

# Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS - SOLAR DIVISION

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December 2001

**Table I. Mean Sunspot Numbers for December 2001**  
[boldface = maximum, minimum]

Day	N	Raw	s.d.	K-corrected	s.d.	s.e.
<b>1</b>	26	222	11.4	173	5.6	1.10
<b>2</b>	27	200	9.3	163	5.5	1.06
<b>3</b>	28	224	10.9	175	4.6	0.87
<b>4</b>	23	208	14.6	167	6.4	1.33
<b>5</b>	23	216	12.2	174	4.9	1.02
<b>6</b>	20	206	12.5	163	5.2	1.16
<b>7</b>	27	197	11.2	164	6.4	1.23
<b>8</b>	25	203	10.2	163	4.9	0.98
<b>9</b>	36	182	10.0	146	4.9	0.82
<b>10</b>	27	159	11.0	123	5.0	0.96
<b>11</b>	21	140	9.3	113	3.8	0.83
<b>12</b>	19	170	8.2	130	4.0	0.92
<b>13</b>	18	171	10.0	137	5.2	1.23
<b>14</b>	22	150	9.8	118	6.1	1.30
<b>15</b>	23	178	14.4	134	6.6	1.38
<b>16</b>	31	175	7.4	139	3.2	0.57
<b>17</b>	18	181	12.7	133	6.2	1.46
<b>18</b>	21	158	13.0	118	5.4	1.18
<b>19</b>	32	130	8.7	<b>101</b>	4.0	0.71
<b>20</b>	29	150	10.3	113	4.9	0.91
<b>21</b>	22	188	10.7	148	3.3	0.70
<b>22</b>	29	195	10.3	156	5.1	0.95
<b>23</b>	25	201	10.1	162	4.4	0.88
<b>24</b>	34	207	9.5	169	6.4	1.10
<b>25</b>	27	209	11.1	178	6.6	1.27
<b>26</b>	29	250	12.2	195	5.9	1.10
<b>27</b>	23	249	13.9	<b>198</b>	7.8	1.63
<b>28</b>	26	227	13.4	181	6.7	1.31
<b>29</b>	26	195	12.5	149	5.8	1.14
<b>30</b>	26	198	9.9	159	5.6	1.10
<b>31</b>	34	192	8.3	155	3.7	0.63

Means: **25.7**    **191.4**                      **151.5**

Total No. of Observers: **57**

Total No. of Observations: **797**

**Table II. December Observers**

14 AAP P.Abbott	17 MALK K.Malde
2 ANDE E.Anderson	9 MARE E.Mariani
2 ATON A.Attanasio	26 MARJ J.Maranon
10 BARH H.Barnes	25 MCE E.Mochizuki
13 BATR R.Battaiola	7 MILJ J.Miller
11 BEB R.Berg	11 MMI M.Moeller
7 BLAJ J.Blackwell	22 RITA A.Ritchie
17 BMF M.Boschat	8 SCGL G.Schott
29 BOSB B.Bose	3 SIMC C.Simpson
23 BRAB B.Branchett	2 STEF G.Stefanopoulos
22 BRAR R.Branch	9 STQ N.Stoikidis
12 BROB R.Brown	26 SUZM M.Suzuki
2 BURS S.Burgess	6 SZUM M.Szulc
14 CARJ J.Carlson	21 TESD D.Teske
28 CHAG G.Morales	10 THR R.Thompson
17 CKB B.Cudnik	6 TJV J.Temprano
13 CLZ L.Corp	12 URBP P.Urbanski
8 COMT T.Compton	13 VALD D.delValle
26 CR T.Cragg	11 VARG A.Vargas
3 DEMF F.Dempsey	12 WILW W.Wilson
22 DGP G.Dyck	5 YESH H.Yesilyaprak
23 DRAJ J.Dragesco	
16 DUBF F.Dubois	
26 ELR E.Reed	
13 FEEC C.Feehrer	
15 FERJ J.Fernandez	
21 FLET T.Fleming	
20 GIOR R.Giovanoni	
9 GOTS S.Gottschalk	
5 HRUT T.Hrutkay	
23 JAMD D.James	
7 JEFT T.Jeffrey	
25 KHAR R.Khan	
19 KNJS J&S Knight	
3 LERM M.Lerman	
16 LEVM M.Leventhal	

## 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 (RG) and Ratios of Spots to Groups (S:G) in December

Day	RG	S:G	Day	RG	S:G	Day	RG	S:G	Day	RG	S:G
1	12.0	8.5	9	11.5	5.8	17	9.9	8.3	25	10.6	9.7
2	11.4	7.5	10	9.0	7.7	18	9.2	7.2	26	12.3	10.3
3	12.0	8.7	11	7.3	9.2	19	7.5	7.3	27	13.1	9.0
4	11.9	7.5	12	9.2	8.5	20	8.0	8.8	28	12.3	8.5
5	12.9	6.7	13	9.6	7.8	21	9.7	9.4	29	10.2	9.1
6	12.0	7.2	14	8.6	7.4	22	10.6	8.4	30	11.5	7.2
7	12.7	5.5	15	9.0	9.8	23	9.9	10.3	31	11.5	6.7
8	12.8	5.9	16	10.0	7.5	24	10.5	9.7	Mn.	10.6	8.1

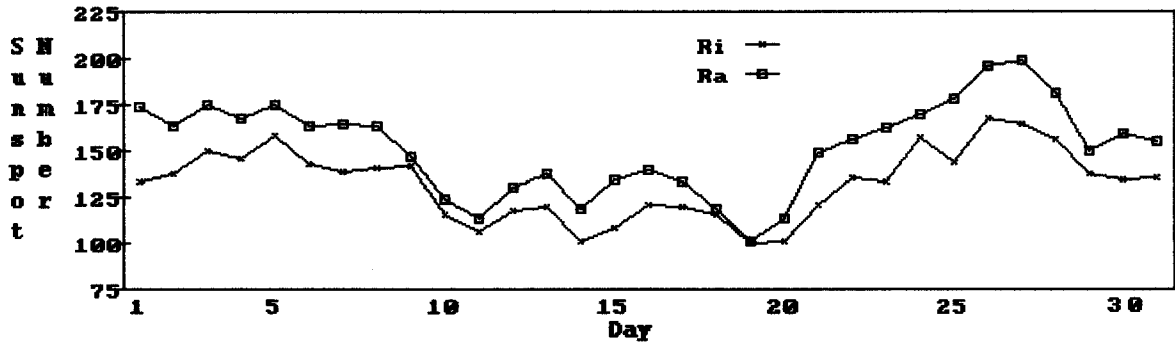


Fig. 1. Comparison of Ri (provisional) and Ra Estimates for December.  
(Ri Source: <http://sidc.oma.be/index.php3>)

Smoothed Mean Sunspot Number (Rsm) for June 2001: 121.1

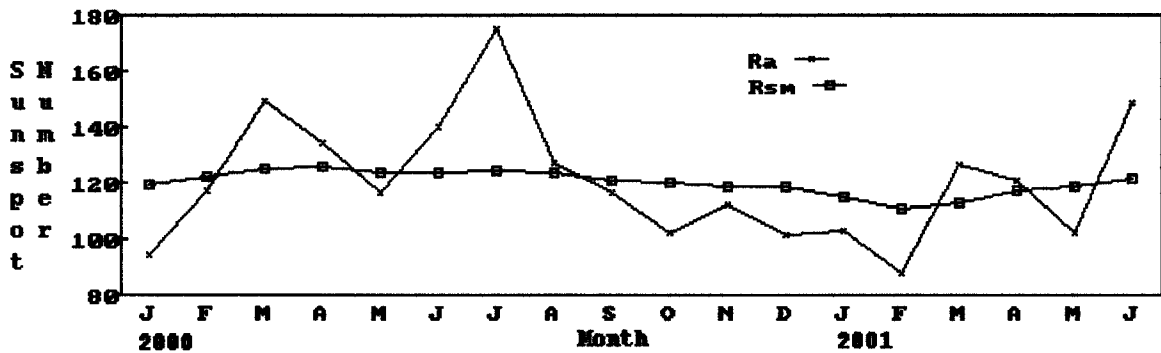


Fig. 2. Monthly Ra and Smoothed Mean Sunspot Numbers (Waldmeier method).

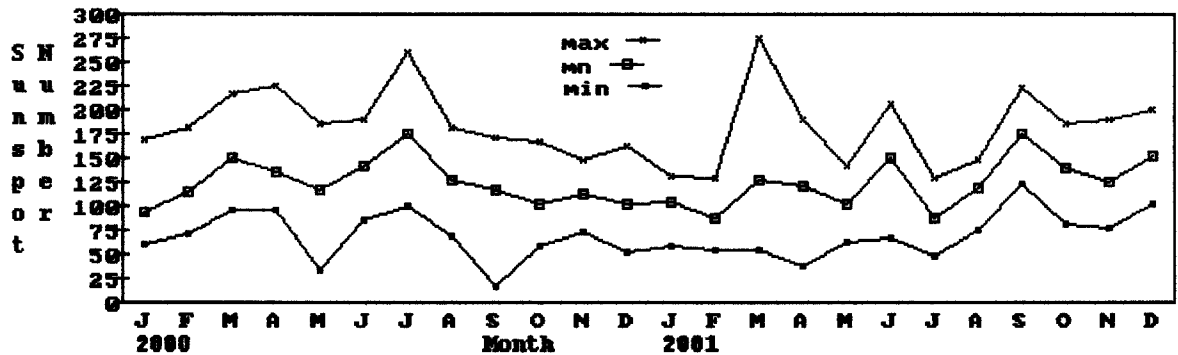


Fig 3. Maximum, Mean, and Minimum Ra Values for Each Month from January 2000 to Present.

**Table IV. Sunspot Observers Who Contributed Reports During 2001**

AAP	P. Abbott	Alberta, Canada	JEFT	T. Jeffrey	Armona, California
ANDE	E. Anderson	Verplanck, New York	JENJ	J. Jenkins	Homer, Illinois
ATON	A. Attanasio	Tirreni, Italy	JENS	S. Jenner	Kent, England
BARH	H. Barnes	Auckland, New Zealand	KAPJ	J. Kaplan	St. Paul, Minnesota
BATR	R. Battaiola	Milan, Italy	KHAR	R. Khan	Kolkata, India
BEB	R. Berg	Crown Point, Indiana	KNJS	J&S Knight	Boksburg, South Africa
BEDJ	J. Bedient	Honolulu, Hawaii	KUZM	M. Kuzmin	Moscow, Russia
BEGM	M. Begbie	Zimbabwe, Africa	LARJ	J. Larriba	Zaragoza, Spain
BERJ	J. Berdejo	Zaragoza, Spain	LERM	M. Lerman	Ontario, Canada
BLAJ	J. Blackwell	Northwood, New Hampshire	LEVM	M. Leventhal	Maroubra, Australia
BMF	M. Boschat	Halifax, Nova Scotia	LIZT	T. Lizak	Tiverton, Rhode Island
BOSB	B. Bose	Calcutta, India	MALK	K. Malde	Hundvaag, Norway
BRAB	B. Branchett	Deltona, Florida	MARE	E. Mariani	Varese, Italy
BRAD	D. Branchett	Deltona, Florida	MARJ	J. Maranon	Zaragoza, Spain
BRAR	R. Branch	Upland, California	MAV	D. Matsnev	Moscow, Russia
BROB	R. Brown	Georgetown, California	MCE	E. Mochizuki	Saitama, Japan
BURS	S. Burgess	Winterport, Maine	MILJ	J. Miller	Bethesda, Maryland
CAMP	P. Campbell	Alberta, Canada	MMI	M. Moeller	Timmendorfer Strand, Germany
CARJ	J. Carlson	Harwich, Massachusetts	MUDG	G. Mudry	Ontario, Canada
CHAG	G. Morales	Cochabamba, Bolivia	OBOS	IPS Observatory	Narrabri, Australia
CKB	B. Cudnik	Houston, Texas	PARN	N. Parker	Banning, California
COLJ	J. Collins	Phoenix, Arizona	PENG	G. Pennington	Spring Creek, Nevada
COMT	T. Compton	Birmingham, Michigan	RICE	E. Richardson	Yorkshire, England
CORA	A. Coroas	Camaguey, Cuba	RITA	A. Ritchie	Lexington, Massachusetts
CR	T. Cragg	Coonabarabran, Australia	SCGL	G. Schott	Wesel, Germany
DEMF	F. Dempsey	Ontario, Canada	SCHG	G. Scholl	Allegheny, New York
DGP	G. Dyck	Assonet, Massachusetts	SIMC	C. Simpson	Cleveland, Ohio
DRAJ	J. Dragesco	St. Clements, France	STEF	G. Stefanopoulos	Lavrion-Attiki, Greece
DUBF	F. Dubois	Langemark, Belgium	STEM	G. Stemmler	Oelsnitz, Germany
ELR	E. Reed	Midland, Texas	STQ	N. Stoikidis	Larissa, Greece
FEEC	C. Feehrer	Bedford, Massachusetts	SUZM	M. Suzuki	Tsu Mie, Japan
FERJ	J. Fernandez	Santande, Spain	SZAD	D. Szady	Brewer, Maine
FLET	T. Fleming	Grand Prairie, Texas	SZAK	K. Szatkowski	Lodzki, Poland
FUJK	K. Fujimori	Suwa City, Japan	SZUM	M. Szulc	Tuchola, Poland
GALM	M. Gallo	Buenos Aires, Argentina	TESD	D. Teske	Jackson, Mississippi
GIOR	R. Giovanoni	Hagerstown, Maryland	THR	R. Thompson	Ontario, Canada
GOTS	S. Gottschalk	Lowden, Iowa	URBP	P. Urbanski	Zychini, Poland
HALB	B. Halls	Lancing, WSx, England	VALD	D. Del Valle	Aguardilla, Puerto Rico
HAYK	K. Hay	Ontario, Canada	VARG	A. Vargas	Cochabamba, Bolivia
HRUT	T. Hrutkay	Indiana, Pennsylvania	VIDD	D. Vidican	Bacau, Romania
HSF	C. Hossfield	Orlando, Florida	WILW	W. Wilson	Cordova, Tennessee
IMPR	R. Imperi	Willard, Ohio	WITL	L. Witkowski	Sun City, Florida
JAMD	D. James	Leesburg, Virginia	YESH	H. Yesilyaprak	Istanbul, Turkey

**Table V. SID Observers Who Contributed Reports During 2001**

A29	A. Clerkin	Bedford, Massachusetts	A90	J. Mandaville	Tucson, Arizona
A50	J. Winkler	Houston, Texas	A93	G. DiFillipo	Teramo, Italy
A52	D. Overbeek	Edenvale, South Africa	A95	T. Poulos	Brookline, Massachusetts
A52	D. Toldo	Edenvale, South Africa	A96	R. Battaiola	Milan, Italy
A62	A. Stokes	Hudson, Ohio	A97	J. Wallace	Torrington, Connecticut
A63	J. Ellerbe	Nerja, Spain	A98	NJAA	Montclair, New Jersey
A83	A. Panzer	Parma, Ohio	A99	M. King	London, England
A84	W. Moos	Koenitz, Switzerland	A100	P. Campbell	Alberta, Canada
A87	M. Hill	Marlborough, Massachusetts	A101	G. Bressan	Udine, Italy

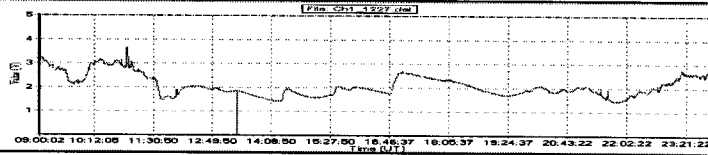
**Editor's Note**

A distributor of Rustrak rolls has now been identified, and our supply is once again assured. Please let Mike Hill or me know if you are in need of additional rolls.

Thank you again for your continuing support of the AAVSO's Solar Division. I wish all of you a happy and prosperous New Year!

# Sudden Ionospheric Disturbance Report

Michael Hill, SID Analyst  
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 Marlborough, MA 01752 USA  
 noatak@aol.com



## Sudden Ionospheric Disturbances (SID) Recorded During December 2001

(Analysis performed by Michael Hill, SID Analyst)

Date	Max	Imp	Date	Max	Imp	Date	Max	Imp
011201	0650	2	011212	2026	2	011223	1918	2+
011201	1446	1+	011213	0643	2	011224	1400	2+
011201	1525	2+	011213	1432	2+	011224	1638	1+
011201	1655	2	011213	1617	1-	011226	1235	2
011201	1749	2+	011213	1803	1+	011226	1723	2+
011202	0815	1	011214	0653	2	011227	1135	2
011202	1504	3+	011214	0912	2+	011227	1422	2
011202	1849	2+	011214	1254	1	011227	1532	2
011203	0712	1	011214	1629	1+	011227	1555	2
011203	1058	1+	011214	1750	1+	011227	1945	1
011204	0547	1+	011214	1954	3	011228	1227	3
011204	0900	2	011215	1010	1-	011228	1353	2
011206	0825	2+	011215	1249	1+	011228	1523	1
011206	1908	3	011215	1701	1-	011228	1850	2
011207	0814	1	011216	0743	2+	011228	2023	2
011209	1547	2+	011216	1424	1	011229	1200	2
011209	1640	2	011218	0447	1	011229	1628	1-
011209	1754	2+	011219	1055	1	011229	1340	2+
011209	2035	2	011219	1300	1	011229	1848	1+
011210	0939	1	011219	1708	2+	011229	1955	3+
011211	0808	2	011220	1528	1+	011230	1506	1-
011211	1450	1+	011220	1716	1+	011230	1834	2+
011212	1230	1-	011220	1813	2			
011212	1429	2	011222	1200	2			
011212	1909	2+	011223	1110	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, NPM
D Toldo	A52	NAA, NWC
J Ellerbe	A63	ICV
A Panzer	A83	NAA
W Moos	A84	FTA
M Hill	A87	NAA
T Poulos	A95	NAA
R Battaiola	A96	HWU
J Wallace	A97	NAA
NJAA	A98	NAA
M King	A99	GBZ
P Campbell	A100	NLK

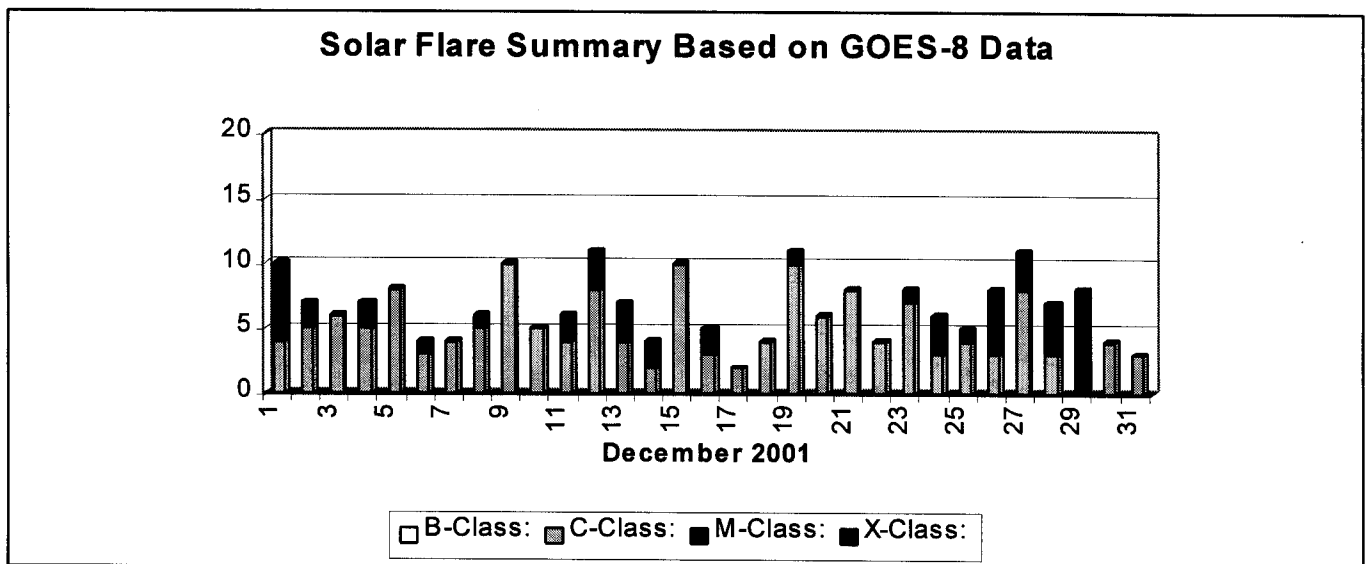
Importance	Duration (min)
1-	< 19
1	19 - 25
1+	26-32
2	33-45
2+	46-85
3	86-125
3+	> 125

# Solar Events

December saw an apparent drop in activity from past months. As can be seen by the graph below, there were no more than 10 X-Ray flares on any given day, with the average being more around 5. There was a total of 204 of these X-Ray flares detected by the Goes-8 Satellite. Of these, 47 were M-Class events and 3 were X-Class events. There were no B-Class events. So although there was less apparent activity, most of the flares were fairly energetic, with some very large ones on the 11<sup>th</sup>, 13<sup>th</sup> and 28<sup>th</sup>. Observers detected 72 correlated SID events. The trend of these followed that of the flares, with the majority of them having 2 and 2+ importance ratings with more than usual 3 and 3+ events. These were, of course, due to the large X-Class flares.

Thanks to all of you for working with me to get your reports into the correct format. I have been in touch with a number of you to work out individual problems and everyone has been very cooperative. It is important to get these reports into standard format as it causes problems with the analysis processing software that I use if they are not.

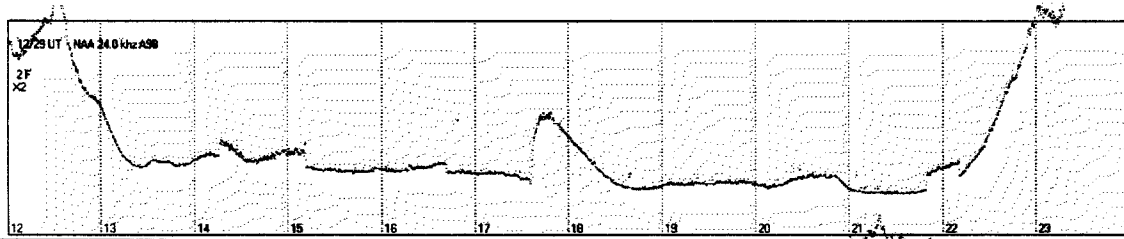
I want to welcome a new observer, or actually a set of observers. The New Jersey Astronomical Association is now contributing data with a newly completed monitoring station. They are reporting under the ID of A98. This is being done as a group project, something that this club does with a lot of their endeavors. A warm welcome to all of you.



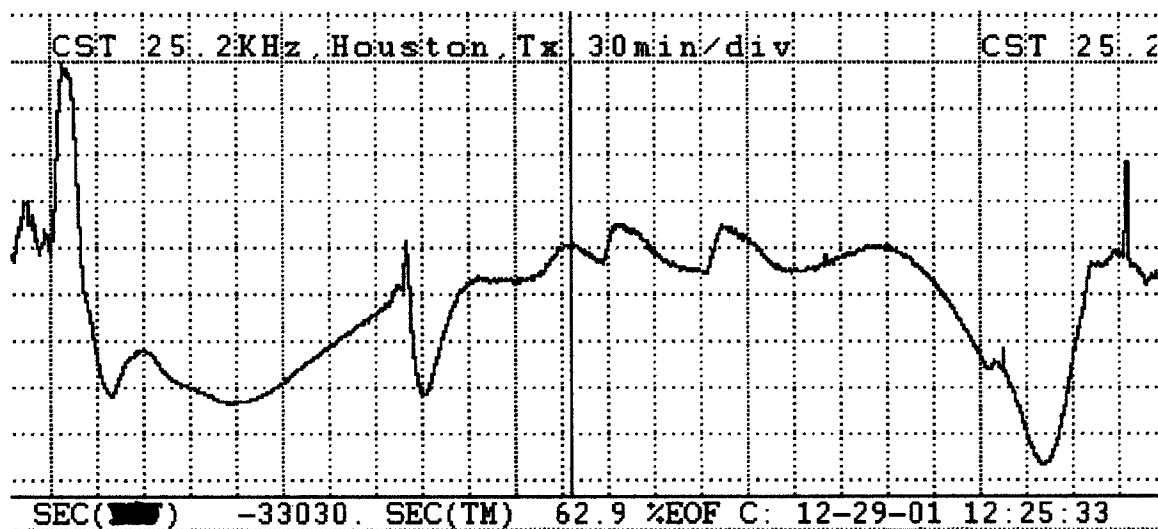
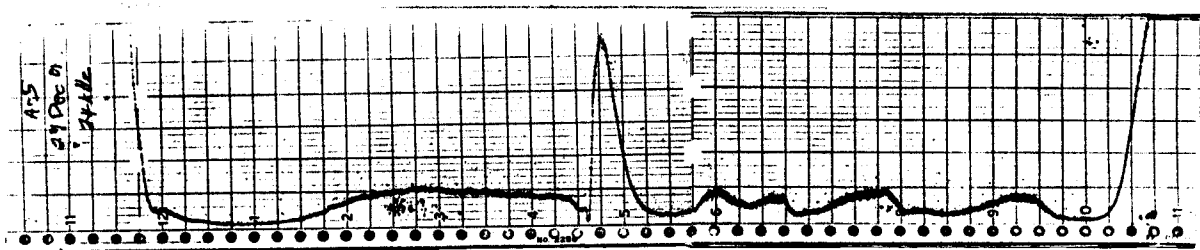
**SUDDEN IONOSPHERIC DISTURBANCES SUPPLEMENT**

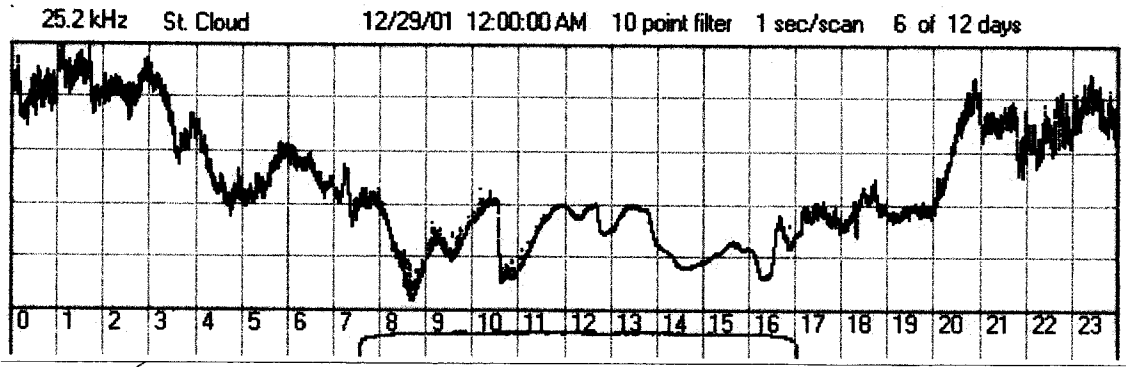
Casper H. Hossfield, SID Sup. Editor **SUDDEN IONOSPHERIC DISTURBANCES**  
 PO Box 23 **RECORDED DURING DECEMBER 2001**  
 New Milford, NY 10959, USA

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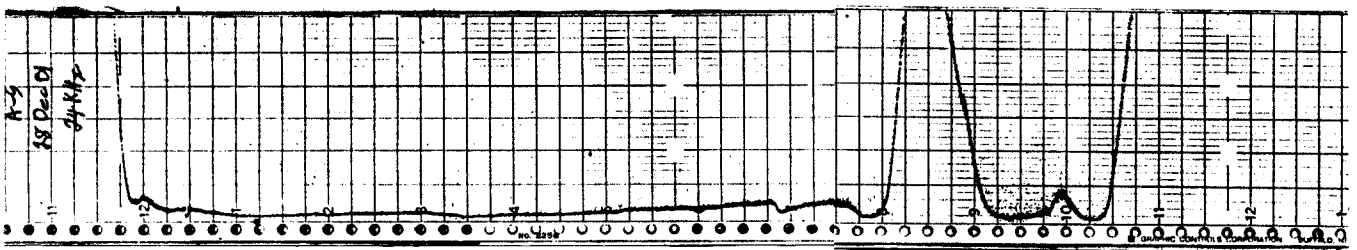
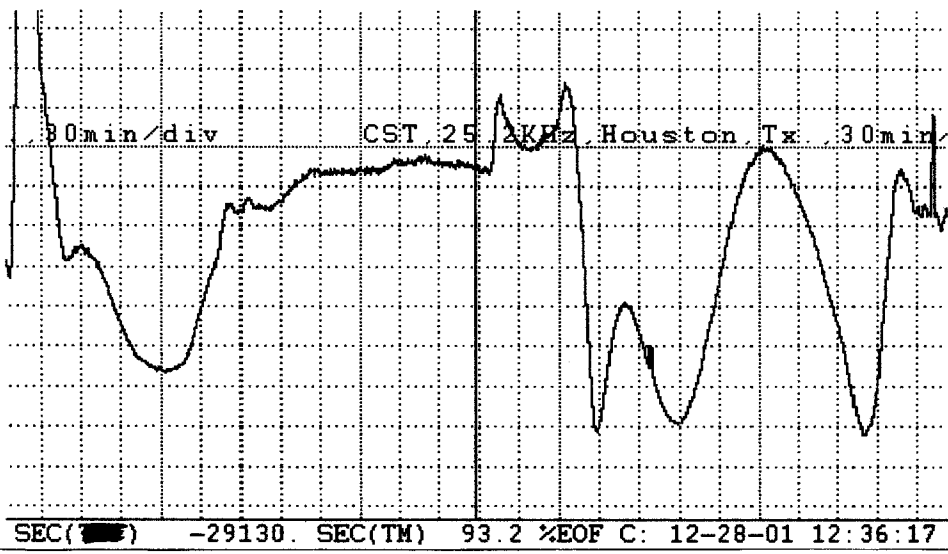
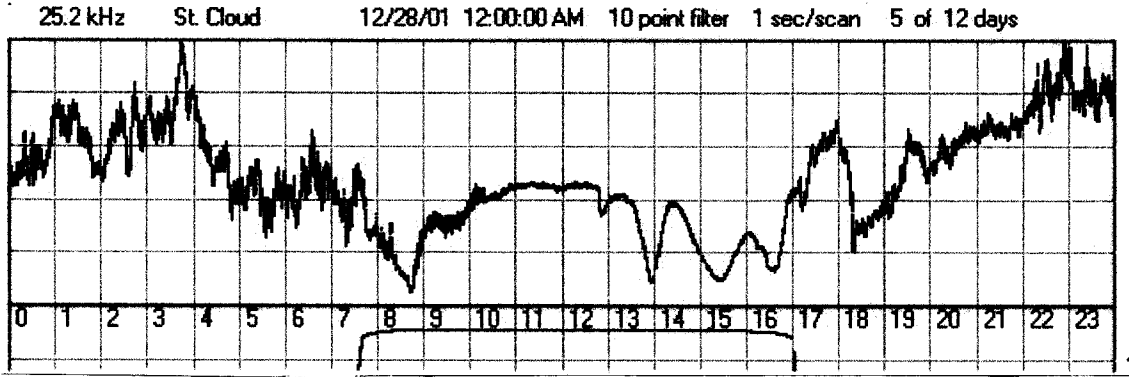


The above SES recording was made by station A-98 which recently became a contributing member to the AAVSO's SID program. A-98 is a club station built by the New Jersey Astronomical Association in High Bridge, New Jersey. I first heard about NJAA's plans to build this station from Bill Anthony, the clubs Research Director, back last spring. He found a club member who is an electronics expert and likes to build homemade instruments. Several other members helped and by this fall the station was up and running and sending monthly data reports to AAVSO SID analyst, Mike Hill, A-87. Over the years I have helped other clubs build SID stations but this is the first club I know of that got one going properly on its own. Bill Anthony is the driving force that kept the project on track. He now analyzes the charts to prepare the monthly SID reports for the AAVSO. Another fortunate circumstance is the clubs observatory is located in Voorhees Park, an interference free location. You can see a picture of the A-98 station at the clubs Website, < NJAA.org >. Take a look at this site and you will see a beautiful example of one of Art Stokes's Gyrator II receivers with a Stokes square loop antenna recording in DOS on a laptop computer. Bill plotted its DAT file Using PicLogger32D to make the chart above and sent it to me as an email attachment. The SID station will hopefully be on exhibit for the public to see sometime in the not too distant future. Posters are being made describing how the SID system works. At the very least a fastened down Plexiglas cover needs to be made for the receiver so people don't twirl the dials and detune it, or worse. Below are three other SES charts that recorded the same big SES on 29 December, 2001. The first of these three is by Cap Hossfield, A-5 in Orlando, Florida recording NAA in Cutler Maine transmitting on 24 kHz. The second is by Jerry Winkler, A-50, in Houston Texas recording the VLF station in La Mourie, North Dakota on 25.2 kHz. The third, on the next page, is by Al McWilliams, A-94, in St. Cloud, Minnesota also recording the station in La Moure ND. Three smaller SESs can be seen following the big one reaching maximum at 1645 UT



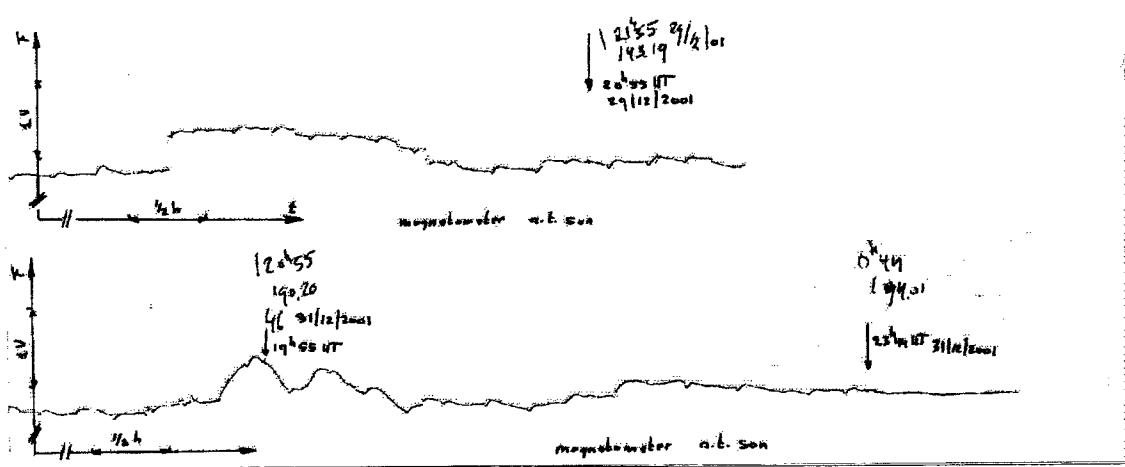


Three charts below show a big SES created by an X3 solar flare on 28 December by the same three observers. These recordings are of a much bigger flare than Caused the SESs above on 29 December. The first is by A-94, and shows several inversions. The second is by A-50 and shows a similar complicated inversion pattern. Both are recordings of the 25.2 kHz Station in La Mourie. The third chart is by A-5 and a normal enhancement of the 24 kHz signal from NAA in Cutler, Maine, USA. The signal goes off scale at 2015 UT and has returned to normal by 2115 UT (9:15 On the chart). The sudden rise to off scale starting at 2230 UT is the normal sunset rise to the nighttime signal level.



The Solar Flare activity at the end of December also produced a small magnetic storm that is shown below. This magnetogram was made by sunspot observer Andries Sol. He is a new contributor to the SID Supplement who lives in Neerpelt, Belgium. Here, in his own words, is a description of his homemade McWilliams magnetometer that he used to make the recording below:

“The magnetometer (Mc Williams design) I use is made of scrap items all out of aluminium parts and non-magnetic chrome nickel steel bolts and nuts, except for the magnets and the violin string, to avoid any influence on the results. The three magnets are single grown crystals made out of a special alloy. Three magnets coupled to form one long quite heavy magnet of about 20 cm. This magnet hangs on a thin violin string and is torsioned away from the north to the west for about 30° to work as a torsion meter and not for direction variations of the earth magnetic field. The movement of the magnet is detected by means of an aluminium strip (shadow vane) attached to the magnet which shuts partly off the CS photocell on the left or on the right side of the magnet, depending on the direction of the movement of the magnet. The two CS photocells are coupled in a simple electric system (Wheatstone bridge) ; the difference electric signal is recorded with aid of an old strip chart recorder, the strip chart is moved with 4 cm/hour. The strip chart is adapted for simple paper strip rolls used for calculators. Due to the small paper strip, a heavy magnetic storm can't be recorded, only a range of +/- 1 Voltage (+/- 2 cm) can be recorded. The system works on direct voltage 12 V, this caused in the beginning a lot of problems, due to variations in the 220 V net system, but an electric feed system of an old computer delivers exactly stable voltage without any disturbance all day and night. The whole magnetometer is shielded off with black plastic foil to avoid disturbance of external light to the two photocells. I don't use a damping system for the movement of the magnet, the movement is slow during a magnetic storm, only a car passing by gives a quick disturbance, which dies out in a few minutes. The magnetometer is mounted against the wall in the basement under the house.”



Roberto Battaiolo, A-95, made the SES recording below of a sudden ionospheric disturbance caused by a solar flare on 11 December. Roberto sent it as a DAT file and I plotted it using Piclogger32D. Roberto lives in Italy and records the signal from HWU, the French Naval transmitter in Le Blanc, France, transmitting on 20.9 kHz. The Piclogger32D plotting software is available free to anyone who wants a copy. It can plot most any DAT file as a Rustrak format strip chart and has options that includes plotting at ¼ inch/hr for magnetograms.

