Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS - SOLAR DIVISION

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Table I. Mean Sunspot Numbers for February

Day	N	Raw	s.d.	K-corrected	s.d.	s.e.
1	24	98	4.3	76	2.9	0.59
2	28	112	5.5	88	3.6	0.68
3	38	128	7.0	102	4.5	0.73
4	23	134	6.7	107	4.5	0.94
5	26	139	8.2	112	5.5	1.08
6	32	148	8.7	122	6.1	1.08
7	30	147	8.5	125	5.6	1.02
8	32	151	7.7	124	5.1	0.90
9	32	154	9.7	128	6.3	1.11
10	39	129	6.5	103	4.6	0.74
11	35	120	5.4	100	4.6	0.78
12	33	90	5.3	75	4.3	0.75
13	27	104	4.0	84	2.9	0.56
14	21	95	3.5	81	2.0	0.44
15	29	97	3.0	79	2.5	0.46
16	29	78	4.9	68	3.3	0.61
17	35	80	4.1	66	3.0	0.51
18	38	96	4.9	81	3.4	0.55
19	34	103	5.3	84	3.2	0.55
20	35	109	5.0	88	3.7	0.63
21	37	129	5.5	102	3.9	0.64
22	35	107	6.0	84	3.8	0.64
23	36	86	5.7	72	3.8	0.63
24	27	79	5.1	66	3.7	0.71
25	35	78	3.9	62	2.5	0.42
26	39	73	4.4	61	3.0	0.48
27	31	62	3.6	53	2.6	0.47
28	36	68	4.1	57	3.1	0.52
29	---	---	---	---	---	---
30	---	---	---	---	---	---
31	---	---	---	---	---	---

Means: 32 106.9 87.5

Total No. of Observers: 65

Total No. of Observations: 896

Table II. February Observers

13	AAP	P.Abbott
7	ATON	A.Attanasio
13	BARH	H.Barnes
6	BATR	R.Battaiola
8	BEB	R.Berg
7	BEDJ	J.Bedient
28	BOSB	B.Bose
21	BRAB	B.Branchett
11	BRAR	R.Branch
13	BROB	R.Brown
10	CAMP	P.Campbell
19	CARJ	J.Carlson
24	CHAG	G.Morales
9	CKB	B.Cudnik
10	CLZ	L.Corp
18	COLJ	J.Collins
6	COMT	T.Compton
28	CORA	A.Coroas
28	CR	T.Cragg
3	DEMF	F.Dempsey
18	DRAJ	J.Dragesco
13	DUBF	F.Dubois
20	ELR	E.Reed
12	FEEC	C.Feehrer
12	FLET	T.Fleming
18	FUJK	K.Fujimori
20	GIOR	R.Giovanoni
10	GOTS	S.Gottschalk
4	HALB	B.Halls
7	HRUT	T.Hrutkay
23	JAMD	D.James
10	JEFT	T.Jeffrey
18	KAPJ	J.Kaplan
20	KHAR	R.Khan
9	KNJS	J&S Knight
7	LERM	M.Lerman
10	LEVM	M.Leventhal
18	MALK	K.Malde
4	MARE	E.Mariani
25	MARJ	J.Maranon
19	MCE	E.Mochizuki
13	MILJ	J.Miller
21	MMI	M.Moeller
3	MUDG	G.Mudry
16	OBSO	IPS Obs.
11	PENG	G.Pennington
18	RICE	E.Richardson
22	RITA	A.Ritchie
17	SCGL	G.Schott
12	SCHG	G.Scholl
9	SIMC	C.Simpson
4	STEF	G.Stefanopoulis
13	STEM	G.Stemmler
15	STQ	N.Stoikidis
18	SUZM	M.Suzuki
20	SZAK	K.Szatkowski
12	SZUM	M.Szulc
12	TESD	D.Teske
2	THR	R.Thompson
15	URBP	P.Urbanksi
9	VALD	D.del Valle
9	VARG	A.Vargas
9	WILW	W.Wilson
19	WITL	L.Witkowski
18	YESH	H.Yesilyaprak

Reporting Addresses

Sunspot Reports **-- email:** solar@aavso.org
postal mail: AAVSO, 25 Birch St. Cambridge, MA 02138
FAX *(AAVSO):* (617) 354-0665

SES Reports **-- email:** noatak@aol.com
postal mail: Mike Hill
114 Prospect St. Marlboro, MA 01752

Magnetometer Reports **-- email:** capaavso@aol.com
postal mail: Casper Hossfield
PO Box 23, New Milford, NY 10959
FAX: (973) 853-2588 or (407) 482-3963

Table III. Means of Raw Group Counts for February 2001

Day	Mn.	Day	Mn.	Day	Mn.	Day	Mn.
1	6.7	9	10.0	17	6.1	25	4.6
2	6.8	10	8.4	18	7.0	26	4.0
3	7.9	11	8.5	19	7.0	27	3.7
4	8.9	12	6.8	20	6.7	28	4.2
5	8.6	13	7.7	21	8.2	29	---
6	8.3	14	7.3	22	6.8	30	---
7	8.3	15	7.6	23	5.4	31	---
8	9.6	16	6.1	24	5.0	Mn.	7.01

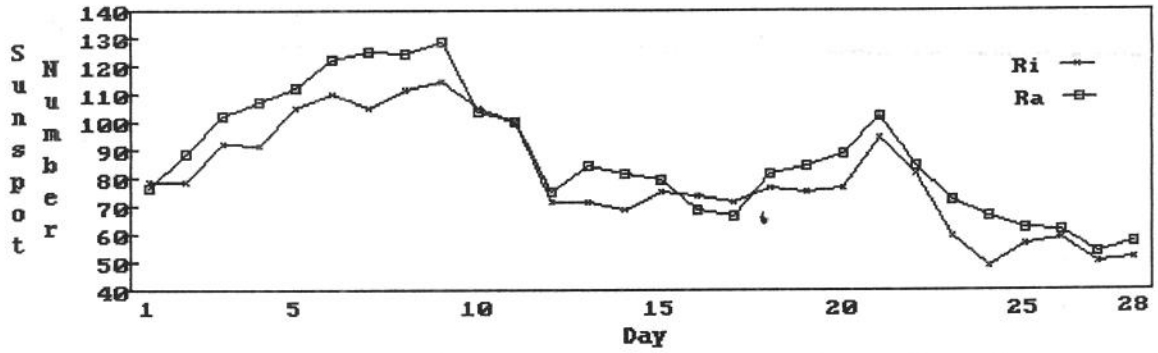

Fig. 1. Comparison of Ri (provisional) and Ra estimates for February.
(Ri Source:http://sidc..oma.be/index.php3)

Smoothed Mean Sunspot Number (Rsm) for February 2000: 123.0

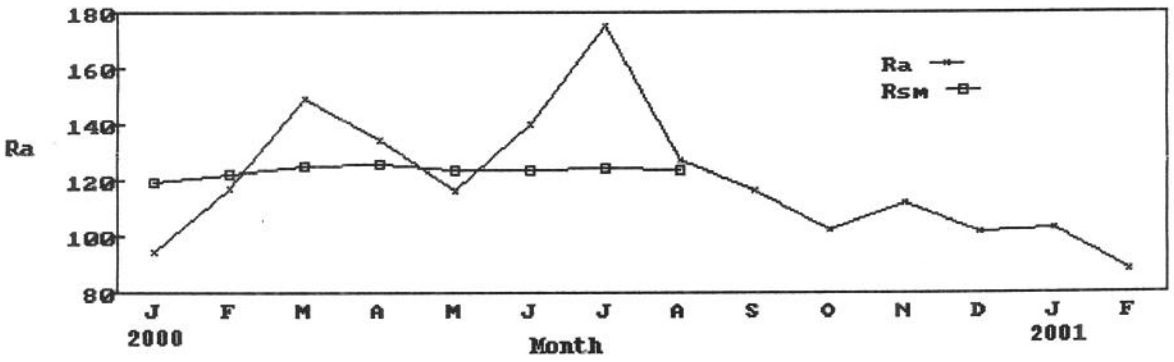

Fig. 2. Monthly Ra and Smoothed Mean Sunspot Numbers (Waldmeier method).

Editor's Notes

New Items on the AAVSO Website

- *SID Antenna*

At the request of several parties, Mike Hill (A87) has produced a document containing suggestions and guidance on antenna design and construction. Included are contributions by Art Stokes (A62), Cap Hossfield (A09), Guglielmo DiFillipo (A93), and Mike himself. The material should prove quite useful to prospective observers who are interested in building and using various Gyrator-type receivers.

- *Spreadsheet for Calculating Sunspot Number Statistics*

William Wilson (WILW) has contributed an Excel spreadsheet that, given a set of observer's daily R-numbers, computes a variety of statistics with respect to the AAVSO's Ra number and the International number, Ri. Although the calculations differ from those employed by the AAVSO, the spreadsheet offers a useful means of tracking performance.

Beta Test of New Report Form

I'm pleased to report that we will soon have an alternative to the SUNKEY-generated report form and related text version currently on the website. The new version embodies an up-to-date user interface for data entry and editing, and, unlike the text version, performs automatic computation of the R-value.

A beta version of the software should be available by the middle of next month, and we will be in need of a small group of volunteers to put it through its paces. Please email me at my hotmail address on the front of the Bulletin if you would like to participate in a test of the program before it is put on the website for general use. Be aware that, as a participant, you will need to send two reports at the end of the month: your "normal" report, using whatever format you customarily use, and a report that uses the new format. I expect that the need to file dual reports will occur only once.

Solar Filter Review

The April issue of *Astronomy* magazine (Kalmbach Publishing Co.) contains a review and evaluation of solar filters that may be of interest to observers.

Change in Sun's Polarity

Several sources (e.g., NASA's website, *Science News,* v.159, 1) have reported on the changing polarity of the sun, a major event associated with the arrival of solar maximum. As of this writing, the magnetic pole in the northern hemisphere now points south, and the southern pole is expected to complete the reversal shortly by pointing north. Time to flip your Stonyhursts!

Detection of Gamma Ray Burst by SID Observers

As observers who are interested in Gamma Ray Burst (GRB) detection and subscribe to the GRB Alert network are already aware, the occurrence of GRB010222 was apparently detected as an SES event during the month by the A52 team of Danie Overbeek and Domenic Toldo in South Africa. The detection was made with the aid of VLF receivers and demonstrates the potential of SID equipment to contribute to this exciting area of study. The SID Supplement this month contains details on the discovery.

SID and visual observers who want to keep abreast of developments in this area are urged to join the GRB Discussion Group and sign up to receive Alert Notices that are issued when suspected GRB events are detected.

New Observers in February

Sunspot reports were received from three new observers during the month: Jim Bedient (BEDJ), Hawaii; Rana Khan (KHAR), India; and Mieczyslaw Szulc (SZUM), Poland. SID reports were received from two new observers: Ted Poulos (A95), Massachusetts; and Roberto Battaiola (A96), Italy. Readers of the Bulletin will recognize that Roberto is also a long-time contributor of sunspot data.

Thank you all very much for your contributions and welcome to the AAVSO's Solar Division.

Clear skies,

-CEF

Sudden Ionospheric Disturbance Report

Michael Hill, SID Analyst
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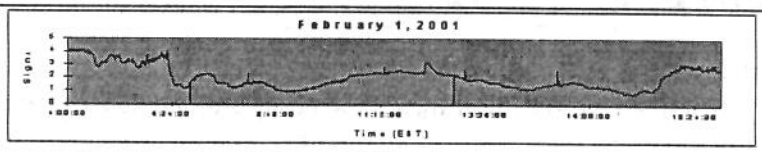


Sudden Ionospheric Disturbances (SID) Recorded During February 2001

(Analysis performed by Michael Hill, SID Analyst)

Date	Max	Imp	Date	Max	Imp	Date	Max	Imp
010201	0714	1+						
010201	1303	1-						
010201	1713	1						
010204	0842	1-						
010205	1520	2						
010210	2013	1+						
010211	0917	1+						
010219	1025	1						
010219	1310	1-						
010219	2100	2+						
010220	1449	1						
010221	0818	2						
010221	1430	2+						

The events listed above meet at least one of the following criteria

1) Reported in at least two observer reports
2) Visually analyzed with definiteness rating = 5
3) Reported by overseas observers with high definiteness rating

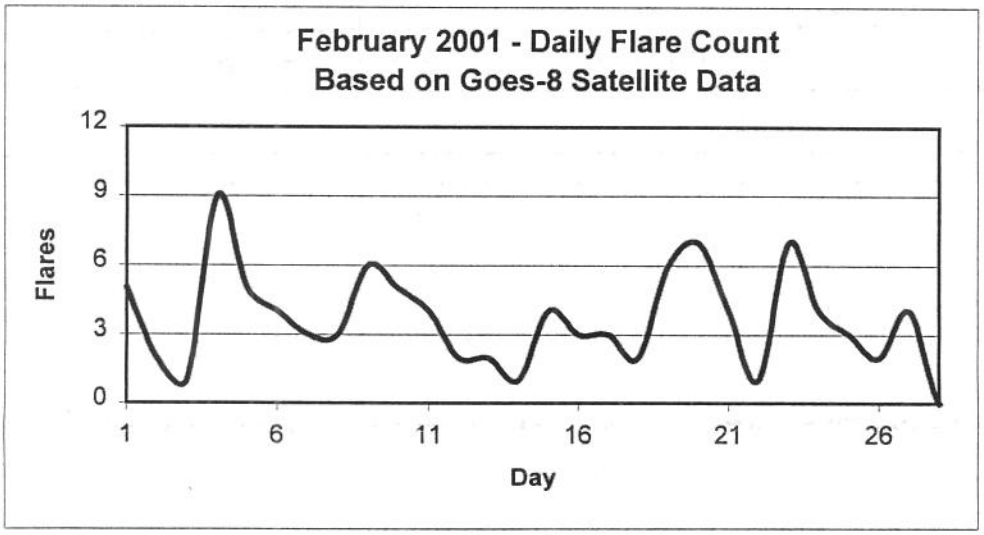
Observer	Code	Station(s) monitored
A Clerkin	A29	NAA
J Winkler	A50	NAA,TBD,NPM
D Toldo, D Overbeek	A52	NAA,NSW,GBR
A Stokes	A62	NAA
J Ellerbe	A63	ICV
P King	A80	FTS
W Moos	A84	FTA
M Hill	A87	NAA
G DiFillipo	A93	GBZ

Importance	Duration (min)
1-	< 19
1	19 – 25
1+	26-32
2	33-45
2+	46-85
3	86-125
3+	> 125

Solar Events

February was indeed a very quiet month as far as solar flares go. As can be seen by the SID event listing there were only 13 events detected by observers. The Goes-8 satellite registered only 100 events. None of these were M-Class events, in fact the strongest X-Ray event registered was a C8.2 on the 5th of February. This was detected by most observers.

The 19th to the 21st was the most active period as far as reported events. There were 3 on the first day, one on the second and 2 on the third. Other than that it was a very sparse month for solar flares. I have started working on a way to graphically show the flare activity for the month. At first showing the SIDs, as detected by observers, was considered but it was decided that, for now, that was too dependant on the number of observers, and the ability of individual setups to detect smaller flares. Clearly we are not detecting all the flares that occur so it was decided, since it is readily available, to plot the number of flares registered each day by the Goes satellite instead. An example of such a plot is provided below.



It has not been decided yet how this data will be presented on a regular basis in the future. It will be provided, however, in order to compare the flare activity directly to the sunspot activity. I will be preparing a similar chart for the past 8 months and continue to prepare a chart each month from now on.

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SUDDEN IONOSPHERIC DISTURBANCES SUPPLEMENT

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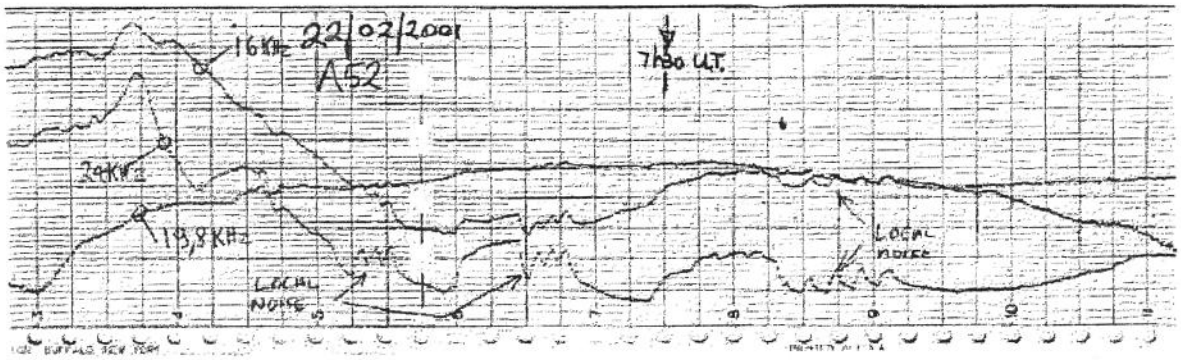
SUDDEN IONOSPHERIC DISTURBANCES
RECORDED DURING FEBRUARY, 2001

A very strong gamma ray burst, GRB, was detected by the Italian GRB satellite, Beppo SAX on 22 February at 0723.5 UT. It was described as being the strongest GRB Beppo SAX had ever detected. When I saw this notice on the AAVSO's GRB network as a GCN Circular I immediately emailed five of our SID observers to see if any of them recorded anything unusual at that time. All USA observers were in darkness at 0723 UT and none of them reported seeing anything unusual in their nighttime traces that might be the GRB. A few days later I did receive a daytime chart from Danie Overbeek and Domonec Toldo, A-52, that showed a very clear sudden ionospheric disturbance, SID, at that time on all three multiplexed signals that they record, 24 kHz, NAA, in Cutler, Maine, USA; 16 kHz, GBR in Rugby, England, UK and 19'8 kHz, NWC, at Northwest Cape, West Australia. This seemed like a definite recording of an SID at the time of GRB010222 so I sent it to Arne Hendon at the US Naval observatory in Flagstaff, Arizona, USA. Arne posted it as GCN Circular on the GRB network where it came to the attention of professional astronomers interested in GRBs who asked many questions about the SID. You can see this Rustrak strip-chart recording at ftp://ftp.aavso.org/grb/sid010222.jpg I was able to present enough data to convince them it was an SID caused by the GRB. The original chart as sent by A-52 is shown below.



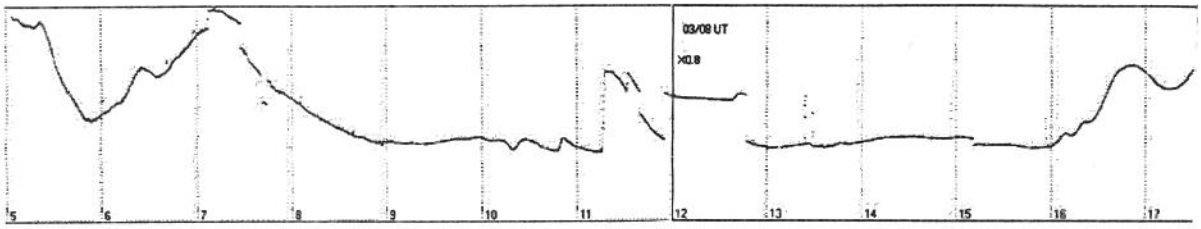
There is one thing about the chart that is curious and raised some doubts. The chart shows the SID taking ~6 minutes to rise to maximum and yet the GRB lasted only 30 seconds. A later GCN Circular announced that The Chandra x-ray satellite was detecting the GRB as a strong x-ray source 19 hours after the burst. This suggests that the SID may have been actually a recording of an x-ray transient that accompanied the optical transient that AASO variable star observers attempt to monitor with CCD equipped telescopes to plot its light curve.

The daytime ionization of the D-layer of the ionosphere is maintained by solar ultraviolet. The recombination rate there is very high and responds very quickly to any additional ionizing radiation. X-rays from solar flares disturb the delicate balance between ionization and recombination quite suddenly. These sudden ionospheric disturbances change the propagation characteristics of the D-layer for very low frequency, VLF, radio propagation. Many nations use powerful VLF radio transmitters to communicate with their submerged submarines taking advantage of the laws of optics which allow electromagnetic radiation to be scattered into a conducting medium (salt water) for a small fraction of a wavelength. The propagation paths of these VLF transmitters are very sensitive to SIDs which enhance the signal strength of their signal at the receiving end of the propagation path. AAVSO observers monitor the signal strength of VLF transmitters to detect sudden enhancements of the signal, SES, to detect solar flares. The VLF propagation paths are surprisingly sensitive detectors of solar flares making it possible detect small C-1 C-2 flares and sometimes the weaker B-7 and up flares as SESs. Such good sensitivity is comparable to that of the NASA x-ray satellites. Looking at the SES recording made by A-52 in South Africa of the GRB, a rough guess might be that the x-radiation from GRB010222 was about the same as that from perhaps a C-5 solar flare. An SES chart recording on the next page was made using the propagation path of Italian VLF station ICV as the sensor.

AAVSO Director, Dr. Janet Mattei, has invited Solar Division SID observers to subscribe to the GRB alerts and become part of the GRB discussion group. To find a form to fill out that will get you on the alert mailing list log into http://www.aavso.org/grb/filterdatabase.shtml and fill out the form. If you choose "all" in the right places you will receive all GCN Circulars as emails. This way you will know for yourself when each new GRB is discovered by the Satellites and you can check your SID chart to see if you have anything interesting at the given time. Log into http://www.aavso.org/grb/join.stm To join the GRB discussion group. Good luck and enjoy.

CHH

A new observer joins our SID monitoring group this month. He is Roberto Battaiola, A-96, in Italy. He has been trying to get his receiver on the air and record by computer for some time. Now at last he has everything working and has recorded some SIDs as SESs. These are shown in his chart below that he sent as a DAT file. The file is plotted using Piclogger software that duplicates the format of Rustrak strip-chart recordings. Anyone who would like to use this plotting program can get it free from Al McWilliams who wrote the program. Write to Al at his email address which is — amcwill417@email.msn.com — The signal Roberto monitors in his chart recording below is ICV on the island of Sardinia off the coast of Italy in the Mediterranean Sea. ICV transmits on a frequency of 20.27 kHz and puts out a good signal that is also monitored by long-time SID observer Jim Ellerbe, A-63, in Spain. Jim has been very successful for many years monitoring the ICV signal to detect solar flares. The A-96 chart shows the sunrise and sunset patterns at the ends of the chart. Three SESs are recorded between 1000 and 1200 UT. Offsets in the trace may be due to interference but could also be changes in signal strength at the ICV transmitter.



I received SES recordings made on 22 February from A-96 and also A-84 in Switzerland. The GRB occurred during the sunrise pattern on these charts and I do not see the GRB signature. SIDs are hard to find in sunrise patterns. Sunrise patterns in South Africa on the A-52 chart are well before the GRB occurred so its signature as an SID is easy to find. The strange interference marked on the South African chart is caused by VLF signals superimposed on the 60 Hz power lines. Their purpose is to turn off hot-water heaters to conserve power during peak loads.

It is very important to run charts with time set accurately if they are to be used to search for gamma ray bursts. All charts should be run on Universal Time with the dates also in Universal Time. I like to publish charts in the Solar Bulletin that show the whole civil day with its sunrise and sunset patterns. The SIDs are easier to understand if they can be compared to the whole day with sunrise and sunset patterns. This is especially true for those not so familiar with how SIDs are detected as SESs. CHH