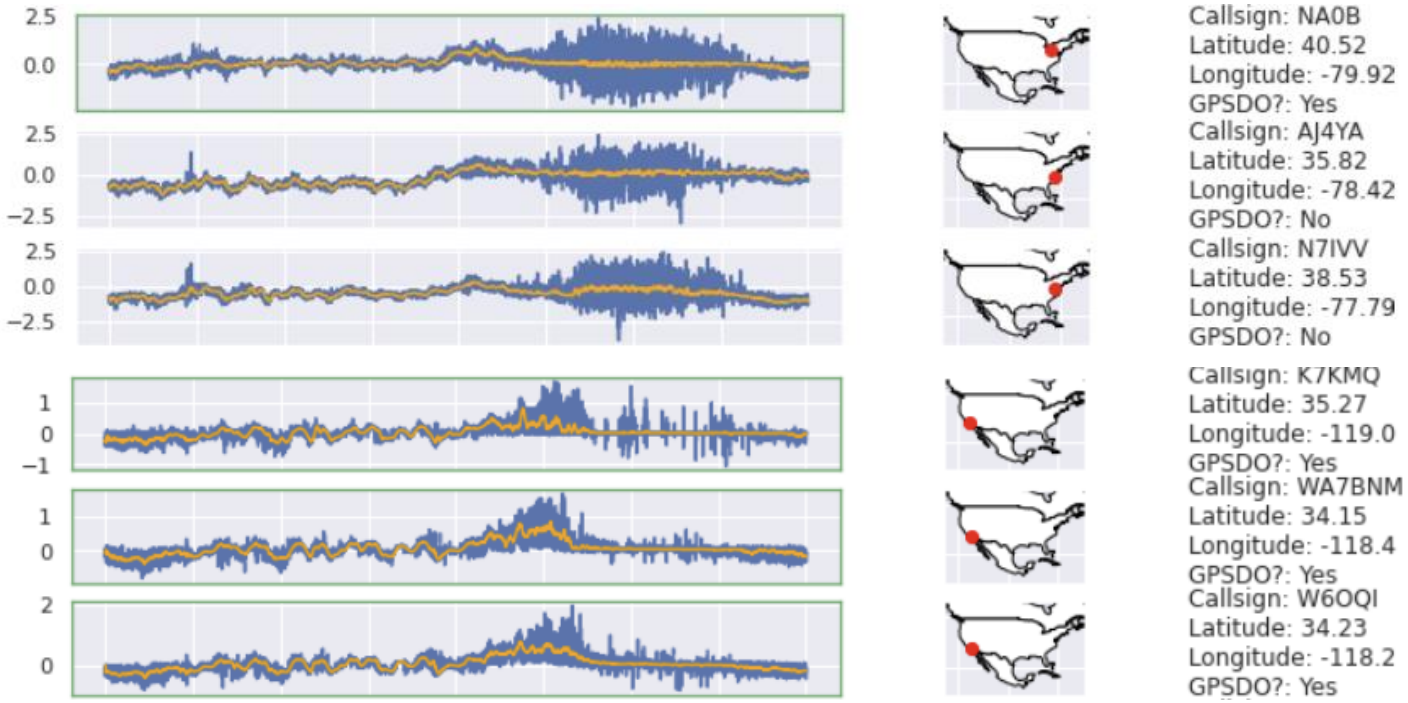
PILOT EXPERIMENTS FOR THE PSWS GRAPE: OR, THE ELEPHANT IN THE SKY

HamSCI

Kristina Collins KD8OXT, MS EE, and the
Case Amateur Radio Club, W8EDU

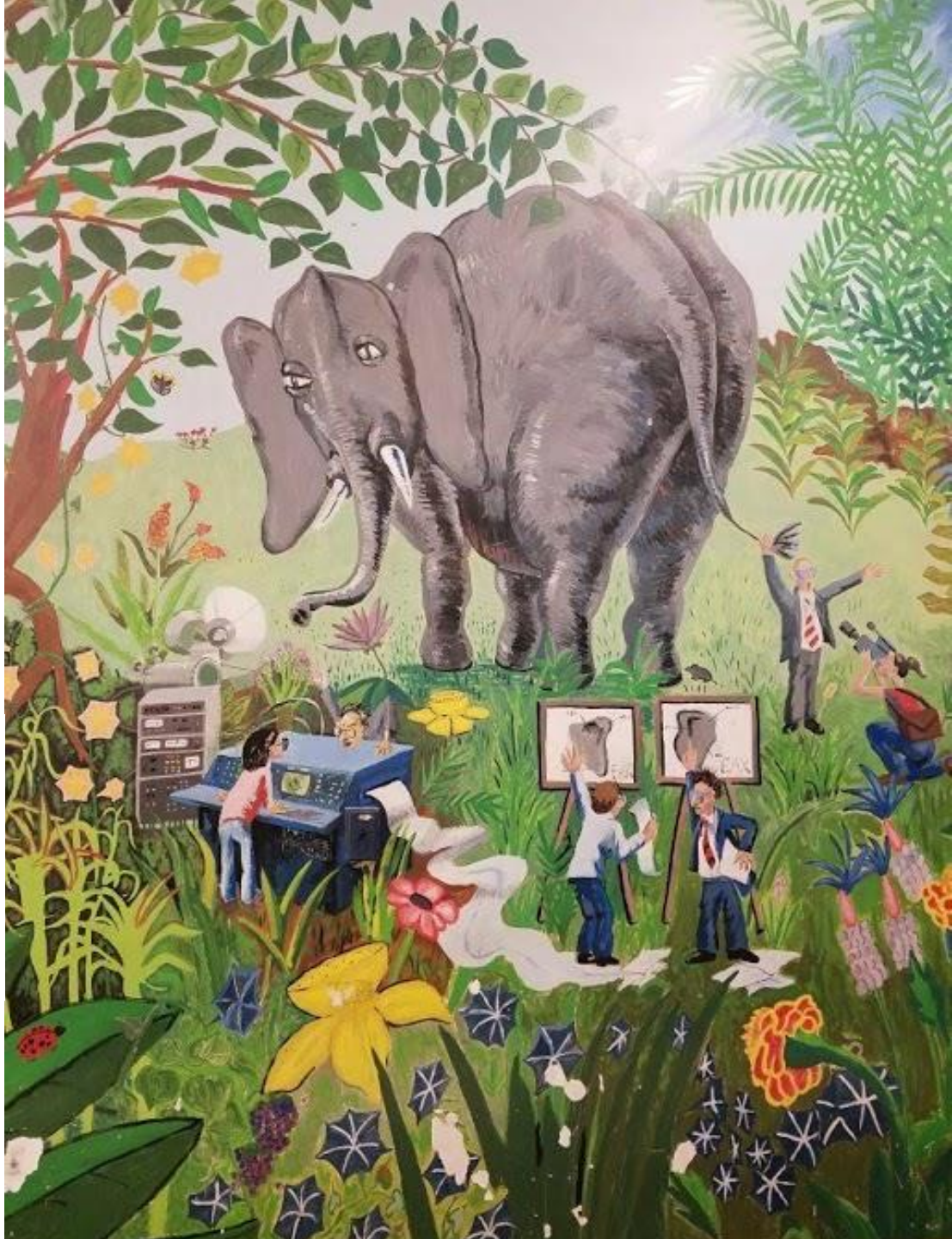
TAPR DCC 2020

THE BLIND MEN AND THE ELEPHANT



Callsign: NA0B
Latitude: 40.52
Longitude: -79.92
GPSDO?: Yes
Callsign: AJ4YA
Latitude: 35.82
Longitude: -78.42
GPSDO?: No
Callsign: N7IVV
Latitude: 38.53
Longitude: -77.79
GPSDO?: No
Callsign: K7KMQ
Latitude: 35.27
Longitude: -119.0
GPSDO?: Yes
Callsign: WA7BNM
Latitude: 34.15
Longitude: -118.4
GPSDO?: Yes
Callsign: W6OQI
Latitude: 34.23
Longitude: -118.2
GPSDO?: Yes

"And so these men of Indostan /Disputed loud and long,
Each in his own opinion /Exceeding stiff and strong,
Though each was partly in the right, / And all were in the wrong! "



IN CONTEXT

Several talks at TAPR DCC this morning about the low-cost Personal Space Weather Station and Doppler measurement.

This is one of two annual meetings where we discuss the PSWS, the other being the annual HamSCI workshop.

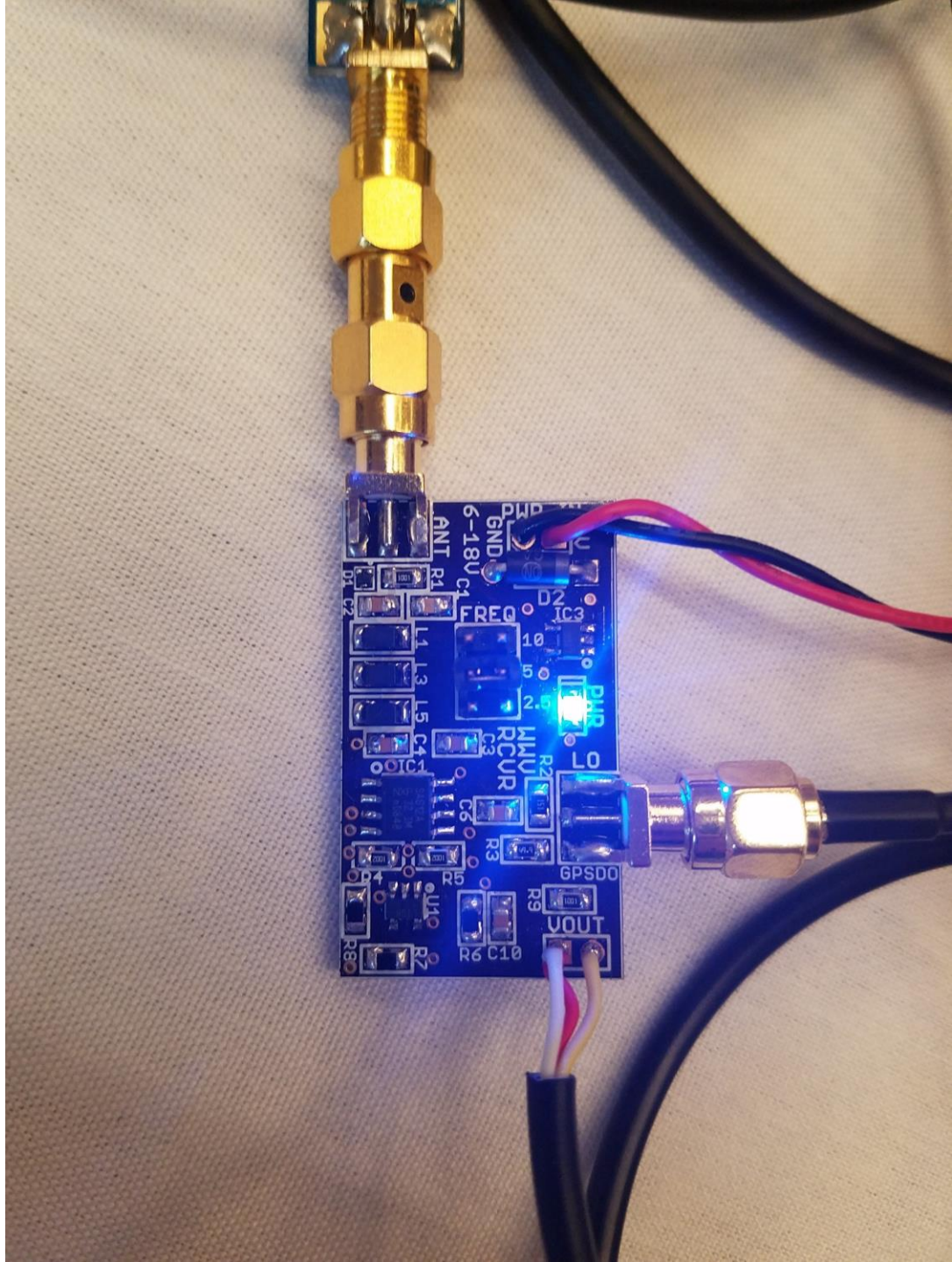
FRIDAY, SEPTEMBER 11, 2020

EDT UTC-4	PDT UTC-7	UTC	PRESENTATION
9:00	6:00	13:00	**Opening Remarks**
9:15	6:15	13:15	**HamSCI PSWS Overview/Status** by Nathaniel Frissell, W2NAF (University of Scranton)
9:30	6:30	13:30	**HF Propagation Measurement Techniques and Analyses** by Steve Cerwin, WA5FRF
10:00	7:00	14:00	**Early Results of Festival of Frequency Measurement Experiment & June 21, 2020 Asian Eclipse** by Kristina Collins, KD8OXT (Case Western Reserve University)
10:30	7:30	14:30	Break Time
11:00	8:00	15:00	**Frequency Estimation Techniques** by David Kazdan, AD8Y (Case Western Reserve University)
11:30	8:30	15:30	**LC-PSWS Engineering Status** by John Gibbons, N8OBJ (Case Western Reserve University)
12:00 NOON	9:00	16:00	**PSWS Control Software and Database** by Bill Engelke, AB4EJ (University of Alabama)

LAST YEAR…

At TAPR 2019, I talked about the Standards Station Receiver.

I also invited you all to check in with our special event for the Centennial of WWV.



(WHY “THE GRAPE”?)

0) Easier to say than “Low-Cost Personal Space Weather Station”

1) Tiny fruit

2) It does its best work in bunches

3) We hope the data will ferment into something quite nice

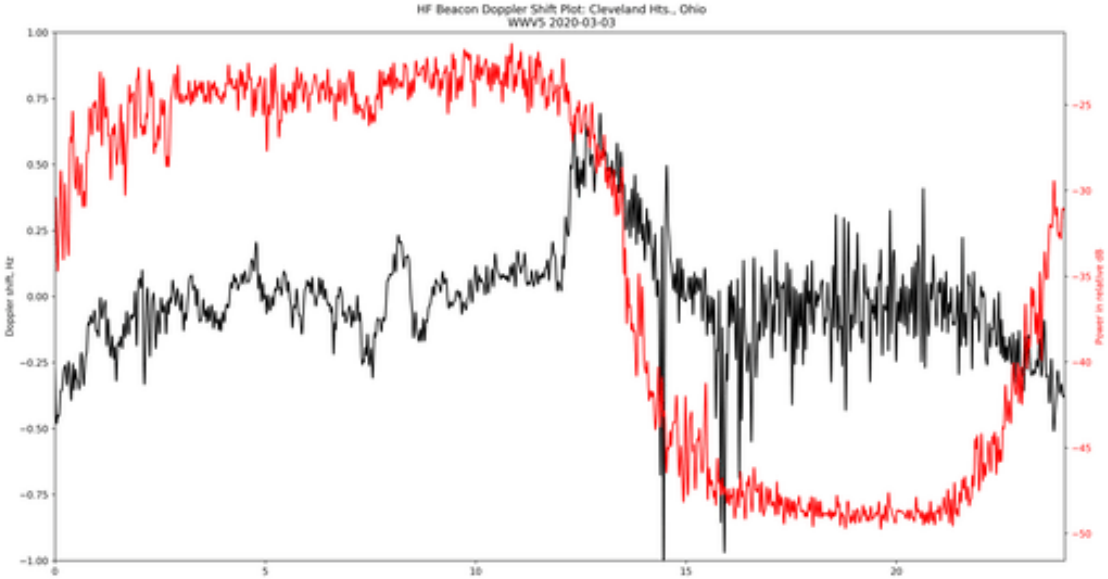
THIS YEAR…

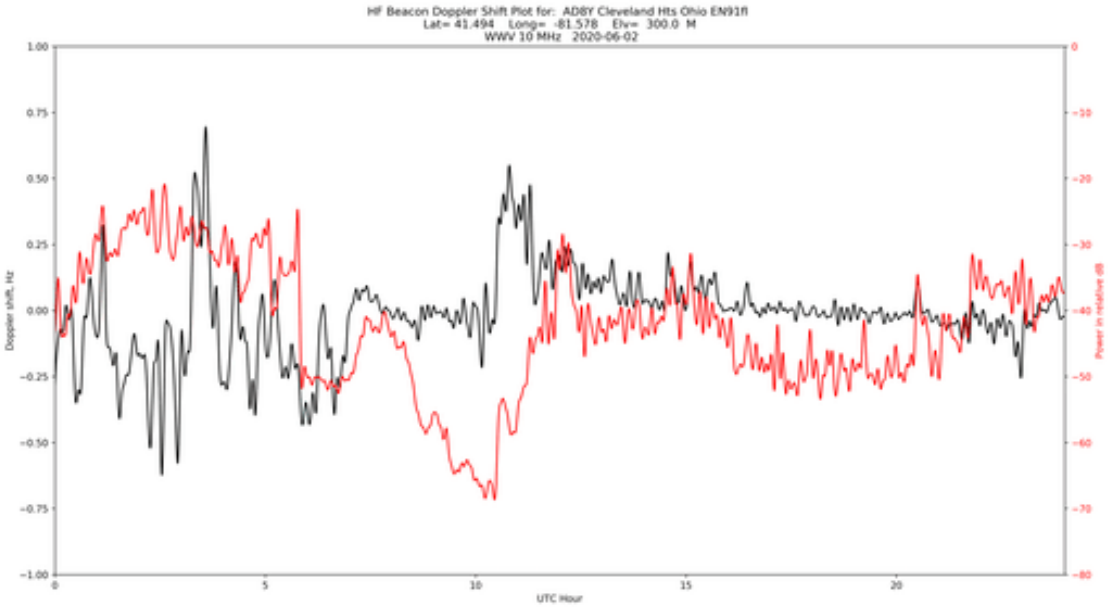
We have three experiments to report:

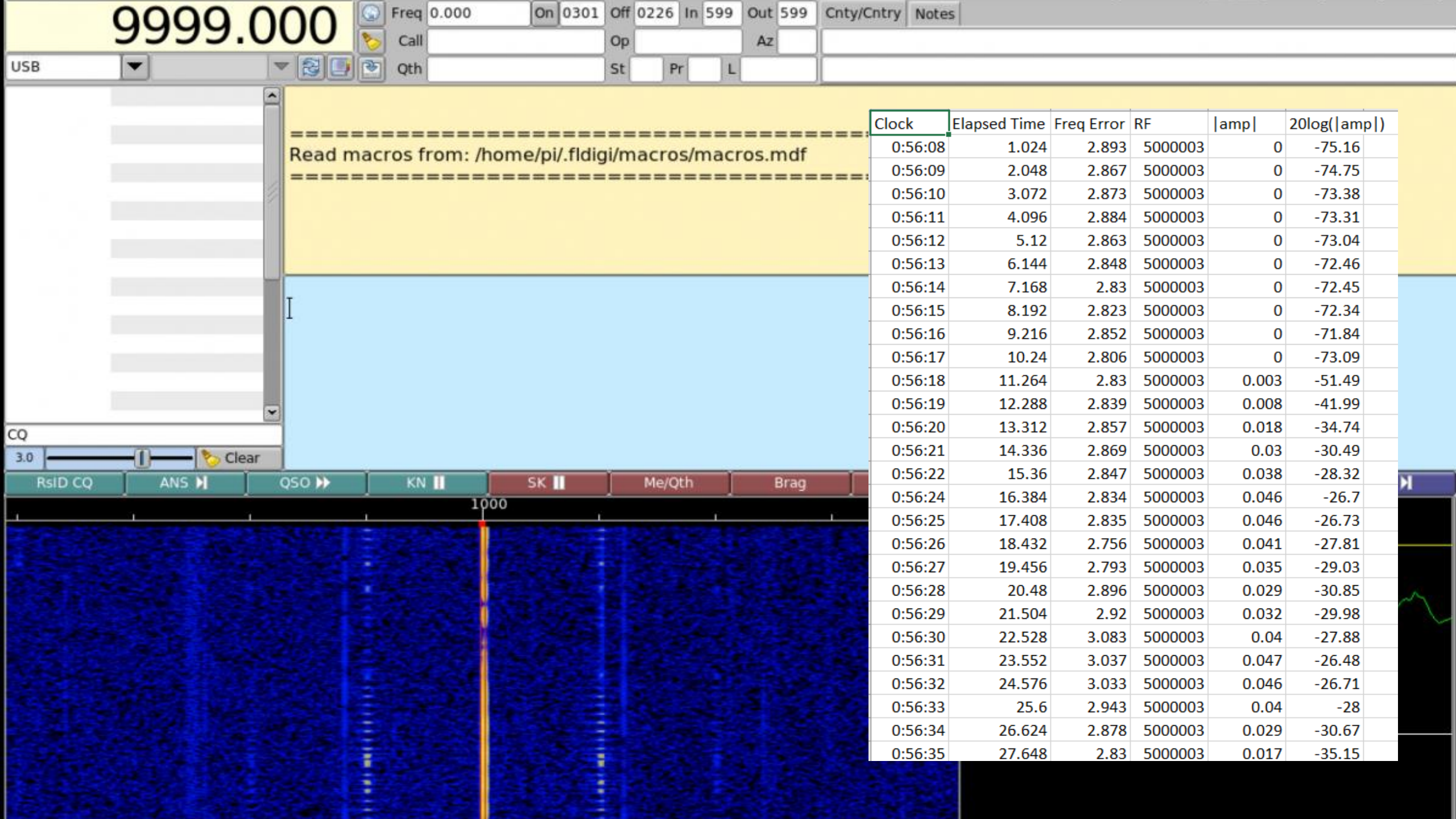
- Long-term data collection: Grape prototypes
- Festival of Frequency Measurement
- June 2020 Eclipse Festival

And experiments for upcoming eclipses:

- December 2020 Eclipse Festival
- Upcoming eclipses in 2021, 2023, 2024







Clock	Elapsed Time	Freq Error	RF	|amp|	20log(|amp|)
0:56:08	1.024	2.893	5000003	0	-75.16
0:56:09	2.048	2.867	5000003	0	-74.75
0:56:10	3.072	2.873	5000003	0	-73.38
0:56:11	4.096	2.884	5000003	0	-73.31
0:56:12	5.12	2.863	5000003	0	-73.04
0:56:13	6.144	2.848	5000003	0	-72.46
0:56:14	7.168	2.83	5000003	0	-72.45
0:56:15	8.192	2.823	5000003	0	-72.34
0:56:16	9.216	2.852	5000003	0	-71.84
0:56:17	10.24	2.806	5000003	0	-73.09
0:56:18	11.264	2.83	5000003	0.003	-51.49
0:56:19	12.288	2.839	5000003	0.008	-41.99
0:56:20	13.312	2.857	5000003	0.018	-34.74
0:56:21	14.336	2.869	5000003	0.03	-30.49
0:56:22	15.36	2.847	5000003	0.038	-28.32
0:56:24	16.384	2.834	5000003	0.046	-26.7
0:56:25	17.408	2.835	5000003	0.046	-26.73
0:56:26	18.432	2.756	5000003	0.041	-27.81
0:56:27	19.456	2.793	5000003	0.035	-29.03
0:56:28	20.48	2.896	5000003	0.029	-30.85
0:56:29	21.504	2.92	5000003	0.032	-29.98
0:56:30	22.528	3.083	5000003	0.04	-27.88
0:56:31	23.552	3.037	5000003	0.047	-26.48
0:56:32	24.576	3.033	5000003	0.046	-26.71
0:56:33	25.6	2.943	5000003	0.04	-28
0:56:34	26.624	2.878	5000003	0.029	-30.67
0:56:35	27.648	2.83	5000003	0.017	-35.15

Celebrating 100 years of WWV

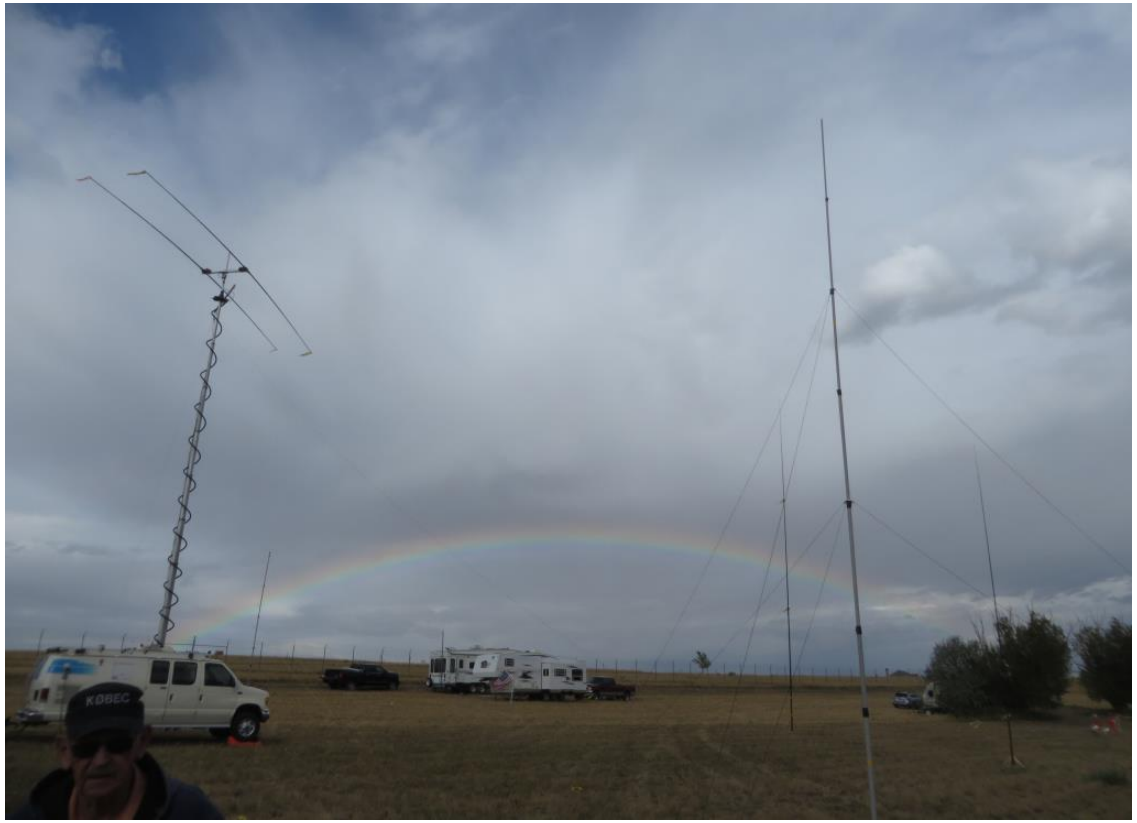
Festival of Frequency Measurement

Festival of Frequency Measurement

Calling all amateur radio stations, shortwave listeners, and others interested in calibrating their equipment and/or capable of making HF frequency measurements--celebrate the 100th anniversary of WWV by participating in frequency calibration and measurement!

WWV is the US broadcast center of frequency distribution and measurement. In that spirit, WW0WWV is sponsoring frequency measurement as part of its activities.

POSTCARDS FROM NERDSTOCK

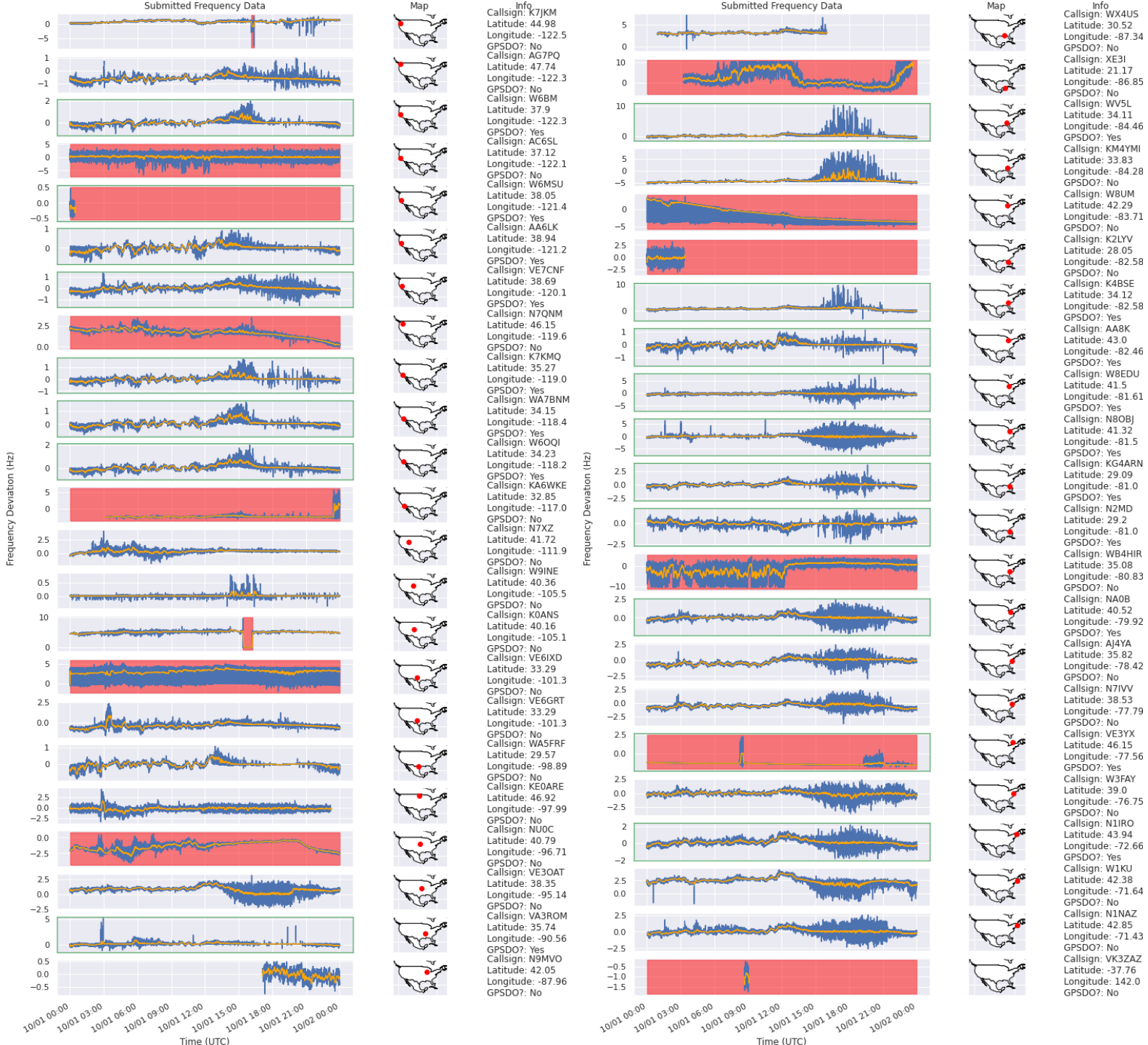


FESTIVAL OF FREQ. MEASUREMENT PARTICIPANTS

We had 45 stations record data during the Festival of Frequency Measurement. Most, though not all, had external frequency standards.

Data was submitted on the open data site www.zenodo.org. >250 KB in total.

Amateur radio callsigns are associated with mailing addresses.



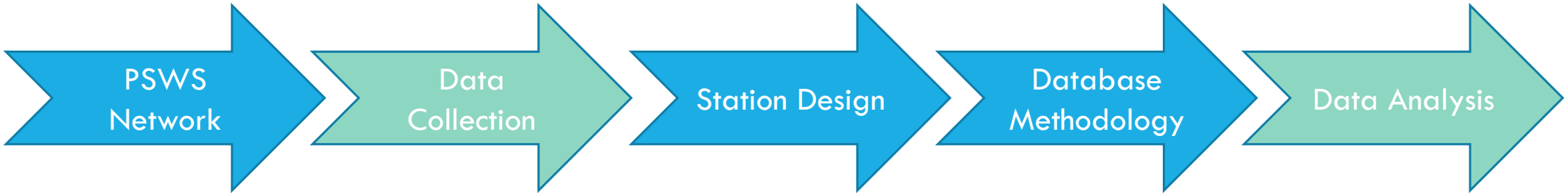
Stacked plot, sorting by longitude, proved to be a good way to evaluate data from many stations at once. It also showed which datasets to eliminate.

Stations near to one another showed similar patterns.

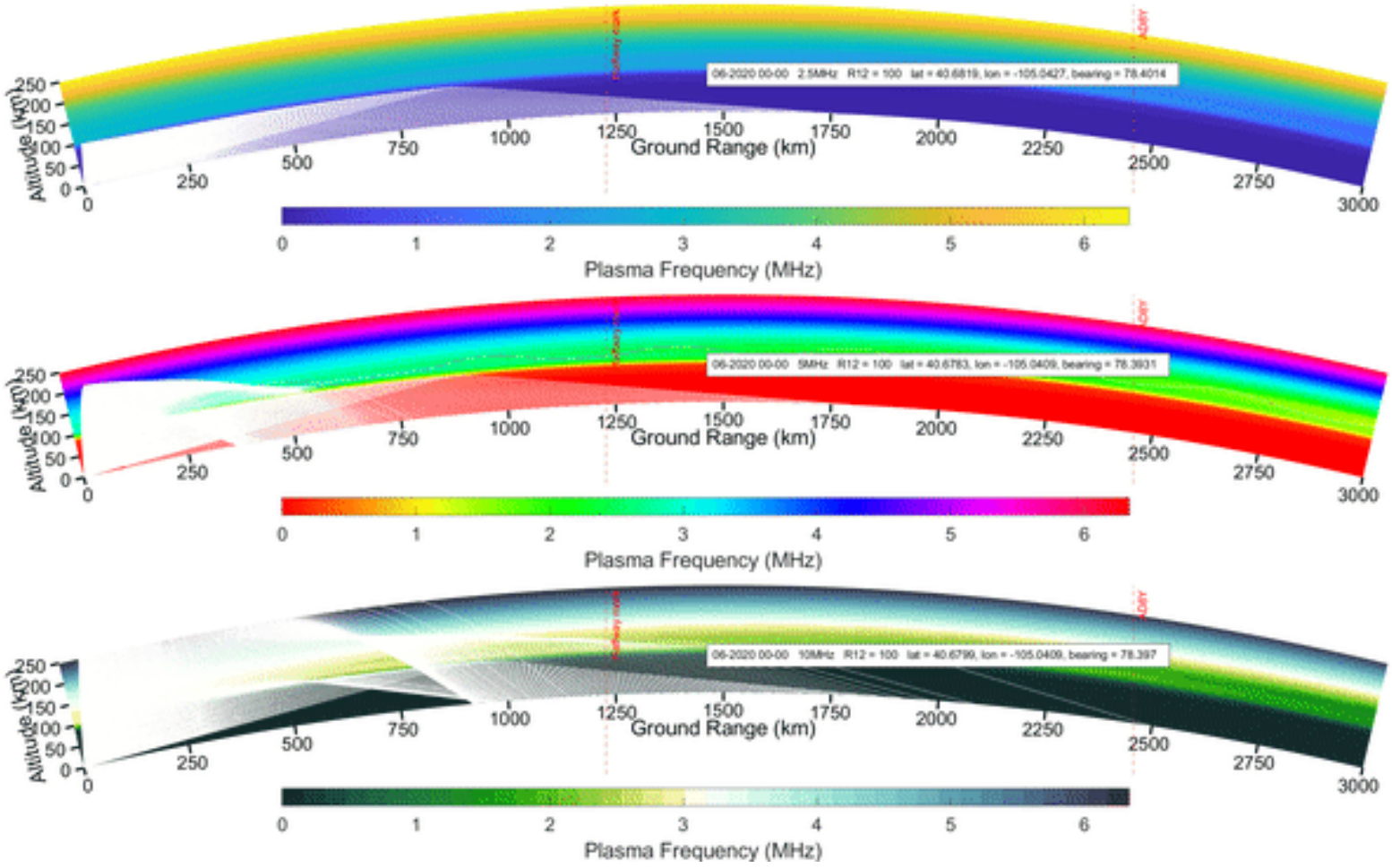
GPSDOs were important.

BIG QUESTIONS FOR THE PERSONAL SPACE WEATHER STATION PILOT EXPERIMENTS

1. **How many volunteer stations can we get?** *As many as possible.*
2. **How close do these stations have to be?** *Wherever they are.*
3. **What kind of data do we need to collect?** *Whatever we can.*
4. **How do we analyze this data once we have it?** *Hmm...*

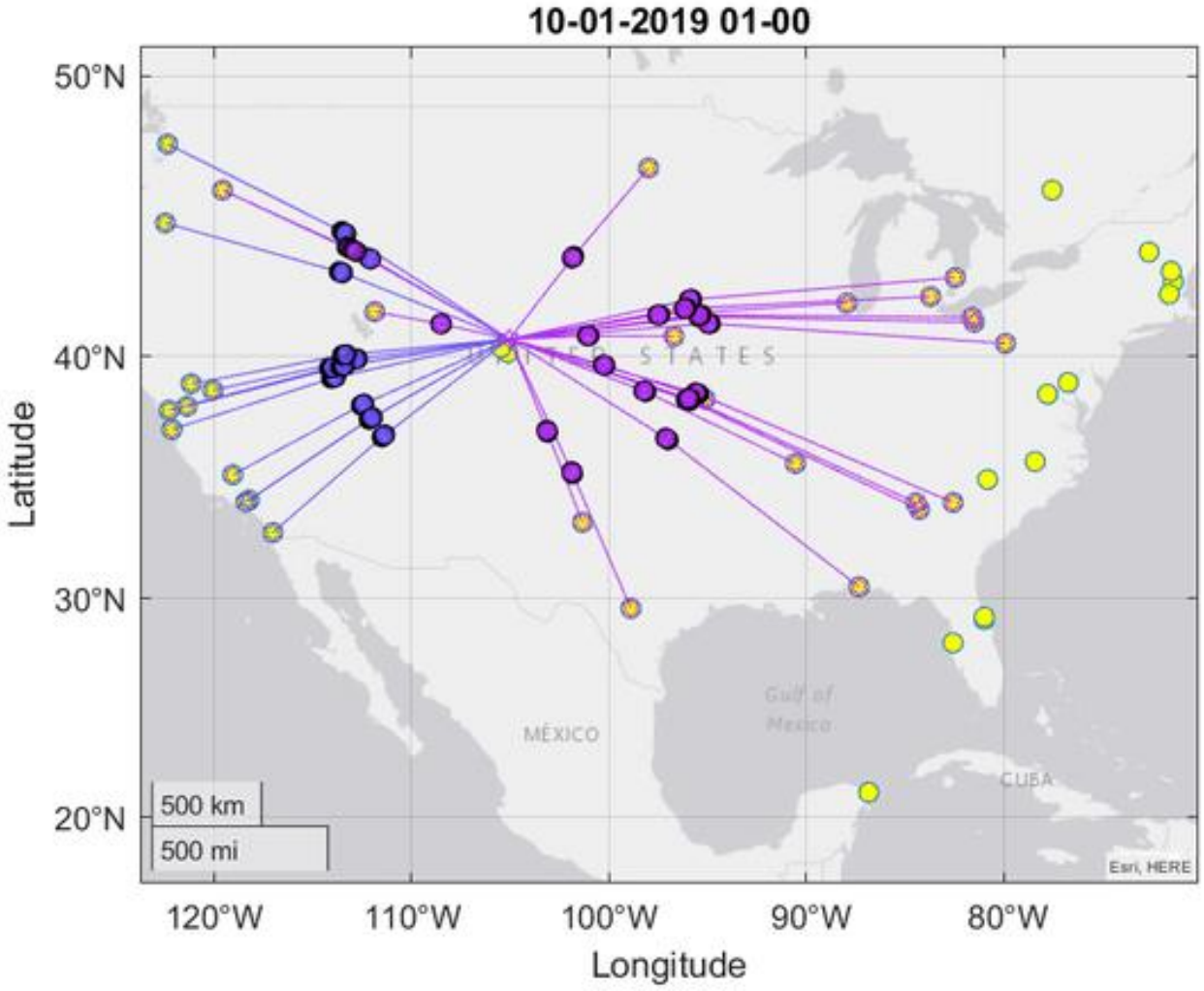


THE "MIDPOINT" ISN'T THE MIDPOINT



PHaRLAP raytrace simulations of WWV to AD8Y's station in Cleveland, using the International Reference Ionosphere. 2.5, 5, and 10 MHz.

THE "MIDPOINT" ISN'T THE MIDPOINT

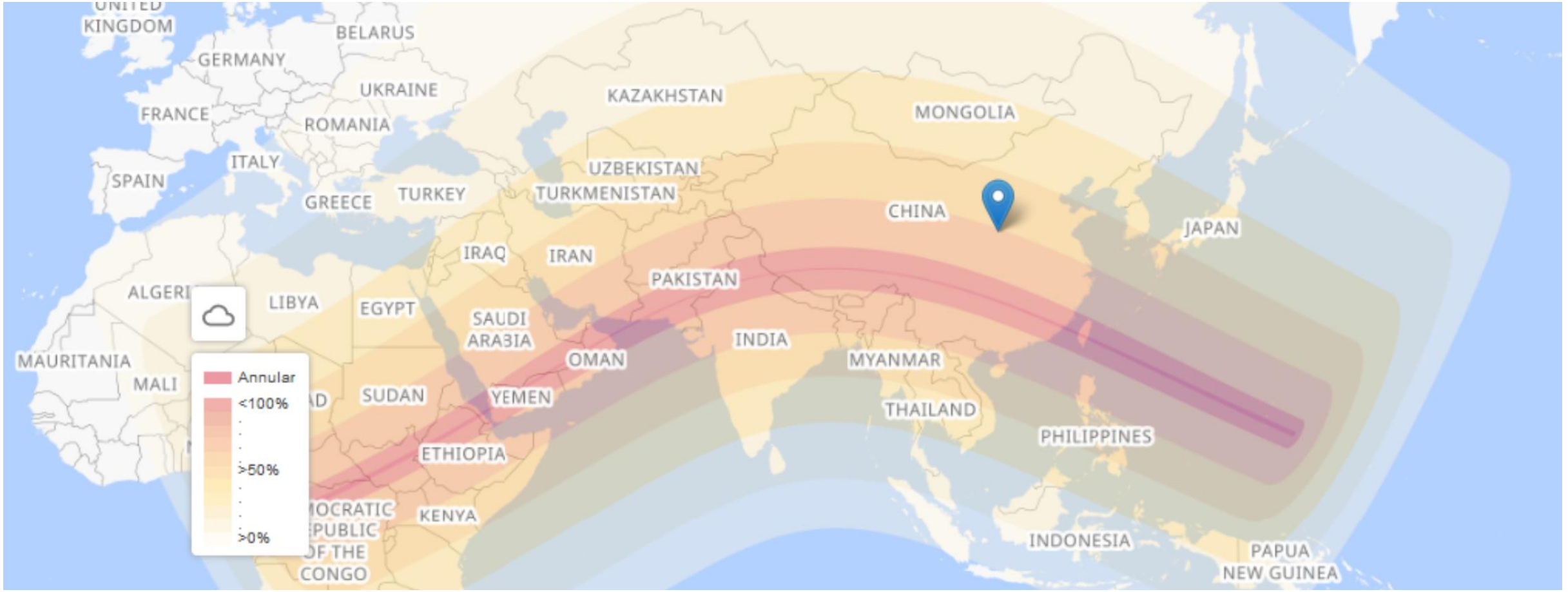


PHaRLAP simulation: Change in ray apogee for each FFM station over a 24-hour period using IRI.

Blue is the E layer, purple F1, pink F2.

Note that the midpoints move around more for some stations than others.

JUNE 21, 2020 ECLIPSE FESTIVAL



JUNE 21, 2020 ECLIPSE FESTIVAL

Standard station: BPM, 10 MHz; otherwise, basically the same process as the original Festival of Frequency Measurement.

https://hamsci.org/june-2020-eclipse-festival-frequency-measurement

Open call to amateur community – website was translated into Chinese, Dutch and Spanish.

Ran a practice day and helped stations get their instrumentation up and working.

Three days of data collection – should record more control data. Analysis is ongoing.

Vereniging voor Experimenteel Radio Onderzoek in Nederland

Blog - laatste nieuws

Hulp radioamateu

04/06/2020 / in Aankondiging

Zoals iedere radioamat
van radiogolven. Zo k
Doppler-verschuivin
waarschijnlijk tijde

Kristina Collins (
maken van de
Daarbij heeft
Doppler-verschuiving
aangesloten computer en opens

Inleiding

Kristina Collins (KD8OXT) is een doctoraatstudent in Cleveland en al
aan HamSCI, een organisatie die de gemeenschap van radioamateurs en die van
Afrika en Azië doorkruisen. Die zonsverduistering
1 en 3 om tijdens de eclips

Radio Licence » News and Events » For Members » Affiliated Radio Clubs » WIA Information » Home

The Wireless Institute of Australia

U bevindt zich hier: Home / Hulp radio

June 2020 Festival of Frequency Measurement:

Date : 09 / 06 / 2020
Author : Oscar Reyes - VK3TX

HamSCI (www.hamsci.org) is looking for amateur radio operators to help collect propagation data during the June 21 eclipse. Data collection requires an HF radio connected to a computer. There will be two data collection exercises: a control day, held on June 14 UTC, followed by the event from June 20–22 UTC, which encompasses the annular solar eclipse across eastern Africa and Asia on June 21.

Details of the experiment may be found here: Link

Interested operators should sign up at this Link or directly contact Kristina Collins at kd8oxt@case.edu.

Source IARU Region 3 https://iaru-r3.org/ Link

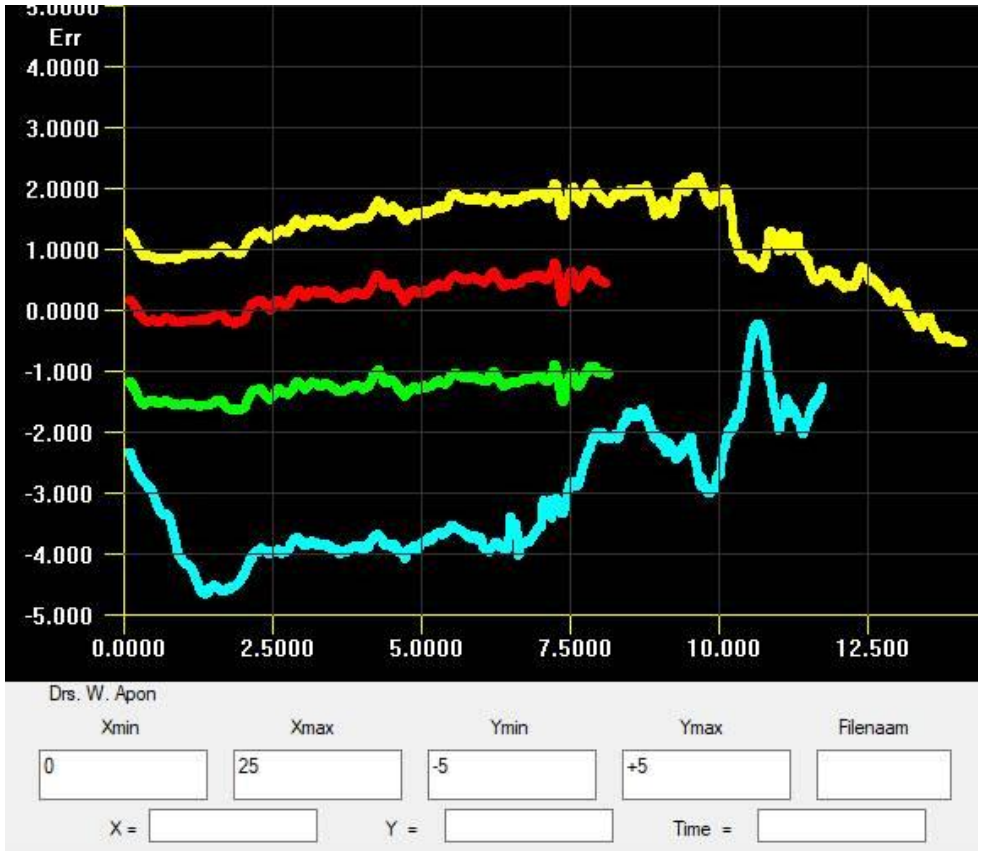
Page Last Updated: Tuesday, 09 Jun 2020 at 10:25 hours by Robert Broomhead

ECEIVER

ns verbonden
gt.

armee ook de HF-
uiving te
et de verzamelde data

NEW FRIENDS



premilinairy result Eclipse Festival ×

Wim <pa0slt@

to me

Hi Kristina,
We are working with 3 guys on the measurements on 10 mHz for some days now.
Our receivers are reasonable stabil now.

This is what we get with a running mean over 10 minutes for today 16 june 2020.
The scale is okay but i added soms numbers to get the lines above eachother.

Yellow is me PA0SLT
Red is PA0RWT, about 5 Km from my home
Green is also PA0RWT with a second rig.
Blue is an other guy with a not stabil receiver. (PE1JVU)

I do not know what we are seeing.... the temp of our receiver or changing of ionosfere.

Maybe you will laugh at us....
but we have fun!

Yours Wim PA0SLT

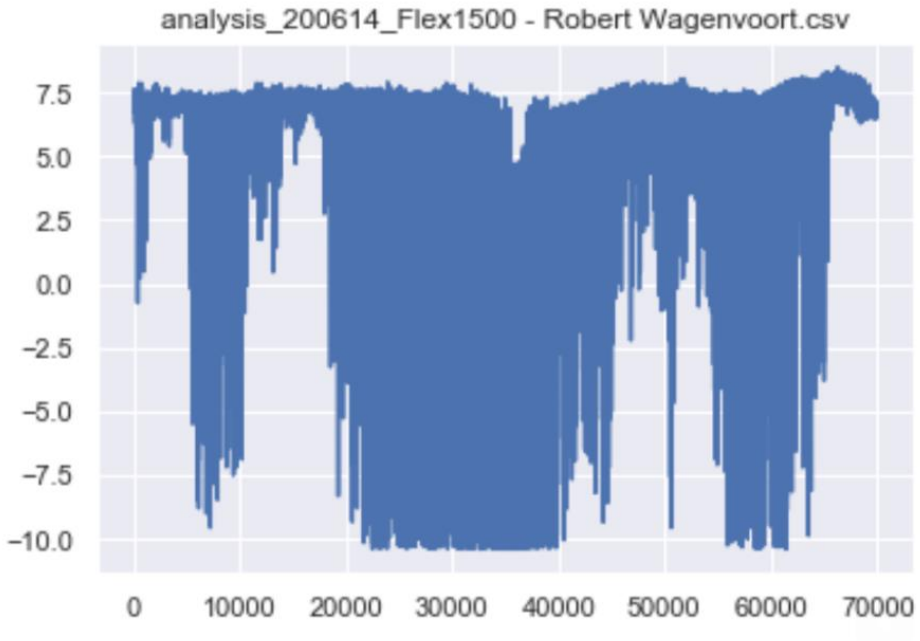
LESSONS LEARNED, SO FAR

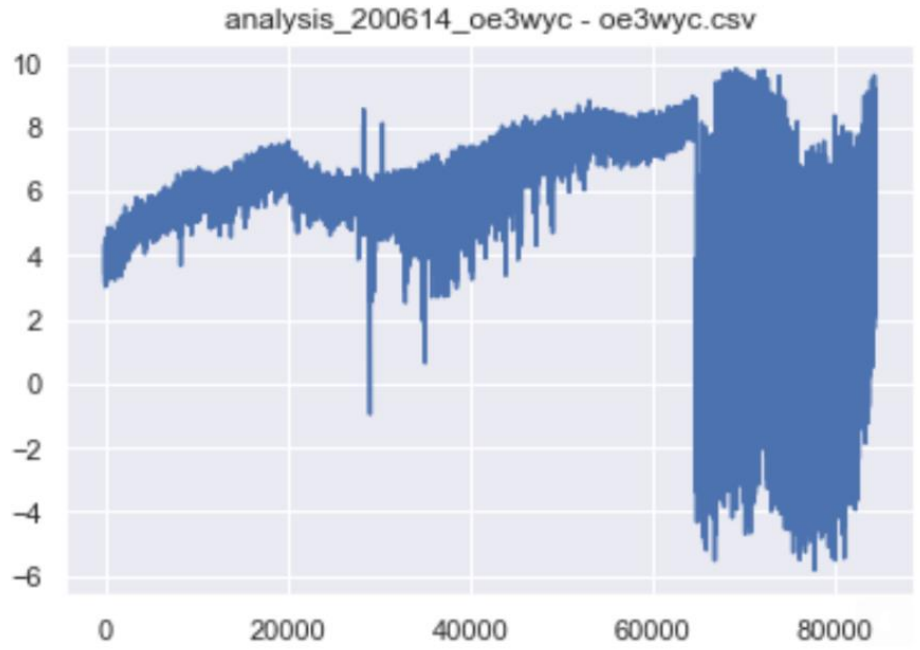
We should be recording raw audio, not a derived data product.

Fldigi is not good at recording audio, which led to computer crashes.

3 days' data collection (plus an optional additional 2) looking for a good control period. In future, let's try recording a full week.

Recording from the existing KiwiSDR network (rx.linkfanel.net) was helpful, but the scripting needs more work – it tended to crash during control periods.



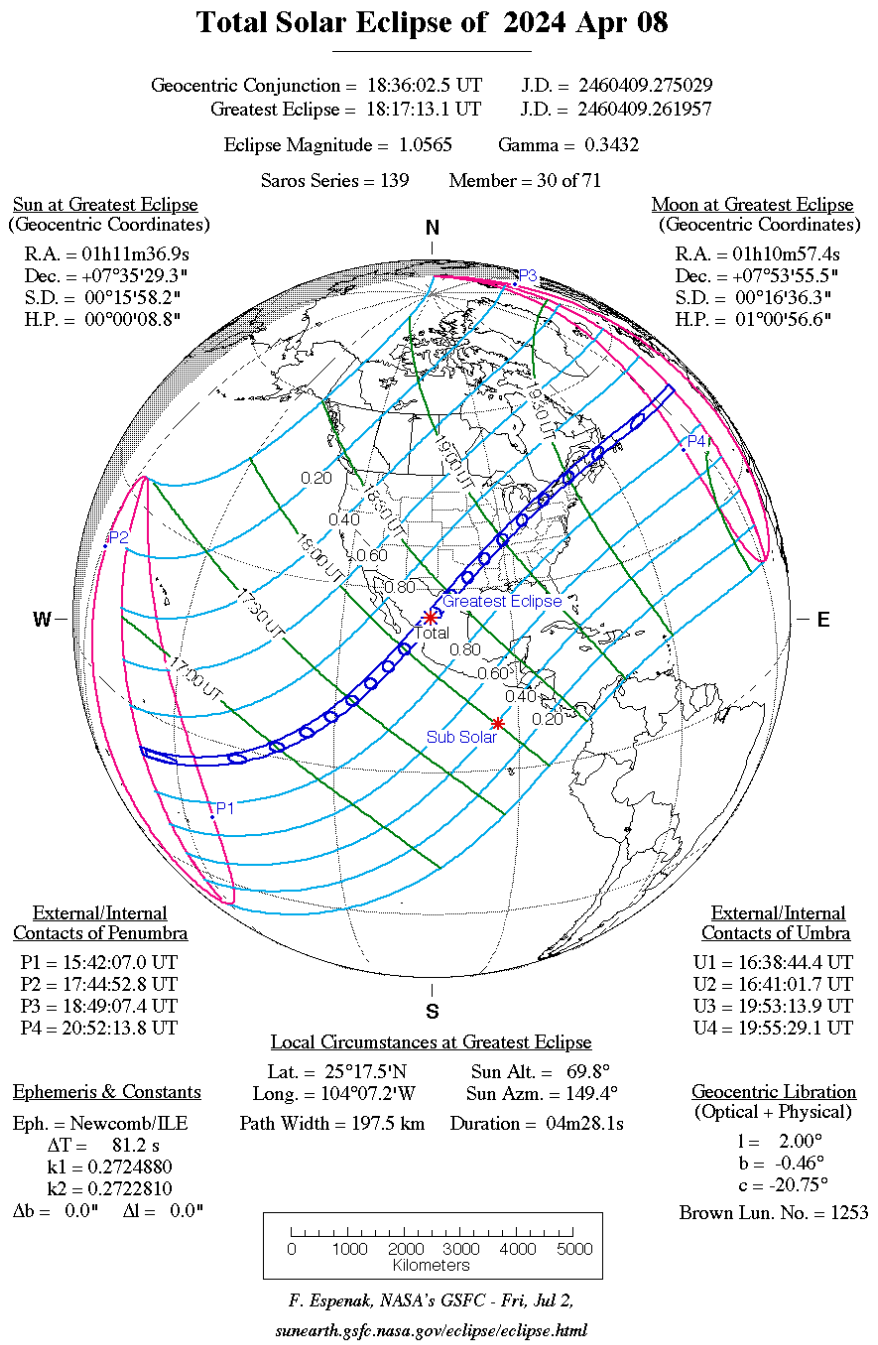


PREPARATIONS FOR THE 2024 SOLAR ECLIPSE

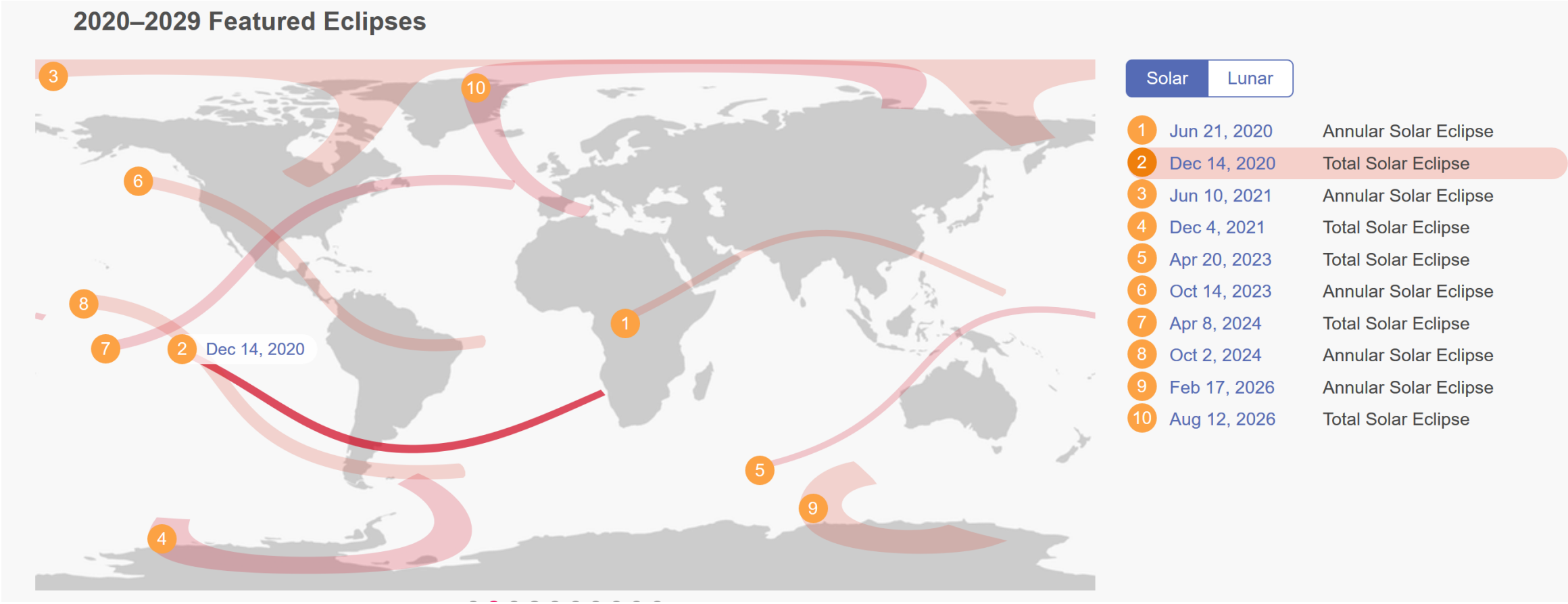
CWRU will be in totality for this one!

We hope to have WWV measuring stations running across the country by then.

With any luck, this will give us the opportunity to make some cool maps.



....BUT WHY WAIT?


2020–2029 Featured Eclipses
3
10
6
8
7
2
Dec 14, 2020
1
5
9
4
Solar
Lunar
1 Jun 21, 2020 Annular Solar Eclipse
2 Dec 14, 2020 Total Solar Eclipse
3 Jun 10, 2021 Annular Solar Eclipse
4 Dec 4, 2021 Total Solar Eclipse
5 Apr 20, 2023 Total Solar Eclipse
6 Oct 14, 2023 Annular Solar Eclipse
7 Apr 8, 2024 Total Solar Eclipse
8 Oct 2, 2024 Annular Solar Eclipse
9 Feb 17, 2026 Annular Solar Eclipse
10 Aug 12, 2026 Total Solar Eclipse

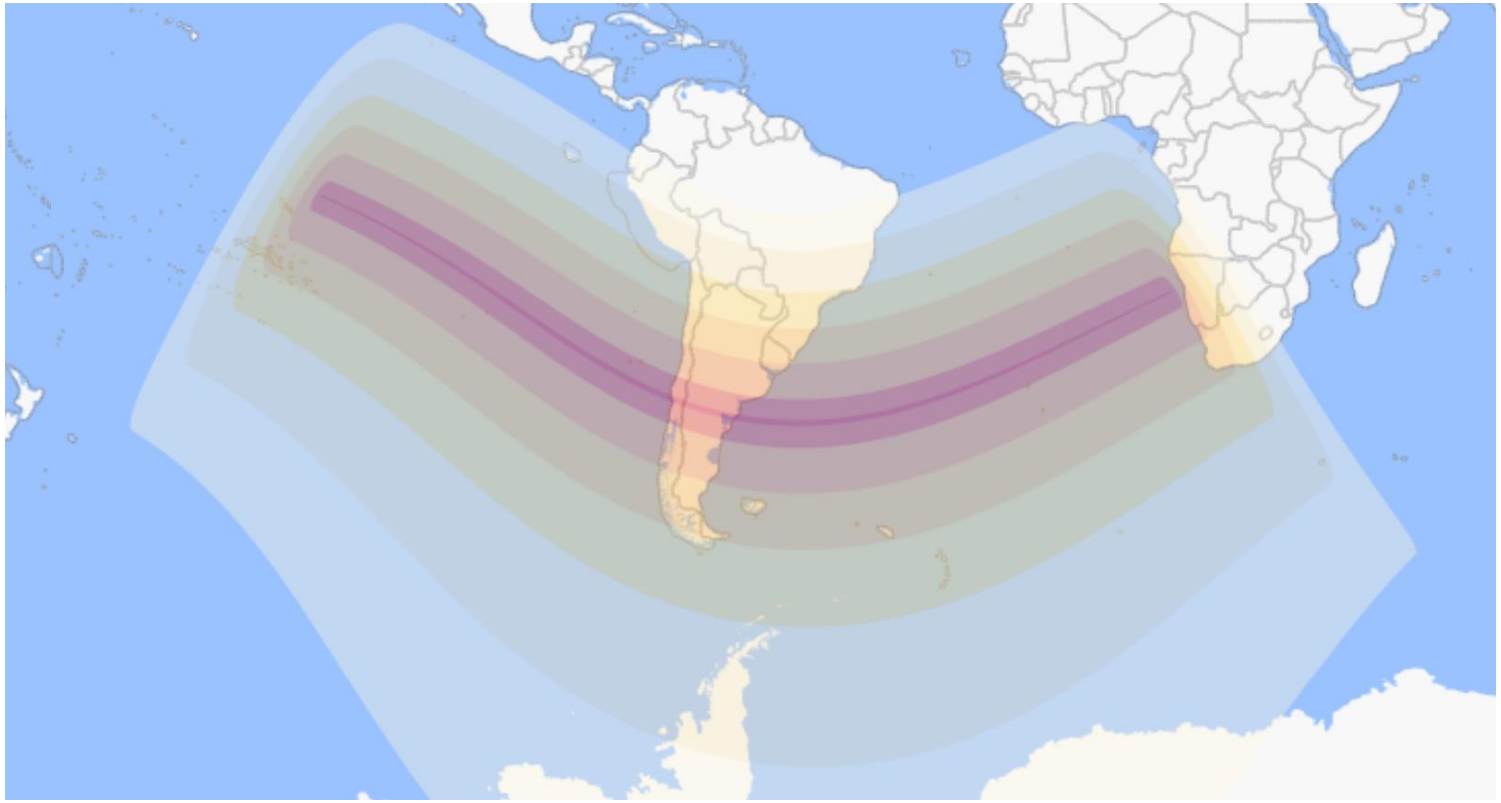
NEXT: DECEMBER 2020 ECLIPSE

Most of the June Eclipse Festival participants also expressed interest in participating in the December eclipse.

Will move away from fldigi collection and not use a derived data product.

Planning to deploy PSWS prototypes in tandem with other networks.

Looking for a Portuguese translator!



https://hamsci.org/december-2020-eclipse-festival-frequency-measurement

FOR MORE INFORMATION…

If you'd like to look at the data from these and future experiments, check out the HamSCI group on Zenodo: https://zenodo.org/communities/hamsci

Join our mailing list and regular telecons: https://hamsci.org/get-involved

Sign up for the December eclipse: https://forms.gle/zk6TtbedfSeu8RAX7

ACKNOWLEDGEMENTS

We gratefully acknowledge support to this project from NSF Grants AGS-2002278, AGS-1932997, and AGS-1932972.

PHaRLAP, created by Dr Manuel Cervera, Defence Science and Technology Group, Australia (manuel.cervera@dsto.defence.gov.au). This toolbox is available by request from its author.

This work made use of the High Performance Computing Resource in the Core Facility for Advanced Research Computing at Case Western Reserve University.

Thanks to W8EDU, WWV, BPM and all experiment participants!

Contact: kd8oxt@case.edu