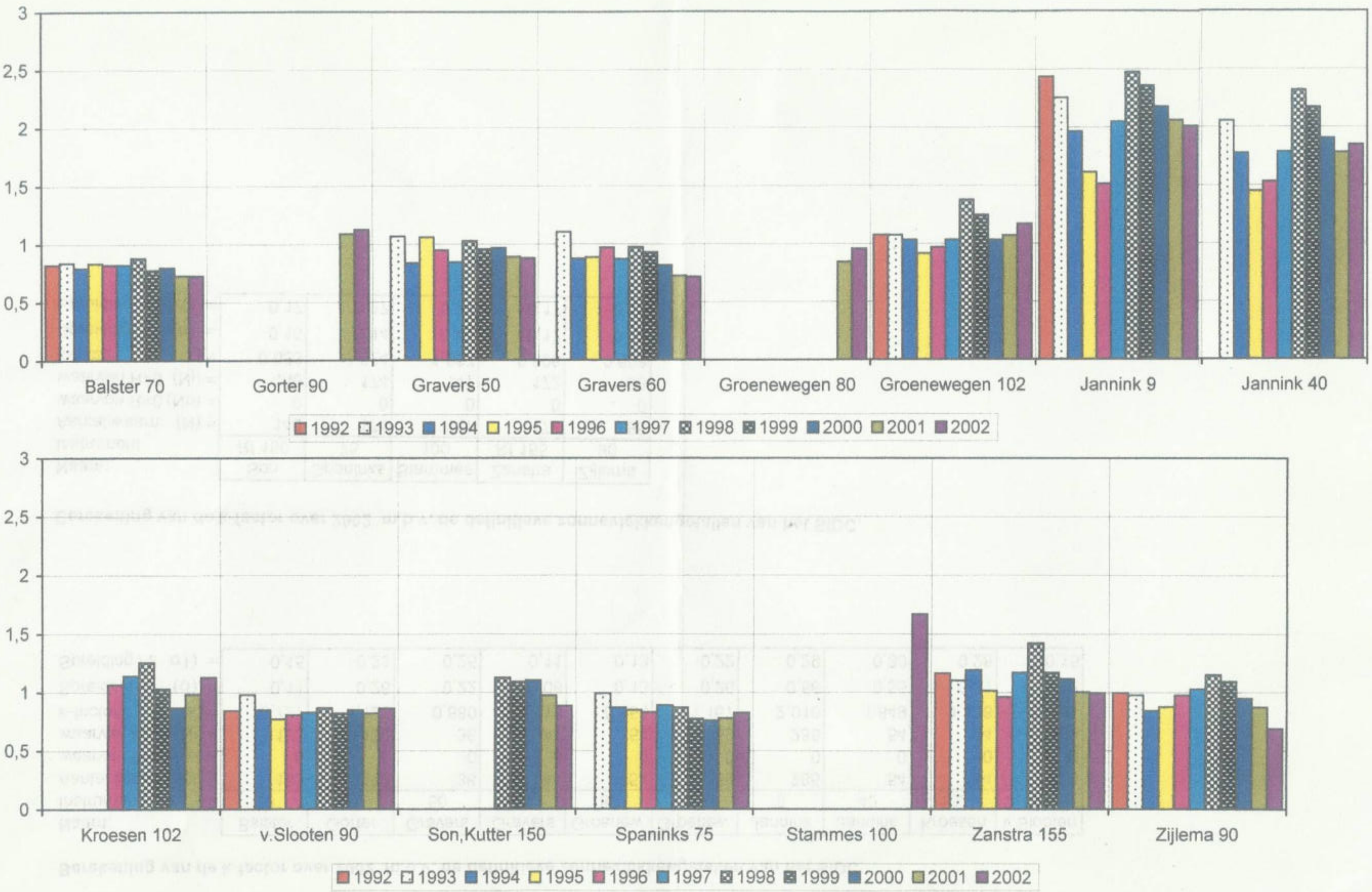
Berekening van de k-factor over 2002 m.b.v. de definitieve zonnevlekkengetallen van het SIDC.

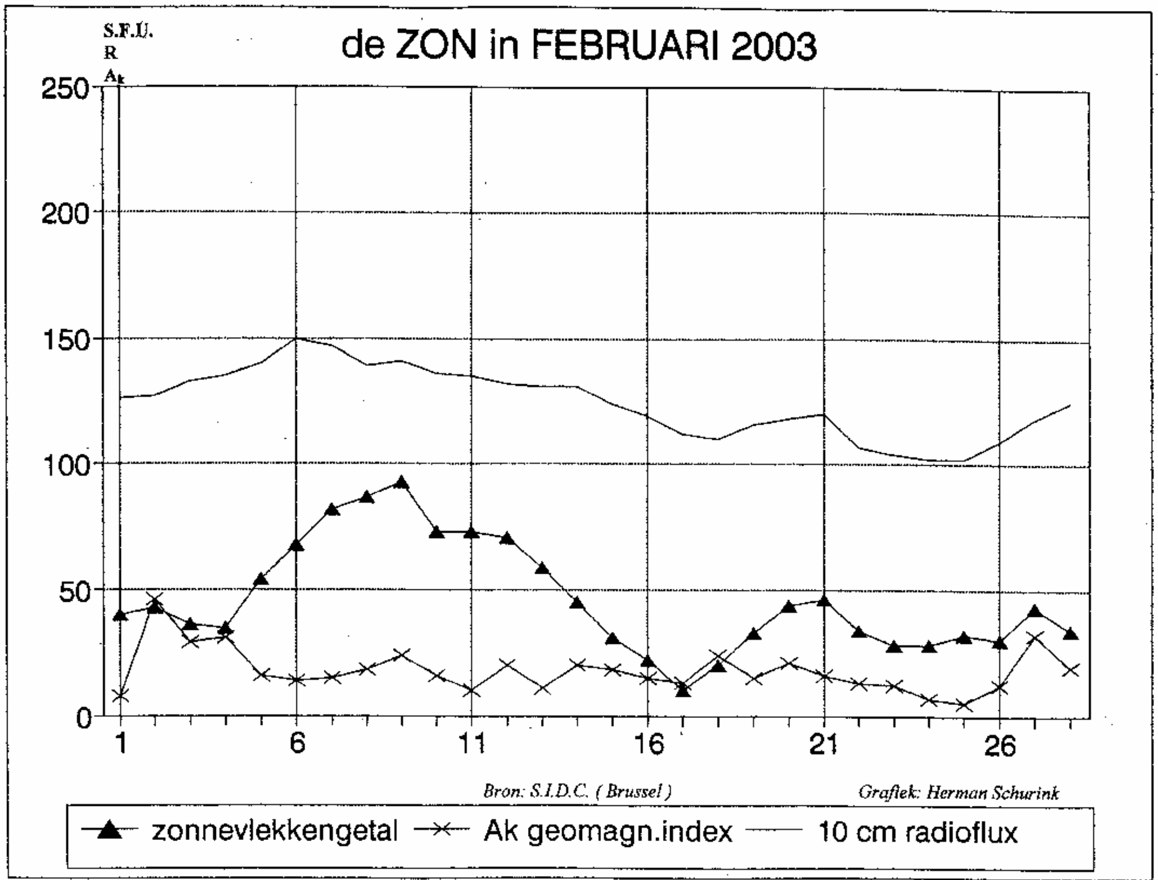
Naam: Instrument	Balster 70	Gorter 90	Gravers 50	Gravers 60	Groenew. 80	Groenew. 102	Jannink 9	Jannink 40	Kroesen 102	v.Slooten 90
Aantal waarn. (N) =	163	170	36	41	54	59	285	54	94	269
waarvan R=0 (No) =	0	0	0	0	0	0	0	0	0	0
waarvan R>0 (Nj) =	163	170	36	41	54	59	285	54	94	269
k-factor (k) =	0,727	1,125	0,880	0,716	0,954	1,167	2,010	1,849	1,128	0,861
Spreiding (σ) =	0,11	0,26	0,22	0,08	0,13	0,26	0,58	0,55	0,31	0,13
Spreiding / k σ1) =	0,15	0,23	0,25	0,11	0,13	0,22	0,29	0,30	0,28	0,15

Berekening van de k-factor over 2002 m.b.v. de definitieve zonnevlekkengetallen van het SIDC.

Naam: Instrument	Son Rf 150	Spaninks 75	Stammes 100	Zanstra Rf 155	Zijlema 90
Aantal waarn. (N) =	146	174	147	172	86
waarvan R=0 (No) =	0	0	0	0	0
waarvan R>0 (Nj) =	146	174	147	172	86
k-factor (k) =	0,883	0,824	1,667	0,996	0,698
Spreiding (σ) =	0,15	0,14	0,44	0,17	0,13
Spreiding / k σ1) =	0,17	0,17	0,27	0,17	0,19

Overzicht jaarlijkse k-factoren




S.F.U.
R
Ak
de ZON in FEBRUARI 2003
250
200
150
100
50
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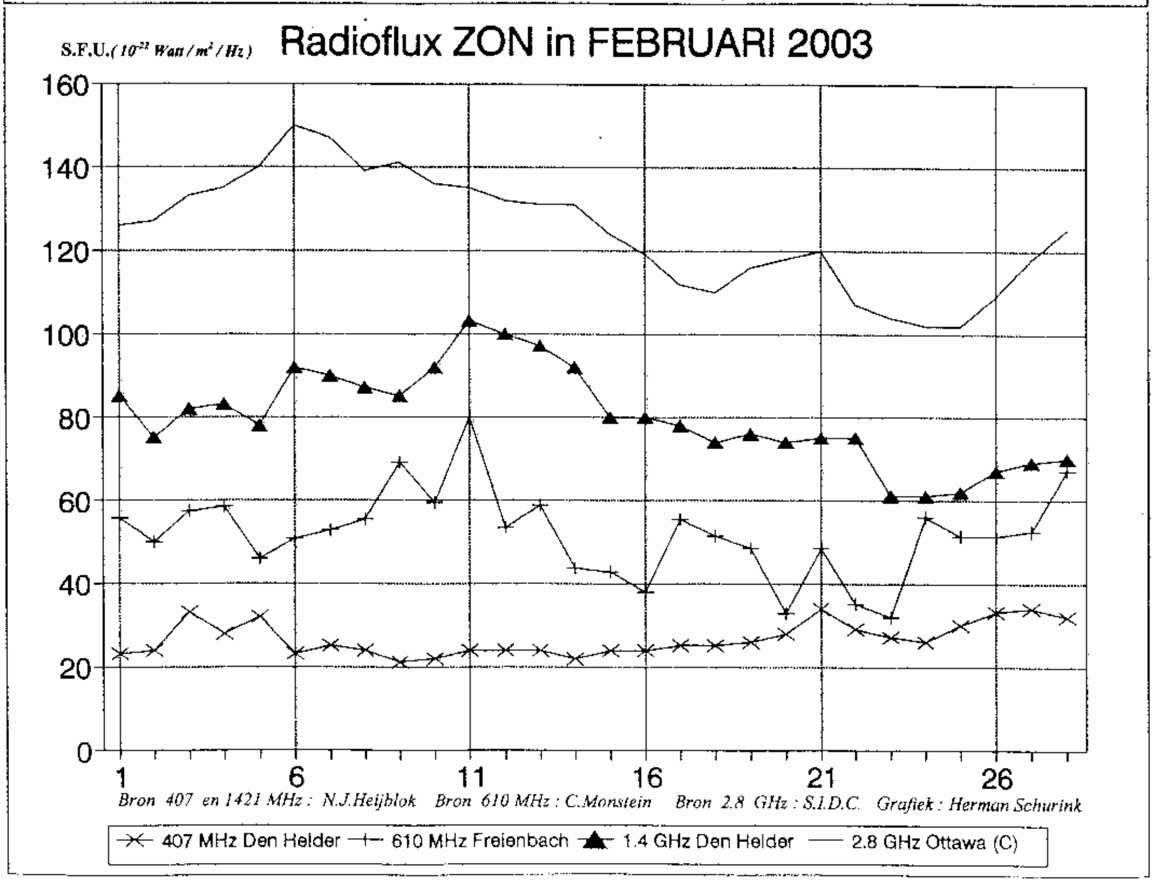
1
6
11
16
21
26
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux


S.F.U.(10^{-22} Watt / m² / Hz)
Radioflux ZON in FEBRUARI 2003
160
140
120
100
80
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11
16
21
26
Bron 407 en 1421 MHz : N.J.Heijblok
Bron 610 MHz : C.Monstein
Bron 2.8 GHz : S.I.D.C.
Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon Maart 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr60	Groe	Jn 9	Jn40	Kroe	vSloo	Son	Spa	Stam	Zans	Zijle	Uccle groups	Uccle spots
1	79	40	77	51	23		61	66	71	68	28	55	56		
2	89							65							
3	70	46	88	52	26		71	91	53	80	22			6	23
4		52			24	24		115	103	71		88		6	35
5									76						
6				37	13						22			5	15
7	77	40		69	11				64	84				8	32
8	77	74					70	83		102				8	42
9		71		120	33			86	108	102	36			12	49
10		70			22			66	76	82	36	48		4	10
11															
12		73							76	74	38	53		7	31
13	61	43		48	24	35	45	58	60	69		50	81	5	25
14	64	61	90	55	46		87	77	67	61	52	60	92	5	38
15	94	85			46			82	73	73		73	90	6	54
16	93	58	90	60	39		55	67	74	109	59	62	96	5	51
17	58	49		47	29			50	56	66		43		3	39
18	61	51			28	29	34	52	55	63	36	52	78	3	41
19	60	42		42	26			41	49	53				3	27
20				25	12			39	34	35	0			3	16
21	11	0	12	11	0			21	24	11		0	22	1	1
22	11		12	0	0			22	11	22	0	0	22	1	1
23	50	14	33	24	0			52	39	41	0	12	25	3	15
24	69	40		48	22		47	55	53	60	17	41	44	4	18
25				64	34	35		66	91	70		55	69	4	13
26		55		65	39		68	94	101	95	21	51	104	7	38
27		88		77	40			87	113	104	33		98	7	69
28	136	101	192	124	40		110	132	148	136	47	128	154	7	55
29	147								146				185	8	88
30	157	127	185	108	50	61		144	166	144	67	112	153	8	58
31	131	113		94	71			135	148	152	69	105		8	70
observ	20	23	9	21	25	5	10	25	27	26	18	19	16		
k	0,79	1,10	0,80	1,08	2,34	1,87	0,93	0,79	0,80	0,80	1,98	1,07	0,72		
st.dev.	0,33	0,37	0,43	0,33	1,37	0,84	0,19	0,16	0,15	0,30	0,73	0,42	0,20		
st.d./k	0,41	0,34	0,54	0,30	0,58	0,45	0,21	0,20	0,19	0,38	0,37	0,39	0,28		

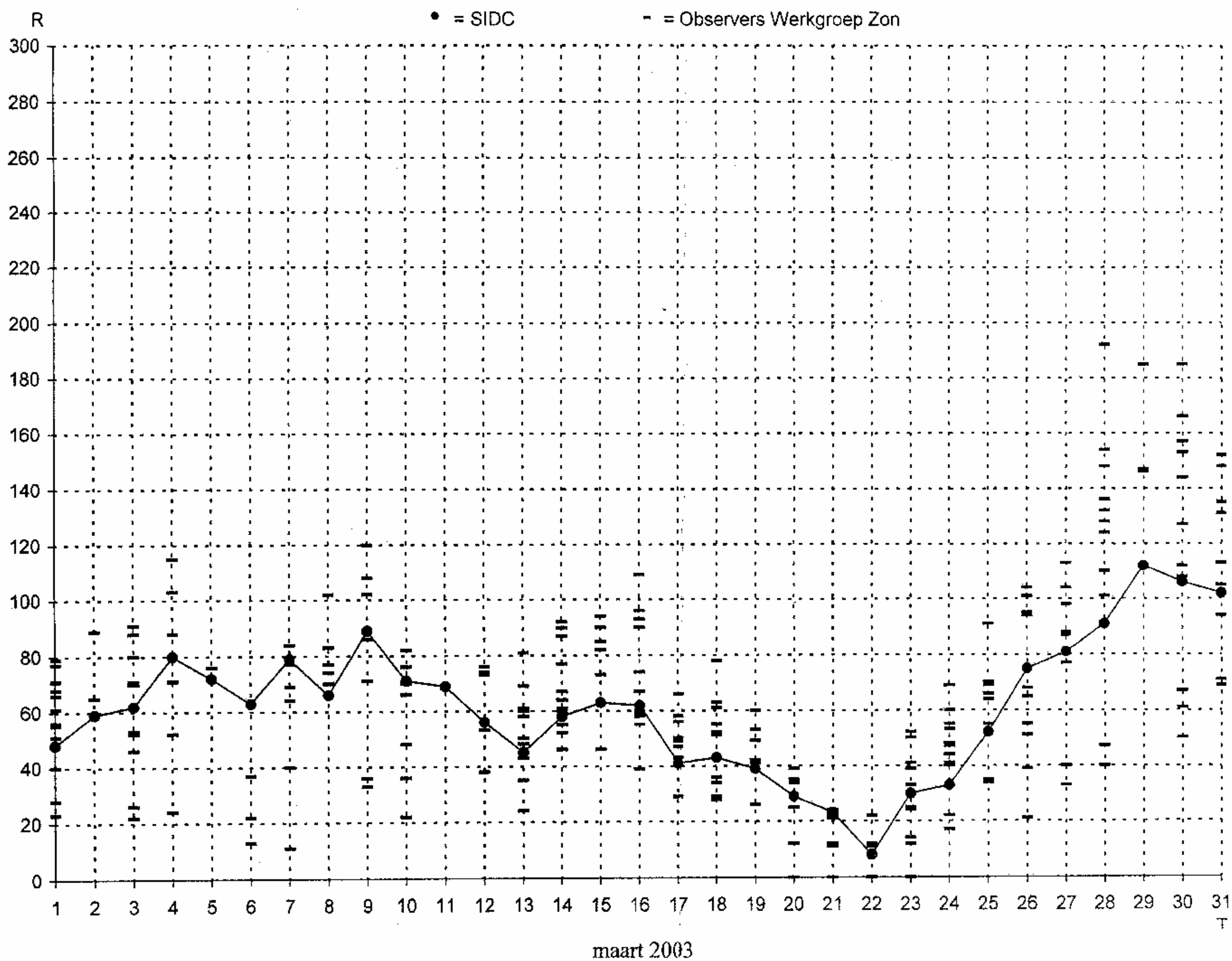
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Spa = T. Spaninks [75]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Stam = R.Stammes [100]
Gr60 = Mw G. Gravers [60]	Kroe = K. Kroesen [102]	Zans = W. Zanstra [Rf 155]
Groe = A.Groenewegen [102]	Scho = A. Scholten [60]	Zijle = W.A. Zijlema [90]
	vSlo = B. van Slooten [90]	

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
28	34	20	-	125	851	2	0/0	(//)	
1	48	28	-	138	855	2	0/0	19	
2	59	46	-	147	851	5	0/0	15	
3	62	62	-	149	854	0	0/0	31	
4	80	84	-	146	847	0	0/0	32	
5	72	90	-	149	852	2	0/0	21	
6	63	77	-	150	853	0	0/0	26	
7	79	78	-	150	865	0	0/0	16	
8	66	81	-	148	856	2	0/0	9	
9	89	95	-	153	852	6	0/0	16	
10	71	78	-	144	848	1	0/0	21	
11	69	93	-	142	856	1	0/0	14	
12	56	92	-	138	852	1	0/0	10	
13	45	100	-	134	856	1	0/0	14	
14	58	101	-	139	852	0	0/0	24	
15	63	115	-	131	847	1	0/0	29	
16	62	117	-	129	844	2	0/0	31	
17	41	86	-	125	845	11	0/1	45	
18	43	61	-	118	849	45	2/1	24	
19	39	41	-	108	842	225	4/0	14	
20	29	14	-	97	831	11	1/0	25	
21	23	4	-	91	839	0	0/0	28	
22	8	3	-	89	850	0	0/0	19	
23	30	5	-	93	853	0	0/0	25	
24	33	17	-	98	851	0	0/0	9	
25	52	24	-	109	833	5	0/0	4	
26	75	44	-	127	850	3	0/0	8	
27	81	104	-	141	846	0	0/0	21	
28	91	129	-	147	838	0	0/0	29	
29	112	123	-	155	837	16	0/0	38	
30	106	139	-	155	832	1	0/0	38	
31	102	132	-	160	831	2	0/0	39	

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 x Sn+10 x "1"+100 x ">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.


• = SIDC
= Observers Werkgroep Zon
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maart 2003

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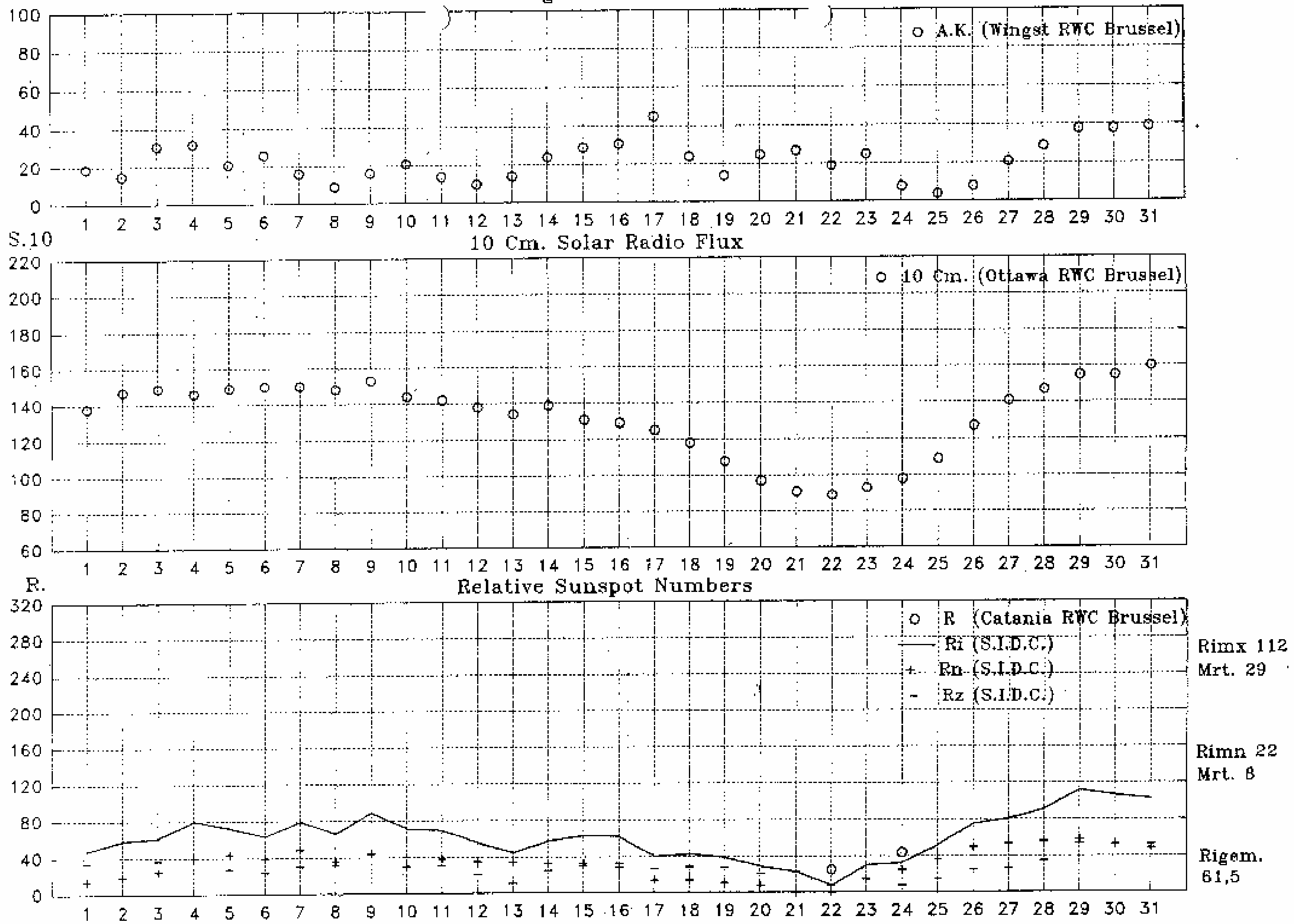
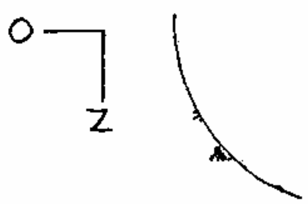

A.K.
Geomagnetic A.K. Index
o A.K. (Wingst RWC Brussel)
S.10
10 Cm. Solar Radio Flux
o 10 Cm. (Ottawa RWC Brussel)
R.
Relative Sunspot Numbers
o R (Catania RWC Brussel)
Ri (S.I.D.C.)
+ Rn (S.I.D.C.)
- Rz (S.I.D.C.)
Rimx 112
Mrt. 29
Rimn 22
Mrt. 8
Rigem.
61,5

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

maart 2003

	S.I.D.C.		Balster		Groenew		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	14	34	30	49	15	36			15	51	18	53	18	50	17	38
2	19	40	34	55					17	48						
3	25	37	32	38	17	35			31	60	53	0	25	55		
4	40	40					13	11	61	54	103	0	34	37	50	38
5	44	28									62	14				
6	39	24			24	13										
7	49	30	54	23	45	24					64	0	57	27		
8	35	31	39	38					39	44			56	46		
9	45	44			49	71			48	38	49	59	51	51		
10	30	41							23	43	51	25	27	55	35	13
11	38	31														
12	35	21									64	12	43	31	38	15
13	34	11	43	18	36	12	23	12	41	17	60	0	55	14	36	14
14	33	25	33	31	27	28			45	32	67	0	32	29	31	29
15	33	30	54	40					38	44	73	0	28	45	39	34
16	29	33	43	50	26	34			32	40	74	0	47	62	27	35
17	14	27	18	40	15	32			15	35	56	0	18	48	17	26
18	14	29	16	45			13	16	13	42	44	11	16	47	17	35
19	11	28	14	46	23	19			11	31	38	11	13	40		
20	8	21			11	14			12	27	23	11	11	24		
21	0	23	0	11	11	0			0	22	13	11	0	11	0	0
22	0	8	0	11					0	22	0	11	0	22	0	0
23	15	15	24	26	12	12			27	25	14	25	27	14	0	12
24	25	8	44	25	36	12			41	14	40	13	46	14	27	14
25	37	15			29	35	24	11	53	13	47	44	58	12	42	13
26	50	25			38	27			65	29	90	11	68	27	39	12
27	54	27			39	38			48	39	100	13	61	43		
28	56	35	81	55	71	53			78	54	105	43	79	57	74	54
29	58	54	83	64							121	25				
30	53	53	77	80	40	68	35	26	64	80	136	30	73	71	53	59
31	49	53	62	69	38	56			66	69	119	29	76	76	45	60



Protuberans, 19 maart 2003
12.02 UT

tekening: Dennis Jannink

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Solar activity was low to very low until March 16, however with a few big active regions which came rotating into the view at the solar limb. They produced only a few C-flares. The largest active regions were NOAA0296 (Beta-gamma) and NOAA0306, which passed the East limb on March 7. The activity increased then abruptly to high levels, due to the development of active region NOAA0314 to a beta-gamma-delta configuration, which produced two X-class and several M-class flares, as well as numerous C-flares. The group remained by far the dominant source of solar activity until it rotated from view on March 21. By that time however, its activity had already dwindled to much lower levels. Many CMEs were observed, including several that were associated with flares from AR 314. The two halo CMEs observed on March 18 and 19 were determined to be backsided. On March 18 a spectacular filament eruption occurred from the southwest quadrant of the sun. A nearly simultaneous eruption from the east limb was captured in beautiful pictures made by the EIT instrument in the 304 and 195 passbands (see picture of the month). The sunspot index increased then sharply. In fact, a large activity complex consisting of NOAA AR 0321, 0323, 0319 and 0318 dominated the solar corona. Except NOAA0318, all these active regions went through a phase of beta-gamma magnetic configuration, but the activity remained at low level until the end of the month.
A large filament on the NE limb erupted in a peculiar arch like appearance, late on March 28.
There were no halo CMEs during the period.

II. Geomagnetic Activity

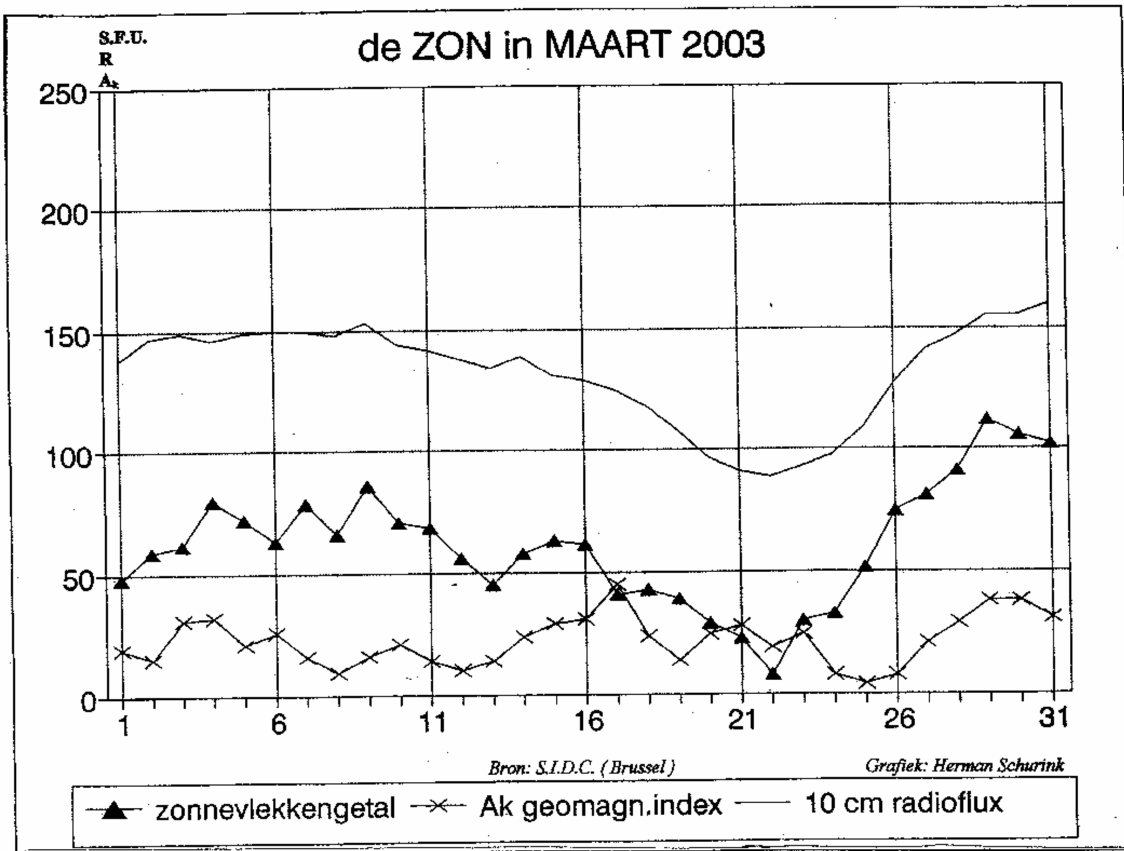
The geomagnetic field was mostly unsettled to active at the beginning of the month, with brief minor storms on March 3 and March 6. This elevated activity was due to southward oscillations of the interplanetary magnetic field. The Earth was under the influence of a high speed solar wind stream (550 km/s) between March 3 and March 7, because of the presence of a low-latitude coronal hole in the N-W quadrant of the solar disc. The geomagnetic activity continued to be governed essentially by coronal hole activity. From 14 onwards, the Bz component of the IP field was predominantly negative and the solar wind velocity between 600 and 700 km/sec. As a consequence, the geomagnetic field was mostly active with peaks at minor storm level. A high activity was recorded on March 17, when the Wingst K-index reached 6. The solar wind speed was high, reaching up to nearly 900km/s, while the Bz component of the interplanetary magnetic field was oscillating. The geomagnetic field became quiet on March 24 to 26, but the influence of another coronal hole began late March 26 up till late March 29. The maximum solar wind speed, of about 500 km/s, was reached on March 27, and brought the geomagnetic activity minor storm levels during the last days of the month.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	TYPE	Cat	NOAA	NOTE
17	1850	1905	1916	S14W39	X1.5	1B	520	III/2		0314	CME
18	0030	0037	0042	S14W44	M1.6	1N		III/3		0314	
18	0551	0600	0602	S14W46	M2.5	1B	36	III/1		0314	
18	1151	1208	1220	S15W46	X1.5	1B	1400	III/2,II/3,IV/2		0314	CME
19	0258	0307	0421		M1.5		52	III/1			CME
19	0636	0646	0649	S12W60	M1.6	2F				0314	
19	0934	0953	1000	S15W57	M3.7	1N	30			0314	
19	1325	1332	1338	S07W61	M1.4	2F	34			0314	
20	1125	1131	1137	S04W75	M1.5	1F	210			0314	

Xray: Xray flare class
op: optical flare class
10 cm: radio flux on 10 cm
type: type of radio-burst

Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection



de ZON in MAART 2003
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Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
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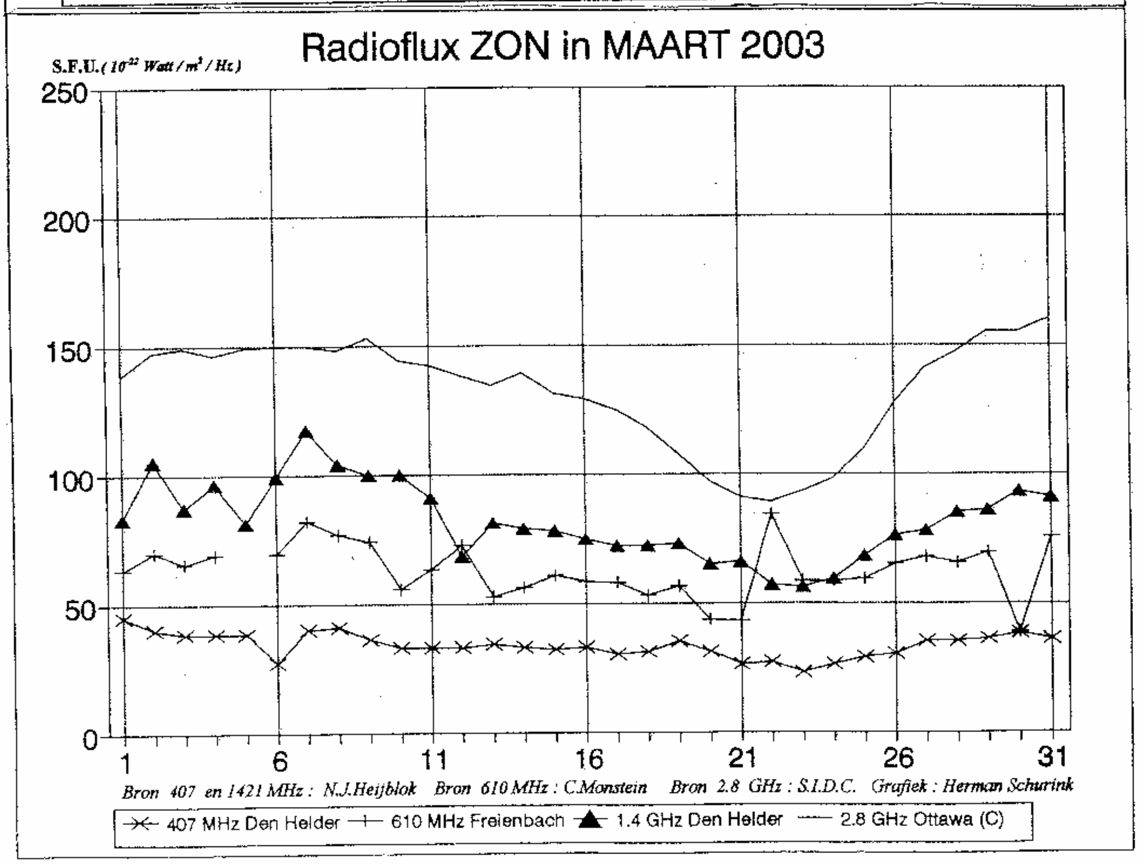
Ak geomagn.index
10 cm radioflux



Radioflux ZON in MAART 2003
S.F.U. (10^{-22} Watt / m² / Hz)
250
200
150
100
50
0
1
6
11
16
21
26
31
Bron 407 en 1421 MHz : N.J.Heijblok Bron 610 MHz : C.Monstein Bron 2.8 GHz : S.I.D.C. Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon April 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr60	Groe	Jn 9	Jn40	Kroe	vSlo	Son	Spa	Stam	Zans	Zijle
1		111			69			127				99	
2	145	103			59			161		162	56	109	
3		79		84				133		138	51	77	
4		73			63				89	115	62	72	
5	90	70		74	48			72	94	77		76	
6	79	51	90	49	45			63	65	84	33	62	69
7	76	58		33	22		33	84	75	85	27	48	75
8	50	46		34	22	22	22	55	40	47	15	34	51
9	49	25		23	11		11	60	42		13	38	54
10		29		22	22		22	61		37		22	
11		31	40		22			30	35		14	26	
12	30	36	49	42	22			43	56	51	13	36	60
13	53	37	63		22	22	34	54	49	61	14	48	66
14	52	38			22		34	49	52	51	14	48	56
15	36	37			22			44	37	48	18	35	41
16	12	12			11			11	11	12	12	11	22
17	24	23			11			23	26	25	10	11	13
18	25	22	30	34	22		22	22	23	22	21	23	45
19	36	35			33			46				37	48
20	58	37	56		24			65	54	55	31	49	71
21	81	55	90		35		39	72	69	66	39	56	83
22	103	66			40			107	84	117	51	57	113
23	88	58			39			96	82	97		68	106
24	95	89			29	29		103	96	86	52	67	107
25		92	94		47			104	114			77	
26		96			47								
27	166	99			52			132			71	91	
28		116			56			126	129				
29	164	117			67	78	126	140	135		103	98	180
30		102						120					
observ	21	30	8	9	28	4	9	28	22	20	21	27	18
k	0,80	1,02	0,73	1,16	1,70	1,80	1,59	0,78	0,83	0,78	1,81	1,07	0,71
st.dev.	0,19	0,20	0,14	0,39	0,54	0,50	0,88	0,18	0,18	0,21	0,58	0,25	0,19
st.d./k	0,24	0,20	0,19	0,33	0,32	0,28	0,56	0,23	0,22	0,27	0,32	0,23	0,27

Uccle	
groups	spots
9	65
9	60
7	53
5	22
6	10
3	7
4	8
2	14
4	13
3	4
3	3
1	2
2	3
4	9
4	12
6	47
6	44
6	56
6	48
8	81
8	90
7	98

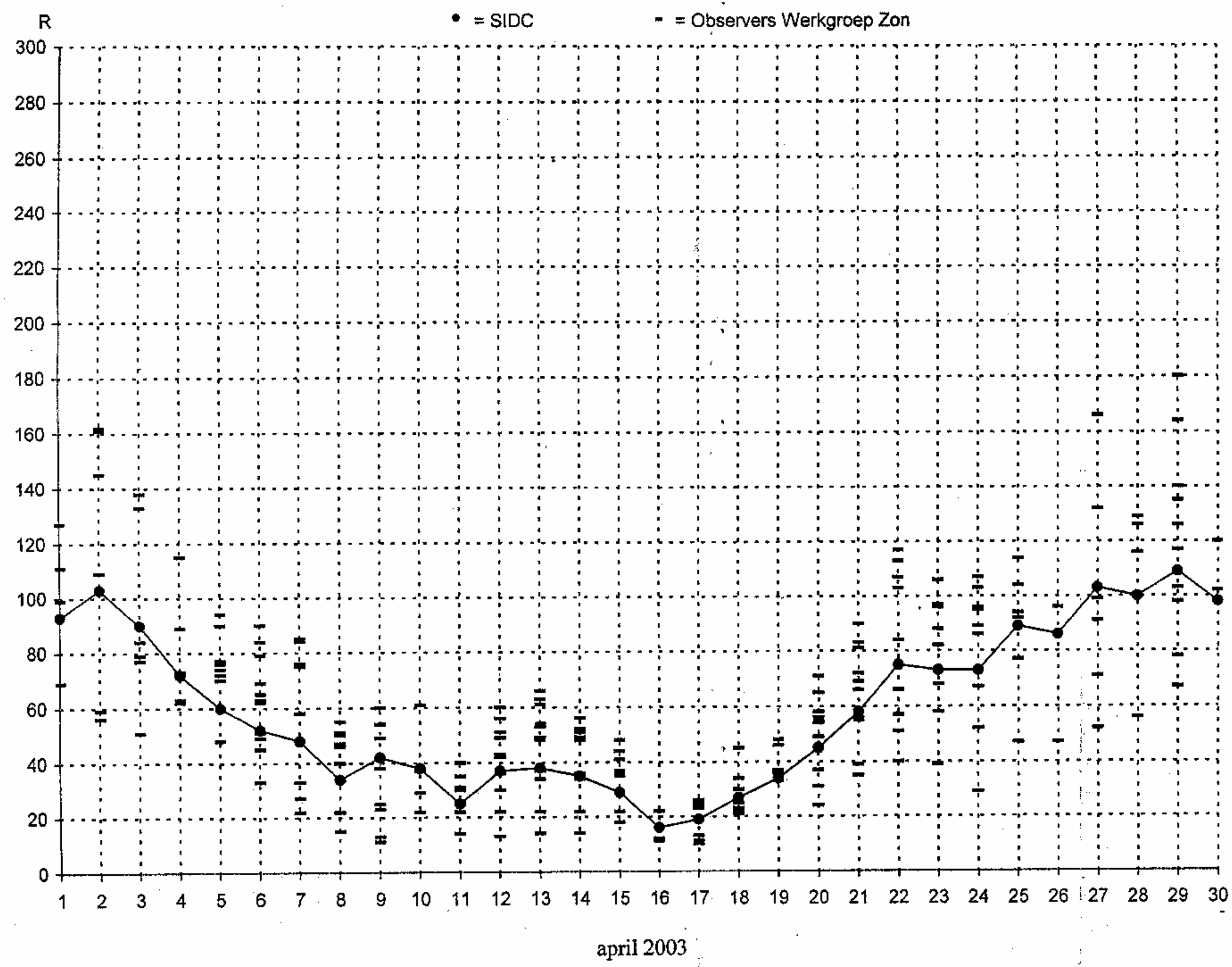
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Son = A.T. Son [Rf 150 Kutter]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Spa = T. Spaninks [75]
Gr60 = Mw G. Gravers [60]	Kroe = K. Kroesen [102]	Stam = R.Stammes [100]
Groe = A.Groenewegen [102]	vSlo = B. van Slooten [90]	Zans = W. Zanstra [Rf 155]
		Zijle = W.A. Zijlema [90]

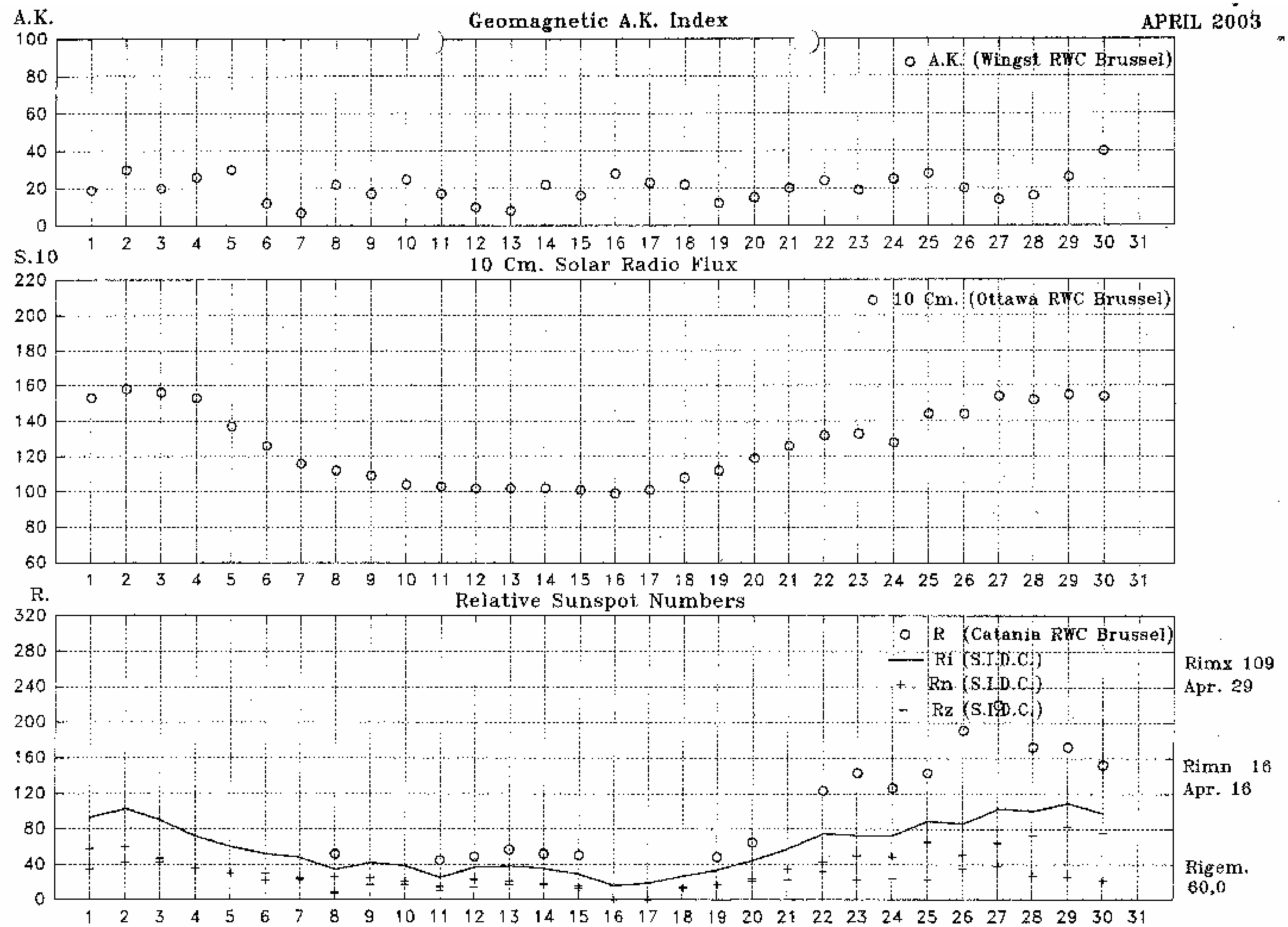
S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'_1	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	102	132	-	160	831	2	0/0	39	
1	93	156	55	153	837	2	0/0	19	
2	103	157	56	158	842	4	0/0	30	
3	90	140	56	156	847	15	0/0	20	
4	72	133	53	153	845	10	2/0	26	
5	60	107	51	137	842	2	0/0	30	
6	52	89	49	126	849	1	0/0	12	
7	48	73	46	116	853	0	0/0	7	
8	34	70	46	112	849	0	0/0	22	
9	42	80	47	109	842	12	1/0	17	
10	38	77	-	104	830	0	0/0	25	
11	25	61	-	103	822	0	0/0	17	
12	37	59	-	102	826	0	0/0	10	
13	38	51	-	102	833	1	0/0	8	
14	35	32	-	102	830	0	0/0	22	
15	29	18	-	101	833	0	0/0	16	
16	16	18	-	99	837	0	0/0	28	
17	19	13	-	101	842	0	0/0	23	
18	27	15	44	108	////	0	1/0	22	
19	34	24	44	112	842	0	0/0	12	
20	45	44	43	119	843	3	0/0	14	
21	58	61	46	126	841	16	1/0	20	
22	75	90	50	132	837	3	0/0	24	
23	73	300	55	133	839	21	2/0	19	
24	73	106	53	128	838	12	1/0	25	
25	89	124	51	144	////	5	1/0	28	
26	86	158	53	144	////	19	4/0	20	
27	103	170	56	154	////	105	1/0	14	
28	100	205	51	152	843	2	0/0	16	
29	109	227	54	155	842	13	1/0	26	
30	98	224	52	154	837	0	0/0	41	

- R'_1 : 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 x Sn+10 x "1"+100 x ">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.


R
• = SIDC
- = Observers Werkgroep Zon
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
april 2003



A.K.
Geomagnetic A.K. Index
APRIL 2003
A.K. (Wingst RWC Brussel)
S.10
10 Cm. Solar Radio Flux
10 Cm. (Ottawa RWC Brussel)
R.
Relative Sunspot Numbers
R (Catania RWC Brussel)
Ri (S.I.D.C.)
Rn (S.I.D.C.)
Rz (S.I.D.C.)
Rimx 109
Apr. 29
Rimn 16
Apr. 16
Rigem.
60,0

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

april 2003

	S.I.D.C.		Balster		Groenew		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	35	58							45	82					24	75
2	43	60	53	92					57	104			55	107	37	72
3	43	47			40	44			48	85			61	77	40	37
4	36	36									53	36	53	62	40	32
5	30	30	54	36	45	29			39	35	69	25	42	35	40	36
6	22	30	39	40	24	25			23	40	49	16	38	46	24	38
7	23	25	39	37	22	11			35	49	52	23	36	49	22	26
8	26	8	38	12	34	0	22	0	43	12	40	0	35	12	23	11
9	25	17	36	13	11	12			36	24	42	0			24	14
10	21	17			22	0			28	33			25	12	11	11
11	15	10							16	14	22	13			13	13
12	23	14	16	14	29	13			17	26	28	28	35	16	20	16
13	21	17	27	26			11	11	28	26	38	11	32	29	25	23
14	18	17	24	28					24	25	40	12	24	27	23	25
15	13	16	12	24					24	27	25	12	24	24	12	23
16	0	16	0	12					0	11	11	0	0	12	0	11
17	0	19	11	13					11	12	26	0	11	14	0	11
18	13	14	12	13	12	22			11	11	12	11	11	11	12	11
19	17	17	12	24					23	23					13	24
20	24	21	27	31					37	28	26	28	27	28	24	25
21	35	23	51	30					46	26	47	22	47	19	41	15
22	43	32	59	44					63	44	32	52	71	46	42	15
23	50	23	71	17					67	29	59	23	74	23	52	16
24	49	24	65	30			15	14	71	32	73	23	63	23	50	17
25	66	23							74	30	85	29			63	14
26	51	35														
27	38	65	63	103					43	89					33	58
28	27	73							31	95	32	97				
29	26	83	33	131			24	54	29	111	32	103			29	69
30	22	76							39	81						

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Activity on the sun showed a strong variation during April 2003. The month started with a fairly low level of solar activity, despite a relatively high sunspot number. Although both NOAA 0319 and NOAA 0323 had a beta-gamma magnetic configuration, they proved only capable of producing occasional C-flares. From April 2 onwards, region NOAA0324 started a rapid development and became the dominant centre of solar activity. In the following days it unleashed many C-flares and also, on April 4, the first M-class solar flare since quite a few days. This flare was also accompanied by a partial halo CME. This sunspot group continued producing C-class flares until it rotated out of view on April 8, but by then its activity was already decreasing.

The Sun remained quiet on April 8, but the next day, NOAA 0326 pushed up the activity to moderate level with several C-class flares, followed by an M2.5/1F. This active region rotated behind the limb on April 10, and the Sun remained then mostly quiet (with some isolated C-flares) for a long period. On April 11, a filament erupted at the NW limb, followed by a CME. In the following days, the X-ray background from the sun dropped to the bottom level of the B-scale. Also the sunspot number became very low; Ri reached its lowest value of 16 on April 16.

On April 17, EIT195 images clearly indicated the presence of an active sunspot group behind the east limb of the sun. Even before this group (later labelled Catania sunspot group 71, corresponding to NOAA 0337) rotated onto the visible side of the solar disk, it pushed up the X-ray background to double its previous value, and produced its first significant flare, a C4.4 late on April 17, followed the next day, April 18, by an M1.1 flare peaking at UT 19:58. In the next few days, this sunspot group remained the dominant activity centre on the sun and continued to grow, but generated no more M-class flares until April 29, a few days before it rotated over the west limb. Yet another region, however, started growing very rapidly on April 20 and soon demonstrated it was destined to become the most flare-productive region of April. This was Catania sunspot group 72 / NOAA 0338, which produced many C-flares and a total of 9 M-class flares, included this month's largest event: an M7.0 on April 26. This region remained very active until it reached the solar limb on April 28; by then it had developed a complex beta-gamma-delta magnetic configuration.

Proton flux enhancements were recorded following every M-flare produced by CAT72/NOAA0338, until April 24 when the active region - at 40 degrees west on the solar disc at that time - was apparently no longer magnetically connected to the Earth environment. The event/alert thresholds for proton flux enhancements were however not exceeded. At least two of the M-flares (M2.8 on April 21 and M5.1 on April 23) were associated with partial halo CMEs, but none of the two produced a clear signature in the solar wind recorded at L1.

A large eruptive prominence was observed by EIT in the NE quadrant around 21h50 UT on April 26.

II. Geomagnetic Activity

In terms of geomagnetic activity, once more the influence of coronal holes dominated the scene, leading to active geomagnetic conditions for most of the month.

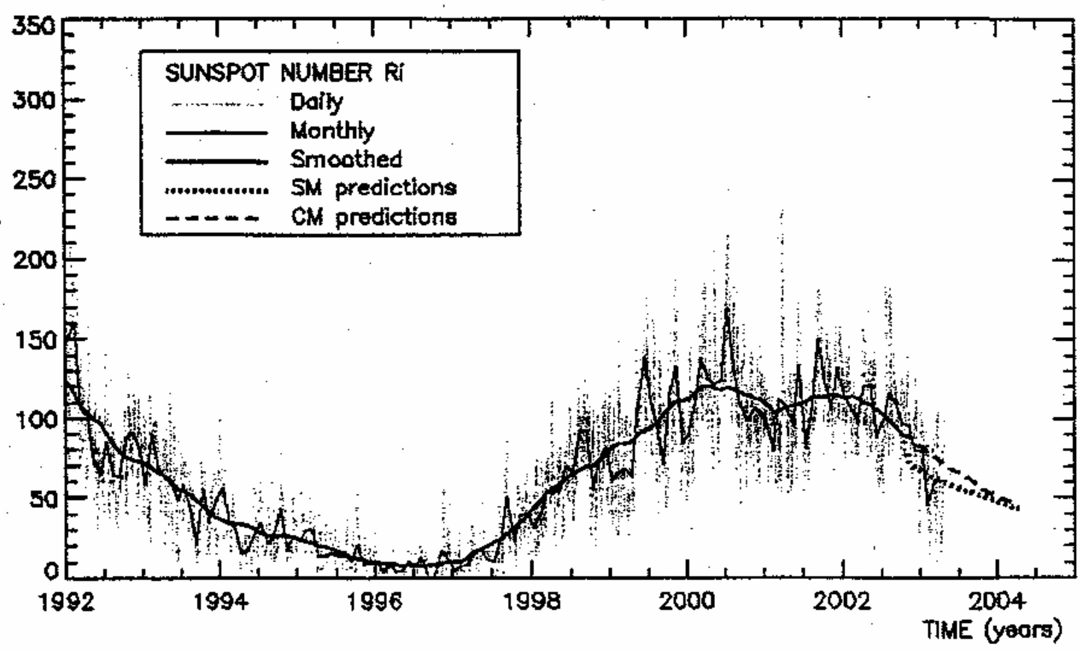
Although the beginning of the month saw a decrease of the solar wind speed, marking the end of the influence of a coronal hole, the geomagnetic conditions remained unsettled during the first week, with frequent brief excursions to minor storm levels. This was related to the fact that the solar wind remained mostly above 450km/s, and there were frequent intervals of southwards oriented interplanetary magnetic field.

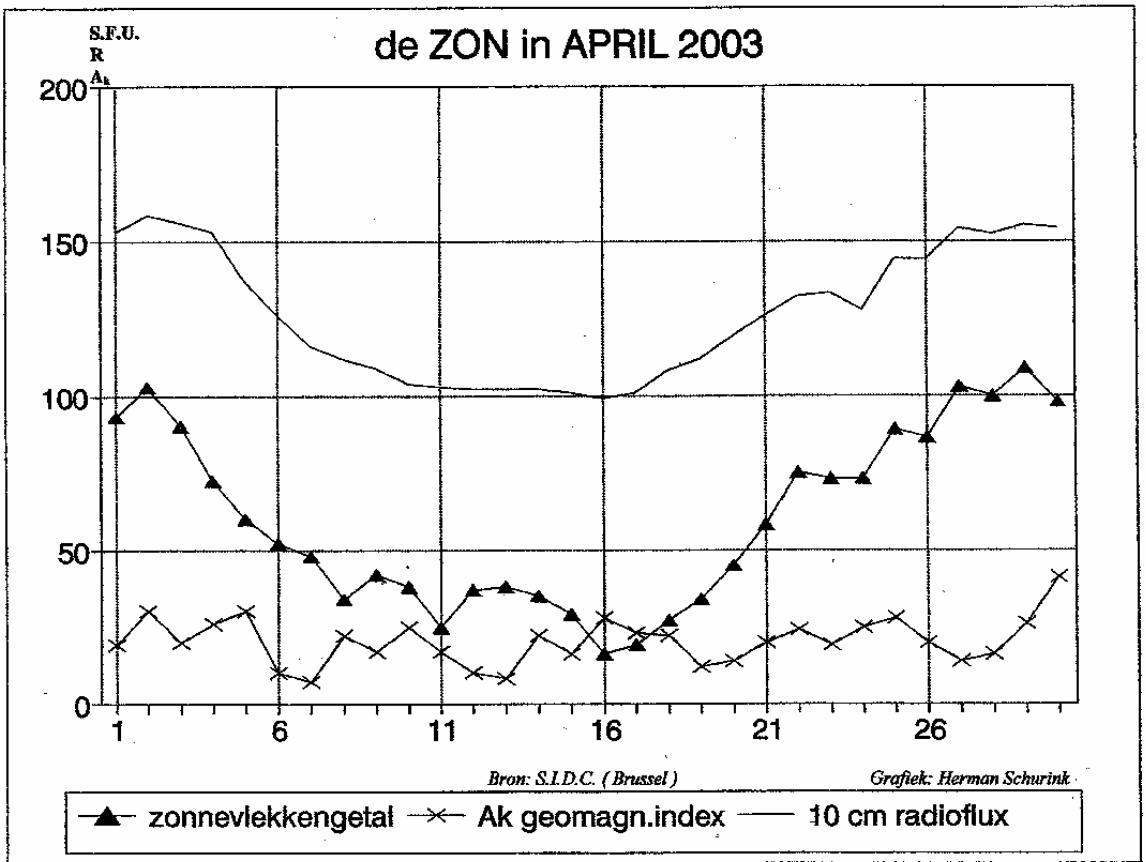
Towards the end of the first week, geomagnetic conditions became quiet, but then reached active conditions again from April 8 due to a small shock arrival and the effect of a recurrent coronal hole.

The high-speed stream associated with this coronal hole (700 km/sec on April 10-11) caused geomagnetic perturbations from active to minor storm level until April 11, followed by quiet conditions for some days (April 12-14). Then, yet another coronal hole made its influence felt. In the course of a few days the solar wind speed gradually rose to a peak of nearly 800 km/s on April 17. Then it started to decline and was down to about 550 km/s on April 20. Another coronal hole caused enhanced solar wind speeds (up till 600 km/s) and a fluctuating Bz from roughly April 24, noon till late April 25. Towards the end of the month, the solar wind speed was elevated due to a coronal hole yet again. The north-south orientation of the interplanetary magnetic field was very variable, with many short periods of mild southwards orientation. In all, this caused active geomagnetic conditions for the rest of the month, with the K-index in Wingst frequently at the value 4, and occasionally reaching up to 5. The latter was the case in particular on April 30, when minor storm conditions persisted for most of the day.

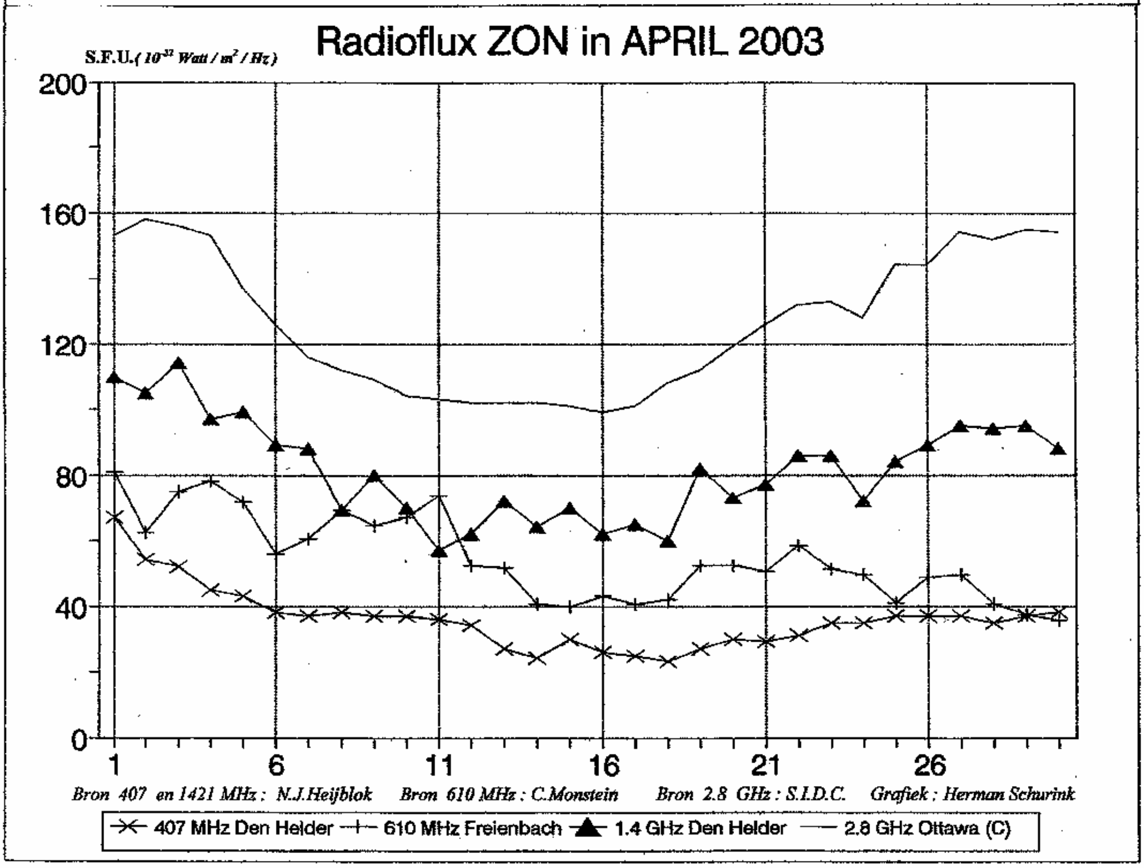
III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	Cat.	NOAA	NOTE
04	1905	2019	2038	S11W40	M1.9	1F	66	III/1		0324	
09	2323	2329	2334	S10W78	M2.5	1F	140	III/1		0326	
18	1950	1958	2002	S12E91	M1.1		41		71	0337	EIT derived location
21	1254	1307	1314	N18E02	M2.8	1N	300	III/1,IV/3, II/3	72	0338	
23	0039	0106	0115	N22W25	M5.1	1N	380	II/2	72	0338	EIT derived location
23	1536	1556	1611	N20W22	M2.0	1F	66		72	0338	
24	1245	1253	1303	N21W39	M3.3	1N	89	II/2, III/2, IV/1	72	0338	
25	0523	0540	0558	N14E79	M1.2	SF	82	II/2, III/2	80	0346	
26	0051	0058	0100	N20W65	M2.1	SF	55	V/2, III/2	72	0338	
26	0301	0306	0312	N20W69	M2.1	SN		III/2	72	0338	
26	0801	0807	0809		M7.0			III/3	72	0338	
26	2337	2340	2342		M2.5		71	II/1	72	0338	
27	1527	1532	1535	N21W85	M1.7	SF	65	III/3	72	0338	
29	0432	0459	0510	S12W55	M1.1	1F			71	0337	CME





de ZON in APRIL 2003
S.F.U.
R
Ak
200
150
100
50
0
1
6
11
16
21
26
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux



Radioflux ZON in APRIL 2003
S.F.U.(10⁻²² Watt / m² / Hz)
200
160
120
80
40
0
1
6
11
16
21
26
Bron 407 en 1421 MHz : N.J.Heijblok
Bron 610 MHz : C.Monstein
Bron 2.8 GHz : S.I.D.C.
Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon — Mei 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr50	Jn 9	Jn40	Kroe	vSloo	Son	Spa	Stam	Zans	Zijle
1		104		70			109			91	106	137
2		95		71			93	81			87	
3	130	96		58			108			87	80	142
4	143	97		62		84	120	129		66	84	173
5	130			55				114			98	
6				50	49		84			56	79	99
7	72	56		24		49	71	57		31	51	102
8	36	23		22		33	48			24	35	45
9							23	37		17	22	
10	25	22		22		22	23	22		13	22	26
11	36	22		22	22	22	46	35	48	13	22	50
12		34		34			57	36	48	16	36	
13	55	23		23			73		64	7	27	64
14		29		23			65		48		28	
15	72	36		12			61	51		7	38	75
16	67	49		34	35	57	67	43			60	78
17		33		22			44	36	45	18	44	
18	44	31					62		56	7	42	
19							60				57	
20		59		23			89		85	25	66	99
21				24			66				59	
22												
23										11	22	
24												
25		43	56	37			41		65	19	47	
26	82	53	65	38	39	46	68	84	73	34	53	79
27	69	65		39		40	69	88	95	33	56	87
28	87	79	92	41		45	70	90	86	51	64	99
29	86	77	87	38		41	63	73	94	51	64	97
30		76	73	39		41	47	50	79	50	52	77
31		54	59	27	37	29	45	53	63	48	47	70
observ	15	23	6	25	5	12	27	17	14	23	29	18
k	0,78	1,10	0,69	1,70	1,43	1,22	0,82	0,89	0,72	2,39	1,10	0,65
st.dev.	0,12	0,32	0,07	0,68	0,20	0,25	0,12	0,22	0,14	1,86	0,36	0,06
st.d./k	0,16	0,29	0,10	0,40	0,14	0,21	0,14	0,25	0,19	0,77	0,33	0,09

Uccle	
groups	spots
6	52
6	47
9	101
7	107
6	33
2	3
2	3
3	5
3	4
4	10
6	17
5	12
6	18
3	16
4	43

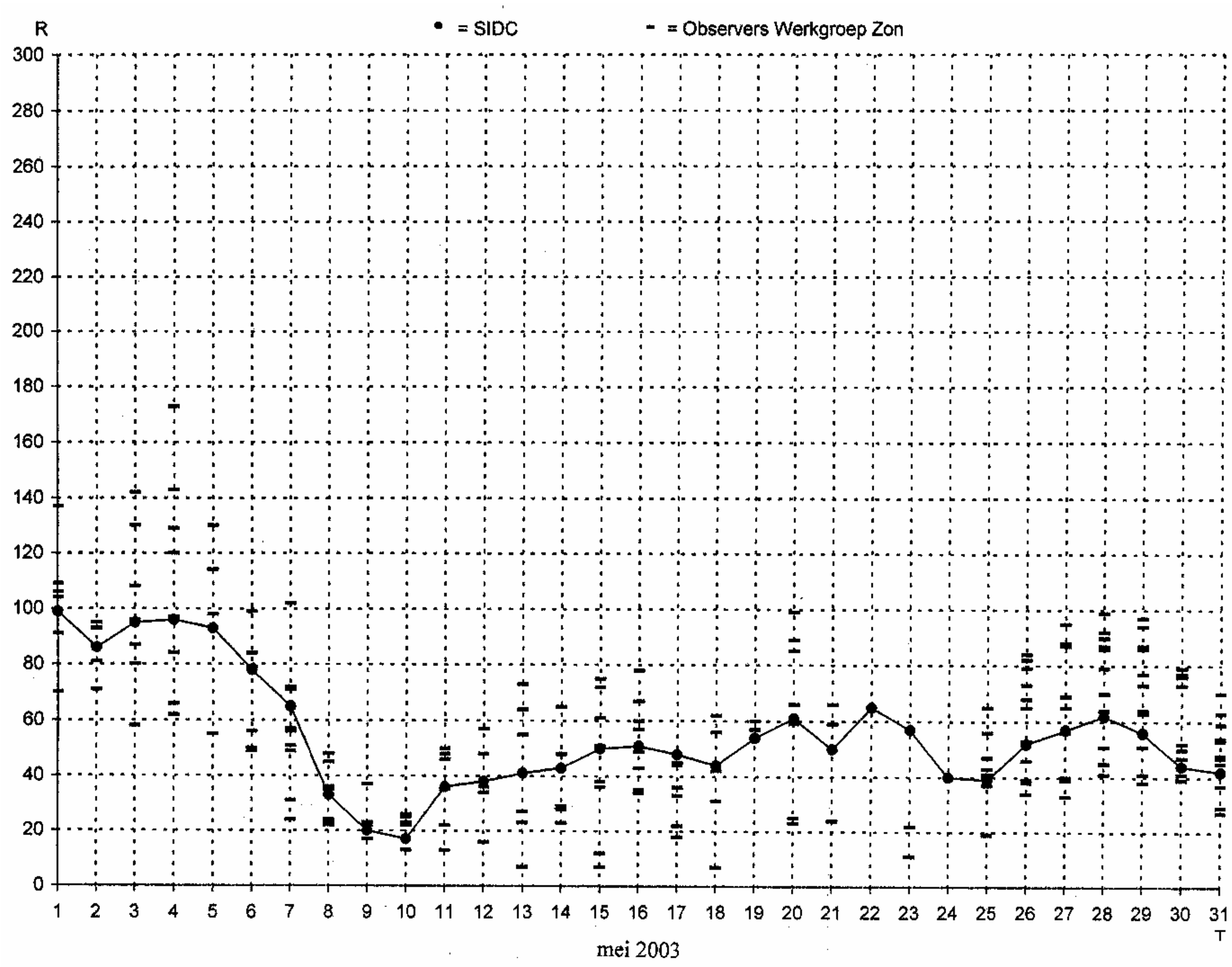
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn40 = D. Jannink [40]	Spa = T. Spaninks [75]
Gort = E.Gorter [90]	Kroe = K. Kroesen [102]	Stam = R.Stammes [100]
Gr50 = Mw G. Gravers [50]	vSlo = B. van Slooten [90]	Zans = W. Zanstra [Rf 155]
Jn 9 = D. Jannink [9]	Son = A.T. Son [Rf 150 Kutter]	Zijle = W.A. Zijlema [90]

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
30	98	224	52	154	837	0	0/0	41	
1	99	242	53	149	832	7	0/0	35	
2	86	224	49	144	834	5	1/0	16	
3	95	176	42	148	////	2	0/0	12	
4	96	192	41	142	840	6	0/0	8	
5	93	151	46	129	837	3	0/0	18	
6	78	111	43	122	832	1	0/0	32	
7	65	66	44	110	837	2	0/0	40	
8	33	39	42	101	836	0	0/0	43	
9	20	33	40	97	828	0	0/0	33	
10	17	20	40	93	832	0	0/0	31	
11	36	33	40	92	834	0	0/0	29	
12	38	17	40	94	839	0	0/0	22	
13	41	22	40	96	846	0	0/0	27	
14	43	32	40	96	846	0	0/0	36	
15	50	30	42	99	847	0	0/0	22	
16	51	27	43	103	848	1	0/0	14	
17	48	23	42	102	850	1	0/0	8	
18	44	17	43	109	851	///	///	11	
19	54	34	46	115	847	1	0/0	15	
20	61	50	47	117	848	3	0/0	12	
21	50	40	49	119	851	0	0/0	29	
22	65	35	50	118	849	2	0/0	28	
23	57	22	50	118	854	1	0/0	20	
24	40	23	50	117	851	0	0/0	21	
25	39	56	49	121	844	4	0/0	18	
26	52	77	48	125	847	21	2/0	21	
27	57	90	55	129	838	24	2/1	25	
28	62	147	53	130	830	27	0/1	30	
29	56	118	48	138	820	121	2/1	80	
30	44	84	48	117	787	18	0/0	55	
31	42	51	42	113	777	104	1/0	22	

- **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 x Sn+10 x "1"+100 x ">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.



R
• = SIDC
- = Observers Werkgroep Zon
300
280
260
240
220
200
180
160
140
120
100
80
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40
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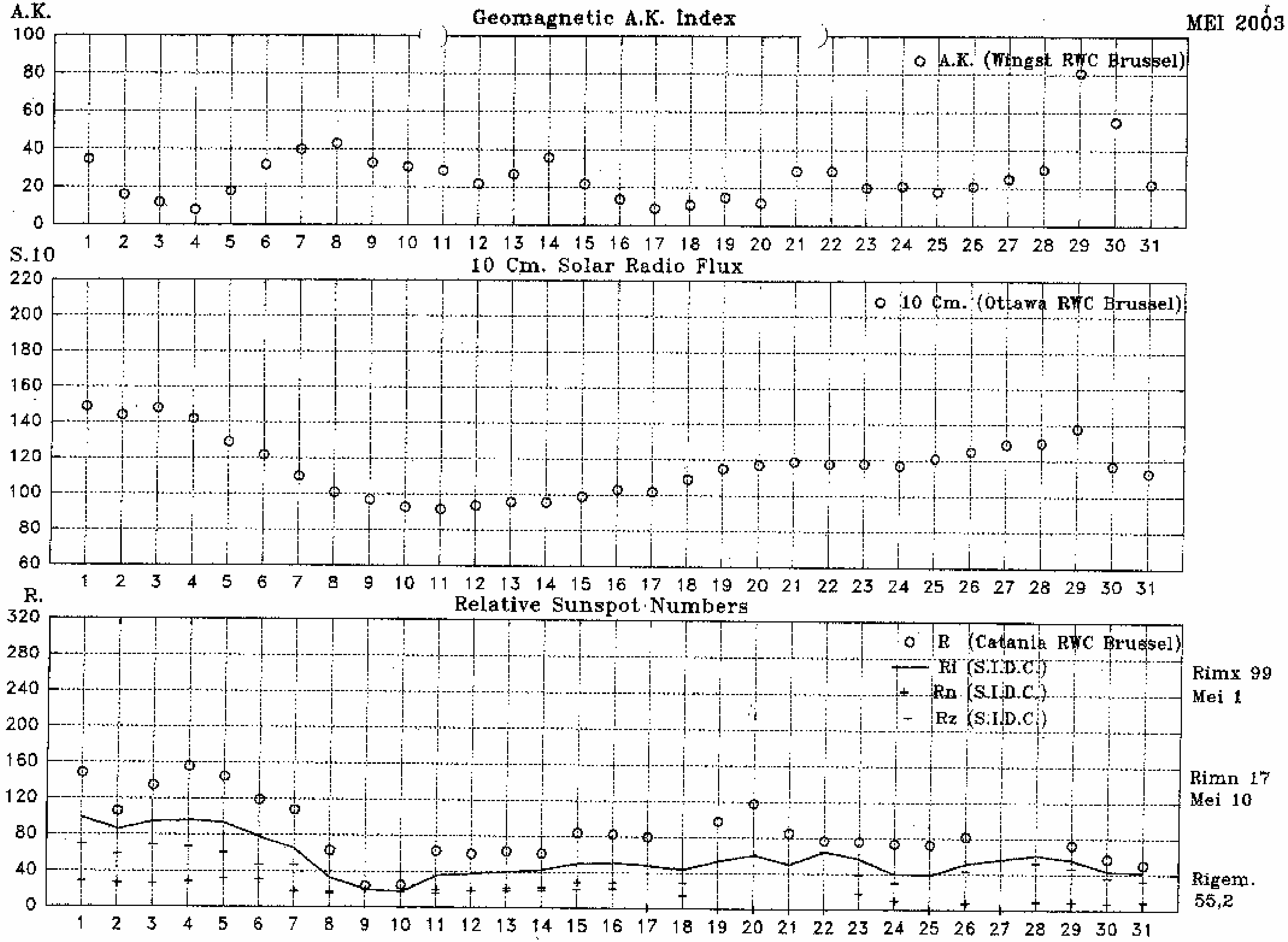
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
T
mei 2003

MEI 2003



Geomagnetic A.K. Index
A.K.
A.K. (Wingst RWC Brussel)
10 Cm. Solar Radio Flux
S.10
10 Cm. (Ottawa RWC Brussel)
Relative Sunspot Numbers
R.
R (Catania RWC Brussel)
RI (S.I.D.C.)
Rn (S.I.D.C.)
Rz (S.I.D.C.)
Rimx 99
Mei 1
Rimn 17
Mei 10
Rigem.
55,2

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

mei 2003

	S.I.D.C.		Balster		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	29	70					38	71					37	69
2	27	59					35	58	38	43			40	47
3	26	69	40	90			34	74					22	58
4	29	67	47	96			33	87	34	95			22	62
5	32	61	46	84					36	78			33	65
6	31	47			22	27	33	51					34	45
7	18	47	25	47			23	52	22	35			23	28
8	17	16	24	12			25	23					22	13
9	20	0					23	0	24	13			22	0
10	17	0	25	0			23	0	22				22	0
11	20	16	23	13	22	0	22	24	23	12	25	23	22	0
12	19	19					33	24	23	13	34	14	22	14
13	22	19	28	27			36	37			26	38	13	14
14	23	20					41	24			23	25	16	12
15	29	21	48	24			39	22	28	23			26	12
16	29	22	38	29	12	23	41	26	15	28			25	35
17	0	48					0	44	0	36	0	45	0	44
18	15	29	11	33			13	49			11	45	0	42
19	0	54					0	60					0	57
20	0	61					11	78			11	74	0	66
21	0	50					0	66					0	59
22	0	65												
23	18	39											0	22
24	10	30												
25	0	39					0	41			12	53	0	47
26	8	44	13	69	0	39	13	55	46	38	12	61	0	53
27	0	57	0	69			0	69	37	51	0	95	0	56
28	9	53	13	74			12	58	48	42	12	74	11	53
29	9	47	13	73			12	51	41	32	13	81	11	53
30	8	36					11	36	34	16	13	66	11	41
31	9	33			11	26	11	34	39	14	24	39	11	36

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

This month saw big variations in solar activity. Roughly speaking, solar activity was low to moderate at the start of the month, then became very low for more than two weeks, and moved rapidly to high at the end of the month.

In the beginning of the month, the most prominent feature on the face of the sun was Catania sunspot group 84 (corresponding to NOAA active region 0349), which was near disk centre at the time. This group covered an area of about 0.1 percent of the solar disk and had a maximum of about 40 spots. Together with the smaller neighbouring sunspot group 79 (NOAA 0345), it formed the dominant centre of solar activity. Only one M-flare was observed (M1.0 from group 79 on May 2), but between the two of them, groups 79 and 84 produced well over 30 C-class flares during the first 8 days of May. On May 7-9, this activity complex rotated over the west limb, and solar activity then dropped sharply. Only small B-class flares (or sometimes not even those) were observed for some time after that. It took until May 20 before the next C-flare was observed. But even then, activity only consisted of several small C flares mainly from Catania regions 7, 8 and 13 (respectively NOAA regions 0362, 0364 and 0368). Things took another turn on May 25, when Catania sunspot group 18 (NOAA 0365) started a very rapid development and became a compact sunspot group with strong, complex and dynamical magnetic fields and more than 70 visible sunspots. It produced its first major flare (an M2.0) on May 26, thereby ending the long period of relative quiet on the sun. Many more large flares followed from this group, including three X-class flares, with the largest event an X3.6 on May 28. Catania sunspot group 13 (NOAA 0368) briefly joined in on the action on May 28 and was responsible for 2 M-flares as well, but this region never reached a comparable state of activity or magnetic complexity. Towards the end of the month, while sunspot group 18 headed for the west limb, strong activity from another group became visible at the east limb in EIT and SXI images, which highlighted the sun's ability to continue this streak of increased solar activity. But that's already the start of the report for next month…

The proton fluxes remained at quiet levels for most of the month, but the flaring activity from Catania sunspot group caused two small proton events. In the first event, the proton fluxes started increasing following the X3.6 flare early on May 28. The >10MeV flux reached the event threshold at the beginning of May 29, reached its maximum at 15-18UT and decreased below the threshold again by the end of the same UT day. On May 31, an M9.3 flare from group 18 again made the proton fluxes increase, and the >10MeV component exceeded the event threshold for a 9-hour-period on this day.

Most of the large flares from Catania sunspot group 18 were accompanied by CMEs, and in view of its location on the solar disk (crossing the central meridian on May 26), several of these had an earth-directed component, causing geomagnetic disturbances (see below). For most of the month, however, the main solar driver of the space weather was the presence of many coronal holes in geo-effective position (see below).

II. Geomagnetic Activity

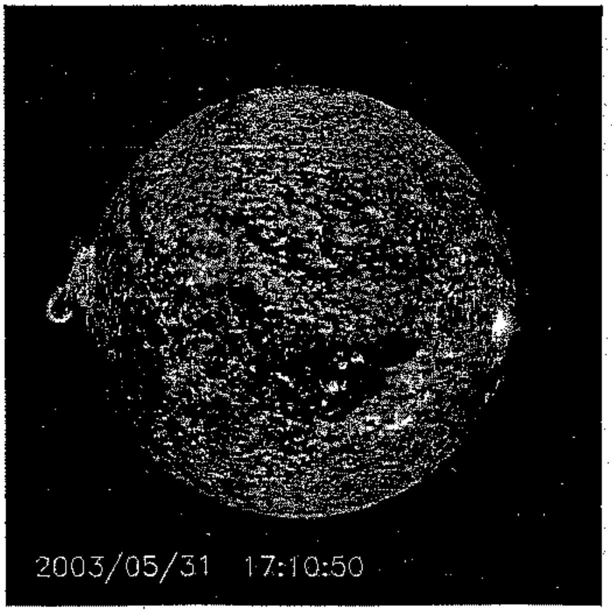
A small low latitude coronal hole was in a geo-effective position in the western hemisphere at the beginning of the month, leading to a high solar wind speed (with maximum 650km/s on May 1) and active geomagnetic conditions on May 1 and 2 (early in the day). The wind speed then decreased to 400km/s and mostly quiet conditions reigned from May 2 (late) until midday on May 6. The leading edge of another, much larger, trans-equatorial coronal hole rotated across the central meridian on May 3. This hole blew a high speed solar wind in the Earth direction between May 5 and May 11, reaching a peak value of about 900 km/s on Friday, May 9, then coming down to 550 km/s on Sunday May 11, only to start rising again immediately to more than 700km/s on May 14 and then gradually decrease to 400km/s on May 18. During most of the first high wind speed episode the Bz component was weakly southward pointing (about -5 nT). As a consequence, geomagnetic conditions were at minor to major storm level during May 6-11, reaching K=6 in Wingst on May 8 and May 10. Then, active to minor geomagnetic storm conditions followed until May 15, while May 16-20 were mostly quiet days.

Several more coronal holes followed suit. A smaller equatorial coronal hole reached the central meridian on May 15. A third, again larger coronal hole with equatorial extension reached the disk centre on May 18. The influence of these was limited, leading to a minor geomagnetic storm on May 21-22 and active geomagnetic conditions from May 22 to May 28. Another small coronal hole reached central meridian on May 24 and pushed up the solar wind speed a few days later, reaching a maximum above 700km/s on May 28 before going down again to just above 600km/s. But on May 29-30 a sequence of 3 shocks due to CME fronts arrived, causing a peak of nearly 900km/s and a few short periods of strongly southwards oriented interplanetary magnetic field. This set off a major geomagnetic storm with the K-index in Wingst reaching 7 for a 12-hour period on May 29-30. Auroral sightings were reported in Belgium on this occasion! After the last shock, the solar wind speed decreased fairly rapidly to just above 600km/s by the end of May 31, and also the geomagnetic storm came to an end.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	Cat.	NOAA	NOTE
02	0247	0308	0344	S17W18	M1.0	SF	37		79	0345	EIT derived loc.
26	0538	0550	0602	S07E06	M2.0	1F	91	III/1, IV/1, CTM/1	18	0365	EIT derived loc.
26	1622	1637	1651	S08W00	M1.0		56	CTM/2	18	0365	EIT derived loc.
27	0240	0306	0321	S07W03	M1.4	1F	98	III/3	18	0365	
27	0506	0626	0716	S07W07	M1.6	1F	150	III/2	18	0365	EIT derived loc.
27	2256	2307	2313	S07W17	X1.3	2B	910	II/3, III/2, IV/2	18	0365	
28	0017	0027	0039	S07W20	X3.6		1600	II/3, III/3, IV/3	18	0365	EIT derived loc.
29	0051	0105	0112	S07W38	X1.1	2B	730	II/3, III/3, IV/1	18	0365	
29	0209	0218	0224	S37E03	M1.5	1F		III/3, IV/1	13	0368	
29	1928	1937	1943	S35W13	M2.8	1N	310	II/3	13	0368	
31	0213	0224	0240	S07W65	M9.3	2B	1300	II/3, V/3	18	0365	

IV. Picture of the month



A new active region announces its arrival. This eruption (on the left) from Catania sunspot group 22 (NOAA 0375) while still behind the solar disk was taken by the EIT telescope in the 304 Å passband. The bright spot on the right hand side is the flare-productive Catania sunspot group 18, about to rotate out of view. *(The EIT instrument is onboard SOHO, a joint ESA-NASA/ESA mission.)*

RINGVORMIGE MICRO-ECLIPS

Relaas van de bedekking van de zon door de planeet Mercurius op 7 mei 2003, waargenomen te Appingedam door W.T. Zanstra

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Op 7 mei 2003 tussen 07:11 en 12:32 uur van de Midden Europese Zomertijd-rekening werd het 40 miljoenste deel van de zonneschijf door de planeet Mercurius bedekt. Een verschijnsel dat niet vaak voorkomt en als Mercurius-overgang bekend staat. Al een aantal dagen van tevoren zag het ernaar uit dat het mooi weer zou worden, wat inderdaad op de dag zelf het geval was. Twee telescopen, een 15 cm Newton en een 20 cm Schmidt-Cassegrain waren voor de waarneming in orde gemaakt. Er kon zowel visueel als fotografisch worden gewerkt. De kijkers werden op het oog zo goed mogelijk parallactisch opgesteld. Als objectieffilter werd het bekende solarscreen gebruikt.
Het probleem van een kleine tuin in een bewoonde buurt is dat het zonlicht niet op ieder moment onbeperkt kan binnenkomen. Voor het begin van de waarneming rond zeven uur moest dan ook worden uitgeweken naar een lokatie in het vrije veld, waar gebruik werd gemaakt van de mobiele Schmidt-Cassegrain. Door de bewolking laag bij de horizon kon bij een vergroting van 80 maal pas om 7:23 uur de eerste waarneming worden gedaan van het exact ronde Mercuriusschijfje voor de zon. Verwarring met een veel grotere, maar grillig gevormde, zonnevlek was niet mogelijk, hoewel er toch later een melding is geweest van iemand die beweerde Mercurius de hele dag te hebben kunnen volgen. In het bedauwde land tussen de eenden, paarden en kievieten kwam het "kosmisch gevoel" wel heel dicht bij. De lange wolkenslierten van zuidwest naar noordoost gaven de windrichting aan. Met behulp van een meetoculair werd om 7:36:30 uur de eerste positiebepaling van het planeetschijfje verricht. Na negen metingen werden vanaf 9:28 uur de waarnemingen voortgezet vanuit de eigen tuin, zowel met de Newton (visueel, zes posities) als met de Schmidt-Cassegrain (visueel, nog acht posities en fotografisch in primair focus, vijf posities). Het derde en vierde contact werden vastgelegd (moeilijk!) om achtereenvolgens 12:30:14 uur en 12:32:08 uur.
Daar de werkgroep Zon een leuke opdracht had verstrekt aan haar leden, houden we ons in dit verhaal verder bezig met de fotografische resultaten. Deze zijn geplot op de zonneschijf. Zie figuur 1. De horiontale as is evenwijdig aan de rechte klimming, de vertikale as komt overeen met de richting van de declinatie. Noord is boven en west naar rechts. De coödinaten van de vijf posities werden bepaald aan de hand van projectie van de gemaakte dia's. De bij de posities behorende tijdstippen zijn nauwkeurig bekend.
De bedoeling was om uit de gegevens dat de diameter van het Mercuriusschijfje 12" bedraagt, de minimale afstand tussen de middelpunten van Mercurius en de

zon 703" werd en uit het feit dat het kwadraat van de afstand van het Mercurius-schijfje tot het middelpunt van de zonneschijf als functie van de tijd een parabool moet zijn, de diameter van de zonneschijf te berekenen.

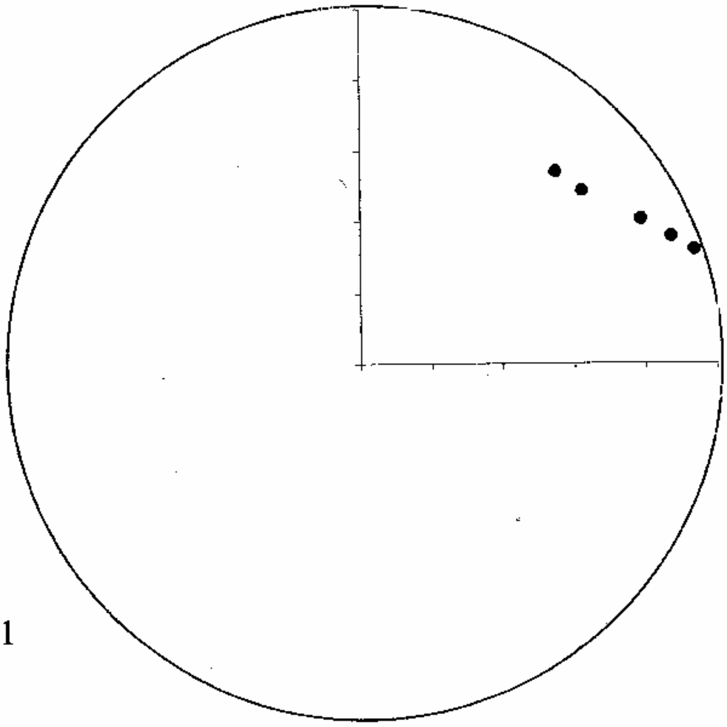


fig. 1

In de praktijk, om de effecten van de afplatting van de zonneschijf door de dampkring en de overstraling door het felle zonlicht te minimaliseren, wordt niet gewerkt met de afstand tussen de middelpunten van de zon en Mercurius (Mm), maar met de verhouding (zie figuur 2):

V = Mm/(DB+CA) = Mm/(diam. Zon + diam. Mercurius).

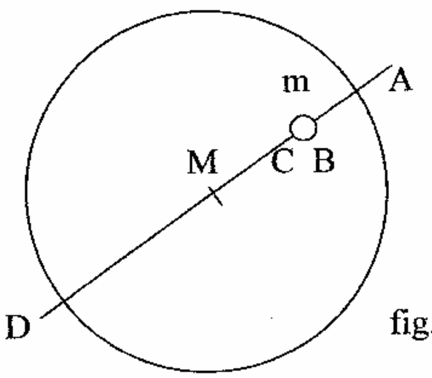


fig. 2

Het kwadraat hiervan is eveneens een parabolische functie van de tijd. Het bewijs hiervoor steunt op de stelling van Pythagoras.
De waarnemingen zijn in de volgende tabel weergegeven. Er is een tijdstip 0 gekozen om 7:00:00 uur in de ochtend van 7 mei.

	T(min)	V^2
1.	220,00	0,147
2.	244,75	0,159
3.	288,00	0,195
4.	311,00	0,223
5.	328.50	0,243

Dankzij een grafische rekenmachine kan de regressieparabool door deze vijf punten worden bepaald met de formule

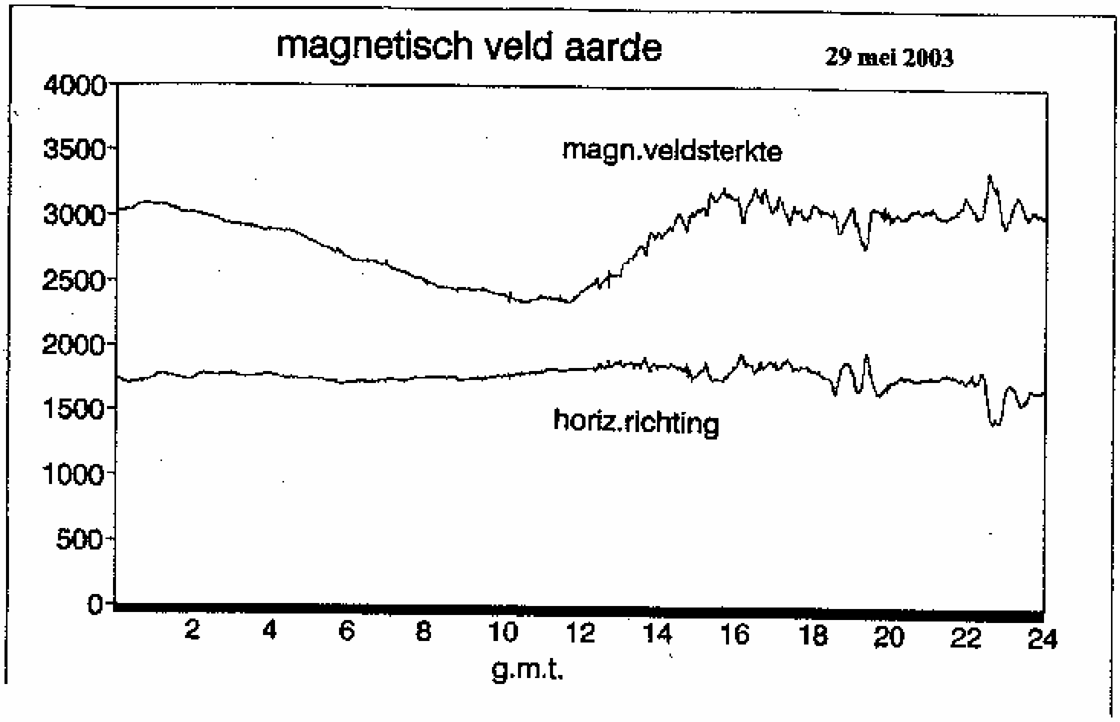
$$V^2 = 4{,}40.10^{-6}.T^2 - 1{,}52.10^{-3}.T + 0{,}27$$

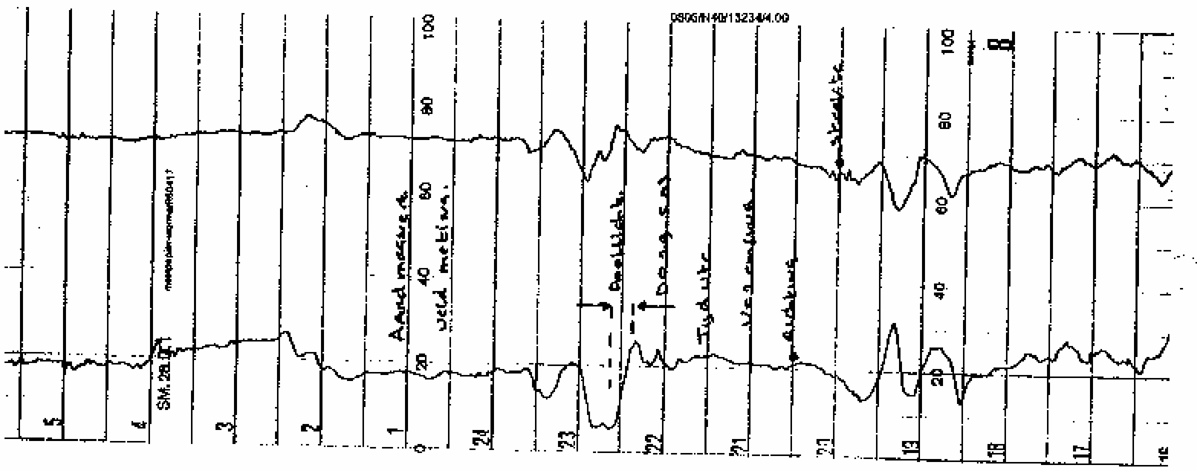
Met behulp van een beetje HAVO-wiskunde valt hieruit te berekenen dat de minimale waarde van V^2 0,136 bedraagt en dat die waarde wordt bereikt op het tijdstip T = 172,3 min (9:52:18 MEZT).
Hieruit en uit de gegevens voor de minimale afstand van Mercurius tot het middelpunt van de zon (703") en de diameter van de planeet (12") kan worden gevonden dat de diameter van de zon op het moment van de waarneming 1894,3" moet zijn geweest. Bij een theoretische waarde van 1902,3" is er zodoende een fout gemaakt van 0,42%.

Opmerking.
Indien er geen mogelijkheid voorhanden is om een regressieparabool door een aantal punten te bepalen, kan ook op de volgende manier een redelijke parabool door een aantal van minimaal drie punten worden gevonden. Bereken voor elke mogelijke combinatie van drie punten uit de totale verzameling van meetpunten de formule van de parabool en bepaal van alle gevonden parabolen het gemiddelde van de overeenkomstige coëfficiënten. Bij vijf meetpunten gaat het om tien parabolen, omdat er op tien manieren drie punten uit vijf gekozen kunnen worden.

(Zie: Bulletin Werkgroep Zon, januari 2003)

Wim Zanstra
Appingedam

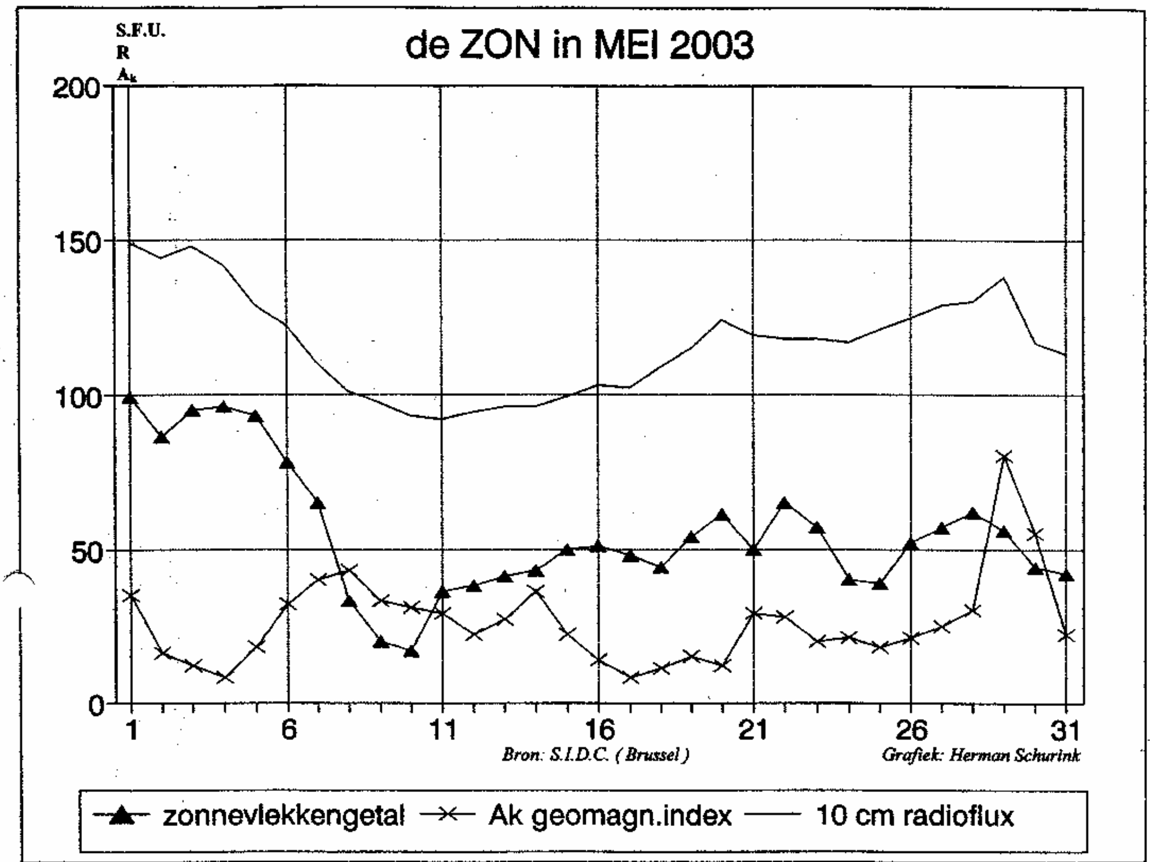


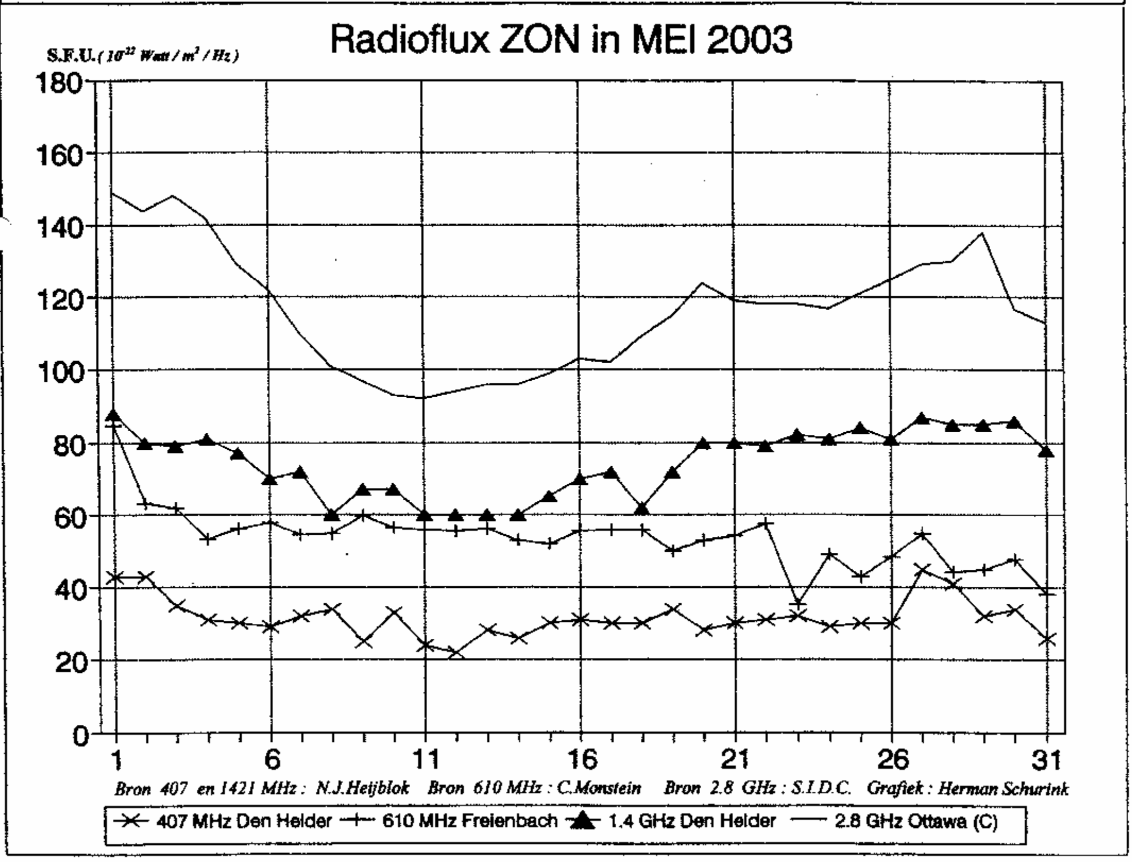


Poollicht op 29 mei 2003

Registraties van het magnetisch veld van de aarde.

Het bovenste diagram is van Nico Heijblok (Den Helder)
Het onderste diagram is van Rob Stammes (Dirkshorn)


de ZON in MEI 2003
S.F.U.
R
A_k
200
150
100
50
0
1
6
11
16
21
26
31
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux


Radioflux ZON in MEI 2003
S.F.U.(10^{-22} Watt / m² / Hz)
180
160
140
120
100
80
60
40
20
0
1
6
11
16
21
26
31
Bron 407 en 1421 MHz : N.J.Heijblok Bron 610 MHz : C.Monstein Bron 2.8 GHz : S.I.D.C. Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon — Juni 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

SIDC	Day	Bals	Gort	Gr50	Gro8	Jn 9	Jn40	Kr105	vSlo	Son	Spa	Stam	Zans	Zijle	Uccle groups	Uccle spots
42	1		30	66		12			55		67		34	70	3	22
38	2	44	41			24		28	51		40	26	39	52	3	17
40	3		43			36			47	48	50	33	47	55	3	27
47	4		67	75		36		69	58	70	54		44	76	5	24
59	5		56	88		35		70	65	69	84		57	88	4	17
88	6	112	68	128		38	39	57	101	103	100	52	93	116	6	58
98	7		93	108		48		67	101	135			118	170	6	84
101	8		100	126		42			104	120	119	62	122	160	6	97
111	9		100	133		42		60	125	120	173	74	117	186	6	116
111	10		121			47			118	117	153					
116	11		133	140	84	44			114	171	154	96	102	192	6	136
115	12		121	120	112	61	61		122	173	148	96	115		7	121
96	13		121	113	100	50		85	114	144	139	72	122	192	6	109
81	14			84		23			83				72		6	63
63	15		26	66	42	12			64		61	26			4	38
57	16		41	72	55	23			63	48	82	15	43	70	5	27
56	17		38		53	35			77	62	71	27	44	102	4	25
68	18		58		57	38			71	70	83	29	76	94	4	53
76	19			87									53			
74	20		51	69	62	28	42		87		87	47	78		4	34
62	21		58		65	42		75	72		79		64		3	43
61	22	66	58			39			64		90	49	64		3	31
66	23	84	65		58	47		63	77			46	63	104	5	41
68	24	81	60		76	36		77	85		80	43	62		5	24
76	25	85	46		82	26		58	85		106	47	61		7	28
82	26	117	61			38	51	140	100		88		55	125	8	29
93	27	140	79		83	57		100	111		94	51	79	165	9	27
93	28		81						91				84		9	29
94	29	131	76	134	116	47		63	103	95	102	43	88	133	8	32
82	30	107							77				82			
	observ	10	27	16	14	27	4	14	29	15	24	19	28	18		
	k	0,80	1,17	0,82	1,06	2,21	1,87	1,14	0,90	0,85	0,80	1,75	1,07	0,65		
	st.dev.	0,09	0,33	0,13	0,19	0,86	0,25	0,37	0,10	0,15	0,11	0,62	0,18	0,08		
	st.d./ k	0,11	0,28	0,16	0,18	0,39	0,14	0,32	0,11	0,18	0,14	0,36	0,17	0,13		

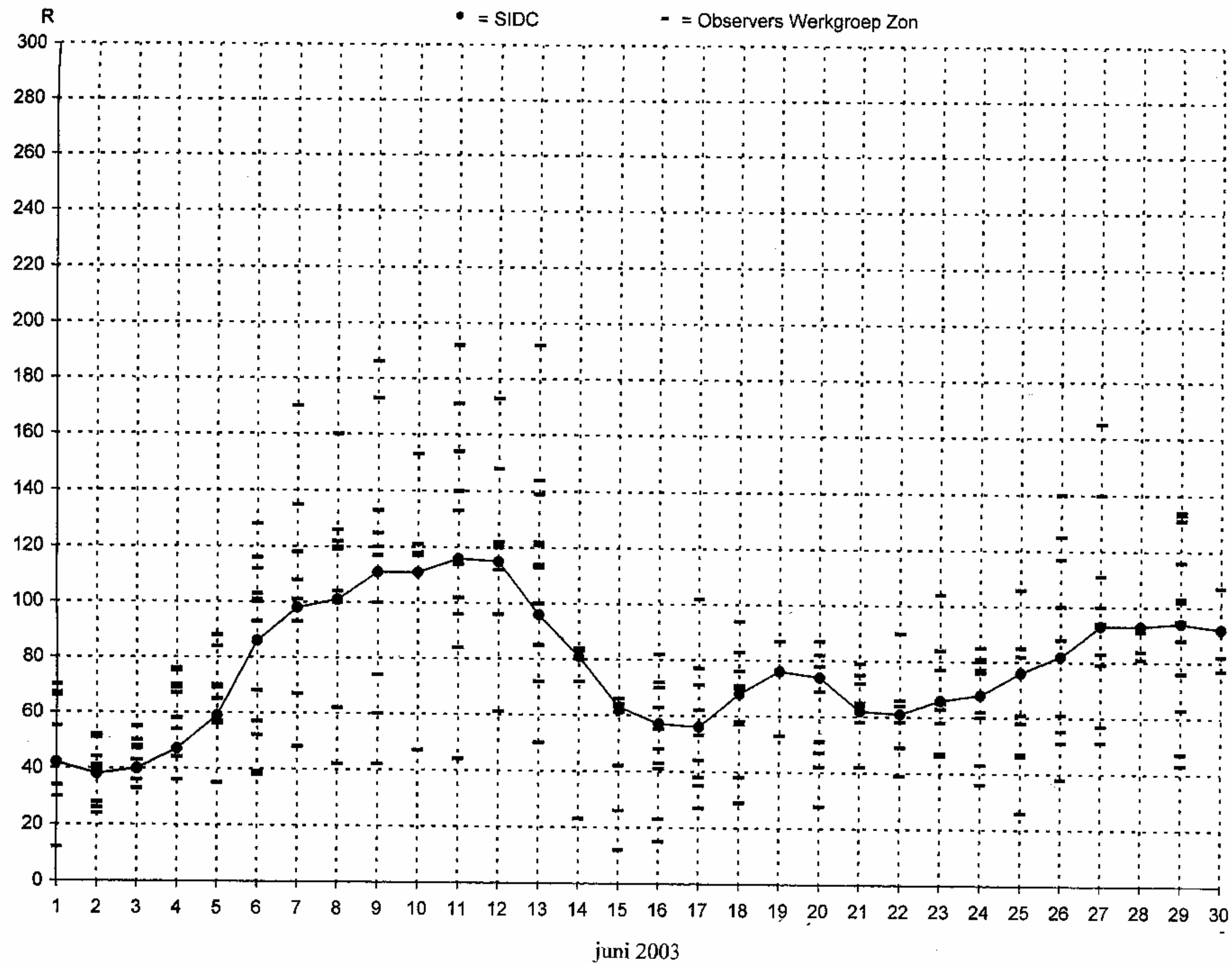
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Son = A.T. Son [Rf 150 Kutter]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Spa = T. Spaninks [75]
Gr50 = Mw G. Gravers [50]	Kr105 = K. Kroesen [105]	Stam = R.Stammes [100]
Gro8 = A. Groenewegen [80]	Scho = A. Scholten [60]	Zans = W. Zanstra [Rf 155]
	vSlo = B. van Slooten [90]	Zijle = W.A. Zijlema [90]

S.I.D.C. SUMMARY OF THE URSIGRAMS

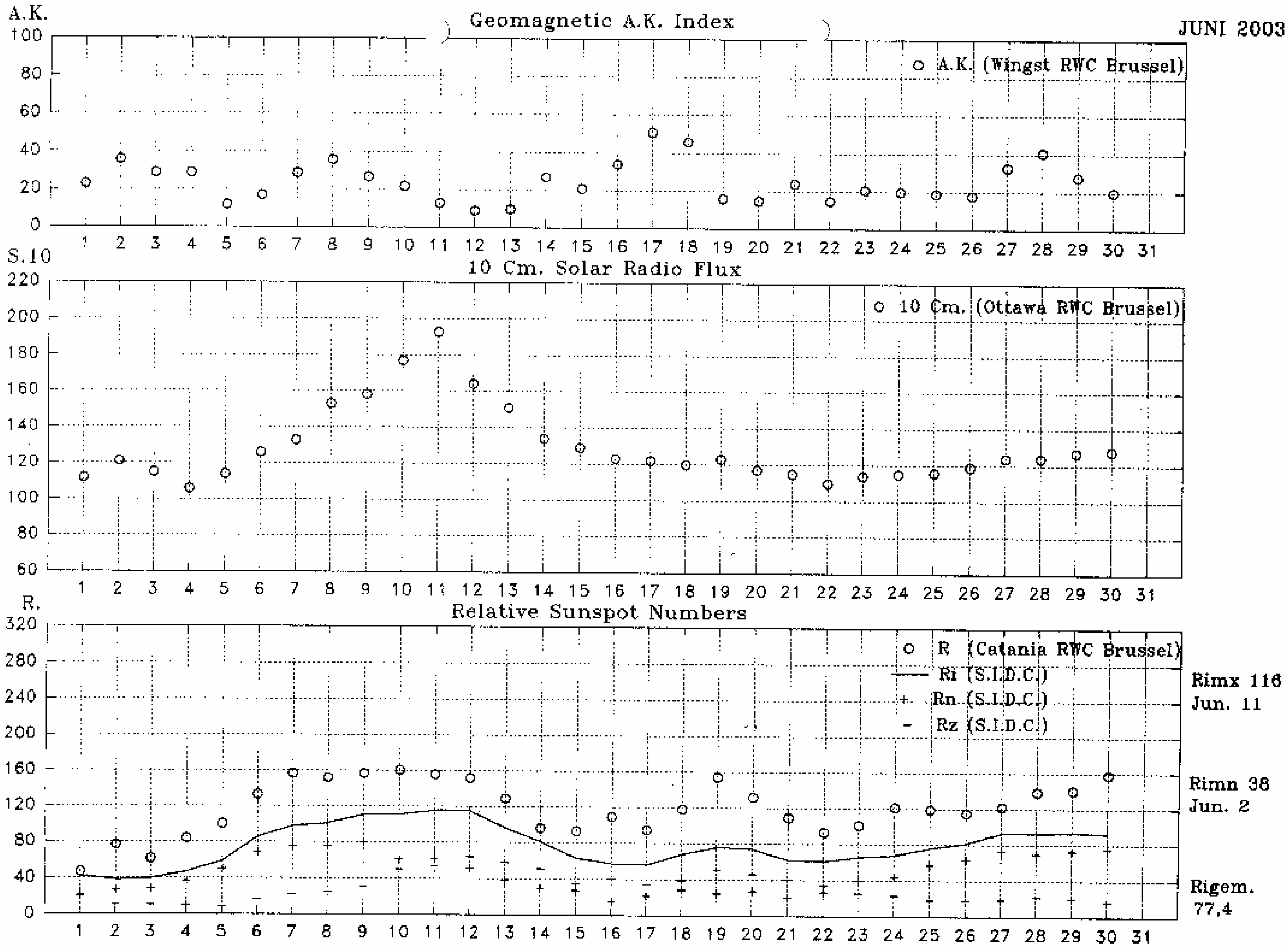
Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	42	51	42	113	777	104	1/0	22	
1	42	29	43	112	789	3	5/0	23	
2	38	45	45	121	806	24	4/0	36	
3	40	64	42	115	823	3	0/0	29	
4	47	83	41	106	830	0	0/0	29	
5	59	85	41	114	835	2	0/0	12	
6	86	109	43	126	835	25	1/0	17	
7	98	145	46	133	832	4	0/0	29	
8	101	210	50	153	831	127	1/0	36	
9	111	215	50	158	830	25	2/1	27	
10	111	260	52	177	830	147	9/1	22	
11	116	277	51	193	829	38	8/1	13	
12	115	233	55	164	832	45	4/0	9	
13	96	161	54	151	838	12	3/0	10	
14	81	75	49	134	839	2	1/0	27	
15	63	42	51	129	839	1	0/1	21	
16	57	37	49	123	821	4	2/0	34	
17	56	41	46	122	810	12	1/0	38	
18	68	66	48	120	816	6	0/0	46	
19	76	58	49	123	811	0	0/0	16	
20	74	91	51	117	803	2	0/0	15	
21	62	60	94	115	800	3	0/0	24	
22	61	68	47	110	799	2	0/0	15	
23	66	75	51	114	798	2	0/0	21	
24	68	73	46	115	798	7	0/0	20	
25	76	91	46	116	805	1	0/0	21	
26	82	84	44	119	818	0	0/0	18	
27	93	77	49	124	821	0	0/0	33	
28	93	106	46	124	820	0	0/0	41	
29	94	117	46	127	826	3	0/0	28	
30	92	148	51	128	826	16	0/0	20	

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 x Sn+10 x "1"+100 x ">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.



R
• = SIDC
- = Observers Werkgroep Zon
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
juni 2003


JUNI 2003
Geomagnetic A.K. Index
A.K.
A.K. (Wingst RWC Brussel)
10 Cm. Solar Radio Flux
S.10
10 Cm. (Ottawa RWC Brussel)
Relative Sunspot Numbers
R.
R (Catania RWC Brussel)
Ri (S.I.D.C.)
Rn (S.I.D.C.)
Rz (S.I.D.C.)
Rimx 116
Jun. 11
Rimn 38
Jun. 2
Rigem.
77,4

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

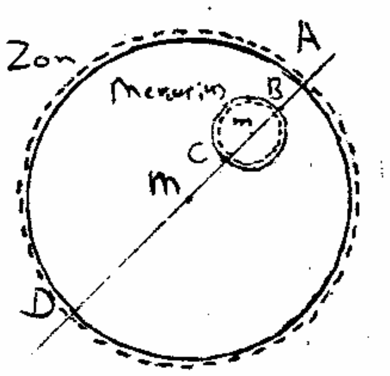
(Hemispheric sunspot numbers)

juni 2003

	S.I.D.C.		Balster		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	21	21					28	27			30	37	14	20
2	27	11	31	13			28	23			28	12	28	11
3	29	11					32	15	34	14	34	16	33	14
4	37	10					43	15	55	15	39	15	31	13
5	50	9					54	11	57	12	73	11	46	11
6	69	17	86	26	39	0	74	27	81	22	76	24	71	22
7	75	23					75	26	105	30			78	40
8	76	25					78	26	92	28	83	36	89	33
9	80	31					89	36	92	28	122	51	78	39
10	61	50					61	57	67	50	92	61		
11	62	54					52	62	80	91	86	68	54	48
12	51	64			17	44	59	63	75	98	74	74	44	71
13	38	58					49	65	50	94	53	86	48	74
14	30	51					36	50					26	46
15	28	35					23	41			14	47		
16	16	41					25	38	14	34	19	63	13	30
17	22	34					26	51	24	38	26	45	11	33
18	29	39					29	42	27	43	28	55	29	47
19	25	51											27	26
20	28	46			28	14	30	57			35	52	31	47
21	21	41					47	25			24	55	22	42
22	27	34	23	43			24	40			39	51	22	42
23	40	26	50	34			41	36					34	29
24	44	24	53	28			55	30			50	30	38	24
25	57	19	60	25			60	25			69	37	38	23
26	63	19	89	28	40	11	74	26			62	26	44	11
27	73	20	111	29			83	28			68	26	54	25
28	70	23					71	20					66	18
29	73	21	111	20			69	34	72	23	74	28	70	18
30	75	17	85	22			58	19					65	17

Diameter Zon bepaald op 7 mei 2003.

Zoals in een vorig maandbulletin is voorgesteld is er aan de hand van de Mercurius-overgang de zonsdiameter bepaald. Hiervoor werden 24 foto's gemaakt met een lens met een opening van 2 cm en een 100 cm brandpuntsafstand die met een converter op 200 cm werd gebracht. Daarvoor werd nog een laag solarscreen aangebracht.



Van elke opname werd de afstand Mm tussen de middens van de zon en Mercurius gemeten, evenals de afstanden DB en CA. Op die manier werd de overstraling van de zon enigszins geëlimineerd en de invloed van de refractie in de atmosfeer was daardoor minimaal. Van elke foto werd Mm/(DB+CA) bepaald en in een grafiek uitgezet tegen de tijd. Het minimum van de grafiek werd afgelezen op 0,3. Mercurius is dan het dichtst bij het midden van de zonneschijf; volgens de sterrengids is de onderlinge afstand dan 703". In de vorige aankondiging stond een fout in de formule;
DB+CA=diameter zon+diameter Mercurius
en **niet**:
DB+CA=diameter zon+**2x** diameter Mercurius.
Het wordt dan:

Mm / (DB + CA) = 703 / diameter zon + diameter Mercurius
0,367 = 703 / diameter zon + 12
diameter zon = 1903.5"

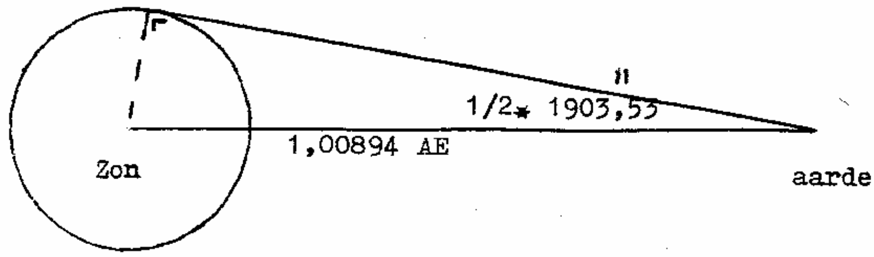
Volgens de sterrengids was dit op 7 mei 1902,25". Wellicht is getal gebaseerd op een andere meettechniek. De meetfout werd bepaald door van elke foto Mm uit te rekenen en het verschil te bepalen met de Mm-waarde, die volgt uit de grafiek op dat zelfde tijdstip van de foto. Dan kom je gemiddeld op ca 1,26". Helaas was er op 7 mei sluierbewolking, waardoor Mercurius een vaag vlekje was en ook was de optiek niet helemaal perfect, anders had ik een veel nauwkeuriger uitkomst gekregen. Achter dit artikel staat de grafiek van Mm / (DB + CA) afgebeeld. Inmiddels heeft ook de heer Zanstra uit Appingedam zijn waarden van Mm / (DB + CA) ingestuurd; deze zijn aangegeven met een **x** , die van mij met een • Zijn uitkomst staat in het vorige Bulletin. Al met al was dit toch een leuk stuk amateur-wetenschap.

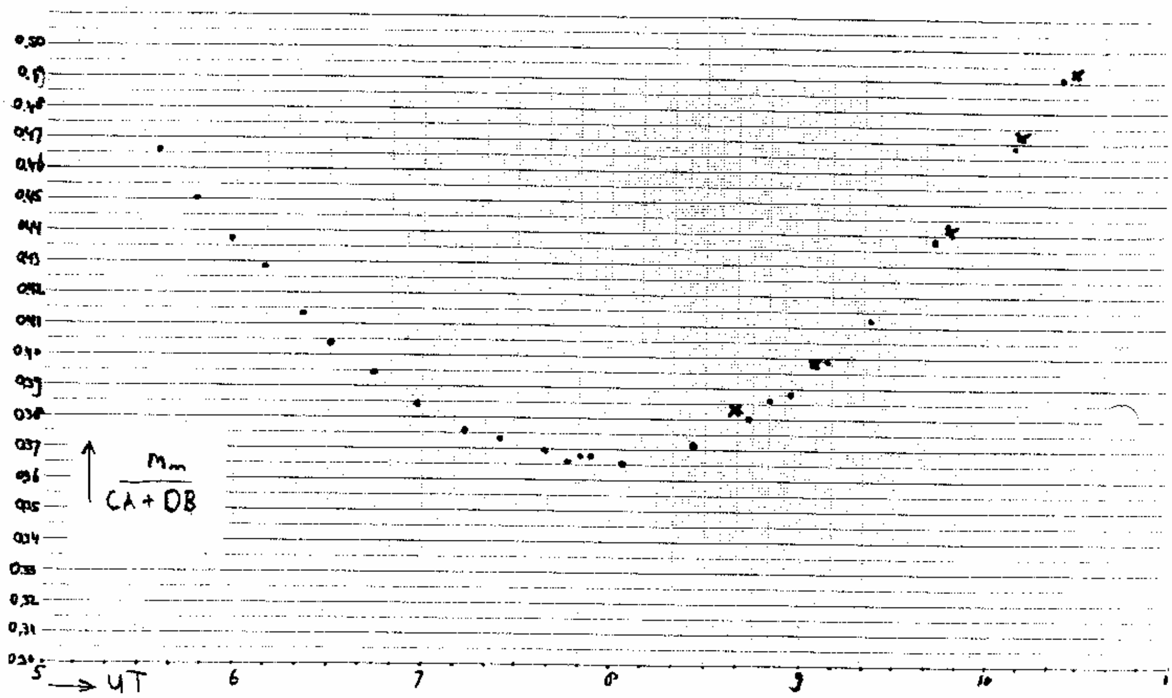
D.W. Jannink

P.S. Als we de diameter van de zon in km willen weten moeten we de afstand weten. Die was op 7 mei 1,00894 AE. Dat wordt dan (zie fig.):

D = 2 sin (1/2 x 1903,53") x 1,00894
= 0,009311 AE
= 1392912 km

Vergelijk dit met de waarde uit de sterrengids. Merk op dat de van de aarde zichtbare rand van de zonneschijf geen grootcirkel op de zonneglobe is. Nou maar afwachten of bij een volgende Mercuriusovergang er dezelfde diameter komt uitrollen.





Waarneming van de Mercuriusovergang over de zon op woensdag 7 mei 2003.

Omdat ik vanuit mijn eigen woonplaats geen vrij uitzicht heb vanwege de vele bomen heb ik waargenomen vanuit de tuin van mijn ouderlijke huis in Thesinge. Vroeg opgestaan en naar mijn ouders gereden, ondertussen de zon zien opkomen. De lucht was bijna wolkenvrij.
Voor half zeven was alles al opgesteld: telescoop, tafel, kruk, klok, papier, documentatie enz. De kijker werd op de zon gericht, maar door de lage stand was het beeld erg onrustig. De intrede heb ik gemist. Doordat ik naar de verkeerde plaats op de zon keek duurde het even voordat ik het roetzwarte schijfje van Mercurius zag. Bovendien werd de seeing slechter door de toenemende bewolking. Het 'zwarte-druppeleffect' was ook waarneembaar. Uit vergelijking met een zonnevlek (in dit geval NOAA Active Region 351) blijkt dat de Mercurius-schijf nog donkerder (zwarter) is dan de centrale gedeelte (umbra) van de vlek. De hele morgen heb ik het fenomeen waargenomen. Af en toe verdween de zon achter de wolken. Omstreeks half één naderde de planeet de zonnerand. Vlak voor het moment dat de Mercurius schijf de zonneschijf begon te raken trad het 'zwarte-druppeleffect' weer op. Dit bemoeilijkte de timing van de uittrede. Steeds minder werd zichtbaar van de Mercurius-schijf. De werkelijke uittrede werd gemist doordat opdat moment een grote wolk voor de zon verscheen.
Enkele gemeten tijdstippen (stopwatch geijkt met DCF77-klok, MEZT):

Intrede I	7h 13m 45s	Mercurius stond al voor deel voor de zon, maar was nog niet volledig 'los' van de zonnerand.
II	7h 15m 52s	Mercurius los van de zonnerand.
Uittrede III	12h 28m 14s	Zwarte-druppel effect treedt op.
IV	12h 32m 00	Wolken voor de zon, uittrede gemist.

Instrument: 90 mm F1000 mm Vixen refractor (azimutaal) met Herschel prisma en oculairfilter (9 mm oculair,111 keer) voor de intrede en een glas-objectief-filter (9 mm oculair, 111 keer) voor de uittrede).

Het druppel-effect.
Vlak na de intrede of vlak voor de de uittrede als Mercurius de zonnerand niet raakt en zich voor de zon bevindt verwacht men ook achter de planeet zonlicht. Dat gebeurt ook wel, maar niet meteen. Er blijkt nog een behoorlijke tijd een soort staart tussen de planeet en de rand van de zon te zitten. Hierdoor heeft Mercurius tijdelijk de vorm van een druppel, ballon of een peer en dit bemoeilijkt de timing van de tijdstippen II en III. Een afdoende verklaring voor dit fenomeen heb ik niet gevonden. Verschillende bronnen geven diverse verklaringen: grote van de kijker, diffractie van licht, slechte seeing. Meest waarschijnlijke verklaring is dat heeft te maken met diffractie van licht.
(zie uitleg: http://nicmosis.as.arizona.edu:8000/POSTERS/TOM1999.jpg).

Volgend jaar is er een nog zeldzamere overgang, namelijk die van Venus. Op dinsdag 8 juni 2004 schuift Venus voor de zon. De laatste maal dat dit gebeurde was in december 1882.
Enkele tijdstippen (zomertijd):

1	Begin van de overgang	7h13m
2.	Maximum	10h19m
3	Einde van de overgang	13h25m

N.B. In de electronische encyclopedie van Microsoft, Encarta, lees ik: Woensdag, de dag van de week die bij de Romeinen genoemd was naar *Mercurius* (Latijn: dies Mercuri, Frans: mercredi)

Wim Zijlema

Bronnen:

Eigen waarnemingen
Paul Doherty — Planetenatlas
Joseph Ashbrook — The astronomical scrapbook
E.M Antioniadi — The planet Mercury
Internet: http://nicmosis.as.arizona.edu:8000/POSTERS/TOM1999.jpg).
Fred Espenak, NASA/gsfc

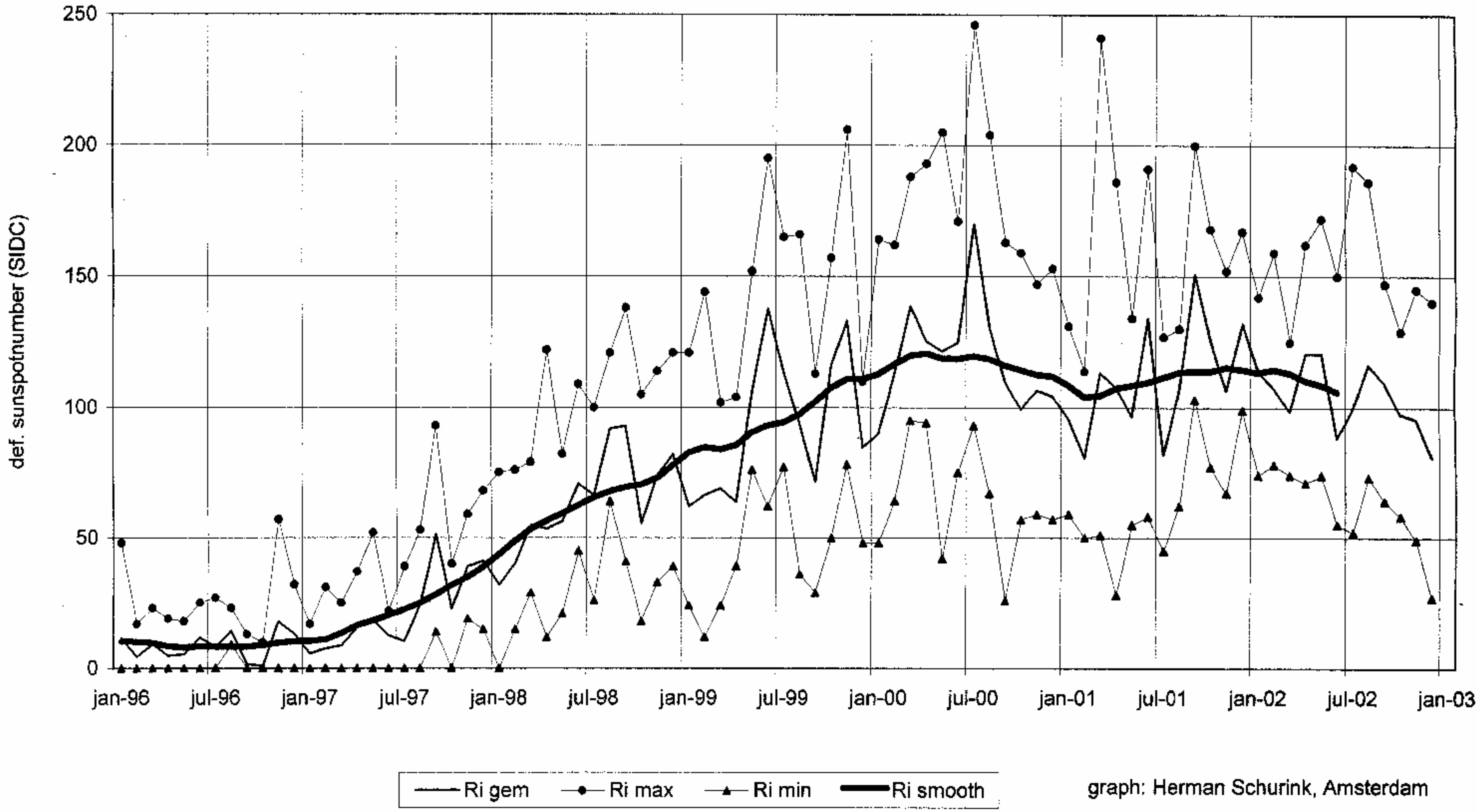
S I D C - *News*

2003 n° 2

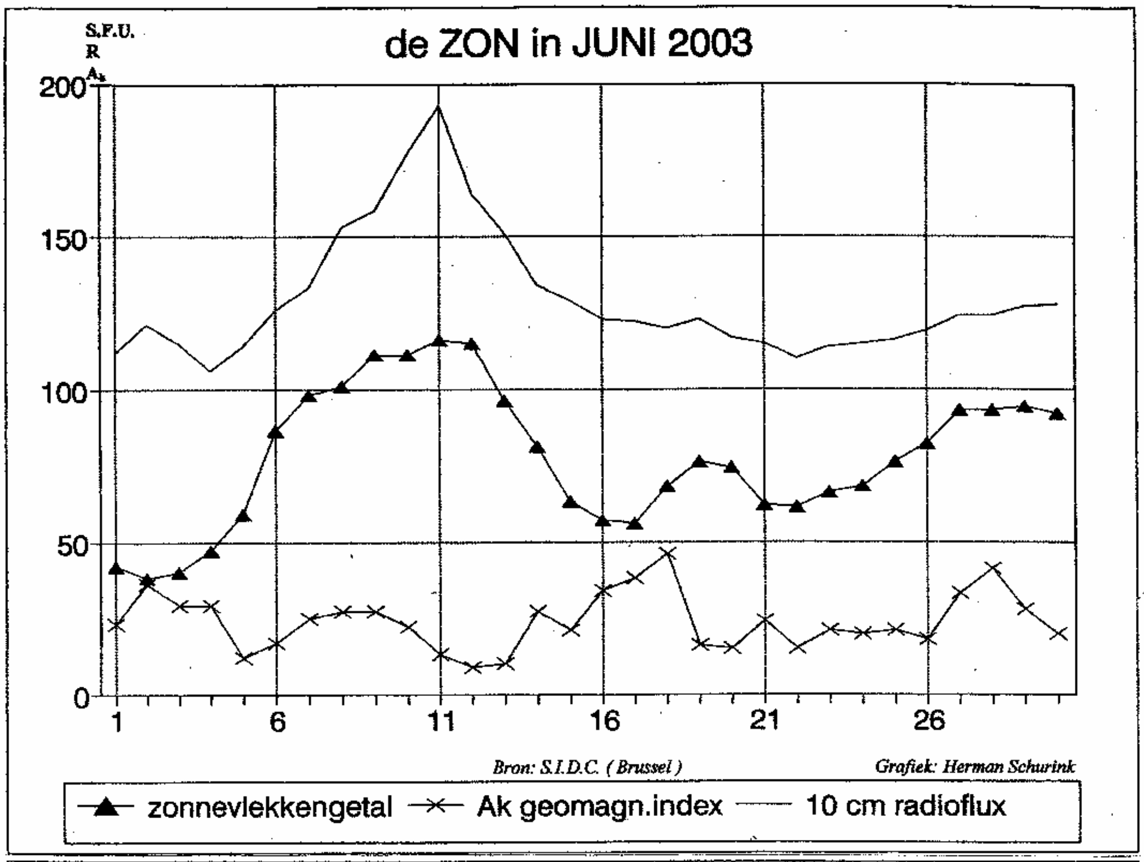
SIDC DEFINITIVE INTERNATIONAL AND HEMISPHERIC SUNSPOT NUMBERS FOR 2003

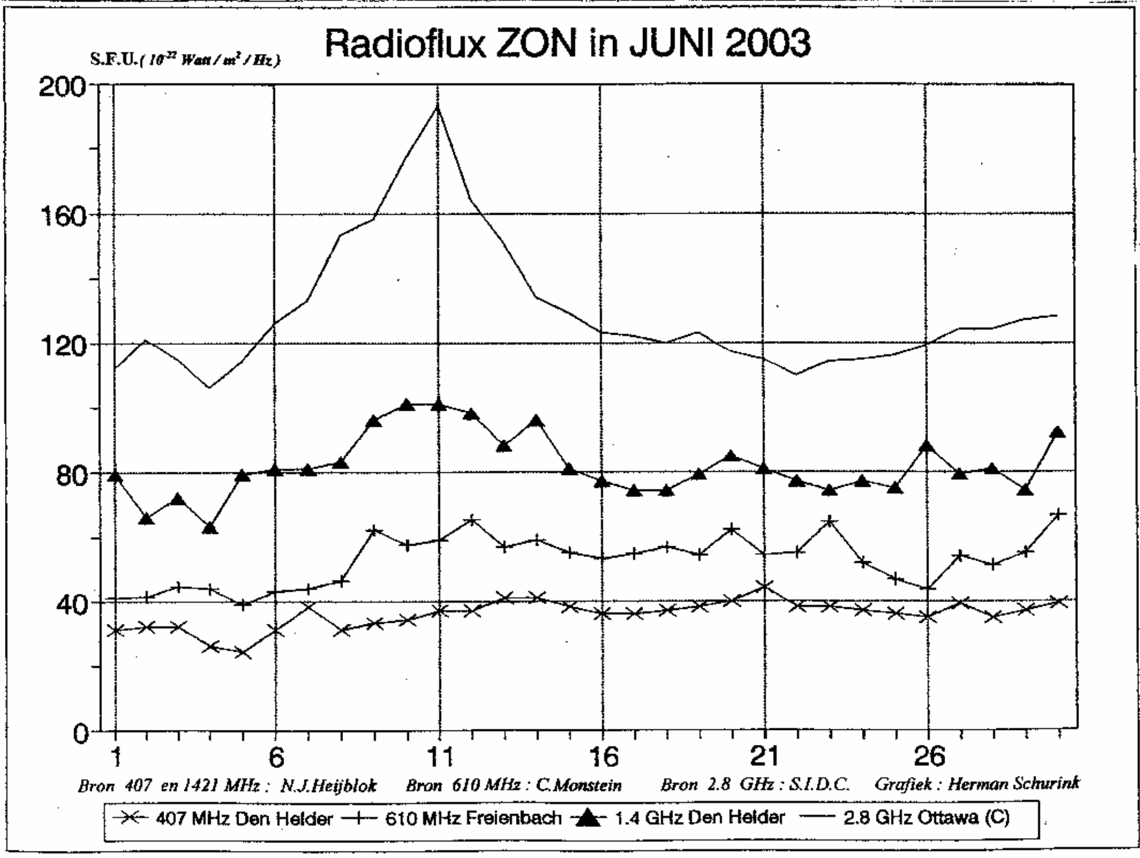
	JANUARY			FEBRUARY			MARCH		
Date	Ri	Rn	Rs	Ri	Rn	Rs	Ri	Rn	Rs
1	31	8	23	40	7	33	48	14	34
2	27	7	20	43	0	43	59	19	40
3	66	14	52	36	0	36	57	24	33
4	65	8	57	35	0	35	80	40	40
5	68	8	60	50	11	39	65	39	26
6	86	18	68	68	14	54	63	39	24
7	90	15	75	82	23	59	79	49	30
8	108	10	98	87	31	56	66	35	31
9	109	8	101	93	32	61	89	45	44
10	117	10	107	73	22	51	71	30	41
11	117	12	105	73	27	46	69	38	31
12	104	9	95	71	29	42	56	35	21
13	94	0	94	59	25	34	45	34	11
14	94	22	72	45	22	23	58	33	25
15	84	25	59	31	31	0	63	33	30
16	84	32	52	20	20	0	62	29	33
17	81	36	45	10	10	0	41	14	27
18	77	38	39	20	20	0	43	14	29
19	87	45	42	33	33	0	39	11	28
20	93	51	42	44	37	7	29	8	21
21	68	34	34	46	37	9	23	0	23
22	86	34	52	34	26	8	8	0	8
23	70	24	46	28	28	0	27	14	13
24	76	22	54	28	28	0	33	25	8
25	59	14	45	32	22	10	52	37	15
26	72	12	60	30	21	9	70	50	20
27	85	21	64	43	10	33	81	54	27
28	85	22	63	34	11	23	91	56	35
29	84	14	70				112	58	54
30	62	13	49				112	57	55
31	41	10	31				102	49	53
MEAN :	79.7	19.2	60.5	46.0	20.6	25.4	61.1	31.7	29.4

SOLAR CYCLE 23



graph: Herman Schurink, Amsterdam


de ZON in JUNI 2003
S.F.U.
R
A_k
200
150
100
50
0
1
6
11
16
21
26
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux


Radioflux ZON in JUNI 2003
S.F.U. (10^{-22} Watt / m² / Hz)
200
160
120
80
40
0
1
6
11
16
21
26
Bron 407 en 1421 MHz : N.J.Heijblok
Bron 610 MHz : C.Monstein
Bron 2.8 GHz : S.I.D.C.
Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon — Juli 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr40	Gr50	Gro8	Jn 9	Jn40	Kr105	vSlo	Son	Spa	Stam	Zans	Zijle	Uccle groups	Uccle spots
1		64			60	39		87	106	93	119		94			
2		81				28			78	83	97		55		2	9
3		60				29			92	75	94				7	33
4										76						
5									49						5	54
6		70				34									7	63
7	129	72			72	33	34		86		116	52	79			
8						32			108	84	107	54			8	53
9	141	96			98	42		111	113	116	115	53			8	93
10	99	74			70	24	39		86	99	77	40		136	8	63
11	97	48			56	16			71	76	58			112	8	68
12	72	72				24			76	86	76	31		115		
13	124	84		134		37		64	127	132	129	48		161		
14	120	85		153	93	38		87	111	124	117	35		147		
15	155	72		153	93	47		96	117	117	127	49		200		
16	149	62			124	48	53		107	110	116	42		168	9	24
17	156					65			110						9	35
18	146	89		123	97	69		96	127	132	125	63				
19	180	106			104	77		88	140	182	167	89		244		
20	192	153			155	80			191	171	228	93		287		
21	217	152			129	68	104	124	161	142	164	91		238	10	39
22	185	118			113	75		113	157	162	155	80		246		
23	147	88			102	75			133	136	124	52				
24	104	61				35					75				7	61
25	62	73			58	22			56	56		12			4	33
26		22	42		33	22		22	33		35	3				
27						22			22							
28	63	52			53	34		50	67	61		18		73		
29	67	49				37			52	50		23		60		
30		39				37			44	68						
31	67	50				24	24	47	55	57		16		68	4	8
observ	21	26	1	4	17	29	5	12	28	24	21	20	3	14		
k	0,72	1,13	0,67	0,75	1,04	2,23	1,91	1,15	1,00	0,86	0,86	2,44	1,30	0,59		
st.dev.	0,08	0,24	–	0,16	0,15	0,76	0,40	0,20	0,62	0,15	0,10	1,71	0,40	0,06		
st.d./k	0,11	0,21	–	0,21	0,14	0,34	0,21	0,18	0,62	0,17	0,12	0,70	0,31	0,11		

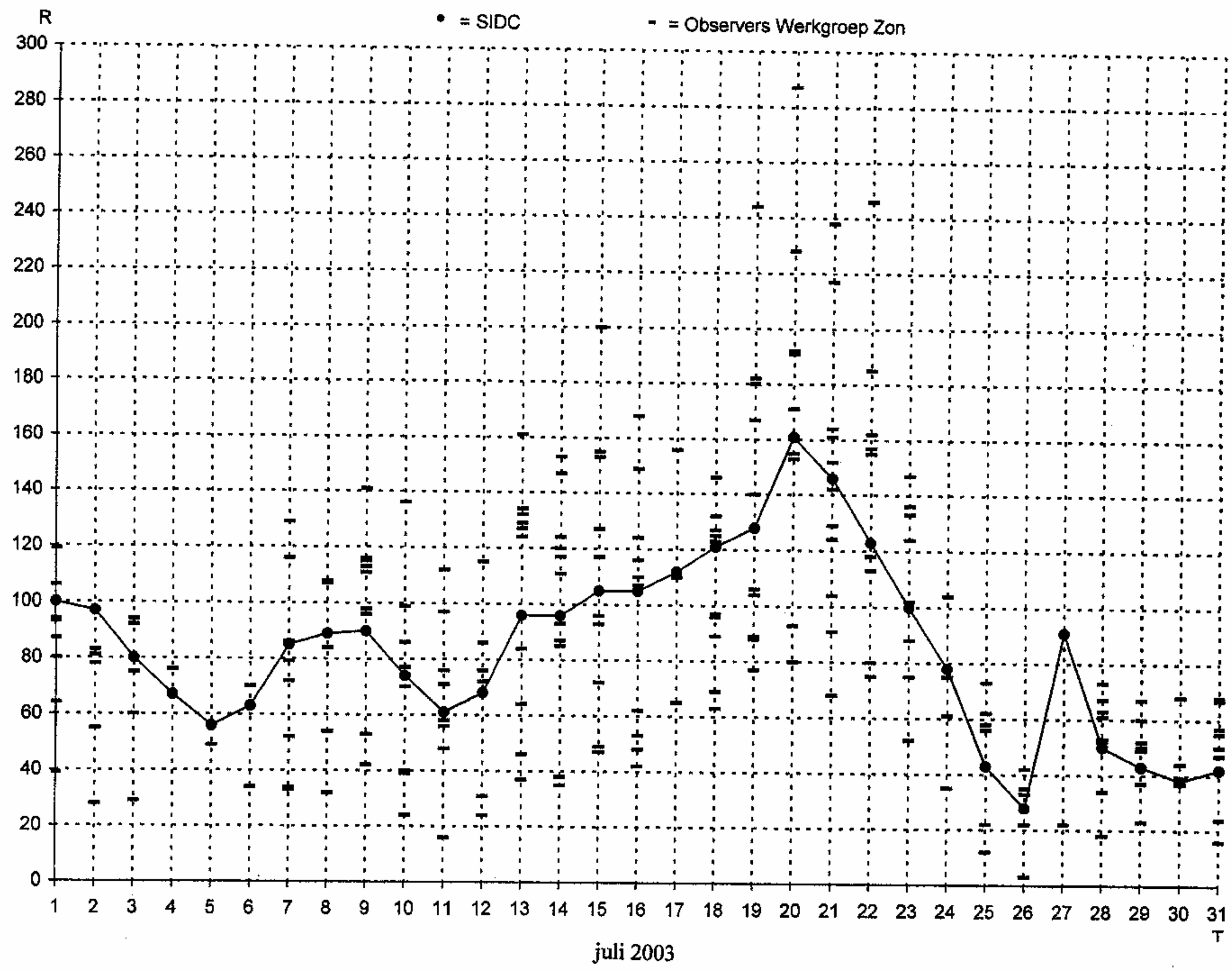
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Spa = T. Spaninks [75]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Stam = R.Stammes [100]
Gr40 = Mw G. Gravers [40]	Kr105 = K. Kroesen [105]	Zans = W. Zanstra [Rf 155]
Gr50 = Mw G. Gravers [50]	vSlo = B. van Slooten [90]	Zijle = W.A. Zijlema [90]
Gro8 = A. Groenewegen [80]	Son = A.T. Son [Rf 150 Kutter]	

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'_i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
30	92	148	51	128	826	16	0/0	20	
1	100	141	46	131	822	1	0/0	11	
2	97	128	48	135	831	13	1/0	16	
3	80	158	49	132	832	11	0/0	22	
4	67	199	46	140	831	17	0/0	22	
5	56	189	49	142	835	5	0/0	22	
6	63	187	47	130	837	8	1/0	14	
7	85	137	47	133	835	1	0/0	16	
8	89	119	49	131	838	17	0/0	6	
9	90	54	50	126	843	7	1/0	6	
10	74	46	48	123	840	4	1/0	10	
11	61	55	48	122	835	0	0/0	41	
12	68	66	48	///	837	0	1/0	35	
13	96	70	47	127	840	5	0/0	17	
14	96	68	44	127	835	4	0/0	16	
15	105	91	44	126	838	0	0/0	31	
16	105	79	46	133	842	3	0/0	31	
17	112	97	48	139	846	15	0/0	18	
18	121	119	49	140	847	12	0/0	19	
19	128	137	51	146	843	17	0/0	32	
20	161	219	57	157	842	17	0/0	21	
21	146	229	47	156	845	11	0/0	10	
22	123	181	52	153	842	20	0/0	11	
23	100	121	50	144	846	16	0/0	12	
24	78	64	49	125	845	0	0/0	12	
25	43	33	45	112	842	0	0/0	10	
26	28	24	41	103	841	0	0/0	41	
27	91	23	42	102	827	0	0/0	24	
28	50	48	44	103	831	3	0/0	23	
29	43	56	43	100	834	11	1/0	34	
30	38	51	45	99	833	0	1/0	30	
31	42	59	47	102	836	1	0/0	39	

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 x Sn+10 x "1"+100 x ">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.


R
• = SIDC
- = Observers Werkgroep Zon
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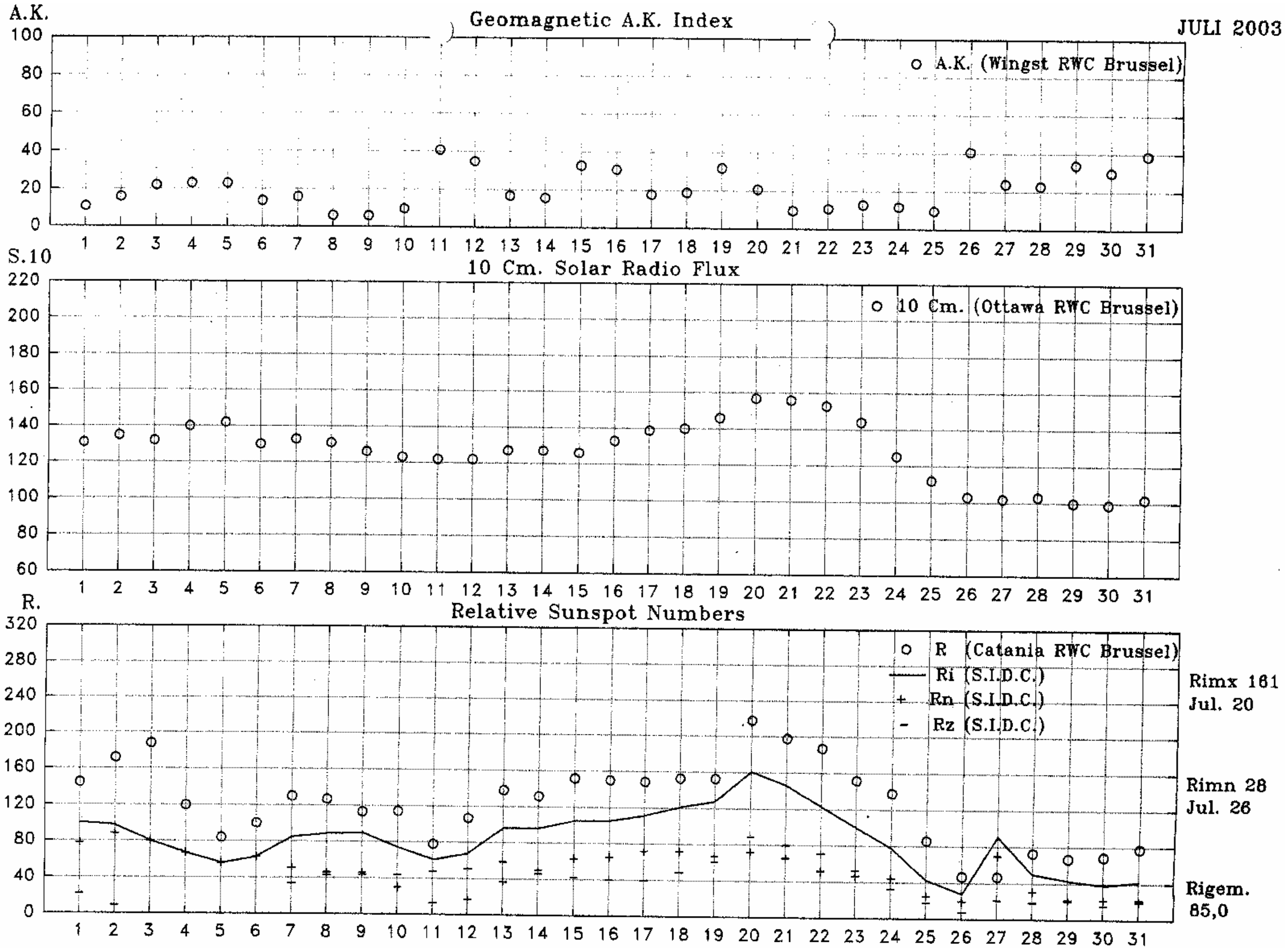
T
juli 2003



JULI 2003
Geomagnetic A.K. Index
A.K.
o A.K. (Wingst RWC Brussel)
10 Cm. Solar Radio Flux
S.10
o 10 Cm. (Ottawa RWC Brussel)
Relative Sunspot Numbers
R.
o R (Catania RWC Brussel)
Ri (S.I.D.C.)
+ Rn (S.I.D.C.)
- Rz (S.I.D.C.)
Rimx 161
Jul. 20
Rimn 28
Jul. 26
Rigem.
85,0

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

juli 2003

	S.I.D.C.		Balster		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	78	22					78	28	93	0	89	30	78	16
2	88	9					78	0	71	12	97	0	55	0
3	80	0					83	14	75	0	94	0		
4	67	0							52	24				
5	56	0					49	0						
6	63	0												
7	51	34	81	48	34	0	49	37			73	43	53	26
8	46	43					49	59	44	40	58	49		
9	46	44	70	71			54	59	76	40	63	52		
10	30	44	50	49	0	39	36	50	46	53	38	39		
11	13	48	36	61			18	53	0	76	20	38		
12	17	51	13	59			13	63	29	57	14	62		
13	37	59	49	75			52	75	56	76	45	84		
14	50	46	56	64			51	60	45	79	49	68		
15	63	42	100	55			62	55	59	58	68	59		
16	65	40	96	53	29	24	70	37	53	57	72	44		
17	72	40	104	52			63	47						
18	72	49	86	60			71	56	78	54	64	61		
19	67	61	97	83			75	65	102	80	62	105		
20	72	89	79	113			73	118	71	100	77	151		
21	66	80	80	137	39	65	73	88	62	80	57	107		
22	52	71	61	124			64	93	60	102	56	99		
23	47	53	59	88			69	64	76	60	53	71		
24	45	33	64	40							41	34		
25	25	18	34	28			33	23	33	23				
26	20	8					22	11			22	13		
27	70	21					11	11						
28	31	19	34	29			41	26	33	28				
29	21	22	36	31			26	26	50	0				
30	22	16					27	17	22	46				
31	20	22	36	31	11	13	24	31	23	34				

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Solar activity was generally speaking low to moderate this month. Some occasional M-flares were recorded from various sunspot groups, but most of the time flaring activity was limited to small C-class flares.

The dominant sunspot groups at the beginning of the month were Catania sunspot group 52 (NOAA 0397), and to a lesser extent group 57 (NOAA 0400). Group 52 was in fact an old acquaintance, being the return of Catania sunspot group 22 (NOAA 0375), which produced 3 X-flares and more than 30 M-flares in June on its previous rotation in. On the current month's rotation the group was again very active, but on a smaller scale: it produced 3 M-flares besides about 30 C-flares. The last M-flare recorded from this group, and M3.6 on July 10, was also the largest flare of the month. The sunspot group was fairly large (covering 0.1% of the solar disk and counting about 50 spots at its maximum extent) and had a complex magnetic structure during its entire transit over the disk. It rotated out of view over the western edge of the solar disk on July 10.

A few days later, on July 12, an M1.4 flare occurred from Catania sunspot group 70 (NOAA 0409) while it was still behind the eastern solar limb. The sunspot group became visible on July 14, also showing a beta-gamma magnetic configuration. It however only produced a few more significant flares, none exceeding C-class. Sunspot group 68 (NOAA 0410) similarly developed into such a beta-gamma configuration. It grew quite large (up to 0.08% of the solar disk with about 30 spots) and generated about 20 C-class flares, but no M-flares. In fact, not a single M-flare was recorded between July 12 and July 29, which is again remarkable, seeing that precisely in this period the Wolf number was highest and that besides sunspot groups 68 and 70, also groups 69 (NOAA 0412) and 77 (NOAA 0417) had a beta-gamma magnetic class. The spell of low solar activity was finally broken near the end of the month, with the rapid growth out of the blue of sunspot group 81 (NOAA 0422), and the appearance of the active sunspot group 83 (NOAA 0421) at the eastern limb on 28 July. Both groups developed into a beta-gamma magnetic configuration. On July 29 group 83 spawned its first M-flare. The day after, July 30, sunspot group 81 followed suit and closed this month's solar activity with an M2.5 flare peaking at 04:10 UT.

No proton flux enhancements were recorded during this month, but several coronal holes with equatorial extension were seen crossing the disk.

II. Geomagnetic Activity

The transit of several coronal holes through a geo-effective position has led to variable geomagnetic activity in July, ranging from quiet to major geomagnetic storm. The highest K-index recorded in Wingst was 6, which happened on July 12 and 26.

During the first 10 days of the month, geomagnetic conditions were quiet to active. A coronal hole arrived in geo-effective position on Thursday 3 July inducing a solar wind speed increase to nearly 800km/s for a few days. Until July 7, active conditions followed with the Wingst K-index often at 4. Then followed 3 quiet days. Late on 10 July, a fifteen-hour period of negative Bz began, marking the onset of a coronal hole high speed stream that began mid day on 11 July and lasted until late on 13 July, with solar wind speed reaching 700 km/s. On 11 -12 July, activity was at minor storm level, followed by mostly active levels until July 20, with occasional brief periods of minor storm conditions. Most disturbed days were July 15 and especially July 16 with minor magnetic storm levels following a moderate southward excursion of the interplanetary magnetic field.

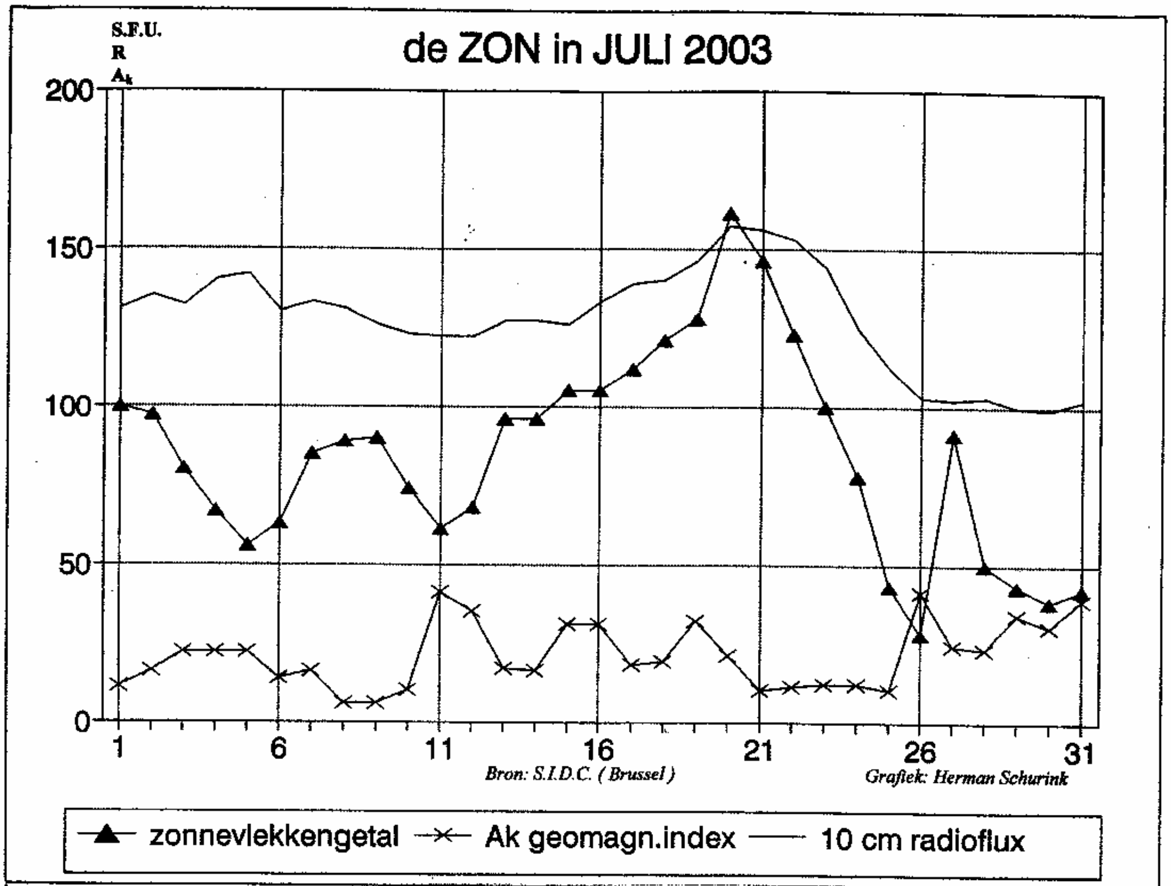
In the period July 21-25, conditions were generally quiet with K-indices typically at 2 or 3 and an isolated K=4 value. On July 26, the influence of a large coronal hole, covering a significant fraction of the southern solar hemisphere and reaching up to the solar equator, triggered a change in character of the solar wind resulting in a short period of major geomagnetic storm on that day (K=6 in Wingst). Early on July 28, the solar wind speed briefly dipped down to 550km/s, yielding quiet geomagnetic conditions for a short time. Near the middle of this UT day, the solar wind speed rose again sharply to 800km/s, and remained near that value until the end of the month. With the interplanetary magnetic field alternating between northwards and southwards orientation, these conditions led to a mix of active and minor geomagnetic storm conditions for the remainder of the month.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	600 (Humain)	Cat	NOAA
02	0706	0728	0746	N13E25	M3.0	1F	230		0710	52	0397
06	0006	0032	0040	N04E18	M2.3	SF		III/2		57	0400
09	2159	2238	2245	N05W35	M2.0	SF	67			52	0397
10	1354	1412	1423		M3.6	SF	140	III/2,V/3,II/3	1400	52	0397
12	1857	1906	1913	N16E79	M1.4	SF	55	II/2	1859,1909	70	0409
29	0128	0139	0143	S13E72	M1.3	1F	34			83	0421
30	0404	0410	0412	N14W55	M2.5	1B	190			81	0422

loc: approximate heliographic location
Xray: X-ray flare class
op: optical flare class
10 cm: radio flux on 10 cm
type: type of radio-burst

600: peak UT time of 600 Mhz radio-bursts in Humain
Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection.


de ZON in JULI 2003
S.F.U.
R
Ak
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150
100
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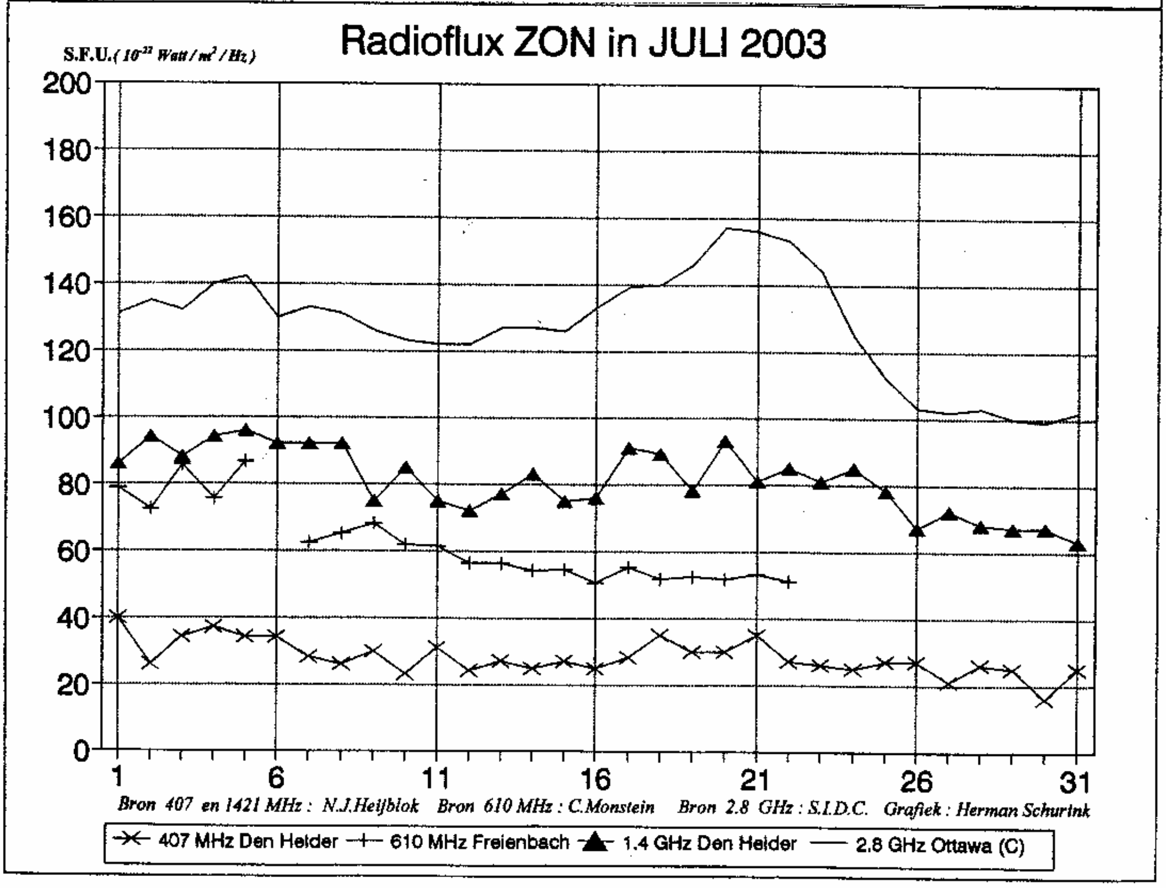
1
6
11
16
21
26
31
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux


Radioflux ZON in JULI 2003
S.F.U.(10⁻²² Watt / m² / Hz)
200
180
160
140
120
100
80
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40
20
0
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6
11
16
21
26
31
Bron 407 en 1421 MHz : N.J.Heijblok
Bron 610 MHz : C.Monstein
Bron 2.8 GHz : S.I.D.C.
Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon Augustus 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr50	Gro8	Jn 9	Jn40	K105	vSlo	Son	Spa	Stam	Zans	Zijle	Uccle groups	Uccle spots
1	72	48		26	25			56						3	21
2	77	53	86		47		57	68	76		40			5	30
3	88	89	115	78	58		82	95	109		44		143	6	43
4	105	85	110	80	48	62		84	96		47		127	6	48
5	109	96	135	81	49		92	95	107				127	7	66
6	109	70	109	80	50			93	102		47		160	6	40
7	114	86	89	82	62		85	81	76				150	5	43
8	97	65	93		42			76	70			83	121	5	47
9	99	67		74	42			75	80			85	131	5	53
10	106	71	103	77	56		69	86	100			85	91	5	47
11	105	81	104	68	53			84	89			75	129		
12	103	64		76	49		68	86	97			74	144	5	68
13	120	55	92	67	28	29		87	78		27	64	115	6	64
14	92	47	69		20		30	71	74			59	93	4	60
15	76	78	66	56	21			79	90		41	65	104	3	81
16	94	75	71	67	18		63	103	75			61	123	4	66
17								88			43	64	154		
18					26		53	95			49				
19	91	45		75	25	26		59		62		72		6	26
20	98	33		63	13			76	49	51		42	96	7	36
21	75	62		67	13			70	69	67		67		4	36
22												82			
23		95	99		39		78	102		125	43	88			
24					53			93						5	71
25	119	84			36			101		100	46	91	112	7	51
26		81		88	37	40		97		107	58	89	155	6	56
27	112	64			37			103				72		8	52
28	87	93										86		10	34
29													102	9	37
30	98	64		77	36			85		75	29	71	146	7	31
31	72	54			36			84		74		65		6	24
observ	24	26	14	18	27	4	19	28	17	8	12	21	20		
k	0,75	1,08	0,78	1,04	2,21	2,01	1,14	0,85	0,86	0,89	1,78	1,01	0,80		
st.dev.	0,11	0,23	0,13	0,23	0,97	0,56	0,36	0,07	0,14	0,17	0,39	0,17	0,10		
st.d / k	0,14	0,21	0,17	0,22	0,44	0,28	0,31	0,08	0,17	0,19	0,22	0,17	0,16		

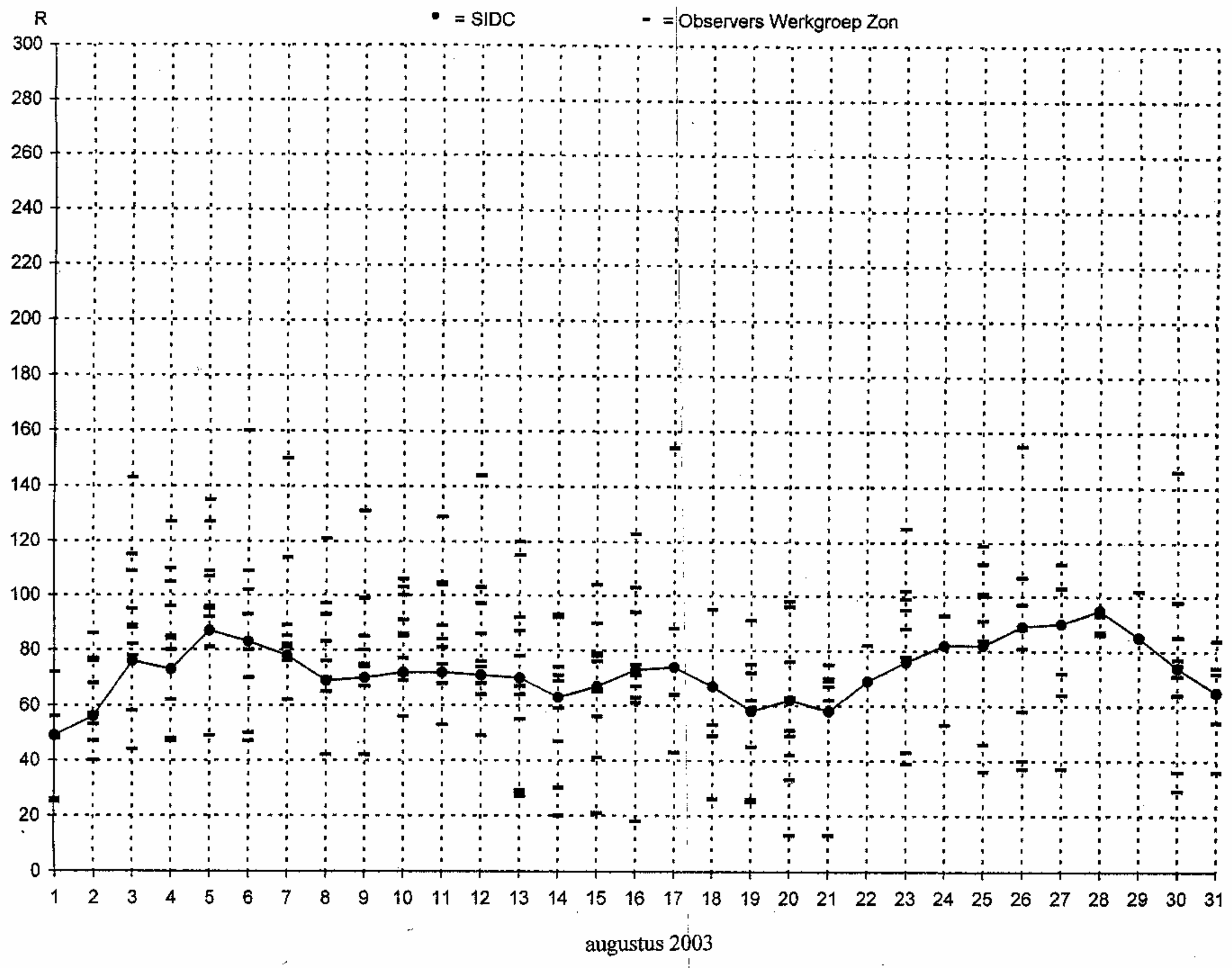
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn40 = D. Jannink [40]	Spa = T. Spaninks [75]
Gort = E.Gorter [90]	K105 = K. Kroesen [105]	Stam = R.Stammes [100]
Gr50 = Mw G. Gravers [50]	vSlo = B. van Slooten [90]	Zans = W. Zanstra [Rf 156]
Gro8 = A. Groenewegen [80]	Son = A.T. Son [Rf 150 Kutter]	Zijle = W.A. Zijlema [90]
Jn 9 = D. Jannink [9]		

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	42	59	47	102	836	1	0/0	39	
1	49	78	-	107	835	0	0/0	36	
2	56	80	-	111	838	21	1/0	24	
3	76	100	-	120	845	21	0/0	17	
4	73	152	-	123	846	0	0/0	14	
5	87	174	-	131	841	3	1/0	10	
6	83	181	-	129	845	0	0/0	24	
7	78	180	-	137	848	1	0/0	37	
8	69	191	-	133	////	1	0/0	41	
9	70	197	-	130	847	1	0/0	19	
10	72	121	-	131	845	3	0/0	12	
11	72	82	-	129	839	0	0/0	14	
12	71	64	-	123	833	3	0/0	26	
13	70	78	-	131	844	4	0/0	17	
14	63	102	-	130	844	2	0/0	17	
15	67	106	-	131	841	5	0/0	16	
16	73	81	-	127	837	1	0/0	12	
17	74	79	-	119	834	1	0/0	21	
18	67	42	-	116	827	3	0/0	64	
19	58	34	-	117	832	111	2/0	21	
20	62	25	-	112	842	0	0/0	19	
21	58	65	-	119	840	0	0/0	47	
22	69	91	-	121	837	1	0/0	40	
23	76	99	-	120	836	2	0/0	38	
24	82	101	-	116	843	10	0/0	21	
25	82	103	-	117	842	10	0/0	17	
26	89	80	-	121	839	10	0/0	14	
27	90	69	-	126	837	2	0/0	12	
28	95	64	50	119	843	2	0/0	21	
29	85	70	47	116	845	0	0/0	19	
30	74	55	47	114	838	2	0/0	16	
31	65	44	45	110	837	0	0/0	7	

- 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 x Sn+10 x "1"+100 x ">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.


R
• = SIDC
- = Observers Werkgroep Zon
300
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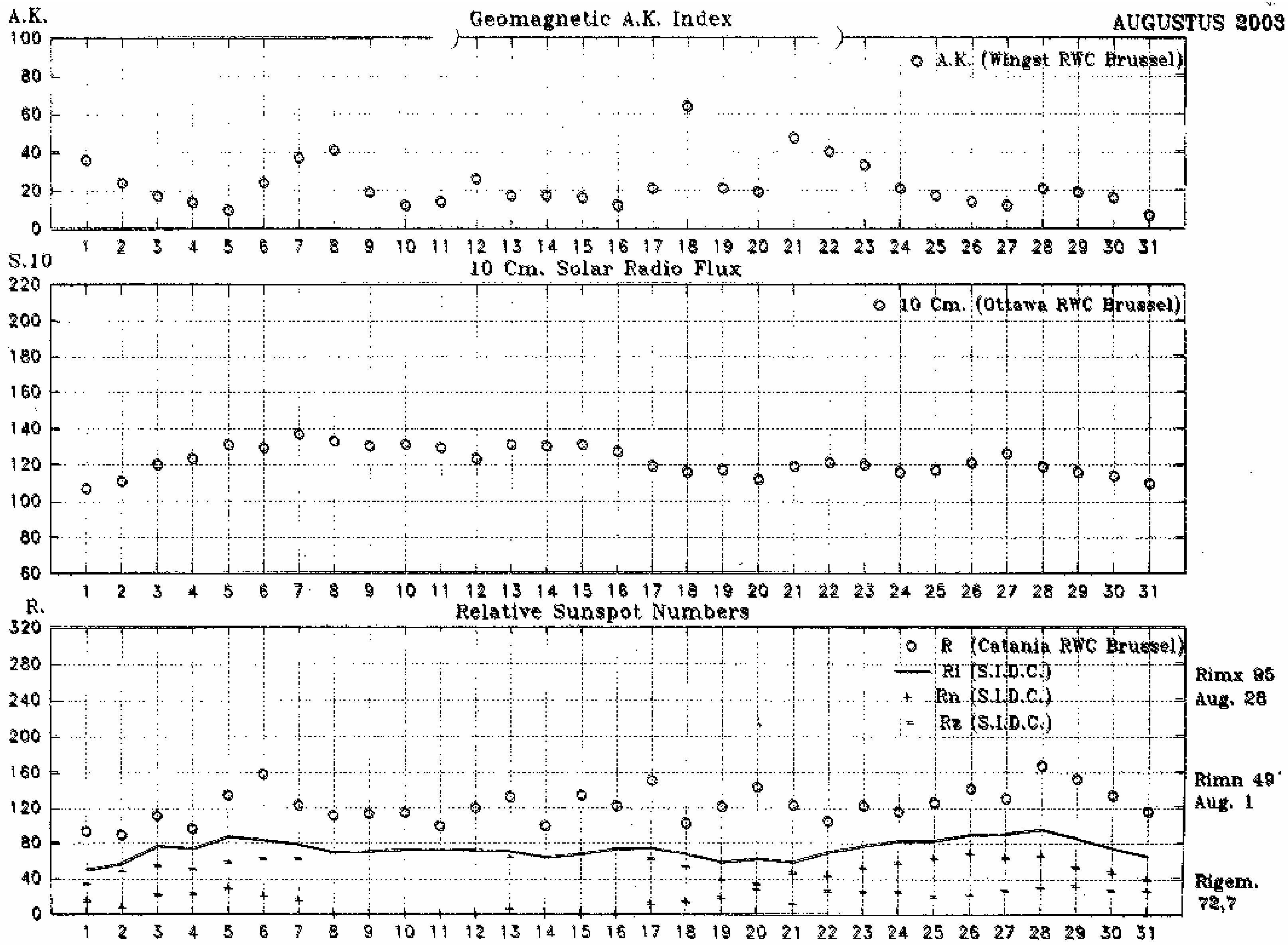
augustus 2003

AUGUSTUS 2003



Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

augustus 2003

	S.I.D.C.		Balster		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	15	34	13	59			23	33						
2	8	48	13	64			11	57	22	54				
3	22	54	30	58			31	64	30	79				
4	23	50	39	66	24	38	27	57	61	35				
5	29	58	50	59			38	57	26	81				
6	21	62	36	73			32	61	16	86				
7	16	62	24	90			24	57	0	76				
8	0	69	0	97			0	76	0	70			0	83
9	0	70	0	99			0	75	14	66			0	85
10	0	72	0	106			0	86	0	100			0	85
11	0	72	0	105			0	84	0	89			0	75
12	0	71	0	103			0	86	12	85			0	74
13	6	64	0	120	0	29	0	87	11	67			0	64
14	0	63	0	92			0	71	11	63			0	59
15	0	67	0	76			0	79	11	79			0	65
16	0	73	0	94			11	92	0	75			0	61
17	12	62					13	75					12	52
18	14	53					17	78						
19	19	39	26	65	0	26	19	40			22	40	31	41
20	28	34	37	61			37	39	23	26	26	25	30	12
21	46	12	62	13			56	14	38	31	54	13	54	13
22	43	26											48	34
23	51	25					68	34			86	39	51	37
24	57	25					62	31						
25	62	20	88	31			74	27			74	26	66	25
26	67	22			12	28	71	26			80	27	38	51
27	63	27	77	35			75	28					39	33
28	65	30	62	25									52	34
29	53	32												
30	47	27	68	30			59	26			48	27	35	36
31	39	26	40	32			58	26			44	30	29	36

Uccle	
groups	spots
9	45
8	39
4	54
3	53
6	37
7	44
7	44
7	36
6	16
5	50
8	52
7	46
8	47
10	55
7	105
6	75
9	54
9	73
7	58
5	9
4	25
3	25
3	14
4	15

In the process of gathering information for the Sunspot Bulletin No. 7, the wrong date file was accidentally used for the UCCLE data. Therefore, the UCCLE sunspot observations reported on page 4 are those for January 2003 instead of July 2003. We therefore enclose an updated copy.

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Solar activity was low this month, with only Aug 19 standing out as a more active day. Just four M-flares occurred; two of these were on Aug 19, which included the largest event of the month, a moderate M2.7 flare. Many days in the month had not even C-flare activity.

At the start of the month, there was reason to expect higher activity when on Aug 1 a new sunspot group appeared at the eastern limb and generated a sequence of large C-flares. These flares were clearly visible in EIT and SXI images, but the sunspot group only became observable on the disk the next day, when it was given Catania sunspot group number 90 (NOAA 0424). It became the dominant centre of solar activity for the first ten days of the month, reaching a maximum size of nearly 0.08% of the disk, distributed over 2 large spots and about 20 smaller ones. It had strong magnetic fields with clear polarity mixing for nearly the whole duration of its transit across the disk, but it did not live up to its anticipated flaring potential. Late on Aug 2, the first M-flare was observed from this group, with a second one following on Aug 05. On the other days only occasional small C-flares were observed, with several days having no C-flares at all. Most of this smaller scale activity also originated from sunspot group 90 and its close neighbour, group 88 (NOAA 0425). Sunspot group 90 started to decay on Aug 08, and finally disappeared from view on Aug 13 without producing much more activity.

On Aug 09 another large and complex sunspot group, Catania 96 (NOAA 0431) rotated over the eastern solar limb, producing a multitude of C-flare activity, in particular from Aug 12 onwards. At its peak, the group counted 70 spots covering slightly more than 0.07% of the solar disk. Although it started to decay rather rapidly from Aug 15, its biggest events were kept for the end, because it finally produced the 2 M-flares of Aug 19 before rotating over the western limb on Aug 21. On Aug 14, a short time after 20:00UT, a full halo CME was observed by LASCO. Although at first this event was thought to be backsided, it was later determined to have probably originated in sunspot group 96, where EIT images clearly show enhanced activity about half an hour earlier.

After the disappearance of group 96 on Aug 21, the main active region was Catania 04 (NOAA 0436), but this group only produced some minor C-flares. During the rest of the month, only isolated small C-flares were recorded. On Aug 25, a C3.6 flare from Catania sunspot group 12 (NOAA 0442) was associated with a modest EIT wave and dimming, primarily to the west, and also a wide partial halo CME. The mean plane-of-sky speed for this event was 308 km/s, with moderate acceleration.

In the beginning of the month, a northern hemisphere coronal hole rotated across the visible solar disk. The leading edge reached the central meridian on Aug 4. This coronal hole had two clearly separated equatorial extensions, the first of which became geo-effective on Aug 6, the second from Aug 11 onwards. On Aug 21, a large trans-equatorial coronal hole rotated in a geo-effective position in the Western hemisphere.

II. Geomagnetic Activity

Due to the perturbations caused by three coronal hole passages and two CME shocks, geomagnetic conditions were frequently at minor geomagnetic storm levels this month, with major geomagnetic storms on Aug 18 and on Aug 21.

The first few days of the month, geomagnetic conditions were entirely dominated by the influence of a large coronal hole. This coronal hole covered a significant fraction of the southern solar hemisphere, reaching up to the solar equator. Its effect was already felt on July 27. Near the middle of July 28, the solar wind speed rose to 800km/s, and remained near that value until late on Aug 2. During this period, the interplanetary magnetic field was alternating between northwards and southwards orientation. These conditions led to the anticipated mix of active and minor geomagnetic storm conditions. The K-index in Wingst was mostly at values of 4 or 5 until Aug 2. On Aug 3 the coronal hole rotated out of its geo-effective position and geomagnetic conditions returned to quiet.

Early on Aug 06, an equatorial extension of a northern hemispheric coronal hole started to influence the geomagnetic environment. The solar wind speed, which had reached a minimum of just above 400km/s on Aug 05, increased in three phases, reaching a maximum of nearly 800km/s in the morning of Aug 8, following which it started to gradually decrease (almost linearly). During most of this period, the interplanetary magnetic field was mainly oriented towards the north, except for a short interval early on Aug 6 and a second one starting at about noon on Aug 7, lasting about 24 hours. During these two intervals, and especially during the latter one, minor geomagnetic storm conditions were reported. On Aug 7, the K-index in Wingst reached an isolated peak of 7, being mostly at 5 before and after. The minor geomagnetic storm ended late on Aug 8, and conditions were quiet for the next two days.

From about midday (UT) on Aug 11, the influence of a second equatorial extension of the same coronal hole pushed up the solar wind speed to approximately 700km/s on Aug 12. The interplanetary magnetic field remained however mostly northwards, limiting the geo-effectiveness of this high speed wind stream. This resulted in active geomagnetic conditions during the second half of Aug 11 and on Aug 12 (the K-index in Wingst was mostly at 4 during this time). From Aug 13 onwards, the solar wind speed slowly decreased to 550km/s, was briefly pushed back up to 600 km/s on Aug 15, but then rapidly decreased to about 400km/s at midday UT on Aug 17. On the same day, the earth's geomagnetic field was perturbed by a shock in the solar wind (due to the halo CME observed on Aug 14). The shock was recorded by both ACE and SOHO/CELIAS at approximately 13:40 UT. Although the increase of the solar wind speed was moderate, jumping up by about 100km/s to a little above 500km/s, this shock led first to minor geomagnetic storm conditions, followed later by a major geomagnetic storm when the interplanetary geomagnetic field turned strongly southwards (at 01:00 UT on Aug 18).

On Aug 19 and 20, geomagnetic conditions were quiet, but on Aug 21 the Earth entered another high-speed solar wind stream, this time due to the low-latitude coronal hole. The solar wind reached a speed of 775km/s and stayed near this value until Aug 24 around 00:00UT, when it dropped to a new plateau at 600km/s. Bz oscillated between +10nT and -10nT. This triggered a long duration disturbance of the geomagnetic field, reaching major geomagnetic storm conditions on Aug 21, followed by minor storm level until late on Aug 23 and active conditions on Aug 24. On Aug 25, the solar wind speed displayed a small increase, but then slowly decreased to about 400 km/s on Aug 28. At the same time the interplanetary magnetic field (IMF) stayed consistently at about -5nT (i.e. slightly southward). This regime resulted in mostly quiet geomagnetic conditions with isolated active geomagnetic episodes.

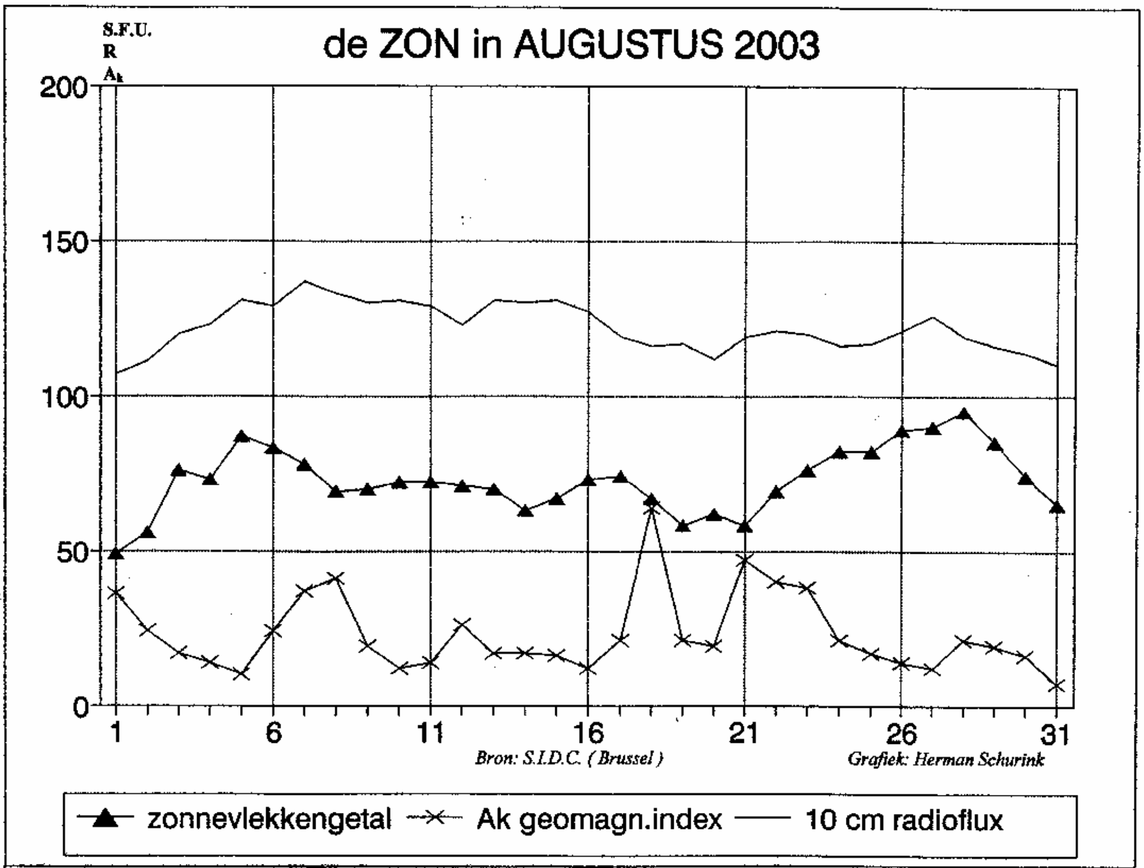
On Aug 29 at 15h00 UT a shock in the solar wind arrived, boosting the wind speed up to 600 km/s and the IMF down to -10 nT. This shock may be related to the CME that was observed leaving the Sun on Aug 25. The geomagnetic field reacted only moderately to this shock with a brief period of minor storm conditions on Aug 29. By the end of the month geomagnetic conditions were back to quiet level.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	600 (Humain)	Cat	NOAA	NOTE
02	2341	2354	0002	S19E63	M1.3	1F				90	0424	EIT derived loc.
05	1243	1249	1251	S16E33	M1.7	SN	40	II/1	12:45	90	0424	
19	0753	0759	0801	S12W61	M2.0	1N	39	V/3		96	0431	
19	0945	1006	1024	S11W60	M2.7	2F	230	II/2,IV/1	09:52	96	0431	

loc: approximate heliographic location
Xray: X-ray flare class
op: optical flare class
10 cm: radio flux on 10 cm
type: type of radio-burst

600: peak UT time of 600 Mhz radio-bursts in Humain
Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection


S.F.U.
R
A_k
de ZON in AUGUSTUS 2003
200
150
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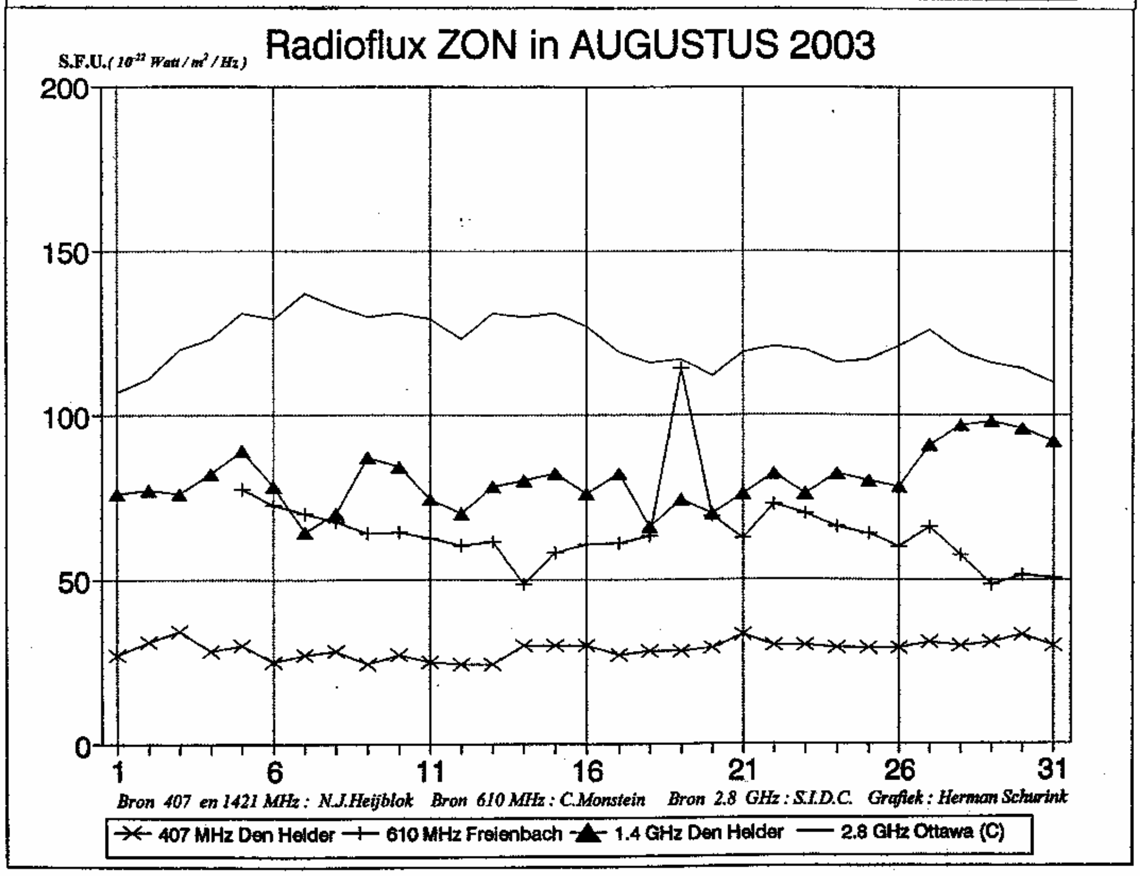
6
11
16
21
26
31
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux


S.F.U.(10^{-22} Watt / m² / Hz)
Radioflux ZON in AUGUSTUS 2003
200
150
100
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31
Bron 407 en 1421 MHz : N.J.Heijblok Bron 610 MHz : C.Monstein Bron 2.8 GHz : S.I.D.C. Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon September 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr60	Groe	Jn 9	Jn40	Kroe	vSlo	Spa	Stam	Zans	Zijle
1		46			36			79	61	29	54	88
2	65	40			24			70			53	87
3	75	25			13	13		67	56	16	53	
4	75	56			23			68	71		41	94
5	54	31	65		24		60	62	46		43	60
6	71				12				30			
7	70		40		0			48			48	77
8	15	16			11			16		3		
9	17	17			11			29	23	3	16	27
10					13					16	24	47
11		39			16	16		42	46		43	76
12	48				14						37	
13	50	35	46		15			41	43	16	34	66
14		28	58		11			45			30	42
15		34			0			54	34		26	66
16		35			0			65	62	13	40	79
17		34		55	24	25	62	76	95	19	68	91
18		55			48		66	71	99	32	72	107
19		62	69		48			67	72		68	79
20	65	37			34			63	67		52	79
21	94	39	98	54	35		37	62	74	38	58	64
22	84	59		54	25		35	62	74	43	67	106
23	91	52			26			87	70		74	112
24	90	51			40		52	78	100		75	123
25	98	69			42		45	75	101	82	88	155
26	91	74	88		44		49	84		78		
27	105		102		31			92			73	
28	95										84	
29	116	61		43	30		52	85			93	
30	98	64		67	49			72	91		93	
observ	21	24	8	5	29	3	9	26	20	13	27	21
k	0,72	1,17	0,71	1,15	2,02	2,69	1,25	0,80	0,78	2,69	0,92	0,58
st.dev.	0,25	0,26	0,11	0,32	0,65	0,81	0,32	0,18	0,18	2,15	0,21	0,12
st.d./ k	0,34	0,23	0,16	0,28	0,32	0,30	0,25	0,23	0,23	0,80	0,22	0,21

Uccle	
groups	spots
5	19
4	16
5	18
6	25
3	17
3	7
1	8
1	5
2	16
2	29
3	21
5	23
5	18
6	25
6	25
5	17
5	13
5	29
4	28
4	33
4	41
4	47
4	61
5	68
7	46
6	37

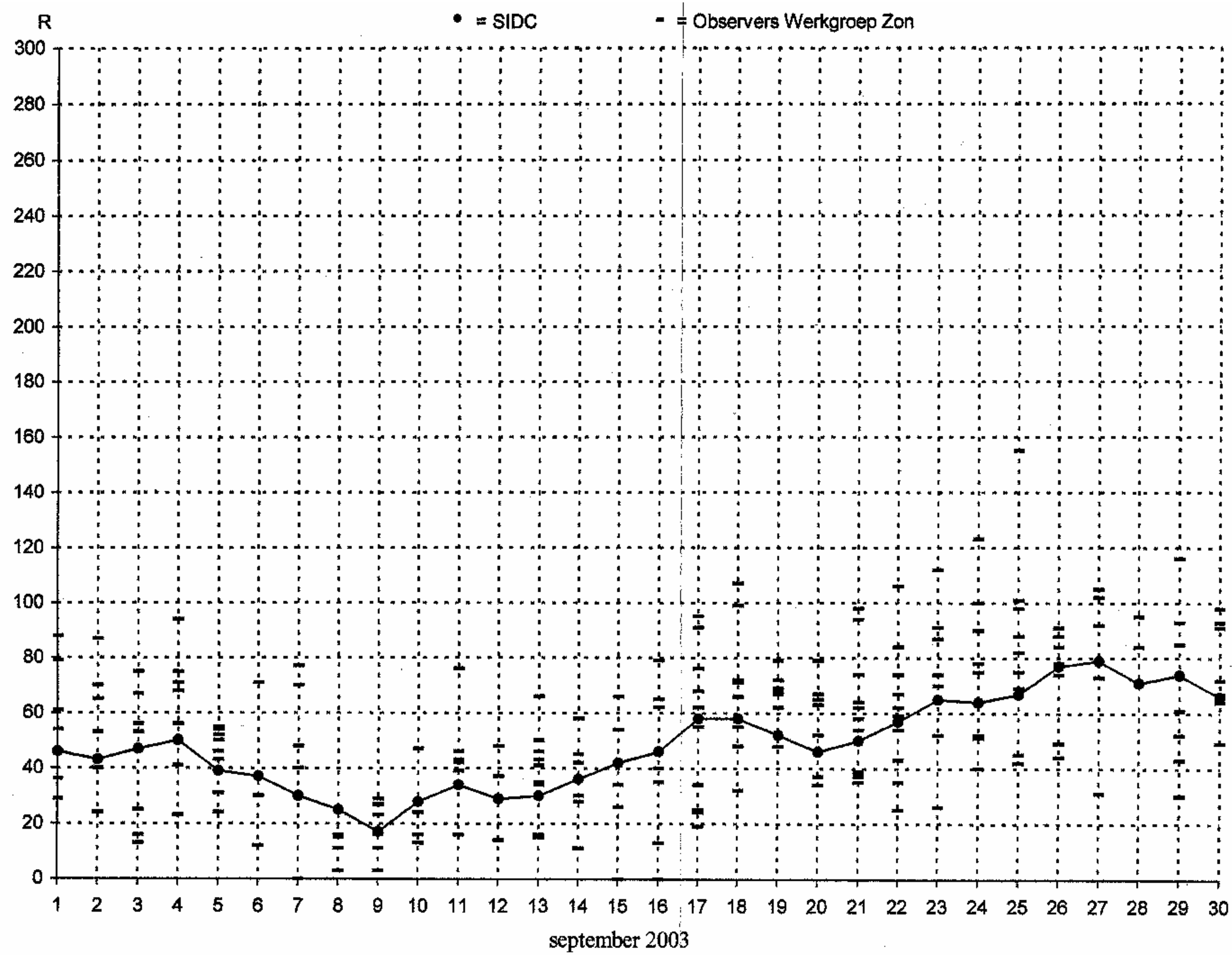
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Spa = T. Spaninks [75]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Stam = R.Stammes [100]
Gr60 = Mw G. Gravers [60]	Kroe = K. Kroesen [102]	Zans = W. Zanstra [Rf 155]
Groe = A.Groenewegen [102]	vSlo = B. van Slooten [90]	Zijle = W.A. Zijlema [90]

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	65	44	45	110	837	0	0/0	7	
1	46	35	44	108	837	0	0/0	16	
2	43	30	45	106	840	0	0/0	14	
3	47	26	46	111	////	1	0/0	17	
4	50	28	48	112	////	0	0/0	21	
5	39	39	47	108	////	0	0/0	17	
6	37	27	44	105	////	0	0/0	12	
7	30	14	42	108	////	1	0/0	6	
8	25	6	43	99	////	0	0/0	8	
9	17	13	43	96	////	0	0/0	24	
10	28	35	44	99	////	0	0/0	20	
11	34	40	42	97	////	0	0/0	18	
12	29	38	42	94	////	1	0/0	10	
13	30	33	41	96	////	2	0/0	9	
14	36	16	40	95	////	2	0/0	6	
15	42	10	40	97	////	10	0/0	7	
16	46	15	41	99	////	0	1/0	27	
17	58	34	45	106	////	0	0/0	53	
18	58	47	44	109	////	0	0/0	47	
19	52	38	46	111	////	0	0/0	33	
20	46	30	48	112	////	0	0/0	27	
21	50	46	47	120	////	0	0/0	18	
22	57	53	47	123	////	0	0/0	18	
23	65	102	50	125	////	0	0/0	18	
24	64	124	51	134	////	9	0/0	37	
25	67	160	50	133	////	0	0/0	27	
26	77	165	51	131	////	2	0/0	16	
27	79	159	52	130	////	3	0/0	7	
28	71	159	52	137	////	2	0/0	7	
29	74	105	49	135	////	12	0/0	5	
30	66	81	49	133	////	15	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 x Sn+10 x "1"+100 x ">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.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- = Observers Werkgroep Zon
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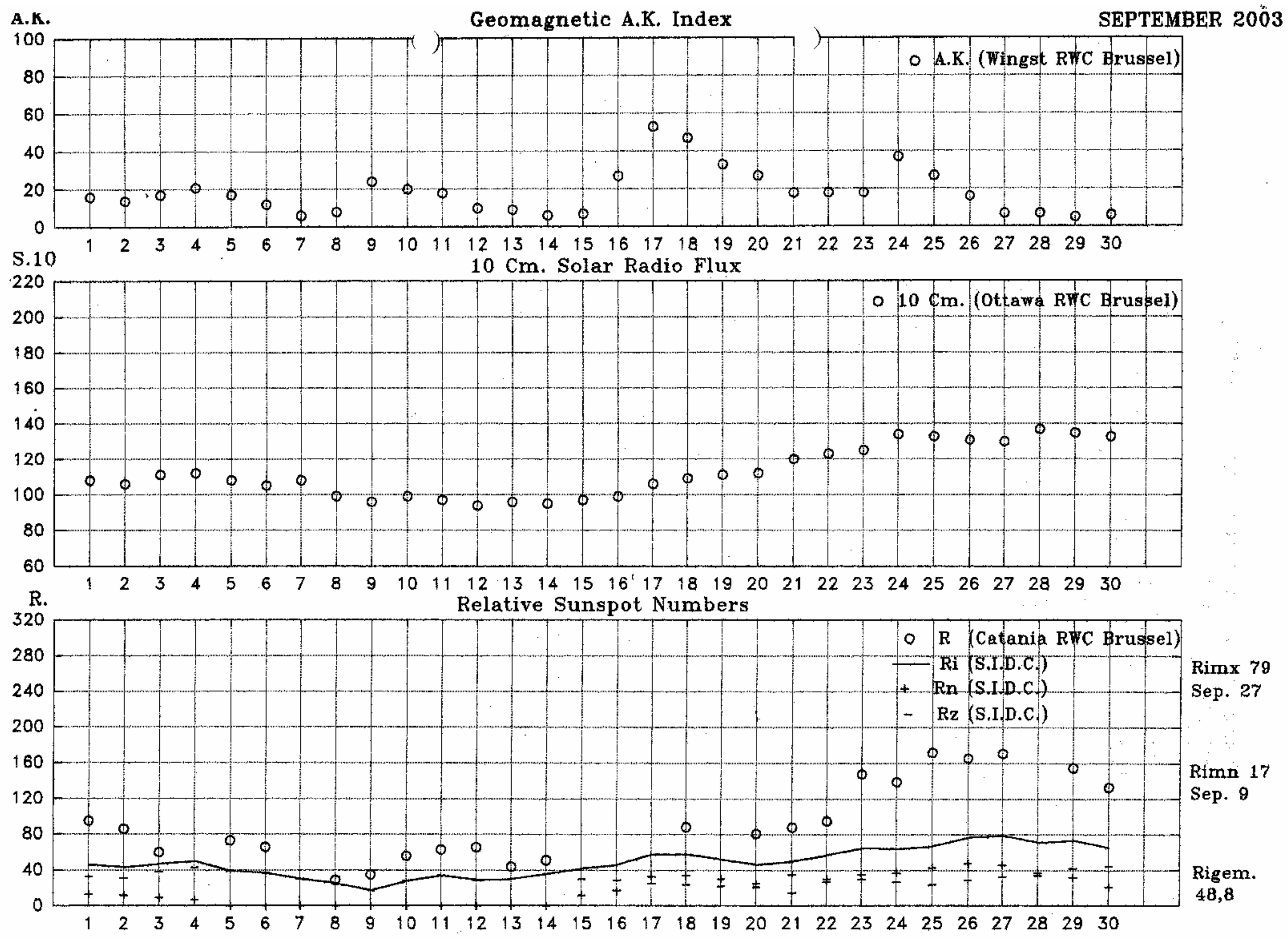
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
september 2003


SEPTEMBER 2003
Geomagnetic A.K. Index
A.K.
o A.K. (Wingst RWC Brussel)
10 Cm. Solar Radio Flux
S.10
o 10 Cm. (Ottawa RWC Brussel)
Relative Sunspot Numbers
R.
o R (Catania RWC Brussel)
Ri (S.I.D.C.)
+ Rn (S.I.D.C.)
- Rz (S.I.D.C.)
Rimx 79
Sep. 27
Rimn 17
Sep. 9
Rigem.
48,8

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

september 2003

	S.I.D.C.		Balster		Groenew.		Jann.40		vSloo		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	13	33							17	62	19	42	16	38
2	12	31	25	40					21	49			16	37
3	9	38	13	62			0	13	14	53	13	43	16	37
4	7	43	0	75					0	68	0	71	0	41
5	0	39	0	54					0	52	0	46	0	43
6	0	37	0	71							0	30		
7	0	30	0	60					0	48			0	48
8	0	25	0	15					0	16				
9	0	17	0	17					0	29	0	23	0	16
10	0	28											0	24
11	0	34					0	16	0	42	0	46	0	43
12	0	29	0	48									0	37
13	0	30	0	50					0	41	0	43	0	34
14	0	36							0	45			0	30
15	12	30							11	43	11	23	0	26
16	17	29							25	40	29	33	11	29
17	33	25			39	16	25	0	43	33	55	40	40	28
18	34	24							43	28	53	46	40	32
19	30	22							38	29	41	31	39	29
20	25	21	38	27					34	29	35	32	35	17
21	35	15	57	37	42	12			45	17	43	31	31	27
22	30	27	35	49	30	24			26	36	46	28	40	27
23	35	30	45	46					39	48	42	28	48	26
24	37	27	49	41					37	41	64	36	50	25
25	43	24	58	40					46	29	74	27	64	24
26	48	29	64	27					54	30				
27	46	33	64	41					51	41			49	24
28	37	34	55	40									45	39
29	32	42	52	64	20	23			26	59			47	46
30	21	45	29	69	19	48			22	50	28	63	31	62

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Solar activity was low during September, with extended periods without any significant activity. Sunspot numbers were decreasing at first, reached a minimum on Sep 09 and, then gradually rose until the end of the month. A single, small M-flare occurred on Sep 16. Plenty of C-flares were recorded (about 60, of which 12 on Sep 24 and 10 on Sep 30), but most of these were in the low C range.

At the start of the month, sunspot group 21 (NOAA 0450) was the largest group on disk. The only significant event identified from this group was a long duration C5.3 flare on Sep 07 peaking at 14:07UT. This event included a nearby filament eruption, leading to a CME on the south-west solar limb. In the more distant corona, it was seen as a streamer blow-out CME, first visible in C2 at Sep 08, 00:30 UT. The event gave rise to pronounced enhancements of the low energy (310-580 keV) proton fluxes (measured by ACE). However, no higher energy protons were recorded in the 10 MeV proton flux channel onboard the GOES satellite.

By Sep 08, sunspot group 21 disappeared at the west limb. Most other sunspot groups also either rotated from view or decayed, leaving only a few small sunspot groups (groups 33, 34 and later 35) near the centre of the disk for some days. Another long duration flare – but only at the B8 level – was observed on Sept 11, 22:37 UT). EIT/SOHO showed an associated eruption left of Catania sunspot groups 34 and 35 (NOAA 0457). The LASCO coronagraphs showed a partial halo CME, mostly southward. During this period Catania Sunspot group 33 (NOAA 0456), which reached a beta-gamma configuration on Sep 11, was clearly the group with the highest flaring potential. Nevertheless it produced no major events until Sep 16 when a long duration M1.4 flare erupted from this region, at that moment already behind the west limb. Following this event, the low energy (≤2 MeV) proton fluxes measured by ACE increased, but the higher energy protons – as recorded by GOES – were not enhanced.

On Sep 20 sunspot group 41 (NOAA 0464) appeared at the east limb. It soon developed into a large and complex group (surrounded by several 'satellite' sunspot groups) and remained the center of solar activity until the end of the month. This sunspot group ranks amongst the biggest groups in recent months, growing to about 70 spots with a total area just over 0.1% of the solar disk. Its beta-gamma magnetic configuration and type F McIntosh classification indicated it was capable of strong flaring activity. However, the background X-ray flux was at a low B level, so most of the numerous flares produced by this active region were recorded as just low C level.

On Sep 24 a large filament in the southern hemisphere erupted around 06:00 UT - 07:00 UT, but this eruption was not directed towards the Earth.

In the beginning of the month, EIT284 images showed a large high latitude coronal hole with two distinct equatorial extensions (in fact this coronal hole already persists over several rotations). The leading edge of this coronal hole turned in a geo-effective position during the first few days of the month, while its second equatorial extension reached the center of the disk on Sep 07. Another large coronal hole (likewise a recurrent one) reached the central solar meridian on Sep 14. A third one, this time a small low-latitude coronal hole in the southern hemisphere, arrived at the central meridian on Sep 22. And finally, the end of the month saw the return of the first-mentioned coronal hole, but by this time it had shrunk to a single elongated trans-equatorial coronal hole.

II. Geomagnetic Activity

During the first days of the month the solar wind speed increased gradually from 400 km/s to approximately 700 km/s due to the leading equatorial extension of the high latitude coronal hole in the northern hemisphere. Meanwhile the interplanetary magnetic field (IMF) varied between +10 and -10 nT. Active geomagnetic conditions were observed on Sep 03-04. From about 21 UT on Sep 04 onwards, the solar wind started to decrease slowly, reaching a speed of approximately 380 km/s by Sep 08. The geomagnetic conditions remained therefore quiet from Sep 05 until early on Sep 09. On the latter day, the second equatorial extension of the same coronal hole became geo-effective and made the solar wind speed increase again. It remained above 600km/s until Sep 13, and then returned to the slow regime below 400km/s on Sep 14. This led to minor geomagnetic storm conditions on Sep 09, followed by active conditions on Sep 10-11. During Sep 12-15, geomagnetic conditions were quiet.

The first signs of the effect of the next coronal hole were noted as a slight increase in the solar wind speed (from 355 to 380 km/s) and a large density enhancement in the solar wind recorded both by ACE and CELIAS/SOHO on the evening of Sep 15, 18h20 till midnight. After that a slow, but steady increase of the solar wind speed was measured, peaking at 800 km/s around noon on Sep 18. The interplanetary magnetic field was mostly southward during this time, with peaks down to -20 nT. The geomagnetic field therefore switched to a major storm regime on Sep 16 and even severe storm (estimated Kp=7) on Sep 17. Stormy geomagnetic conditions persisted until Sep 20. Active conditions then reigned for 3 days, but on Sep 24 the estimated Kp index again reached 5 (the Wingst K-index recorded 6) as the Earth entered the fast flow coming from the low-latitude coronal hole in the southern hemisphere. On Sep 25, minor storm conditions were observed, going down to active levels on Sep 26 as the solar wind speed started to decrease again. From Sep 27 to the end of the month, geomagnetic conditions remained quiet.

III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	600 (Humain)	Cat	NOAA	NOTE
16	2130	2224	2331		M1.3					33	0456	

loc: approximate heliographic location
Xray: X-ray flare class
op: optical flare class
10 cm: 10 cm radio flux
type: type of radio burst

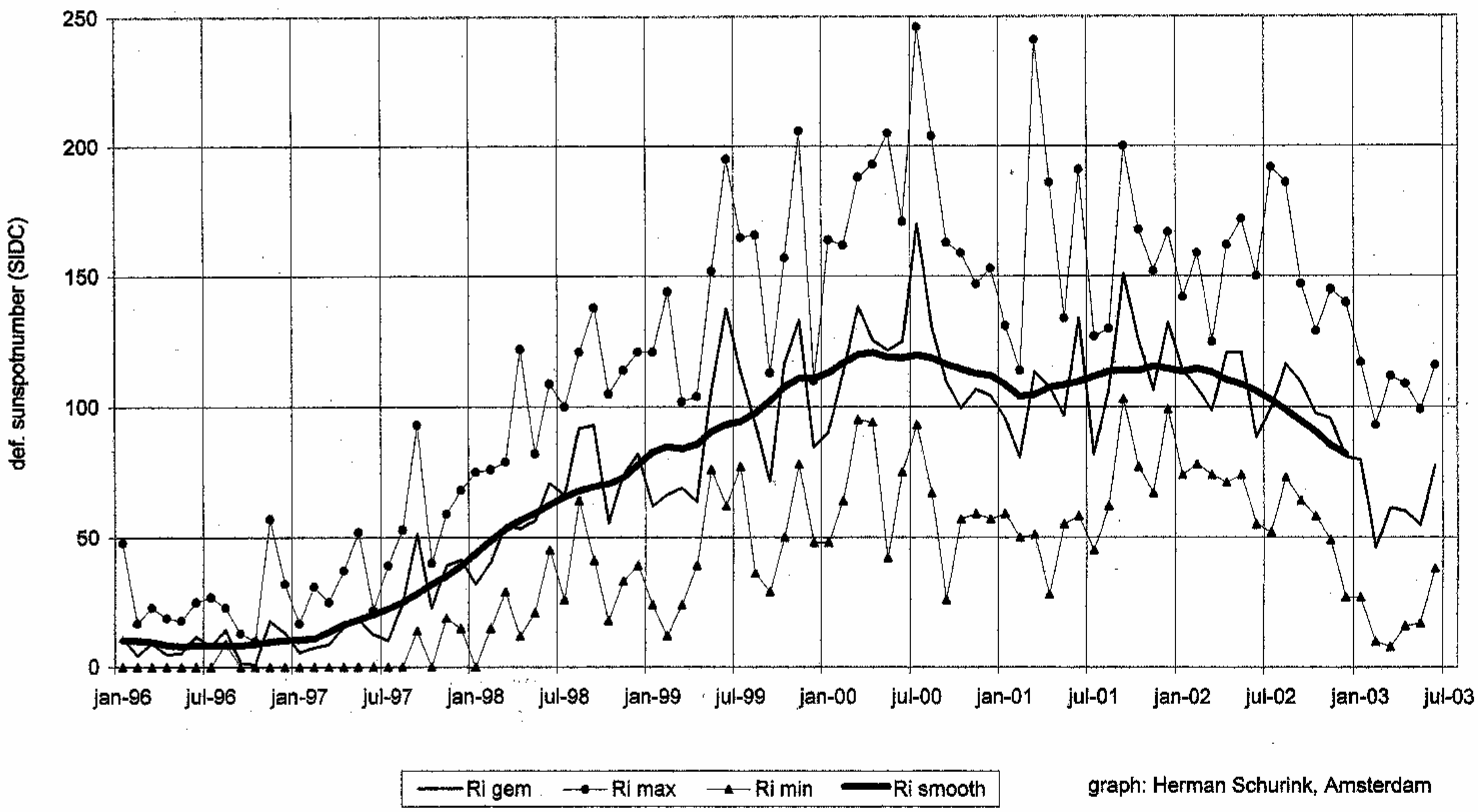
600: peak UT time of 600 Mhz radio bursts in Humain
Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection

S I D C - *News* 2003 n° 3

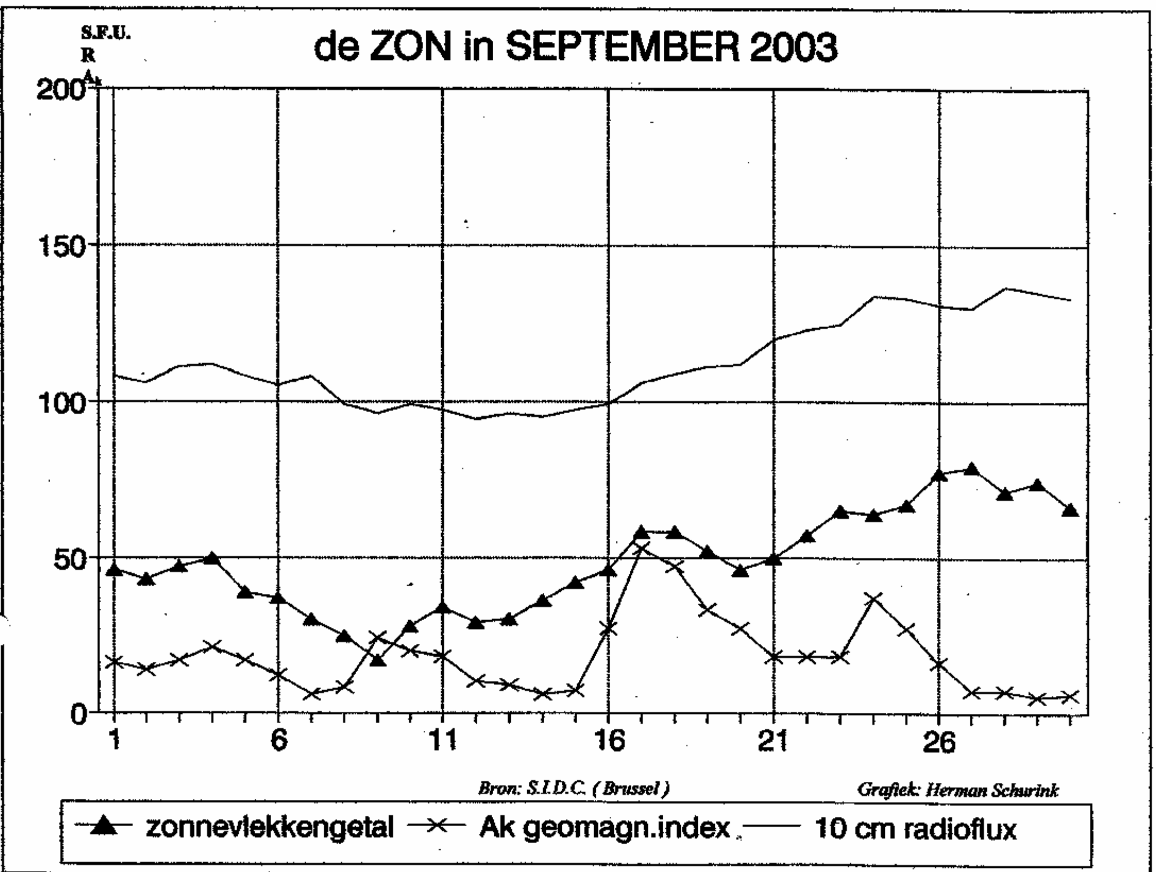
SIDC DEFINITIVE INTERNATIONAL AND HEMISPHERIC SUNSPOT NUMBERS FOR 2003

	APRIL			MAY			JUNE		
Date	Ri	Rn	Rs	Ri	Rn	Rs	Ri	Rn	Rs
1	93	35	58	99	29	70	42	21	21
2	103	43	60	86	27	59	38	27	11
3	90	43	47	95	26	69	40	29	11
4	72	36	36	96	29	67	47	37	10
5	60	30	30	93	32	61	59	50	9
6	52	22	30	78	31	47	86	69	17
7	48	23	25	65	18	47	98	75	23
8	34	26	8	33	17	16	101	76	25
9	42	25	17	20	20	0	111	80	31
10	38	21	17	17	17	0	111	61	50
11	25	15	10	36	20	16	116	62	54
12	37	25	12	38	19	19	115	51	64
13	38	21	17	41	22	19	96	38	58
14	35	18	17	43	23	20	81	30	51
15	29	10	19	50	29	21	63	28	35
16	16	0	16	51	29	22	57	16	41
17	19	0	19	39	0	39	56	22	34
18	27	13	14	44	12	32	68	29	39
19	34	17	17	48	0	48	76	25	51
20	45	24	21	61	0	61	74	28	46
21	58	35	23	50	0	50	62	21	41
22	75	43	32	65	0	65	61	27	34
23	73	50	23	57	18	39	66	40	26
24	73	49	24	37	0	37	68	44	24
25	89	66	23	39	0	39	76	57	19
26	86	51	35	52	8	44	82	63	19
27	103	38	65	57	0	57	93	73	20
28	100	27	73	62	9	53	93	70	23
29	109	26	83	56	9	47	94	70	24
30	98	22	76	44	8	36	92	72	20
31				42	9	33			
MEAN :	60.0	28.5	31.5	54.6	14.9	39.7	77.4	46.4	31.0

SOLAR CYCLE 23



graph: Herman Schurink, Amsterdam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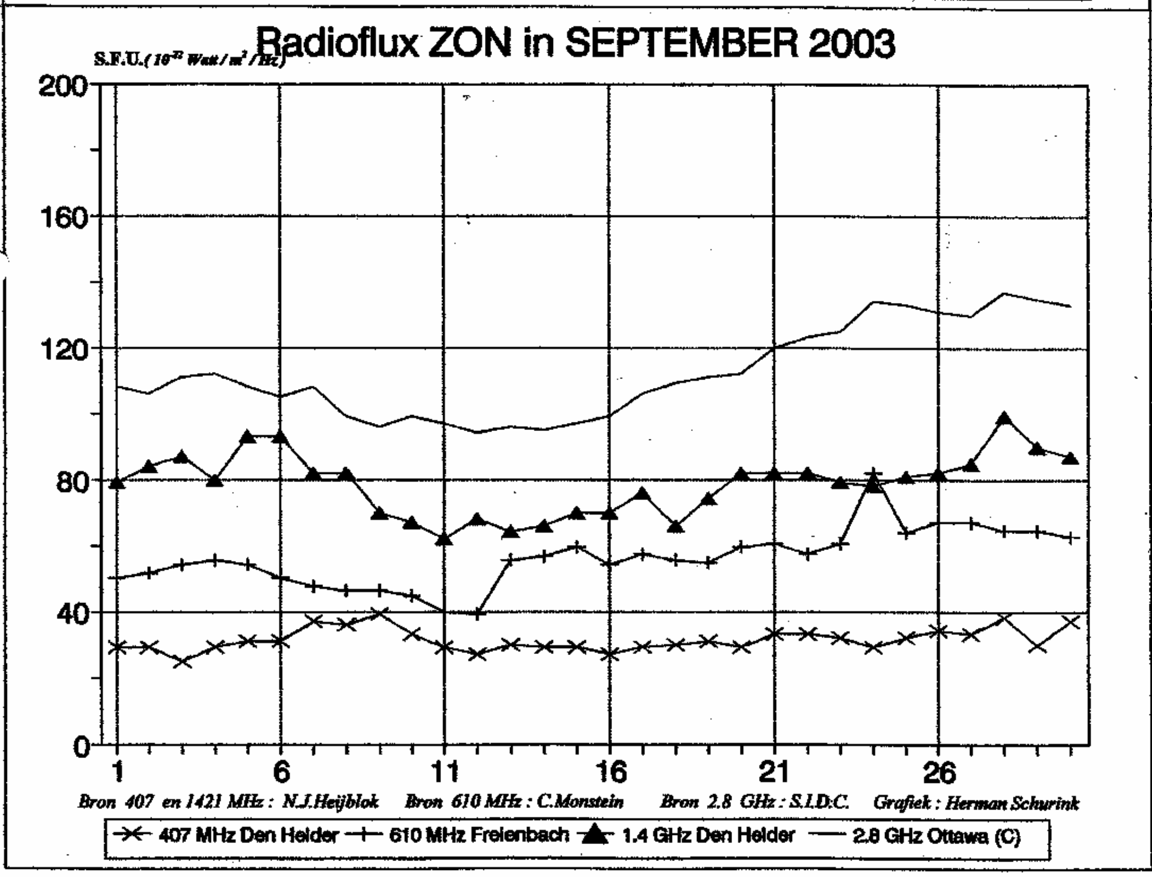
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Bron 407 en 1421 MHz : N.J.Heijblok
Bron 610 MHz : C.Monstein
Bron 2.8 GHz : S.I.D.C.
Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon — Oktober 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bals	Gort	Gr60	Groe	Jn 9	Jn40	Kroe	vSlo	Son	Stam	Spa	Zans	Zijle	Uccle groups	Uccle spots
1	100	60			41			78				102			
2					40		73	80	92			89	132	6	44
3					18	18		50							
4	71	51			17			73	58		62		96	5	52
5	69	42			16		30	62		36	62	47	100	5	60
6					15			44							
7	57			38	18			37						4	48
8														4	32
9												62			
10		43			22					27				4	26
11					11							36		5	27
12	35	23	37	11	11				34	2	36	24	35	3	6
13	24				0				12			12	12	2	3
14	0	0		0	0				0			0	13	1	2
15	14	0			0				16	0	27	13	20	1	5
16	26	13		12	0			26	25		27	26	30	2	4
17	39	24	43		0			37	39	3		37	52	3	6
18	47				13			46				44	68	3	22
19	60	33	63		28	29	27	42	32	26		47		3	35
20	74				31			48	50	26				3	27
21					20				71	54		61			
22	74			25	32			68	41	63		62		3	76
23	60	76	92			31	46	63	62	76		76	94	3	89
24										103		67	105	2	63
25							53	76			190	97		3	89
26			134	74			44	87		121	167	104	145		
27		112		97	67		77	140		134		131	190	6	167
28	260	127			94	98	78	146		147	264	184	270	7	225
29	276				103			192				190	269	8	175
30	261				99										
31					79					133					
observ	18	13	5	7	25	4	8	19	13	15	8	22	16		
k	0,72	1,20	0,67	1,64	2,30	2,14	1,65	0,95	0,83	2,62	0,65	0,94	0,67		
st.dev.	0,10	0,21	0,02	0,54	0,70	0,90	0,39	0,15	0,22	3,70	0,16	0,14	0,16		
st.d./k	0,14	0,18	0,03	0,33	0,30	0,42	0,24	0,16	0,24	1,41	0,24	0,15	0,23		

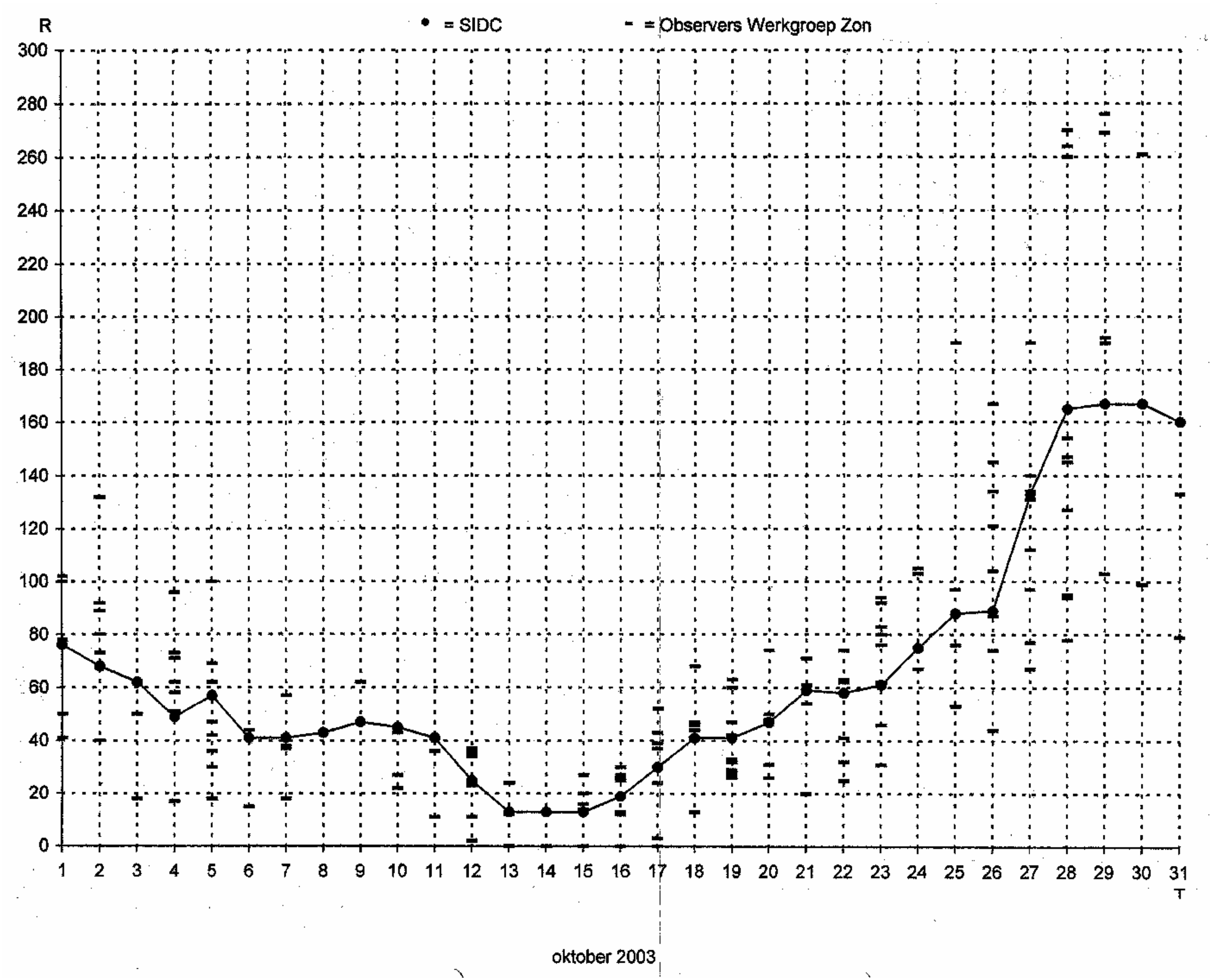
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn40 = D. Jannink [40]	Stam = R.Stammes [100]
Gort = E.Gorter [90]	Kroe = K. Kroesen [102]	Zans = W. Zanstra [Rf 155]
Gr60 = Mw G. Gravers [60]	vSlo = B. van Slooten [90]	Zijle = W.A. Zijlema [90]
Groe = A.Groenewegen [102]	Son = A.T. Son [Rf 150 Kutter]	
Jn 9 = D. Jannink [9]	Spa = T. Spaninks [75]	

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
30	66	81	49	133	////	15	0/0	6	
1	76	80	49	137	////	13	1/0	17	
2	68	65	46	125	////	13	0/0	10	
3	62	60	44	120	////	2	0/0	17	
4	49	66	43	119	////	1	1/0	7	
5	57	69	43	110	////	3	0/0	8	
6	41	61	45	112	////	0	0/0	10	
7	41	73	43	112	////	0	0/0	18	
8	43	81	46	113	////	0	0/0	8	
9	47	36	44	111	////	0	0/0	8	
10	45	30	43	112	////	0	0/0	3	
11	41	25	44	106	////	0	0/0	3	
12	25	9	43	98	////	0	0/0	6	
13	13	4	42	94	////	0	0/0	23	
14	13	3	41	92	////	0	0/0	56	
15	13	4	41	96	////	1	0/0	39	
16	19	7	41	95	////	1	0/0	32	
17	30	6	42	99	////	0	0/0	26	
18	41	22	43	109	////	28	0/0	26	
19	41	46	45	120	////	29	2/1	40	
20	47	132	49	135	////	17	1/0	38	
21	59	271	53	152	////	8	1/0	48	
22	58	254	53	154	////	17	7/0	35	
23	61	283	52	183	////	36	3/2	5	
24	75	233	56	191	////	39	4/0	40	
25	88	390	62	222	////	108	3/0	20	
26	89	474	66	298	////	213	2/2	14	
27	133	467	-	257	////	130	5/0	12	
28	165	595	-	274	////	268	0/1	28	
29	167	601	-	279	////	131	2/1	22	
30	167	831	-	271	////	21	2/0	85	
31	160	616	61	249	////	12	2/0	40	

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 x Sn+10 x "1"+100 x ">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.


R
• = SIDC
- = Observers Werkgroep Zon
300
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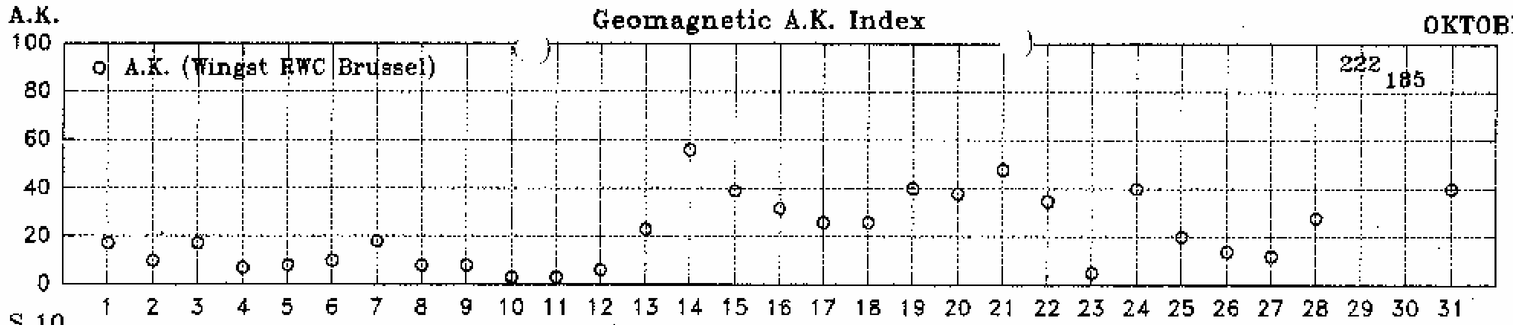
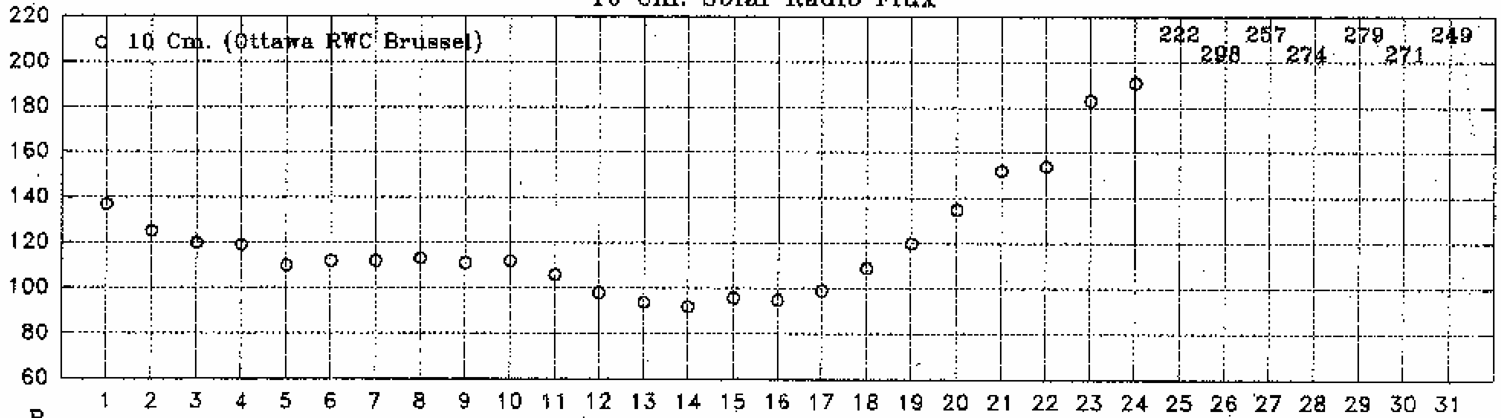
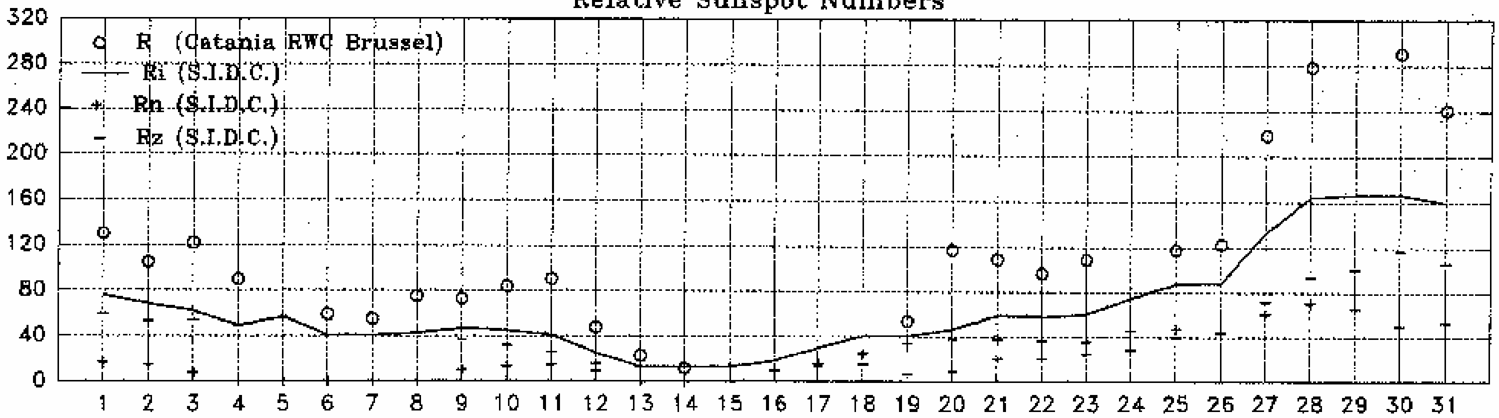






Rimx 167
Okt.
29,30.

Rimn 13
Okt.
13,14,15.

Rigem.
65,6

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

oktober 2003

	S.I.D.C.		Balster		Groenew.		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	17	59	25	75					18	60					29	73
2	15	53							11	69	23	69			12	77
3	8	54					0	18	0	50						
4	0	49	0	71					0	73	0	58	0	62		
5	0	57	0	69					0	62			0	62	0	47
6	0	41							11	33						
7	0	41	0	57	0	38			0	37						
8	0	43														
9	10	37													11	51
10	13	32														
11	15	26													11	25
12	9	16	11	24	0	11					11	23	11	25	12	12
13	0	13	11	13							0	12			0	12
14	0	13	0	0	0	0					0	0			0	0
15	13	0	14	0							16	0	15	12	13	0
16	10	9	13	13	0	12			13	13	12	13	13	14	13	13
17	16	14	15	24					13	24	14	25			23	14
18	25	16	33	14					32	14					32	12
19	34	7	48	12			29	0	31	11	13	19			47	0
20	38	9	60	14					34	14	0	50				
21	38	21									11	60			45	16
22	37	21	48	26	25	0			34	24	0	41			38	24
23	36	25	51	29			0	31	32	51	0	62			42	34
24	46	29													34	33
25	48	40							43	33			99	91	51	46
26	45	44			37	37			43	44			88	79	53	51
27	61	72			57	40			67	73					74	57
28	71	94	95	165			48	49	66	79			112	152	74	80
29	66	101	97	179					69	123					83	107
30	50	117	73	188												
31	54	106														

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

Solar activity varied over the full spectrum during October, ranging from very low activity in the beginning of the month to extremely high activity levels during the last 10 days. Many M-class and 7 X-class X-ray flares were observed, the largest being an X17 from Catania sunspot group 70 (NOAA 0486) on Oct 28, one of the largest flares on record. Several very large sunspot groups transited the solar disk. Catania sunspot groups 41 (NOAA 0464), 65 (NOAA 0484), 70 (NOAA 0486) and 75 (NOAA 0488) all grew to more than 0.1% of the solar disk. The largest of these, and also the largest sunspot group observed in the current solar cycle, was group 70, which grew to more than 0.25% of the solar disk.

Things were fairly quiet at the start of the month. Many C-class flares occurred, but the largest activity consisted of only two small M-flares. *Catania sunspot group 41 (NOAA 0464)* produced an M1.4 on Oct 01 and was the dominant source of solar activity during the first few days. When it rotated over the west limb on Oct 03, attention shifted to Catania sunspot group 52 (NOAA 0471), which had appeared at the east limb on September 30. Also this group had a beta-gamma magnetic classification (with McIntosh type E), but was only about half the size of group 41. It generated about 10 C-flares and an M1 flare (on Oct 04).

From Oct 10 until Oct 17, solar activity was reduced to almost nothing: some small ripples superposed on a background X-ray flux situated at the bottom of the B-range. Starting on Oct 18, solar activity increased gradually due to the apparition of *Catania sunspot group 65 (NOAA 0484)* at the east limb (its position on the solar disk more or less coinciding with the magnetic complex housing the former group 41). This group, with a gamma-beta-delta configuration, started its major flaring sequence on Oct 19 with an M1.9 flare at 06:26UT, an X1.1 flare at 16:50UT and an M1.0 flare at 19:26 UT, the start of a period of extreme solar and space weather activity. This sunspot group covered at its maximum extent 0.14 % of the total disk area. It produced a total of 16 M-flares and 2 X-flares before rotating off disk on Oct 30.

A second big sunspot group, *Catania 70 (NOAA 0486)* appeared at the eastern limb of the solar disk on Oct 23. This group quickly grew to become the largest group of the current solar cycle (measuring more than 0.25% of the solar disk), and produced several of the largest flares on record. An extremely strong X17.2 flare occurred in this group on October 28 peaking at 11:10 UT. At the time this was the third-largest flare on record, but it was overtaken by an even larger flare from this group in November. Many of the flares occurred near the center of the solar disk and generated fast earth-directed CMEs, causing severe space weather conditions. These CME events and their consequences are described in the second section of this report.

Late on 26 Oct a proton event started at about 18 UT, due to an X1.2 flare from group 65. The >10 MeV proton flux exceeded the event threshold, while the >50 MeV proton flux nearly reached the threshold. At about 17 UT on 27 Oct this event ended. The next day however, the X17.2 flare from group 70 generated a severe particle storm: all the proton fluxes exceeded the threshold; by 00:00 UT on Oct 29 the >10 MeV proton flux exceeded 10000. On Oct 29 Catania 70 produced an X10.1 flare peaking at 20:49 UT. The proton fluxes increased again, thus prolongating the proton storm. Several subsequent M-flares maintained the >10 MeV proton flux above the threshold until the end of the month.

II. Geomagnetic Activity

At the start of the month, geomagnetic activity was mostly quiet, with a few brief periods of active conditions. On Oct 01 both Wingst and Izmiran reported K-indices of 5, but the estimated Kp index at SEC NOAA did not exceed 3 on this day. The solar wind speed remained below 400 km/s until Oct 02. It then gradually rose under the influence of a trans-equatorial coronal hole, reached 500km/s early on Oct 03 and remained at this value until late on Oct 04, when it started to decrease again. The interplanetary magnetic field was mostly northwards during these days, and the enhanced solar wind speed only led to short spells of active conditions late on Oct 03 and late on Oct 05. On Oct 06 the solar wind speed started to increase to a maximum of 700 km/s just before midnight and remained high until Oct 09. In this period, the interplanetary magnetic field carried by the solar wind was strongly fluctuating from positive to negative values. This led to occasional active conditions (K-indices of 4 in Wingst and Izmiran) from Oct 06 until Oct 09. Thereafter the solar wind speed decreased to 300km/s (by Oct 12) and geomagnetic conditions became quiet.

Thereafter, the solar wind speed was dominated by two coronal holes. A first small equatorial coronal hole made the solar wind speed increase from Oct 13 onwards. On Oct 14 the influence from a large hole with 2 imbedded weak loop systems was visible. The combination of the increased speed and an IMF that was strongly pointing southward led to strong geomagnetic perturbations. Wingst reported a peak K-index of 7 late on Oct 14. Minor storm conditions persisted until Oct 17, followed by active conditions until Oct 19. Late on Oct 19, geomagnetic activity increased again to minor storm conditions, still under the influence of the trans-equatorial coronal hole. Also on Oct 20-21, active to minor storm conditions were observed. On 22 Oct the coronal hole left its geo-effective position, but on the same day, the earth experienced a minor geomagnetic storm following the arrival of the CME which had left the Sun on Oct 19. During the rest of the month, many more earth-directed CMEs were observed. The most relevant ones are listed below:

1) A partial halo CME on Oct 19 was first seen in the north-east quadrant of LASCO/C2 at 17:08 UT. It was probably associated with the X1.1 flare from Catania sunspot group 65. Both an EIT wave and coronal dimming were observed in conjunction with this event. This halo CME resulted in a minor geomagnetic storm on Oct 22.
2) A full halo CME on Oct 21 was first visible in the SE from 03:54 UT. It wasn't clear whether this event was front- or back-sided, but in any case it didn't generate any geomagnetic perturbation.
3) On Oct 22 a partial (almost full) halo CME was reported by LASCO, starting at 07:54 UT. It was probably related to the flaring activity (at C and M levels) in and around sunspot group 65, and therefore was regarded as front sided. This CME was probably overtaken by the fast one following it.
4) A full halo CME on Oct 23 was first observed in LASCO/C2 at 08:54 UT. The mean plane-of-sky speed for this event was 1110 km/s. The CME was probably associated with the X5.4 flare from Catania sunspot group 70. A very large EIT wave and coronal dimming were observed in association with this event. This event caused a major geomagnetic storm after the arrival of a shock on Oct 24.
5) On Oct 26 a CME was visible in LASCO/C2 at about 01:31 UT. It was most likely related to a large prominence eruption clearly visible in all EIT images. The prominence was situated to the southwest of Catania 70.
6) On Oct 26, while the previous CME was still in progress, a fast partial halo CME developed at the West limb. It was first seen in LASCO/C2 at 06:54 UT and was probably related to the X1.2 X-ray burst

in Catania 70 (NOAA 0486). The shock registered by the ACE spacecraft around 03:00 UT on Oct 28 was probably due to this CME.

7) On Oct 26 at the end of the UT day a third CME was visible in LASCO, this time at the East limb. It was first visible in LASCO/C2 at 17:54 UT and had developed into a full halo by 18:36 UT. This CME escaped just after the X1.2 flare in Catania 65 (NOAA 0484) with peak emission at 18:36.
8) The X17.2 flare from Catania 70 on Oct 28 was accompanied by strong coronal dimmings and an EIT wave indicating the onset of a CME. This full halo CME was first seen in LASCO/C2 at 10:54 UT and had an estimated plane-of-the-sky speed of about 2125 km/s. As the CME was extremely fast, the shock arrived to the earth around 06:00 UT on Oct 29. The ACE/SWEPAM data were not available at this moment (due to the particle storm), but the magnetic field measurements showed the strong jump of the magnetic field at the arrival of the shock. The Bz component of the magnetic field reached about -50 nT, thus producing a ***severe magnetic storm*** with the Kp index reaching 9 on Oct 29-30.
9) On Oct 29 Catania 70 produced an X10.1 flare peaking at 20:49 UT. Again, EIT wave and coronal dimmings were observed, and the full halo CME appeared in the LASCO C2 field of view at 20:54 UT with an estimated plane-of-the-sky speed of about 1950 km/s. The shock arrived around 16:00 UT on Oct 30. A severe geomagnetic storm started right after the arrival of the shock (Kp reached 9 again) and continued on Oct 31.

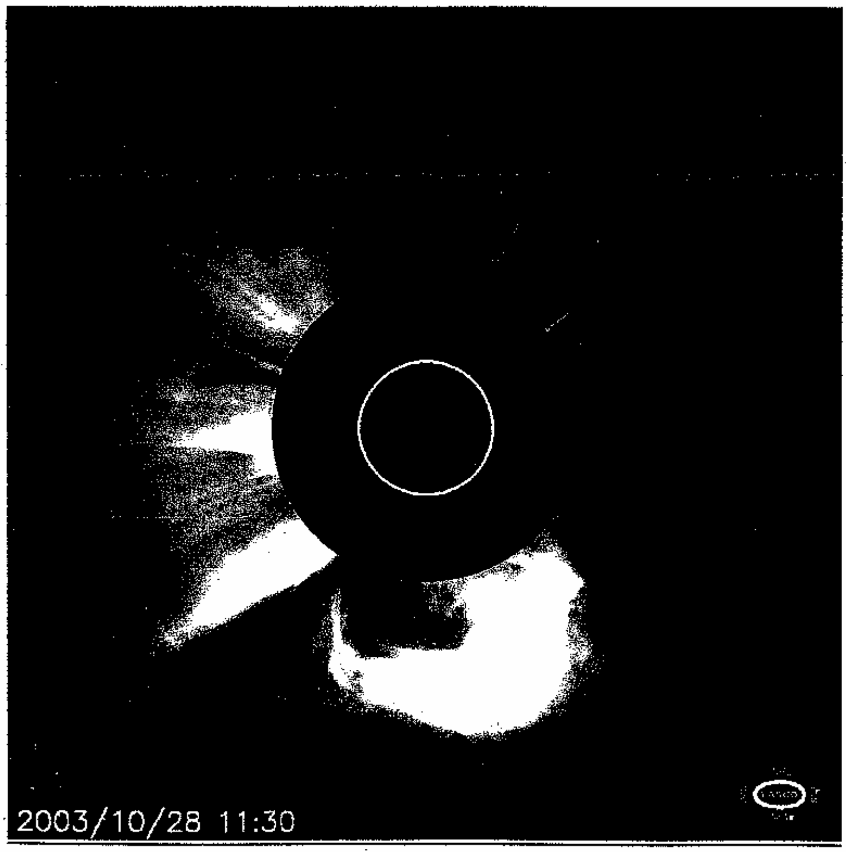
III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	600 (Humain)	Cat	NOAA	NOTE
01	0444	0451	0459	N05W57	M1.4	1F				41	0464	
04	1542	1547	1549	S10E29	M1.0	SF	22			52	0471	
19	0608	0626	0641	N07E65	M1.9	1F	37	III/2		65	0484	EIT derived loc
19	1629	1650	1704	N08E56	X1.1	1N	510	II/1,CTM/1		65	0484	CME
19	1921	1926	1930	N05E54	M1.0	SF				65	0484	
20	0644	0722	0800	NO6E48	M1.9	1N				65	0484	EIT derived loc
21	0823	0827	0833	N02E34	M1.0	SF	35			65	0484	EIT derived loc
21	1922	2330	0305	S18E87	M2.4					70	0486	EIT derived loc
22	0328	0351	0521	S13E88	M3.7	SF	320	III/3		70	0486	EIT derived loc
22	0830	0844	0853	S16E88	M1.7					70	0486	EIT derived loc
22	0937	0956	0959	S18E88	M1.7			II/1		70	0486	EIT derived loc
22	1506	1511	1513	N05E22	M1.4	SN		III/2	1509	65	0484	
22	1557	1601	1604	N03E17	M1.2	SN		III/3		65	0484	
22	1947	2007	2028	S18E78	M9.9	SF	240			70	0486	
22	2156	2204	2217	S16E88	M2.1					70	0486	EIT derived loc
23	0235	0241	0244	N03E15	M2.4	SN	54	III/3		65	0484	
23	0704	0708	0711	N04E13	M3.2	1N	150	III/3	0706	65	0484	EIT derived loc
23	0808	0835	0900	S18E87	X5.4	1B	1500	II/3	0827	70	0486	EIT der. loc, halo CME
23	1049	1053	1055	N04E10	M2.7		130	III/2		65	0484	EIT derived loc
23	1549	1622	1640	S17E82	M1.0					70	0486	EIT derived loc
23	1950	2004	2014	S17E84	X1.1	1N	77			70	0486	
24	0223	0253	0320	S18E80	M7.6	1N	73	IV/2		70	0486	EIT derived loc
24	0504	0510	0518	S22E78	M4.2	1F	91			70	0486	EIT derived loc
24	1842	1856	1905	S19E68	M1.3					70	0486	EIT derived loc
24	2135	2140	2145	N05W09	M1.0	1N		III/3		65	0484	
25	0417	0446	0528	S14E45	M1.2	2N	64	III/1		70	0486	EIT derived loc
25	0544	0553	0625	N00W15	M1.7	SF	130	III/2,II/1		70	0486	EIT derived loc
25	1027	1035	1051	N03W20	M1.5	SF	220		1029	65	0484	
26	0555	0654	0733	S15E43	X1.2	3B	4000	CTM/1,VI/3 III/3,II/3	0733,0842	70	0486	EIT derived loc
26	1415	1420	1424	N05W33	M1.0	SF				65	0484	
26	1721	1819	1921	N02W38	X1.2	1N	2000	CTM/1,II/2		65	0484	
26	2134	2140	2148	N01W38	M7.6	2N	57	III/2		65	0484	
27	0412	0439	0508	N00W44	M1.2	SF				65	0484	

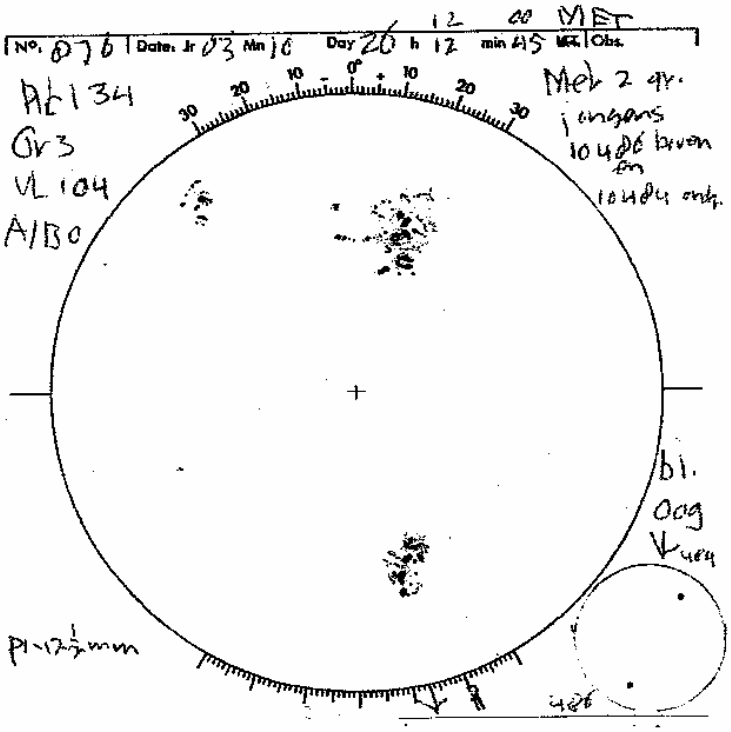
27	0750	0833	0924	N00W48	M2.7	2F	1100	III/3,IV/1	0806, 0825,0848	65	0484	EIT derived loc
27	0922	0927	0937	S16E26	M5.0	SF	65	III/1		70	0486	EIT derived loc
27	1227	1243	1252	S17E25	M6.7	SF	59	III/2		70	0486	
27	2146	2151	2205	N08E09	M1.9	SN		III/3		75	0488	
28	1018	1110	1145	S18E20	X17	4B	13000	IV/3, II/3	1044, 1117,1153	70	0486	EIT der. loc, halo CME
29	0026	0151	0208	S16E10	M1.1	1F	63			70	0486	
29	0408	0511	0554	S17E06	M3.7	SN	610	IV/1		70	0486	EIT derived loc
29	2037	2049	2101	S15W02	X10	2B	2500	II/3,III/3,IV/2		70	0486	halo CME
30	0156	0207	0229	N06W20	M1.6	1F				75	0488	EIT derived loc
30	1515	1528	1537	S15W18	M1.5		29			70	0486	EIT derived loc
31	0427	0433	0440	N06W89	M2.0		67	III/3		65	0484	EIT derived loc
31	0604	0616	0632	N07W30	M1.1	SF		III/1		75	0488	EIT derived loc

loc: approximate heliographic location
Xray: X-ray flare class
op: optical flare class
10 cm: 10 cm radio flux
type: type of radio burst
600: peak UT time of 600 Mhz radio bursts in Humain
Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection

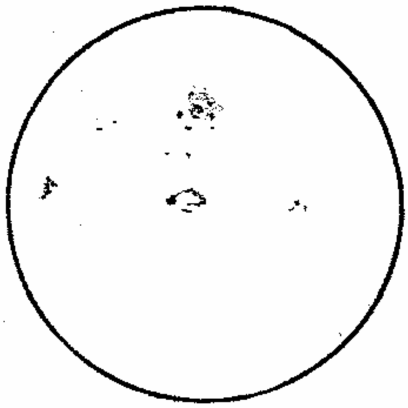
IV Picture of the month



A LASCO/C2 image of the full halo CME accompanying the large X17.2 flare on Oct 28. LASCO is an instrument onboard the joint ESA/NASA mission SOHO.

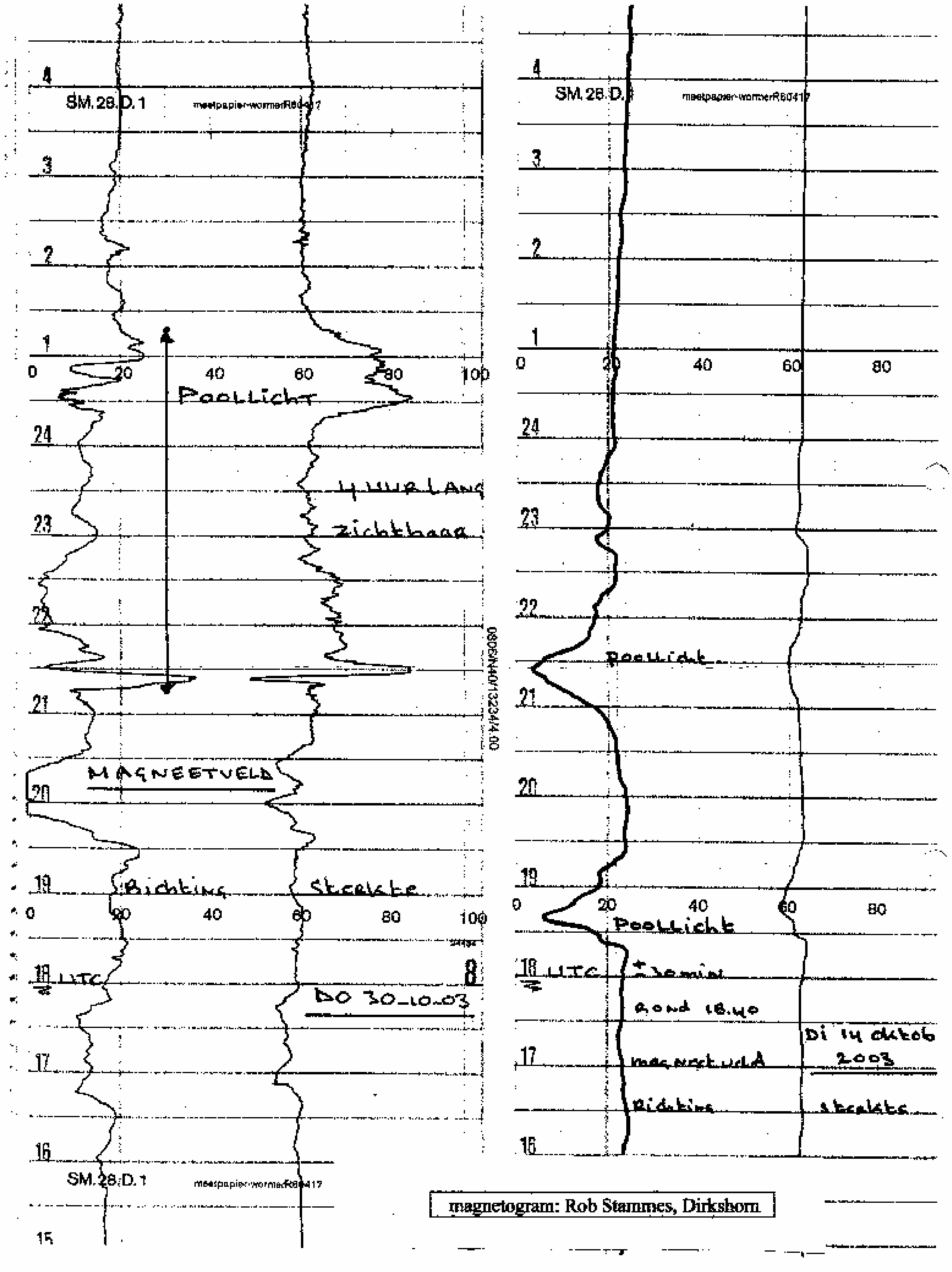


tekening: Gerda Gravers

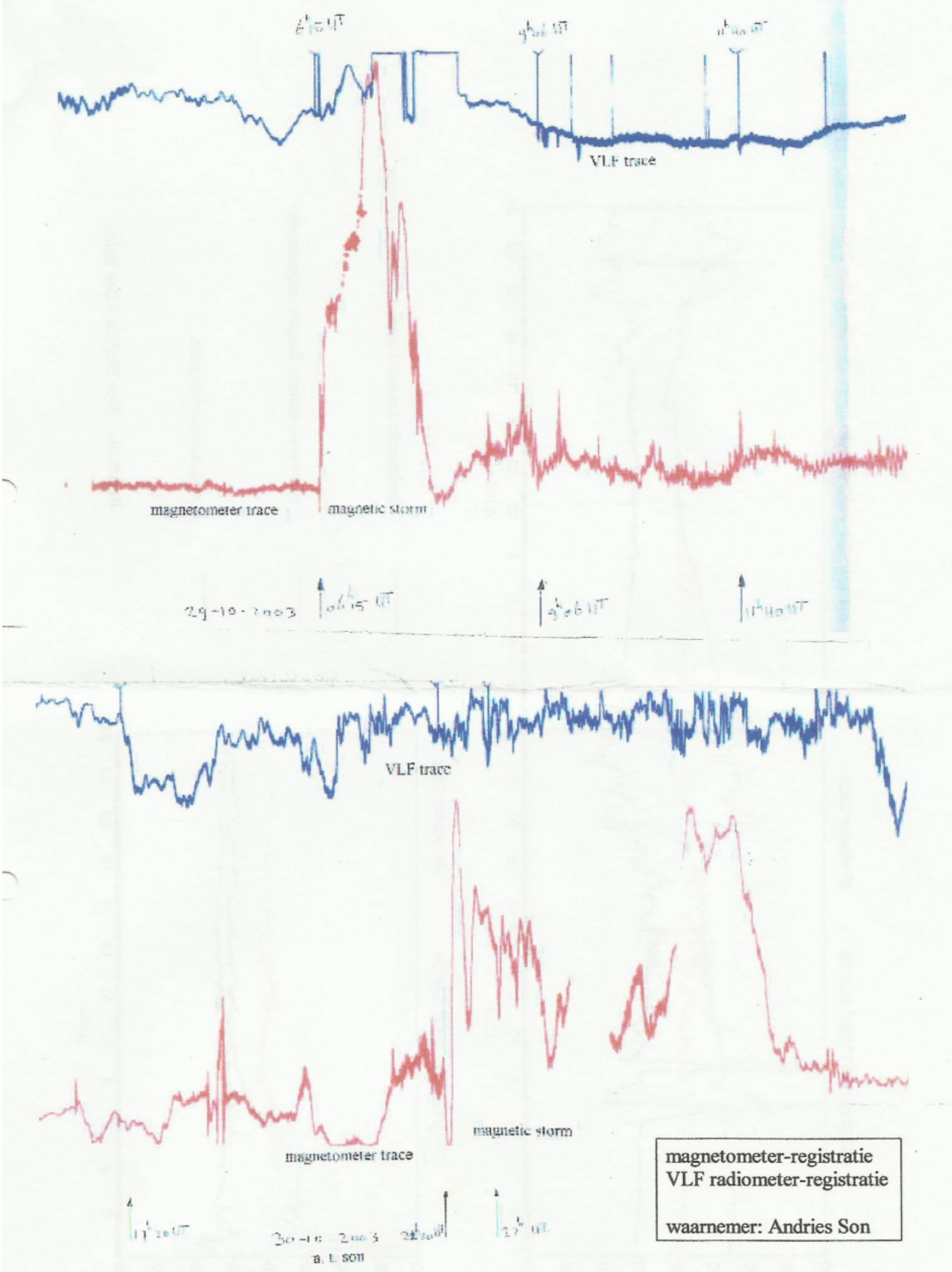


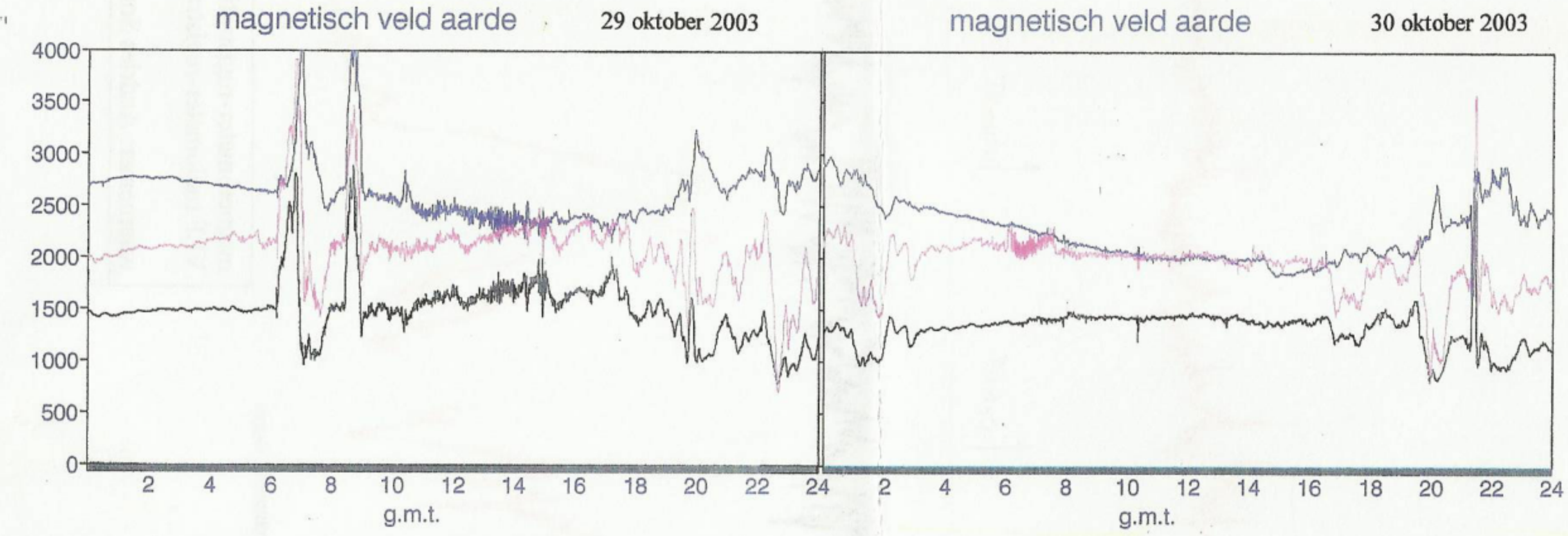
Zonnevlekken, 28 oktober 2003
13.20 UT

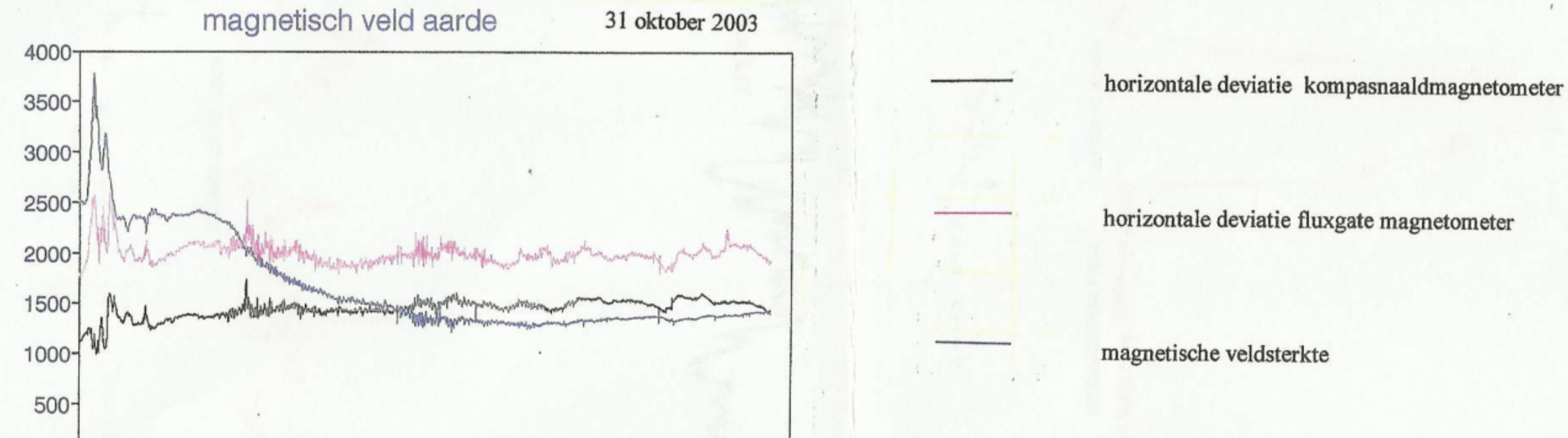
tekening: Dennis Jannink



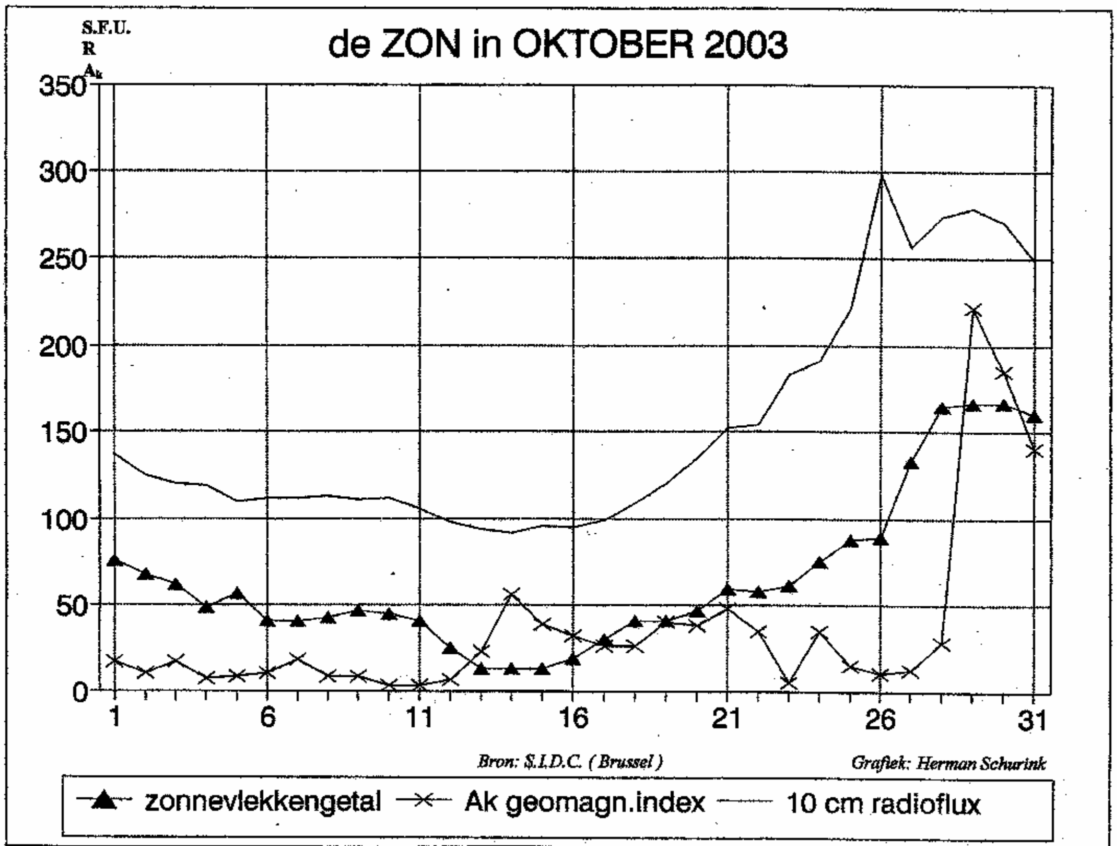
magnetogram: Rob Stammes, Dirkshorn

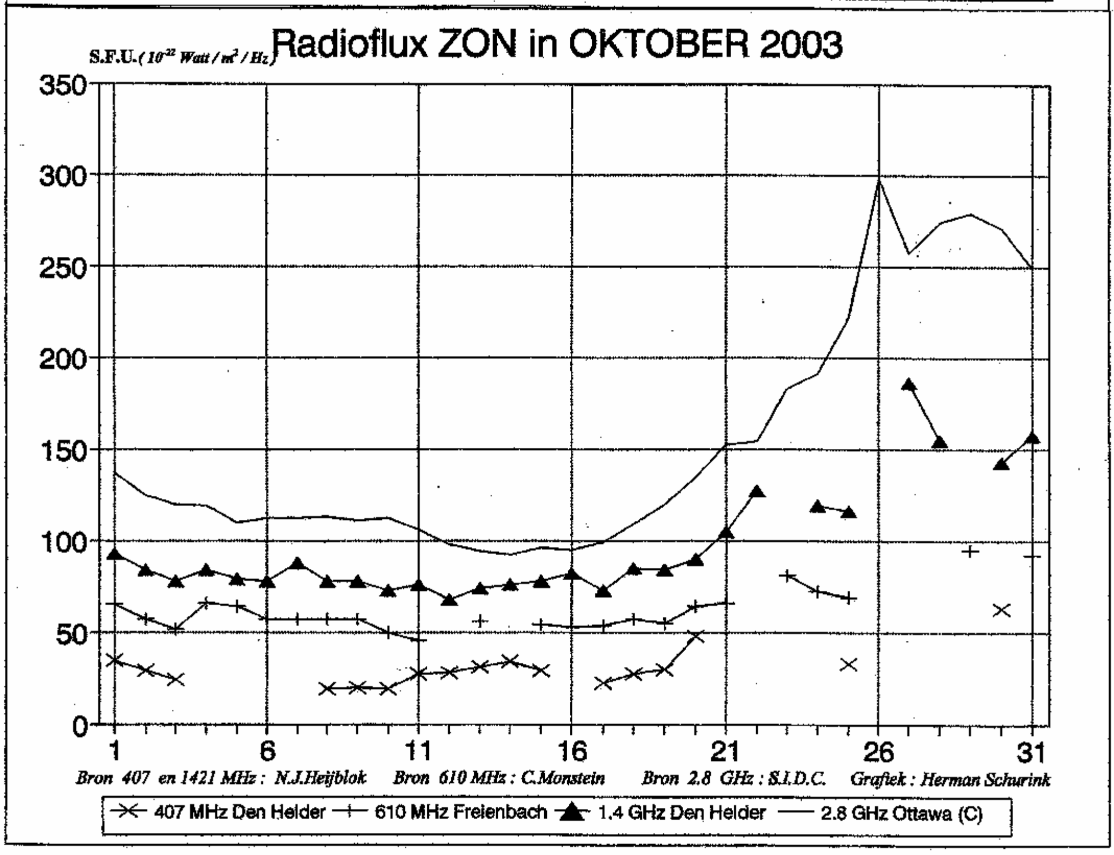

VLF trace
magnetometer trace
magnetic storm
VLF trace
magnetic storm
magnetometer trace
magnetometer-registratie
VLF radiometer-registratie
waarnemer: Andries Son





Registratie : Nico Heijblok – Den Helder


S.F.U.
R
Ak
de ZON in OKTOBER 2003
350
300
250
200
150
100
50
0
1
6
11
16
21
26
31
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux


S.F.U.(10^-22 Watt / m² / Hz)
Radioflux ZON in OKTOBER 2003
350
300
250
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150
100
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0
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6
11
16
21
26
31
Bron 407 en 1421 MHz : N.J.Heijblok
Bron 610 MHz : C.Monstein
Bron 2.8 GHz : S.I.D.C.
Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon November 2003

Waarnemingsleider: Nico Heijblok, Wezenstraat 70, 1781 GM Den Helder
tel: 0223-624130 E-mail: heijpi@planet.nl

Zonnevlekkengetallen (Sunspot numbers)

Day	Bais	Gort	Gr60	Groe	Jn 9	Jn40	Kr105	vSlo	Son	Spa	Stam	Zans	Zijle
1					67						92		
2					59			82					
3	99				44			66		77	59	76	
4					23			62	51		16	49	61
5	22	11		11	11	11		12	12			11	14
6	11	11		11	11			11	11	11	1	12	11
7	0	0	12	0	0			11	11	0	0	0	
8	24	0	12		0			24	13	25	0		57
9	45		49		12			51		33	6	41	
10	44				23			47	45				
11									28	41			
12	13	13			12	12		23	13	13	2		
13	26	22		11	0			23	23	24	0	25	25
14													
15			29		12				35				
16													
17					15							27	
18													
19													
20													
21													
22	123				44			82					
23					49								
24									95				
25					60			141				123	
26					60			104				116	
27		96									72	119	
28			168		73	74	76	129			69	104	
29	134				59			123	147				
30													
observ	11	7	5	4	20	3	1	16	12	8	11	12	5
k	0,80	1,02	1,09	1,27	1,89	1,21	1,59	0,94	1,01	0,89	3,78	1,02	0,75
st.dev.	0,10	0,23	0,40	0,57	0,62	0,37	-	0,20	0,22	0,14	2,91	0,14	0,21
st.d./k	0,13	0,22	0,37	0,45	0,33	0,31	-	0,21	0,22	0,16	0,77	0,14	0,28

Day	Uccle groups	Uccle spots
1		
2		
3	5	45
4	4	4
5	2	2
6	1	1
7	0	0
8	2	7
9	3	24
10	3	21
11	4	59
12		
13	2	4
14		
15	3	16
16		
17		
18		
19		
20		
21	4	59
22	3	64
23	5	106
24	8	70
25		
26		
27		
28		
29		
30		

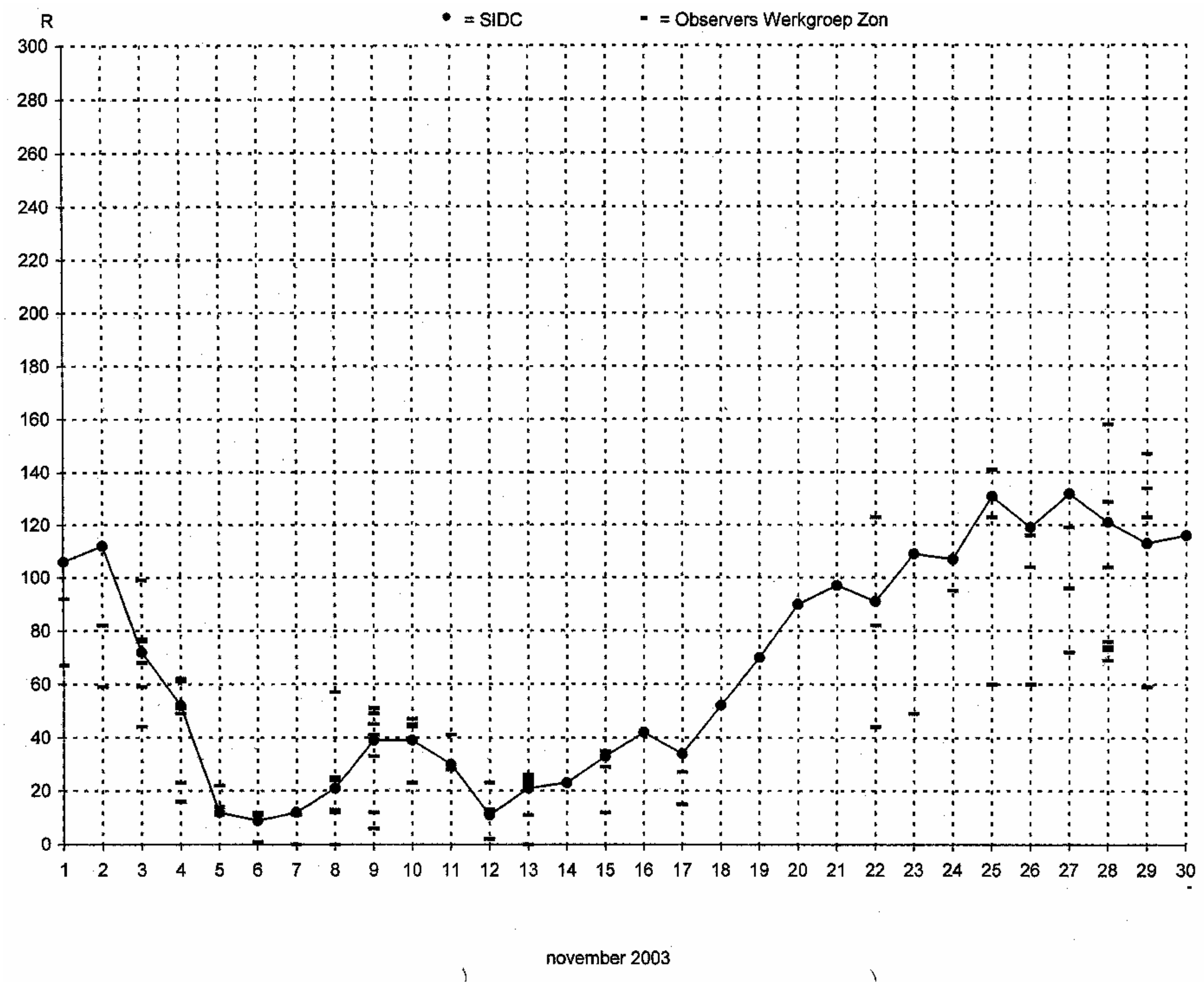
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bais = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Son = A.T. Son [Rf 150 Kutter]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Spa = T. Spanlnks [76]
Gr60 = Mw G. Gravers [60]	Kr105 = K. Kroesen [105]	Stam = R.Stammes [100]
Groe = A.Groenewegen [102]	vSlo = B. van Slooten [90]	Zans = W. Zanstra [Rf 155]
		Zijle = W.A. Zijlema [90]

S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
31	160	616	61	249	////	12	2/0	40	
1	106	416	-	210	////	20	3/0	26	
2	112	296	-	190	////	106	2/1	21	
3	72	80	58	167	////	206	1/2	16	
4	52	26	53	168	////	101	3/1	30	
5	12	10	45	114	////	0	2/0	9	
6	9	4	42	98	////	0	0/0	22	
7	12	1	40	91	////	0	0/0	10	
8	21	4	39	93	////	0	0/0	9	
9	39	21	40	93	////	0	0/0	33	
10	39	28	39	95	////	2	0/0	26	
11	30	37	38	96	////	1	1/0	49	
12	11	7	39	99	////	0	0/0	34	
13	21	8	40	102	////	0	2/0	65	
14	23	14	39	99	////	0	0/0	31	
15	33	30	38	98	////	1	0/0	40	
16	42	50	41	104	////	2	0/0	43	
17	34	67	47	121	////	10	2/0	42	
18	52	81	51	144	////	103	4/0	28	
19	70	122	48	155	////	21	1/0	12	
20	90	150	48	175	////	113	3/0	82	
21	97	160	48	177	////	3	0/0	33	
22	91	188	53	176	////	3	0/0	34	
23	109	235	53	178	////	4	0/0	22	
24	107	280	53	177	////	2	0/0	15	
25	131	242	55	171	////	1	0/0	16	
26	119	220	57	171	////	2	0/0	12	
27	132	229	61	175	////	4	0/0	7	
28	121	158	56	168	////	1	0/0	5	
29	113	118	55	166	////	12	0/0	6	
30	116	71	53	153	////	0	0/0	18	

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/m²: 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 x Sn+10 x "1"+100 x ">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.


R
• = SIDC
- = Observers Werkgroep Zon
300
280
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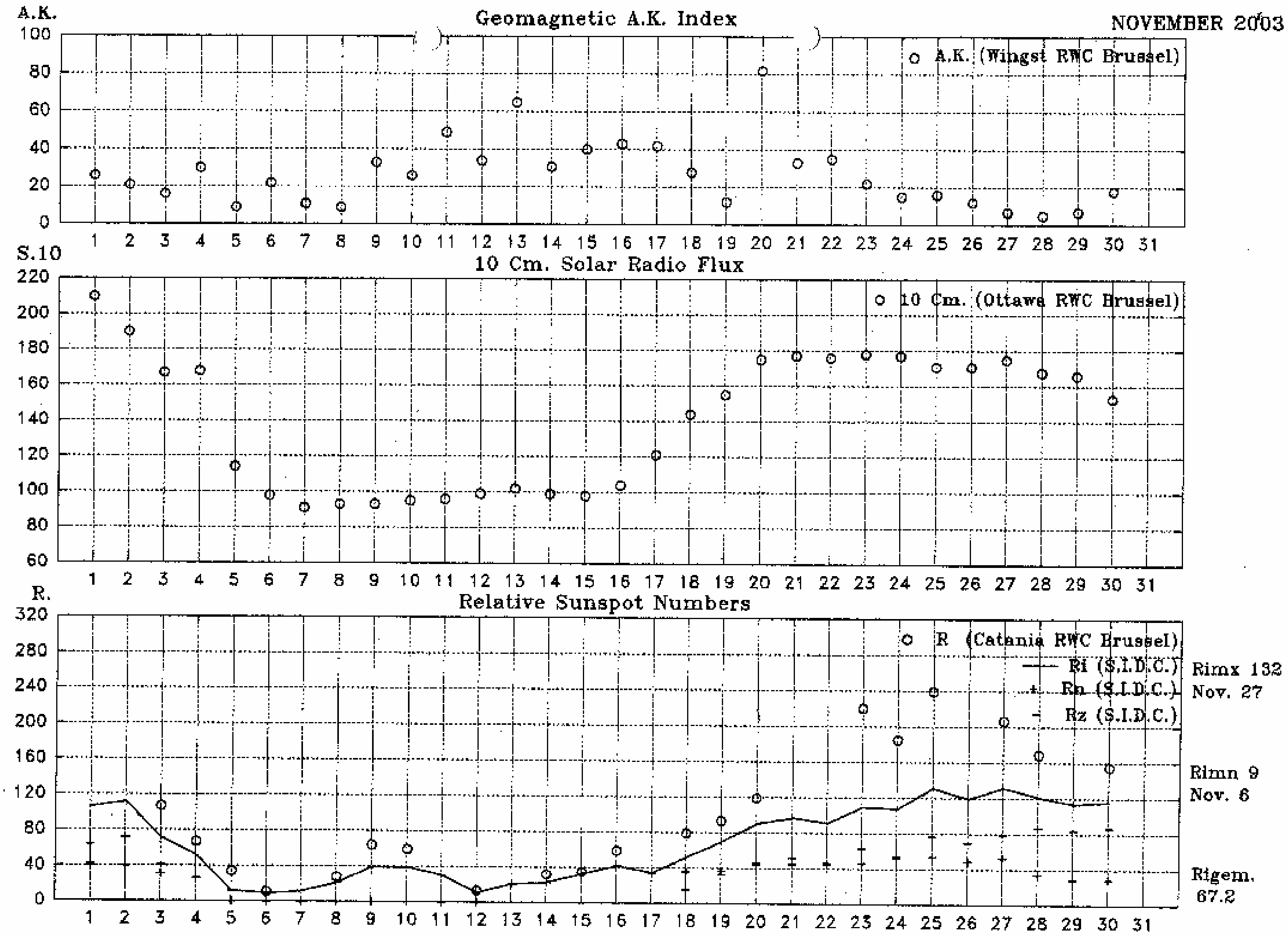
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
november 2003

NOVEMBER 2003



Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

november 2003

	S.I.D.C.		Balster		Groenew.		Jannink4		v.Slooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	42	64														
2	40	72							32	50						
3	31	41	36	63					33	35			34	43	37	39
4	26	26							35	27	22	29			24	25
5	0	12	0	22	0	11	0	11	0	12	0	12			0	11
6	0	9	0	11	0	11			0	11	0	11	0	11	0	12
7	0	12	0	0	0	0			0	11	0	11	0	0	0	0
8	0	21	0	24					0	24	13	0	0	25		
9	0	39	0	45					0	51			0	33	0	41
10	0	39	0	44					0	47	32	13				
11	0	30									28	0	0	41		
12	0	11	0	13			12	0	0	23	13	0	0	13		
13	21	0	26	0	11	0			23	0	0	23	24	0	25	0
14	23	0														
15	33	0									12	23				
16	42	0														
17	34	0													27	0
18	36	16														
19	37	33														
20	44	46														
21	45	52														
22	45	46	59	64					42	40						
23	46	63														
24	54	53									36	59				
25	54	77							52	89					55	68
26	49	70							33	71					42	74
27	53	79													47	72
28	34	87					25	49	11	118					32	72
29	29	84	34	100					28	95	29	118				
30	29	87														

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

The past month was once again one with extreme variations in solar activity, reaching historically high levels at the start of the month, but also dropping to almost nothing during the second week. The most spectacular event was certainly the extremely large X-ray flare on Nov 04 from Catania sunspot group 70 (NOAA 0486) at the west limb of the sun. The flare actually saturated the GOES detector; its true X-ray class was estimated to be X28, making it the largest flare recorded since X-ray monitoring began.

Solar activity at the beginning of the month was still dominated by two of the main actors in October's stormy space weather, viz. Catania sunspot groups 70 (NOAA 0486) and 75 (NOAA 0488). While heading towards the western solar limb, these two very large sunspot groups with a beta-gamma-delta magnetic configuration again produced numerous M-flares and several X-flares (see the events list below), accompanied by many CMEs at the western solar limb. On Nov 01, proton fluxes were coming down from the very large proton storm at the end of October. The >10MeV proton flux decreased below the threshold early on Nov 01, but surpassed the threshold again around noon on Nov 02 due to an M1.8 flare in sunspot group 75. Just a few hours later, a strong increase in all proton fluxes was associated with an X8.3 flare produced by Catania sunspot group 70, peaking at 17:25UT. Coronal dimmings and an EIT wave due to this flare were observed by SOHO/EIT. Although this event occurred close to the western limb, the accompanying CME developed into a full halo with estimated plane-of-the-sky speed of about 2100 km/s. The >100MeV proton flux decreased below the threshold later on Nov 02, the >50Mev component followed in the early afternoon of Nov 03.

On Nov 03, Catania 75 produced two more X-flares (X2.7 and X3.9). The most buoyant day, however, was Nov 04. First, several M-flares were observed from sunspot groups 70 and 75. Some time later, sunspot group 70 generated the extremely large flare that was later estimated to have reached an X28 peak flux. It also produced a 20000sfu tenflare and a full halo CME, and generated a slow increase of the proton fluxes. The >50MeV flux very briefly reached the threshold on Nov 05, while the >10MeV flux, which had only briefly dipped below the threshold just before the flare, remained above threshold level until early on Nov 07. On Nov 05, although the two flaring regions had rotated behind the limb, two more M flares were recorded from sunspot group 70.

With the two culprits out of the way, and the decay of other sunspot groups, the solar disk became almost devoid of sunspots (in fact, for a few hours on Nov 07, not a single sunspot was observed), and solar activity suddenly dropped to very low levels. A few new active regions formed and started to grow, but they remained fairly small and simple. The only sunspot group worth mentioning from this period was the group with Catania number 86 (NOAA 0498). On Nov 11 it was responsible for an M1.6 flare. Together with this event, a full halo CME was reported. This CME was the second in a row of 4 plasma ejections giving nice LASCO movies. The first of these halo CMEs occurred earlier on Nov 11 and was linked with old Catania sunspot group 70. This CME was therefore back-sided. On Nov 12, another clear halo CME could be seen in LASCO/C3. The CME, which is really a 'school example' of a halo event, came out of the occulting disk at 11:18. This eruption was also back-sided, and believed to originate from the old sunspot group 75. A fourth halo CME was only partial. It was associated with a prominence eruption and M1.4 flare on Nov 13 in sunspot group 90 (active NOAA region 0501).

From Nov 11 on, flaring activity was observed from behind the east limb, where the return was expected of the first of the large sunspot groups responsible for the recent activity. Late on Nov 13, Catania sunspot group 90 (the return of group 65) finally crossed the east limb and made its entrance known with an M1.6 flare and the M1.4 flare associated with the prominence eruption and the partial halo CME mentioned higher. However, when this active region was getting more and more visible in the MDI/SOHO imagery, it seemed to have a far less complex structure than it had on its previous rotation. And indeed, flaring activity during the rest of the month remained limited to the M-class. Apart from the two on Nov 13, 10 more M-flares were observed in the period Nov 17-20, all coming from sunspot group 90 (NOAA 0501). On Nov 18, a full halo CME was associated with the M3.2 and M3.9 activity of that sunspot group. On Nov 20, another full halo CME was associated with an M9.6 flare generated in sunspot group 90. This CME was a faint one.

Much was expected on Nov 18-19 from the returning old monster groups 70 and 75, renumbered now as 97 and 96 (NOAA 0508 and 0507) respectively, but solar activity became low after Nov 20, with C-class flares only. Sunspot group 97 was still complex initially with strong magnetic polarity mixing and some potential of large flaring activity, but just like for sunspot group 90, its complexity rapidly faded away. It was the most active sunspot group during the last week of November and released a large number of C-flares, including a C9.6 flare that erupted on Nov 27. Sunspot group Catania 96 (NOAA 0507) also had a beta-gamma-delta configuration but only flared occasionally at the C-class level.

II. Geomagnetic Activity

Early Nov 01 saw the end of the geomagnetic storm that began at the end of October, and the Kp index dropped to values of mostly 3 with an occasional 4 for the next few days. On Nov 04, at 05:53UT, a shock was recorded in the solar wind, which jumped to a speed of 680km/s, marking the arrival of the CME associated with the X8.3 flare of Nov 02. The interplanetary magnetic field pointed southward between 07:00 and 9:30 UT, which triggered a major geomagnetic storm (K=6 in Wingst) but only for a limited duration. Thereafter, the geomagnetic field remained quiet until the arrival of another shock on Nov 06, at 19:37UT, this time due to a glancing blow from the CME associated with the X28 superflare of Nov 04. This weak shock only led to a short minor geomagnetic storm on Nov 06. On Nov 07 and 08 the magnetosphere remained quiet.

At about 15:00 UT on Nov 08 the solar wind speed started to increase, with southward fluctuations of the interplanetary magnetic field (passage of a corotating interaction region). The geomagnetic field became active with minor storm episodes on Nov 09. This enhanced activity was associated with a high speed solar wind stream from the leading part of a large coronal hole with imbedded loop systems that rotated in a geo-effective position. This coronal hole continued to influence geomagnetic conditions for more than a week, resulting in minor geomagnetic storm conditions until Nov 18, with occasional periods of major storm conditions. The solar wind speed further increased to more than 550km/s on Nov 09. After a small decrease because of the imbedded loop systems, the solar wind reached the value of 700 km/s on Nov 11. Until Nov 19, the solar wind speed remained between 600 and 800km/s. In addition to the coronal hole influence, a push to higher values was given twice during this period by the arrival of a full halo CME (associated with the M1.6 flare on Nov 11) on Nov 13 at 10.00UT and of a partial halo CME (associated with the M1.4 flare on Nov 13) on Nov 15 at 05:18 UT. On Nov 13, this led to major storm conditions for a 12 hour period.

On Nov 19, the solar wind speed rapidly decreased to about 400km/s, and geomagnetic conditions became quiet on Nov 19 and early on Nov 20. On Nov 20, however, a *severe geomagnetic storm* was triggered by the arrival of the shock front of the powerful halo CME that left the sun around 07.45UT on Nov 18. The solar wind speed jumped suddenly from 430 to 750 km/s. The horizontal component of the interplanetary magnetic field was even measured to go down to -60nT. The local K-indices in Wingst and Izmiran and the estimated Kp index all reached the highest possible value of 9. This severe geomagnetic storm lasted until early on Nov 21, after which the geomagnetic conditions gradually became quiet.

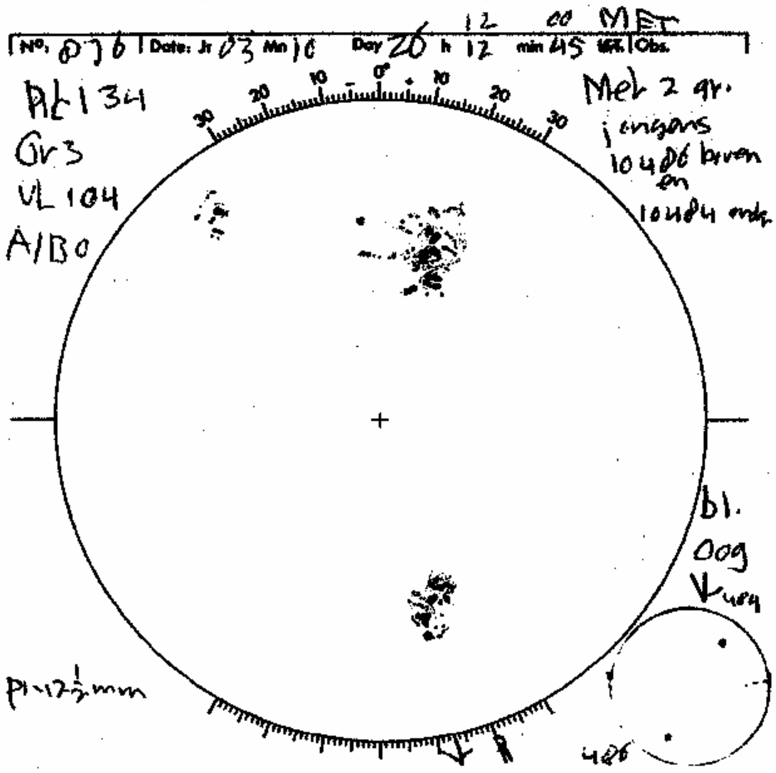
A small impact of the faint full halo CME of Nov 20 could be seen in SOHO/CELIAS data at 10.00 UT on Nov 22. This led to minor geomagnetic storm conditions for the second half of Nov 22 and the beginning of Nov 23. From Nov 23 on, a small coronal hole caused the solar wind speed to increase to the level of 550 km/s leading to a mixture of quiet and active conditions for the next few days. After that, the solar wind decreased (to about 400km/s by Nov 27) and the geomagnetic condition remained quiet from Nov 26 to Nov 30.

III. Noticeable solar events

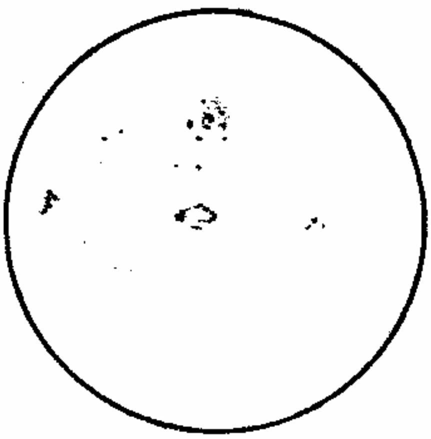
DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	600 (Humain)	Cat	NOAA	NOTE
01	0839	0851	0906		M1.3					75	0488	
01	1742	1751	1808	N09W50	M1.1	SF		III/1		75	0488	
01	2226	2238	2249	S12W60	M3.2	1N	95	III/1,II/2,IV/1		70	0486	
02	0659	0753	0812	S17W55	M1.0	SF				70	0486	
02	1230	1247	1312	N09W66	M1.8		22			75	0488	EIT derived location
02	1703	1725	1739	S14W56	X8.3	2B	7700	II/3,IV/3		70	0486	CME
03	0109	0130	0145	N10W83	X2.7	2B	240	II/1,III/1,IV/3		75	0488	
03	0943	0955	1019	N08W77	X3.9	2F	4400	II/2,III/2,IV/1, V/2		75	0488	
03	1526	1532	1543	S15W79	M3.9	SF	210			70	0486	
04	0543	0556	0607	S17W88	M2.6					70	0486	EIT derived location
04	1011	1022	1033	N08W90	M3.0					75	0488	EIT der. Loc.; CME
04	1343	1349	1401		M1.1					70	0486	
04	1929	1953	2006	S19W83	X28	3B	20000	IV/2,III/3,II/3		70	0486	halo CME;XRAY estimated
05	0237	0241	0245	S19W89	M1.6	SF				70	0486	
05	1046	1052	1056	S16W90	M5.3	SF				70	0486	
11	1321	1351	1417	S03W61	M1.6	SF	1100	II/2, III/2	1336	86	0498	halo CME
13	0454	0501	0506	N01E90	M1.6		100	III/2		90	0501	EIT derived location
13	0845	0929	1005	N04E81	M1.4		130	II/3	0910	90	0501	EIT derived location erupting prominence, partial halo CME
17	0128	0134	0139	N01E31	M1.2		64	III/1		90	0501	EIT derived location
17	0857	0905	0950	N01E32	M4.2	1N	700	II/1,III/3,V/2	0901,0924	90	0501	EIT derived location
18	0134	0139	0142	N01E20	M1.8		100	III/3		90	0501	EIT derived location
18	0722	0751	0815	N01E19	M3.2	2N	1900	IV/2,III/3,II/3		90	0501	EIT der. loc.; halo CME
18	0814	0830	0845	S02E18	M3.9			II/2	0825	90	0501	EIT der. loc.; halo CME
18	0926	1011	1101		M4.5		98		1009	90	0501	also contribution from simultaneous flare in Cat 95
19	0355	0401	0419	N01E06	M1.7	1N	130	III/1		90	0501	
20	0147	0212	0228	N03W08	M1.4	1N	190	III/3		90	0501	
20	0736	0747	0753	N01W08	M9.6	2B	9700	V/3,IV/1,III/3	0738	90	0501	
20	2342	2353	2358	N02W17	M5.8	2B	740	III/3		90	0501	

loc: approximate heliographic location
Xray: X-ray flare class
op: optical flare class
10 cm: 10 cm radio flux
type: type of radio burst

600: peak UT time of 600 Mhz radio bursts in Humain
Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection

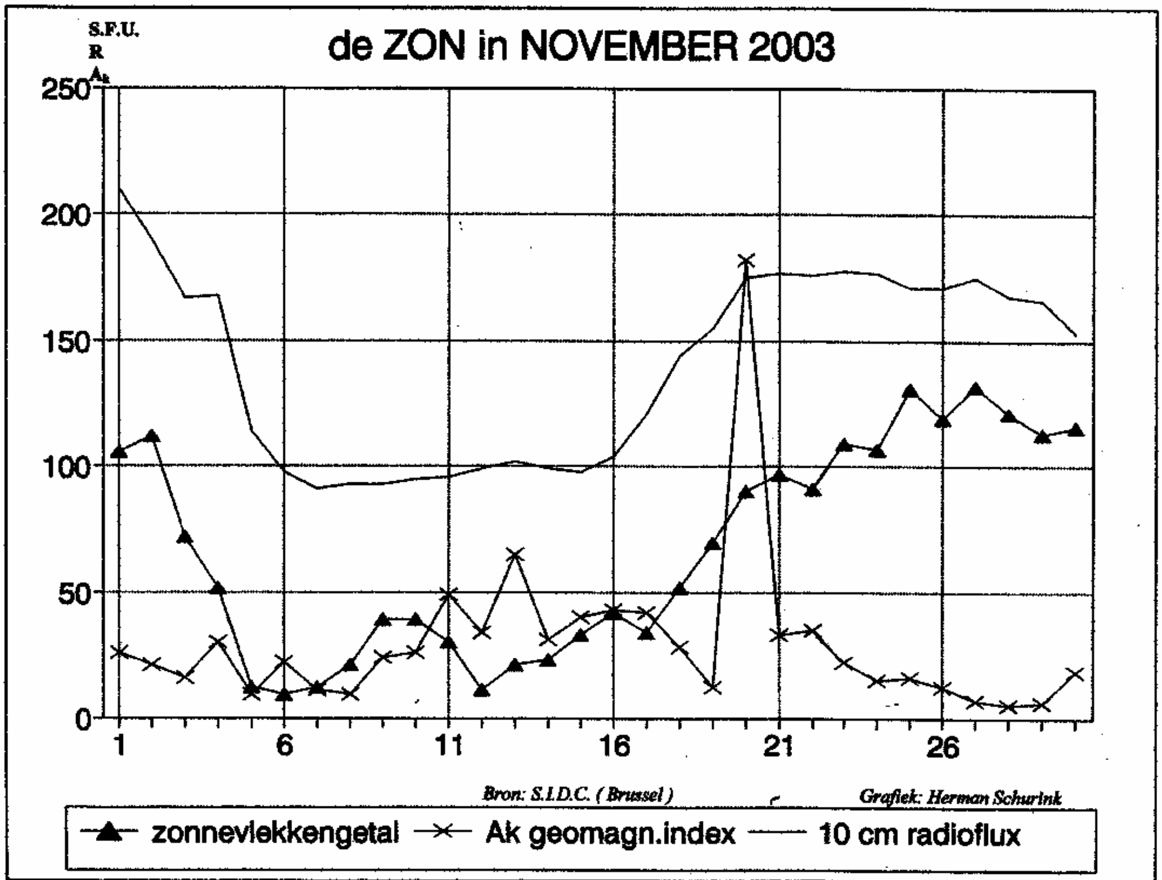


tekening: Gerda Gravers



Zonnevlekken,28 oktober 2003
13.20 UT

tekening: Dennis Jannink


de ZON in NOVEMBER 2003
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Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
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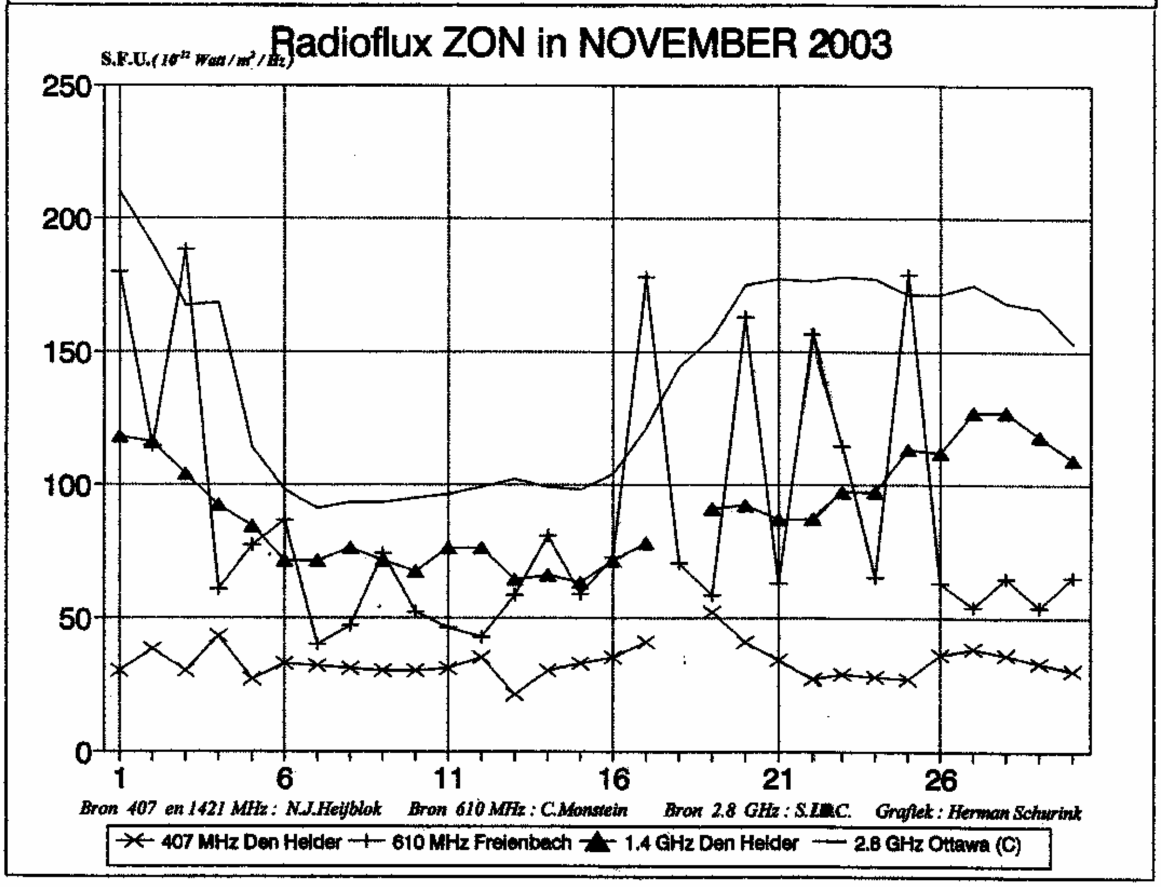
Ak geomagn.index
10 cm radioflux


Radioflux ZON in NOVEMBER 2003
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Bron 407 en 1421 MHz: N.J.Heijblok
Bron 610 MHz: C.Monstein
Grafiek: Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)

Bulletin Werkgroep Zon December 2003

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Zonnevlekkengetallen (Sunspot numbers)

SIDC	Day	Bals	Gort	Gr60	Groe	Jn 9	Jn40	vSlo	Son	Spa	Stam	Zans	Zijle	Uccle groups	Uccle spots
98	1					35		89							
72	2	84				34		79	103						
78	3								100					9	31
66	4														
59	5														
45	6	62		62		34		60	60		46	53			
32	7	46	23			34		40	39	40	31	49		4	11
26	8	38	22		22	22		34	23			46	23	4	4
16	9	24	11			22	22	22	22	22		22	25	2	2
25	10	36	11			11		33	33	34	1	35		4	4
25	11														
23	12	25												3	5
28	13														
31	14	44				24	24	42			16	29			
30	15	46	22	45	23	23		41	42		16	28			
39	16					24		43							
68	17	97	59	88		34	34	92	100		14	72	101	8	34
71	18	108	60	102		45		104	98	92		78	122	9	18
71	19		63						101					7	38
74	20														
60	21														
74	22	103	48	106		42		98	100		39	116		8	24
76	23														
59	24														
44	25														
40	26	53				14								2	6
31	27	46	35	49		17		38	45	48	31	35	47	2	21
34	28														
28	29	33	14			14		25				27			
17	30	19			0				13						
16	31			14							0	12	30		
	observ	16	11	7	3	16	3	15	14	5	9	13	6		
	k	0,74	1,41	0,76	1,24	1,73	1,34	0,83	0,81	0,74	4,82	0,88	0,70		
	st.dev.	0,09	0,40	0,17	0,09	0,61	0,64	0,13	0,19	0,06	8,25	0,22	0,22		
	st.d./ k	0,12	0,29	0,23	0,07	0,35	0,48	0,16	0,23	0,08	1,71	0,25	0,31		

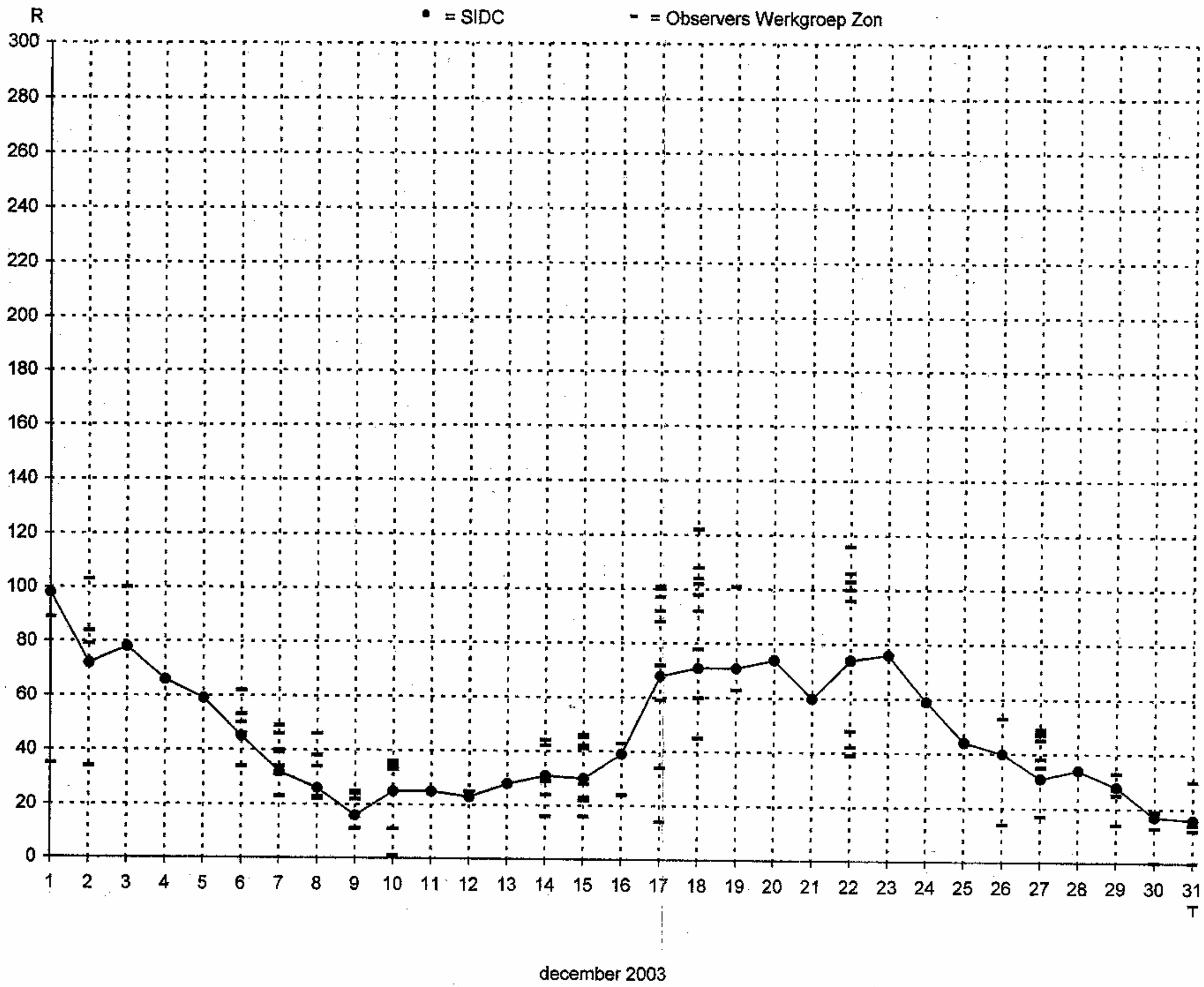
Observers	[...] = Refractor, d = ... mm	[Rf...] = Reflector, d = ... mm
Bals = H.A.M. Balster [70]	Jn 9 = D. Jannink [9]	Spa = T. Spaninks [75]
Gort = E.Gorter [90]	Jn40 = D. Jannink [40]	Stam = R.Stammes [100]
Gr60 = Mw G. Gravers [60]	vSlo = B. van Slooten [90]	Zans = W. Zanstra [Rf 155]
Groe = A.Groenewegen [102]	Son = A.T. Son [Rf 150 Kutter]	Zijle = W.A. Zijlema [90]

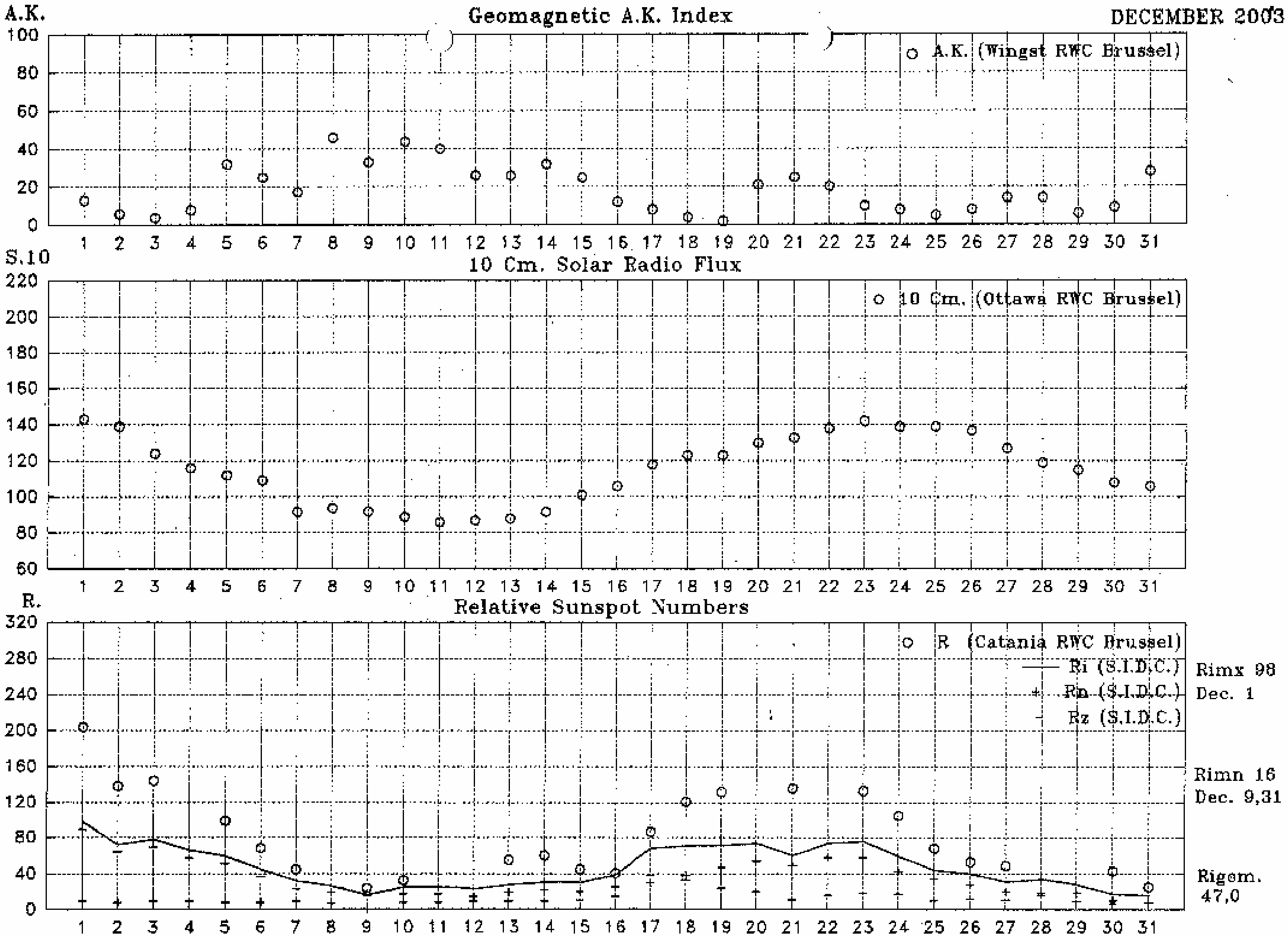
S.I.D.C. SUMMARY OF THE URSIGRAMS

Date	R'i	PPSI	600	2800	COS	SFI	XI	Ak	SEA
30	116	71	53	153	////	0	0/0	18	
1	98	77	–	143	////	0	0/0	13	
2	72	92	50	139	////	1	2/0	6	
3	78	85	47	124	////	0	0/0	4	
4	66	94	46	116	////	1	0/0	8	
5	59	88	43	112	////	1	0/0	32	
6	45	74	42	109	////	0	2/0	25	
7	32	41	39	92	////	0	0/0	17	
8	26	20	38	94	////	0	0/0	46	
9	16	10	38	92	////	0	0/0	33	
10	25	6	38	89	////	0	0/0	44	
11	25	14	37	86	////	0	0/0	40	
12	23	18	35	87	////	0	0/0	26	
13	28	37	36	88	////	0	0/0	26	
14	31	46	39	92	////	0	0/0	32	
15	30	39	46	101	////	0	0/0	25	
16	39	58	43	106	////	0	0/0	12	
17	68	50	45	118	////	1	0/0	8	
18	71	55	46	123	////	4	0/0	4	
19	71	74	50	123	////	7	0/0	2	
20	74	85	51	130	////	2	0/0	21	
21	60	95	55	133	////	2	0/0	25	
22	74	65	57	138	////	4	0/0	20	
23	76	162	60	142	////	4	0/0	10	
24	59	156	59	139	////	2	0/0	8	
25	44	181	56	139	////	8	0/0	5	
26	40	123	55	137	////	21	1/0	8	
27	31	98	52	127	////	0	0/0	14	
28	34	44	48	119	////	0	0/0	14	
29	28	42	46	115	////	0	0/0	6	
30	17	9	46	108	////	0	0/0	9	
31	16	3	46	106	////	0	1/0	28	

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 x Sn+10 x "1"+100 x ">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.


R
• = SIDC
- = Observers Werkgroep Zon
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
T
december 2003


DECEMBER 2003
Geomagnetic A.K. Index
A.K.
A.K. (Wingst RWC Brussel)
10 Cm. Solar Radio Flux
S.10
10 Cm. (Ottawa RWC Brussel)
Relative Sunspot Numbers
R.
R (Catania RWC Brussel)
Ri (S.I.D.C.)
Rn (S.I.D.C.)
Rz (S.I.D.C.)
Rimx 98
Dec. 1
Rimn 16
Dec. 9,31
Rigem.
47,0

Zonnevlekkengetallen noordelijk- en zuidelijk halfrond

(Hemispheric sunspot numbers)

december 2003

	S.I.D.C.		Balster		Groenew		Jannink4		vSlooten		Son		Spaninks		Zanstra	
Day	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs	Rn	Rs
1	9	89							11	78						
2	8	64	12	72					11	68	11	92				
3	9	69									0	100				
4	9	57														
5	8	51														
6	8	37	12	50					11	39	11	39			12	41
7	9	23	12	34					11	29	27	12	11	29	11	38
8	7	19	11	27	0	22			11	23	12	11			11	35
9	0	16	0	24			0	22	0	22	11	11	0	22	0	22
10	8	17	11	25					11	22	22	11	11	23	12	23
11	8	17														
12	14	9	12	13												
13	19	9														
14	22	9	29	15			0	24	30	12					15	14
15	20	10	29	17	11	12			27	14	16	26			14	14
16	25	14							17	26						
17	30	38	43	54			12	22	42	50	43	57			38	34
18	38	33	56	52					66	38	64	34	54	38	41	37
19	47	24									65	36				
20	54	20														
21	49	11														
22	58	16	80	23					73	23	89	11			90	26
23	58	18														
24	42	17														
25	34	10														
26	28	12	36	17												
27	20	11	31	17					22	16	45	0	30	18	20	15
28	18	16														
29	19	9	22	11					14	11					27	0
30	10	7	19	0	0	0					13	0				
31	8	8													12	0

MONTHLY SUMMARY OF SOLAR AND GEOMAGNETIC ACTIVITY

I. Solar Activity

During December 2004, solar activity has been much lower than in the preceding months. In stark contrast to the record flares observed in October and November, flaring activity in December was confined to 6 small M-flares, the largest one being an M2.0 on Dec 06.

In the beginning of the month, the sunspot count was still rather high. About 10 sunspot groups were visible, totaling more than 100 spots. The largest (and most active) groups were however already located at the west limb: Catania sunspot groups 96, 97 and 98 (NOAA 0507, 0508 and 0511 respectively) rotated off the visible disk in the course of the first few days of December. On Dec 02, sunspot groups 97 and 98 generated *M1.4 and M1.5 flares*. Immediately after the M1.4 X-ray peak at 1308 UT, a small *proton event* started (the only such event this month). The low energy (>10MeV) proton flux exceeded the threshold until late on Dec 04. From the vicinity of groups 97 and 98 also originated on Dec 02 a long duration event associated with a C7.2 flare, including a *prominence eruption* very nicely visible in EIT 195. LASCO reported a faint *full halo CME*.

A second active day was again due to a sunspot group on the west limb, viz. Catania 03 (NOAA 510). It produced 2 *M-flares* on Dec 06, including the largest flare of the month (M2.0). On Dec 07, also this group rotated behind the west limb and flaring activity was reduced to a very low level. The X-ray background nearly vanished and for many days in the ensuing period not a single C-flare was recorded. The reason for this lack of activity was the absence of any noteworthy active region. Instead a huge coronal hole passed the disk, which pushed the solar wind to a speed of more than 800 km/s. Two beautiful *prominences* erupted from the west limb: one in the morning of Dec 08 and the second one around 07h19 on Dec 14. The period of extremely low flaring activity was briefly interrupted on Dec 14, on which day two minor C-flares occurred (C1.1 at 19h40 UT and C2.0 at 23h40), but on Dec 15 and 16, again only B-flare activity was observed.

From Dec 16 onwards, new active regions appeared in EIT images at the east limb, leading to an increase of solar activity to moderate levels (mainly C-class flares) from Dec 17 onwards. Most of this activity originated from Catania sunspot groups 18 (NOAA 0525) and 20 (NOAA 0528). Both groups produced about 30 C-class flares, while Catania 20 was also responsible for an *M1.5 flare* on Dec 26 and an *M1.0 flare* on Dec 31 just before passing behind the West limb.

II. Geomagnetic Activity

The month started with a decreasing solar wind speed as a small coronal hole causing the slightly elevated speed value of *450 km/s* turned over the west limb. Geomagnetic conditions were therefore quiet from Dec 01 to Dec 04. A period of slightly increased solar wind speed values was initiated on Dec 05. The cause could be the arrival of a glancing blow of the faint full halo CME associated with the prominence eruption on Dec 02, but on the other hand the swing of the solar wind magnetic vector over 180 degrees was a possible indication that the Earth entered a coronal hole wind stream. Indeed, a *small coronal hole* was at that time situated west of the central meridian. Minor geomagnetic storm conditions were measured on Dec 05, continuing on Dec 06, when the solar wind speed decreased again.

On Dec 07, a small *shock* was measured in the solar wind, while from Dec 08 onwards the Earth came under the influence of a *very large coronal hole*. This made the solar wind speed rise to more than *800 km/s* by Dec 10. The geomagnetic conditions were at the active or minor storm levels from Dec 07 until Dec 15, with isolated brief periods of major storm levels (Kp=6). On Dec 15, the coronal hole rotated over the western solar limb, making geomagnetic conditions return to quiet from late on Dec 15 until early on Dec 20. The solar wind speed, still at nearly 800 km/s early on Dec 15, started decreasing during the second half of that UT day, going down quasi-linearly to about *300 km/s* by the end of Dec 19.

Another *transequatorial coronal hole* with an elongated north-south shape was situated near the central solar meridian on Dec 17-18 and rotated into a geo-effective position on Dec 19-20. At the start of the UT day on Dec 20, the solar wind speed started rising again, reaching the range *600-650 km/s* on Dec 22. The interplanetary field, however, remained mostly northwards, and thus geomagnetic perturbations remained limited to active conditions on Dec 20-22. From Dec 23 onwards, the influence of this coronal hole waned and the solar wind speed started decreasing. Geomagnetic conditions became quiet and remained so until Dec 31, with the exception of a brief period of active conditions late on Dec 27 due to another high-speed solar wind stream (*550-650 km/s* from Dec 27 until Dec 29). On 31/12/03 around 11:00UT, the Earth entered yet another high-speed stream from a *small equatorial coronal hole* (the return of the one causing minor storm conditions on Dec 05). The solar wind speed rose to *550 km/s*, and the month closed with minor storm conditions on Dec 31.

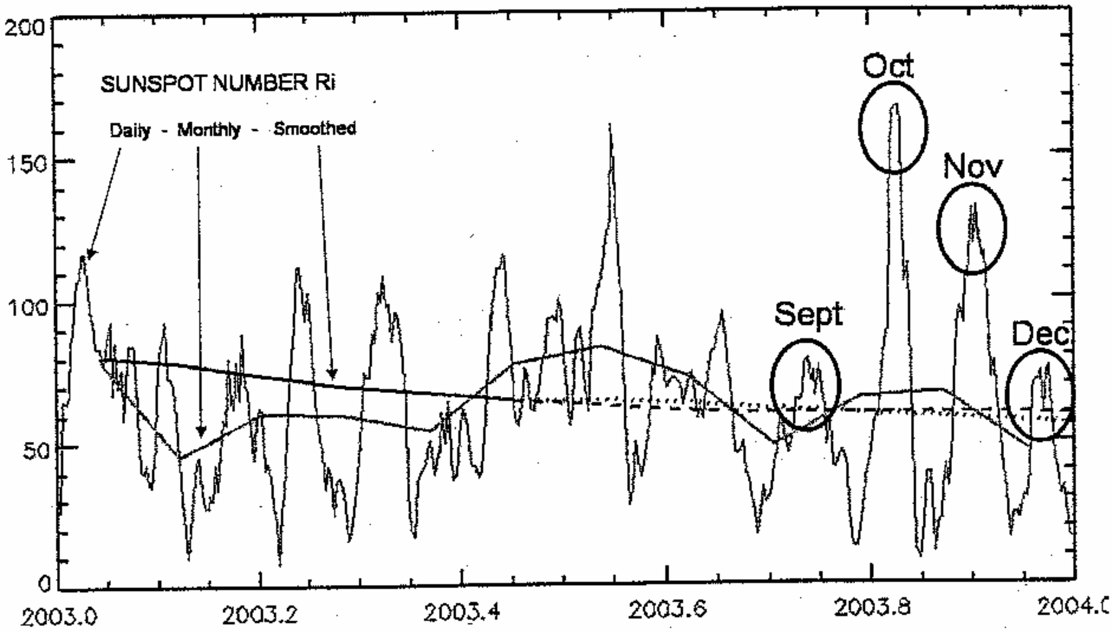
III. Noticeable solar events

DAY	BEGIN	MAX	END	LOC	XRAY	OP	10CM	RADIO TYPE	600 (Humain)	Cat	NOAA	NOTE
02	1247	1308	1322	S08W89	M1.4	-	-	-	-	98	0511	**p**, EIT derived loc., also contrib. from CAT97
02	2250	2300	2307	S19W89	M1.5	-	-	-	-	98	0511	EIT derived location, also contrib. from CAT97
06	1058	1120	1128	S23W89	M1.3	-	-	-	-	03	0510	EIT derived location
06	1539	1546	1553	S23W89	M2.0	-	-	-	-	03	0510	EIT derived location
26	1913	1928	1933	N09W30	M1.5	1N	-	-	-	20	0528	
31	1821	1824	1826	N10W89	M1.0	-	-	III/3	-	20	0528	SXI derived location

loc: approximate heliographic location
Xray: X-ray flare class
op: optical flare class
10 cm: 10 cm radio flux
type: type of radio burst

600: peak UT time of 600 Mhz radio bursts in Humain
Cat: Catania sunspot group identification
NOAA: NOAA active region identification
p: proton event
CME: Coronal Mass Ejection

IV. Picture of the month



Did the Sun lose track?

On a number of days in October and November, the daily sunspot number was very high. This seems unusual since we are in the declining phase of the solar cycle. In this figure, the curve with the highest variability is the daily sunspot number, while the other lines are the monthly and the smoothed monthly indices. In the daily values we can easily detect a recursive pattern. The first peak occurs in September 2003. On Sept 27, a sunspot number of 79 was recorded. Almost one month later, the sunspot index reached 167 on Oct 29 and 30. (As we can remember, this was the time that the Sun became a TV star. In virtually all the media the Sun was mentioned as the source of radio-disturbances, satellite disruptions, GPS disturbances...) One month later, a peak of 132 occurred on Nov 27. The December 23 peak of 76 was comparable with the September peak. This recursive behavior finds its origin in the solar rotation: the Sun rotates around its axis in about 27 days.

However, these peaks in the daily values do not disturb the global trend of the 11-year solar cycle (as can be seen from the graph on the second page of this bulletin). During the month of June, the Sun adorned itself also with a whole bunch of sunspots producing several X-flares. The flares were not so energetic compared to the ones of October and November and did not cause so much fuss. But the line representing the monthly sunspot number shows a higher value in June than in October 2003, and the smoothed sunspot index continues its decreasing trend.

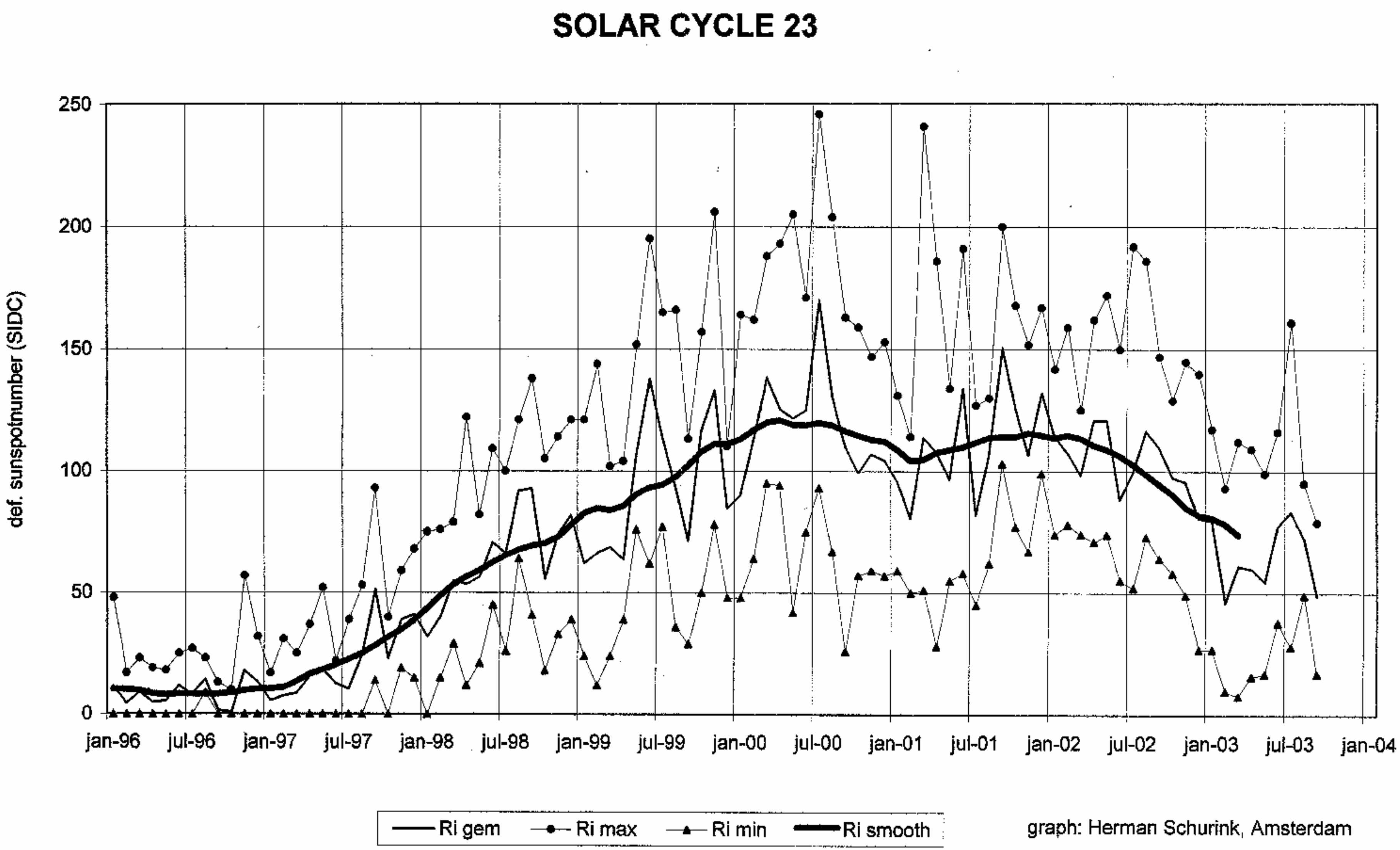
To conclude: it's not because we have a cold summer day that the summer season is not summer any more. *So, we can heave a sigh of relief: the Sun did not lose track and will continue its route on the 11-year cycle.*

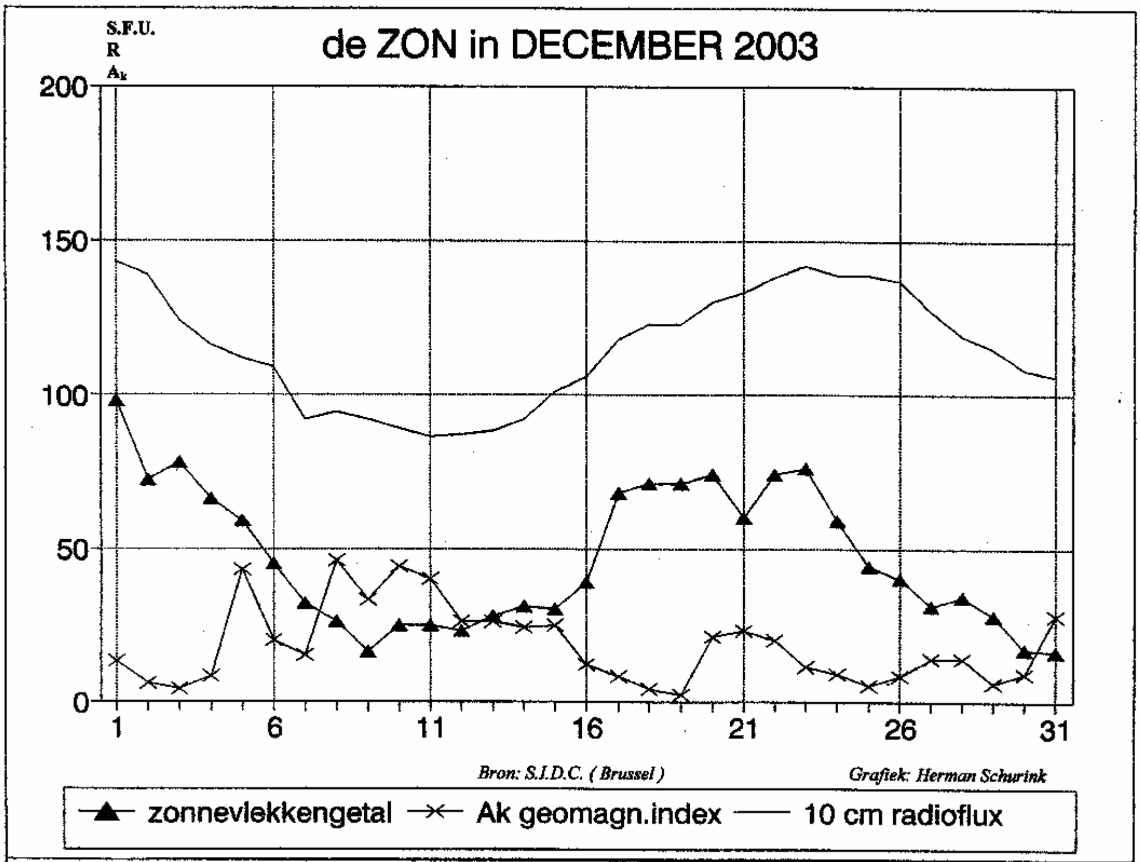
S I D C - *News*

2003 n° 4

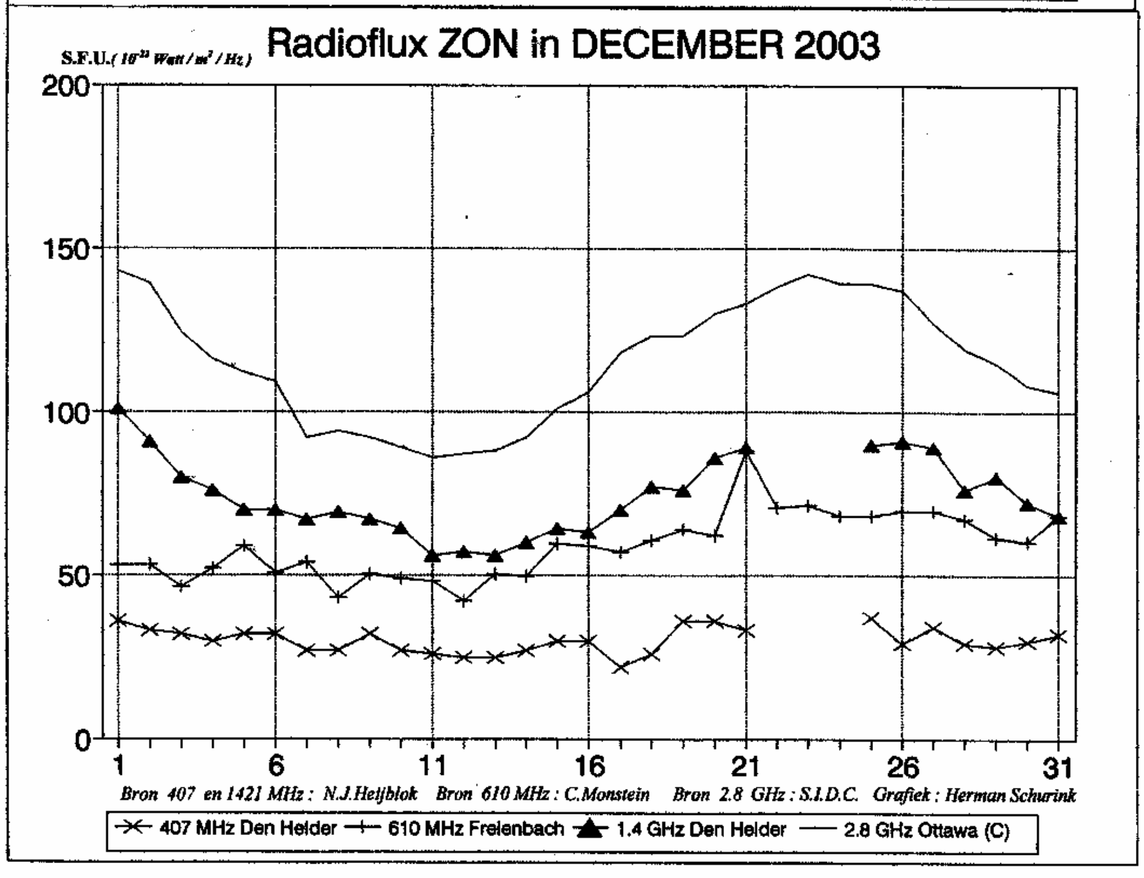
SIDC DEFINITIVE INTERNATIONAL AND HEMISPHERIC SUNSPOT NUMBERS FOR 2003

	JULY			AUGUST			SEPTEMBER		
Date	Ri	Rn	Rs	Ri	Rn	Rs	Ri	Rn	Rs
1	100	78	22	49	15	34	46	13	33
2	97	88	9	56	8	48	46	13	33
3	80	80	0	76	22	54	47	9	38
4	67	67	0	73	23	50	50	7	43
5	56	56	0	87	29	58	39	0	39
6	63	63	0	83	21	62	37	0	37
7	85	51	34	78	16	62	30	0	30
8	89	46	43	69	0	69	25	0	25
9	90	46	44	70	0	70	17	0	17
10	74	30	44	72	0	72	25	0	25
11	61	13	48	72	0	72	34	0	34
12	68	13	55	71	0	71	29	0	29
13	96	37	59	70	6	64	30	0	30
14	96	46	50	63	0	63	33	0	33
15	105	63	42	67	0	67	42	14	28
16	105	65	40	73	0	73	46	17	29
17	112	72	40	74	12	62	58	33	25
18	121	72	49	67	14	53	58	34	24
19	128	67	61	58	19	39	52	30	22
20	161	72	89	62	28	34	46	25	21
21	146	66	80	58	46	12	50	35	15
22	123	52	71	69	43	26	57	30	27
23	100	47	53	76	51	25	65	35	30
24	78	45	33	82	57	25	64	37	27
25	47	30	17	82	62	20	67	43	24
26	28	20	8	89	67	22	77	48	29
27	33	21	12	90	63	27	79	46	33
28	50	31	19	95	65	30	71	37	34
29	43	21	22	85	53	32	74	32	42
30	38	22	16	74	47	27	66	21	45
31	42	20	22	65	39	26			
MEAN :	83.3	48.4	34.9	72.7	26.0	46.7	48.7	18.6	30.1


SOLAR CYCLE 23
def. sunspotnumber (SIDC)
250
200
150
100
50
0
jan-96
jul-96
jan-97
jul-97
jan-98
jul-98
jan-99
jul-99
jan-00
jul-00
jan-01
jul-01
jan-02
jul-02
jan-03
jul-03
jan-04
Ri gem
Ri max
Ri min
Ri smooth
graph: Herman Schurink, Amsterdam



S.F.U.
R
A_k
de ZON in DECEMBER 2003
200
150
100
50
0
1
6
11
16
21
26
31
Bron: S.I.D.C. (Brussel)
Grafiek: Herman Schurink
zonnevlekkengetal
Ak geomagn.index
10 cm radioflux



S.F.U.(10^{-22} Watt / m² / Hz)
Radioflux ZON in DECEMBER 2003
200
150
100
50
0
1
6
11
16
21
26
31
Bron 407 en 1421 MHz : N.J.Heijblok Bron 610 MHz : C.Monstein Bron 2.8 GHz : S.I.D.C. Grafiek : Herman Schurink
407 MHz Den Helder
610 MHz Freienbach
1.4 GHz Den Helder
2.8 GHz Ottawa (C)