Solar Bulletin

THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS - SOLAR DIVISION

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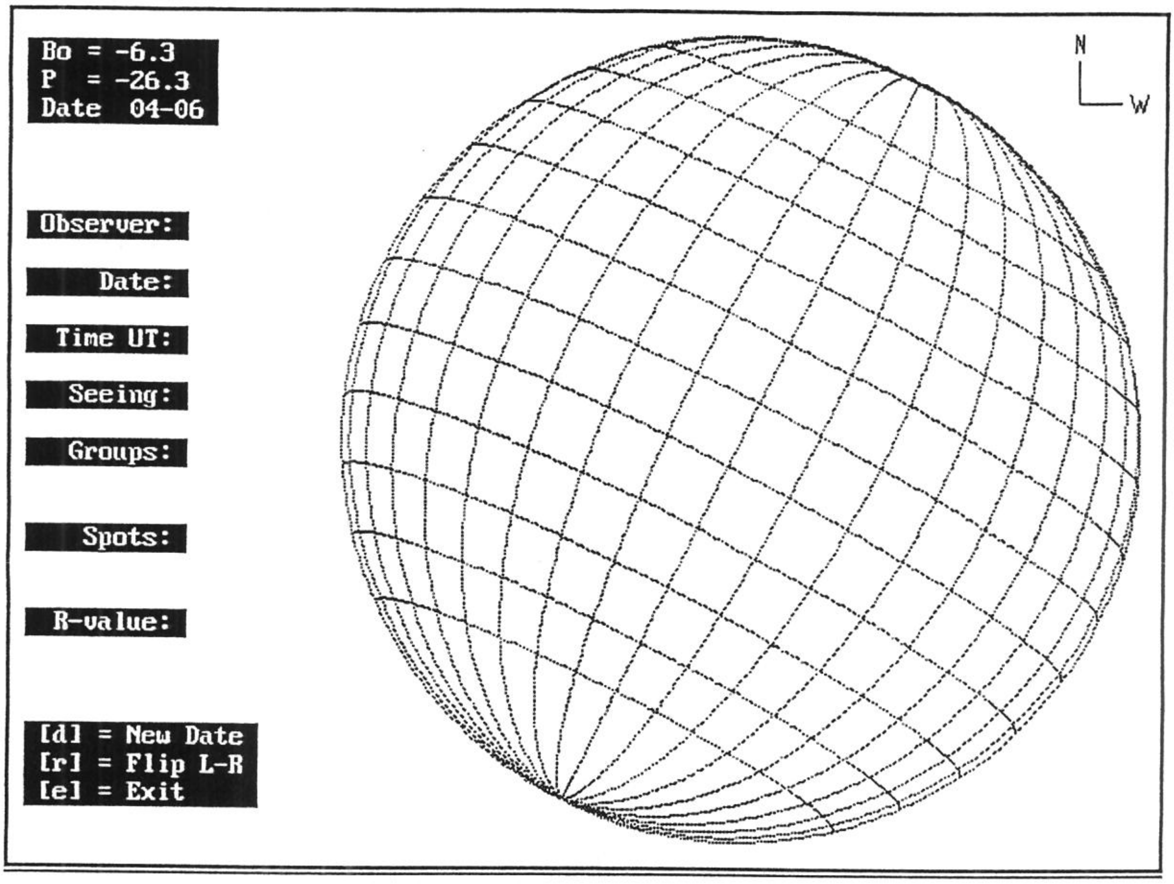
Daily Mean Sunspot Numbers, R_a for March 1999

(computational analysis performed by Grant Foster, AAVSO Headquarters)

simple average			k-corrected	
Day	R_a avg	Std. Dev.	R_a k	Std. Dev.
1	95	7.9	74	5.1
2	124	8.1	99	3.8
3	121	8.0	101	5.0
4	126	8.1	101	4.4
5	109	7.4	92	4.7
6	85	8.2	65	5.9
7	52	3.4	44	2.6
8	55	3.9	49	2.3
9	74	2.9	66	1.8
10	74	2.9	64	2.2
11	86	4.6	67	3.3
12	91	5.8	73	3.2
13	98	4.3	84	2.8
14	104	7.7	86	4.0
15	101	5.3	79	3.3
16	115	6.0	97	4.7
17	120	5.9	99	3.9
18	104	5.3	91	4.0
19	106	5.9	91	4.1
20	86	4.5	76	3.2
21	94	4.4	80	3.4
22	49	4.0	37	2.7
23	37	2.0	32	1.3
24	44	2.0	37	1.4
25	38	1.0	34	0.9
26	32	1.0	29	1.0
27	27	1.1	25	1.0
28	43	1.7	37	1.3
29	63	1.9	53	1.8
30	60	1.5	52	1.4
31	60	1.9	51	1.1

Monthly Mean R_a avg = 79.8
Monthly Mean R_a k = 66.6

Observer	Code	Country	Days Obs.
Abbott, P	AAP	Canada	15
Anderson, E	ANDE	USA, NY	10
Atkinson, G	ATKG	USA, MA	14
Barnes, H	BARH	New Zealand	14
Barton, W	BARW	England	2
Battaiola, R	BATR	Italy	11
Black, B	BLAB	USA, GA	8
Blackwell, J	BLAJ	USA, NH	16
Boschat, M	BMF	Canada	13
Bose, B	BOSB	India	31
Branchett, B	BRAB	USA, FL	27
Branch, R	BRAR	USA, CA	21
Carlson, J	CARJ	USA, MA	30
Morales, G	CHAG	Bolivia	12
Cudnik, B	CKB	USA, TX	13
Compton, T	COMT	USA, MI	20
Conlin, G	CONG	USA, WA	6
Cragg, T	CR	Australia	27
Dempsey, F	DEMF	Canada	14
Dyck, G	DGP	USA, MA	17
Dragesco, J	DRAJ	France	19
Eleizalde, G	ELEG	Venezuela	30
Feehrer, C	FEEC	USA. MA	21
Ruiz, J	FERJ	Spain	21
Fleming, A	FLEN	Argentina	5
Fleming, T	FLET	USA, TX	18
Fujimori, K	FUJK	Japan	20
Giovanoni, R	GIOR	USA. MD	25
Gottschalk, S	GOTS	USA, IA	25
Halls, B	HALB	England	8
Hay, K	HAYK	Canada	17
Hrutkay, T	HRUT	USA, PA	13
Imperi, R	IMPR	USA, OH	17
Janssens, J	JANJ	USA, TX	3
Jeffrey, T	JEFT	USA, CA	16
Jenkins, J	JENJ	USA, IL	15
Kaplan, J	KAPJ	USA, MN	20
Knight, J	KNJS	South Africa	17
Lawrence, J	LAWJ	USA, IN	9
Lerman, M	LERM	Canada	21
Leventhal, M	LEVM	Australia	20
Lizak, T	LIZT	USA, RI	23
Lubbers, T	LUBT	USA, MN	13
Lohvinenko, T	LWT	Canada	8
Malde, K	MALK	Norway	17
Jarboles, J	MARJ	Spain	25
McHenry, L	MCHL	USA, PA	2
Miller, J	MILJ	USA	14
Moeller, M	MMI	Germany	18
Mudry, G	MUDG	Canada	16
Culgoora Solar Obs	OBSO	Australia	17
Parker, N	PARN	USA, CA	3
Randall, T	RANT	USA, NY	12
Richardson, E	RICE	England	15
Ramsey, J	RMAJ	USA, AR	1
Ramsey, S	RMAS	USA, AR	1
Schott, G	SCGL	Germany	17
Scholl, G	SCHG	USA, NY	20
Simpson, C	SIMC	USA, OH	16
Stefanopoulos, G	STEF	Greece	5
Stemmler, G	STEM	Germany	20
Stoikidis, N	STQ	Greece	14
Suzuki, M	SUZM	Japan	17
Teske, D	TESD	USA, MS	16
Thompson, R	THR	Canada	22
Vargas, G	VARG	Bolivia	16
Vardaxoglou, P	VARP	Greece	12
Vazquez, C	VAZC	Argentina	14
Wilson, W	WILW	USA, TN	13
Witkowski, L	WITL	USA, FL	25
Yesilyaprak, H	YESH	Turkey	22



SPOTPLOT.EXE Utility Program Now Available

Although the AAVSO Solar Division's principal activity is determination of the American Relative Sunspot Number, many solar observers preserve their observations by sketching the solar disk and annotating the drawing by distinguishing groups and spots within those groups. This record is more meaningful if the groups can be accurately located on the solar disk. As described in *Observing the Sun* by Peter O. Taylor (1991), the amateur observer has two popular options for determination of sunspot positions. The method of using standard Stoneyhurst templates and the lesser known Porter Disk method require the observer to perform calculations to properly orient the patterns for specific days of the year. Certainly the computations can be automated in a simple program, but neither method lends itself to direct position determination at the eyepiece.

SPOTPLOT.EXE attempts to simplify the sunspot plotting process by providing an accurate 3-dimensional Stoneyhurst template for any given day of the year. The program determines the heliographic latitude of the solar disk center (B_0) and the position angle of the solar axis (P) based on tabulated values in the *Astronomical Almanac*. By default, a template is plotted for the present date indicated by the PC clock. If another date is preferred, then the user may enter the desired date and the template is immediately redrawn. An option to flip the image left to right is provided for observers who view with a reversed imaging system. Hardcopy output of the template is accomplished by pressing Alt-PRINTSCRN (both buttons together) so the screen image is saved to the Windows clipboard buffer. The saved image may be imported into a familiar drawing program such as MS Paint® which is an accessory program provided with the Windows operating system. Simply exit the SPOTPLOT program after pressing the Alt-PRINTSCRN button combination and open the MS Paint program. Use the edit menu to 'paste' the clipboard buffer image into the drawing area. Now the observer may annotate the template with sunspots and text by using the drawing tools. The drawing may be saved, printed, or attached to e-mail messages to share with other solar observers.

At the eyepiece, the correct orientation is determined by the drift method. Center the solar disk in the field of view. Stop the telescope clock drive and watch as the solar image drifts across the field. The first edge of the disk to leave the field is the western limb. Align this point on the solar disk with the cardinal legend on the drawing template. This method works just as simply with alt-azimuth mounted telescopes.

SPOTPLOT.EXE is compiled in QuickBASIC® and may be downloaded from the developer's website or requested on diskette by contacting Joseph Lawrence, AAVSO Solar Division Chairman. Suggestions for improving the utility are welcome.

Sudden Ionospheric Disturbance Report

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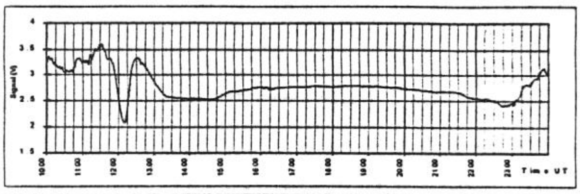

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Sudden Ionospheric Disturbances (SID) Recorded During March 1999

(correlation analysis performed by Joseph Lawrence, SID Analyst)

Date	Max	Imp	Date	Max	Imp	Date	Max	Imp	Date	Max	Imp
990301	0540	2	990311	1720	2	990316	0630	2+	990317	1407	1+
990301	1335	1	990311	2035	2+	990316	0942	2	990317	1450	2+
990302	1211	1+	990312	0653	1	990316	1330	1+	990317	2155	2+
990302	1326	1	990312	0755	1-	990316	1720	2	990318	0407	2
990302	1520	2	990312	0800	1	990316	1832	2	990318	0525	1
990302	1550	1-	990312	1553	1+	990316	1903	2	990318	0730	1+
990303	1654	1-	990312	1730	2+	990316	1931	1	990318	0832	2+
990304	0513	1+	990312	2040	1	990316	1952	1-	990318	1330	2
990305	0835	1+	990313	1052	1+	990316	2022	1-	990318	1422	2
990305	1924	2	990313	1110	1-	990316	2110	2	990318	1605	1
990306	1409	1	990313	2032	2+	990316	2140	2+	990318	1746	1+
990308	0638	2	990314	0950	2	990317	0956	2	990318	1829	1+
990311	0645	1-	990314	1350	2+	990317	1145	1	990318	2008	1+
990311	0827	1+	990314	1611	1-	990317	1215	1	-	-	-
990311	1007	1+	990315	1255	2	990317	1231	1+	-	-	-

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

1) reported in at least two observers' reports.
2) visually analyzed with definiteness rating = 5 on submitted charts
3) reported by overseas observers with high definiteness rating

Observer	Code	Station(s) Monitored
Winkler, J	A-50	NAA, NPM
Overbeek, D	A-52	NAA, NSW, NPM
Toldo, D	A-52	NAA, NSW, NPM
Stokes, A	A-62	NAA
Witkowski, L	A-72	NAA
King, P	A-80	FTA
Landry, A	A-81	NAA
Lawrence, J	A-82	NAA
Panzer, A	A-83	NAA
Moos, W	A-84	FTA, GBZ, ICV
Mandaville, J	A-90	NAA, NPM

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

Editor's Note: SID data was recorded by observers during the entire month of March; however solar activity decreased markedly after 03-18-99. The period 20 - 31 March was characterized by stable small groups of sunspots which produced only very few B-Class flares according to reports from the Space Environment Center (Boulder, CO). For this reason, no sudden ionospheric disturbances were recorded after March 18.

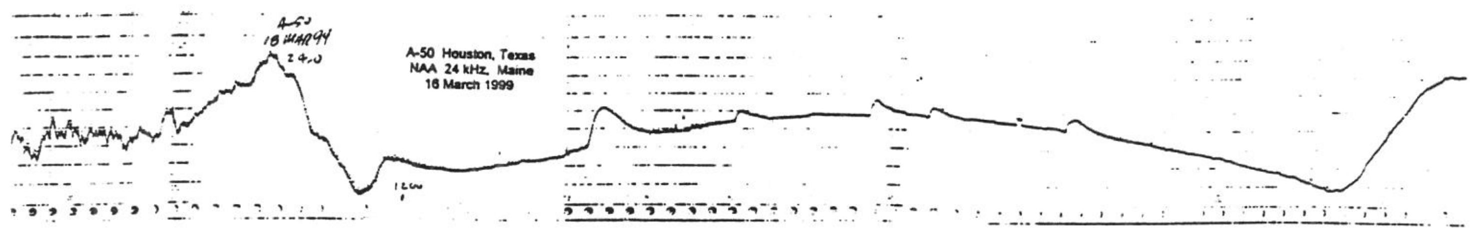
Some SID observers were hindered during March as station NPM (Hawaii, 21.4 kHz) stopped transmitting on 5 March and didn't return to normal operation until the period of very low flare activity near the month's end. The NATO VLF stations frequently undergo maintenance, upgrades, and test transmission sequences. Any SID observer who recognizes a pattern of these events or suspects a station has ceased transmissions should alert the SID Analyst. The most obvious maintenance schedule outage occurs for station NAA (Maine, 24.0 kHz) every Monday as the signal goes silent with a few test pulses during the day. Some significant SID events go unreported by NAA monitors during these Monday outages. Fortunately some SID observers are tuned to other stations and record these events.

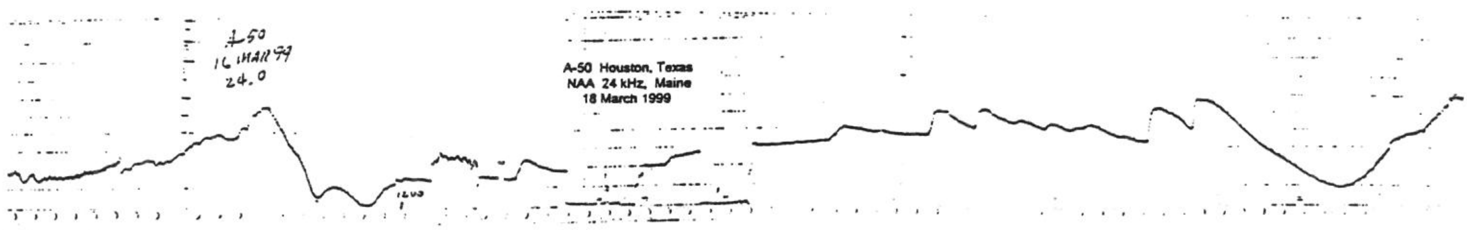
JDL

Sudden Ionosphere Disturbances Recorded during March

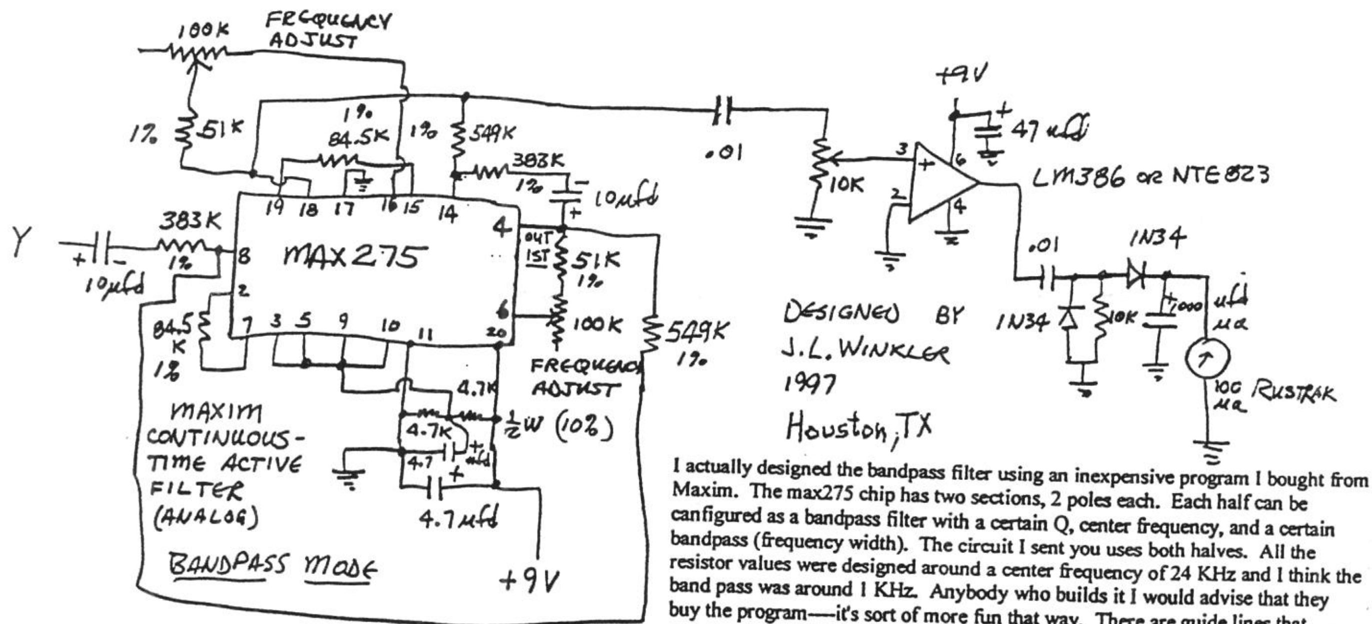
Prepared by

Casper H. Hossfield





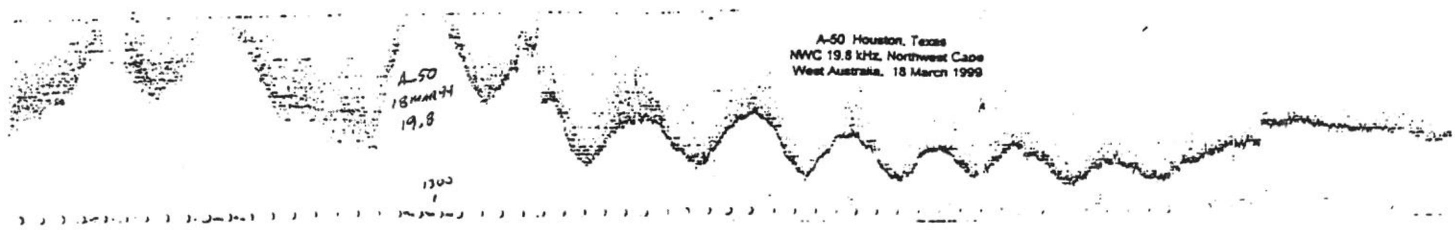
Charts above were made by Jerry Winkler, A-50, using a special SES receiver of his own design. It shows the many SESs he recorded on 16 and 18 March recording NAA on 24 kHz. The receiver is very sensitive and owes much of its success to filters that retrieve the VLF signals from the background noise. Most of the filtering is done by a Max 275 integrated circuit chip that can be programmed to filter VLF signals like NAA, NPM and NWC. Below is Jerry's description of the MAX 275 and a schematic of how it is connected just before the final amplifier and rectifier of Jerry's remarkable receiver. On the following page is a 19.8 kHz recording of NWC in West Australia. The filter is able to pick the very weak NWC signal out of the background noise and produce the interesting 6-hump sunrise pattern that is characteristic of a signal half way around the world. A 2-hump sunrise pattern of NPM in Hawaii is shown for comparison. Jerry is the only AAVSO observer in the USA who can record NWC, although it was done back in the '70s using a superhetrodyne receiver. The MAX 275 filter and final amplifier shown above could be added to most any SES receiver in use today and probably make it sensitive enough to record NWC in Australia. If you would like to build a more sensitive receiver just like Jerry's, write to him for a complete schematic and construction details. His postal mailing address is 16015 Buccaneer Lane, Houston, TX77062 or e-mail him at <<jwink38223@aol.com>>

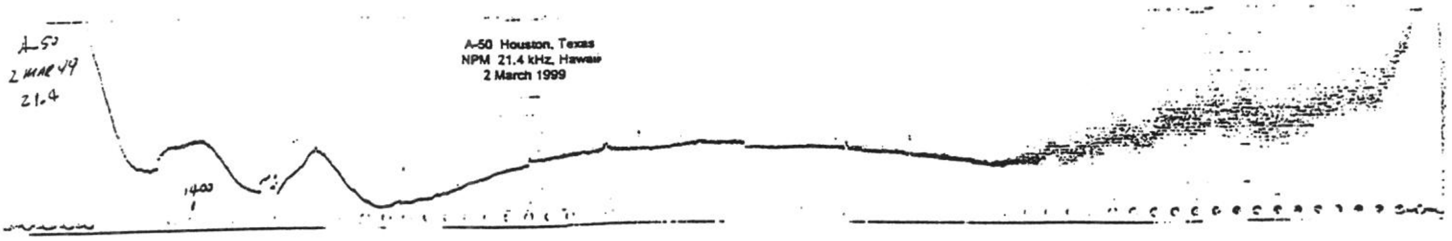


ABOVE CONSISTS OF TWO BANDPASS FILTERS IN SERIES. ABOVE COMPONENTS CHOSEN FOR A CENTER FREQUENCY OF 24 KHz EXCEPT FOR THE 100K POTS.

I actually designed the bandpass filter using an inexpensive program I bought from Maxim. The max275 chip has two sections, 2 poles each. Each half can be canfigured as a bandpass filter with a certain Q, center frequency, and a certain bandpass (frequency width). The circuit I sent you uses both halves. All the resistor values were designed around a center frequency of 24 KHz and I think the band pass was around 1 KHz. Anybody who builds it I would advise that they buy the program—it's sort of more fun that way. There are guide lines that a person has to follow which are usually to chose reasonable Q's and bandpass frequency widths. If one decides to use both halves of the chip the attenuation becomes steeper from 3 db down. To understand this filter one should keep in mind how a simple 1 pole RC low pass and high pass filter works. Each has an attenuation of -6db per octave at 3db down. A two pole filter would have an attenuation of -12 db per octave and so on. An excellent book on the subject is "The Art of Electronics" by Paul Horowitz and Winfield Hill, but I don't think that they cover the MAX275. I think the Digikey catalog lists all the Maxim stuff including the program.

JW





Len Anderson, A-91, recorded SESs shown below on 17 and 18 March. Len also records NWC but he lives in South Perth about 1000 km almost due south of the transmitter. Notice how his sunrise pattern begins and ends in less than an hour. The dawn line sweeps across the transmitter in Northwest cape at almost the same time it sweeps across the receiver in South Perth. The entire propagation path goes from Nighttime to daytime propagation in less than an hour which accounts for the very short sunrise Pattern. The sun rises in Texas, USA about 10 hours before it rises in West Australia so A-50's propagation path to NWC takes that long to become completely sunlit and produces the six humps in the long 10-hour sunrise pattern.