CQ CHATTER

MARCH 2021 VOLUME B21 •ISSUE 1

WOOD COUNTY AMATEUR RADIO CLUB

President	KG8FH/W8PSK	Jeff Halsey/Loren Phillips
Vice President	KE8CVA	Terry Halliwill
Secretary	N1RB	Bob Boughton
Treasurer	KD8NJW	Jim Barnhouse
Board Member	WB8NQW	Bob Willman

Minutes

WCARC Meeting

February 8, 2021

Jeff-KG8FH presiding

Present: KG8FH-Jeff, KE8CVA-Terry, KE8QEV-Roger, KC8PFO-Rex, KA8CEH-Kent, KC8UFV-Chrissy, W8MAL-Michael, W8ALM-Allen, WB8NQW-BOB, N1RB-Bob, WE8TOM-Tom, KD8UHO-Zach, WD8LEI-Eric

Meeting called to order: at 7:30 with Pledge of Allegiance (Woodland Mall).

Minutes: of January business meeting as published in February CQ Chatter were approved (LEI/CVA).

Treasurer Report: Treasurer was not in attendance

Old Business:

- All Club repeaters and beacons (VHF/UHF, Fusion, APRS) are currently functioning at nominal levels. As always, if any operator detects a fault, please let one of the officers know.
- Eric (LEI) gave an update on Wood County ARES activities. He noted that the Sheriff has several voting receivers in dead storage which could be used in conjunction with the ARES repeater—-he will investigate. He also related that the HF antennas on the Courthouse Annex roof still need to be erected—will have to wait for warmer weather. Eric also mentioned that there Is a new

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Net Check Ins

Feb 2 ***Traffic: 0***

KG8FH (NCS)
WD8JWJ
K8JU
KD8RNO
KE8CVA
K8DLF
KD8AVT
WD8LEI
WB8NQW
KD8NJW
N1RB
WE8TOM
KA8VNG
WD8ICP
KC8EKT (15)

Feb 9 ***Traffic: 0***

WB8NQW (NCS)
WWE8TOM
N8VNT
KE8CVA
KC8EKT
KG8FH
WD8ICP
WD8LEI
K8LL
KD8RNO
N1RB
KD8NJW
WD8JWJ (13)

Brain Teasers

1. What is good amateur practice if propagation changes during a contact and you notice interference from other stations on frequency?

a.) tell the interfering stations to change frequency

b.) report the interference to you local Amateur Auxiliary Coordinator

c.) attempt to resolve the interference problem with the other stations in a mutually acceptable manner

d.) increase power to overcome interference

2. Which of the following is an advantage when using single sideband, as compared to other analog voice modes on the HF amateur bands?

a.) very high fidelity voice modulation

b.) less subject to interference from static crashes

c.) ease of tuning on receive and immunity to impulse noise

d.) less bandwidth and greater power efficiency

3. In what part of the 13 cm band may an amateur station communicate with non-licensed WiFi stations?

a.) anywhere in the band

b.) channels 1 through 4

c.) channels 42 through 45

d.) nowhere

March Contests

The contest lineup for the month of March is given below. Please note that the WARC bands (60, 30, 17 and 12 m) are never open to contesting.

Mar 6-7	*0000 to 2359 Z*	160 m to 10 m
ARRL Int'l DX 'test		**SSB**
Mar 13-14	*1400 to 2100 Z*	80 m to 10 m
Oklahoma QSO Party		**all modes**
Mar 13-14	*1600 to 1600 Z*	80 m to10 m
EA (Spain) PSK 63 'test		**PSK**
Mar 13-14	*1900 to 1900 Z*	160 m to 10 m
Idaho QSO Party		**all modes**
Mar 14-15	*1800 to 0100 Z*	160 m to 10 m
Wisconsin QSO Party		**all modes**
Mar 20-21	*1200 to 1200 Z*	160 m to 10 m
Russian DX 'test		**CW/SSB**
Mar 20-21	*1400 to 2359 Z*	160 m to 10 m
Virginia QSO Party		**all modes**
Mar 27-28	*0000 to 2359 Z*	160 m to 10 m
CQ WW WPX 'test		**SSB**

Time to Renew

WCARC 2021 membership dues are payable to:

WCARC Treasurer, P. O. Box 534

Net Check Ins

Feb 16		**Traffic: 0**
	KD8NJW	(NCS)
	WE8CVA	
	KC8EKT	
	KG8FH	
	WD8LEI	
	WB8NQW	
	WE8TOM	
	KD8RNO	
	N8VNT	
	N1RB	
	WD8ICP	
	KE8CUZ	(12)
Feb 23		**Traffic: 0**
	WB8NQW	(NCS)
	K8BBK	
	KE8CVA	
	K8DLF	
	KC8EKT	
	KG8FH	
	WD8JWJ	
	WD8LEI	
	KD8RNO	
	N1RB	
	WE8TOM	
	KA8VNG	
	WD8ICP	
	KB8YRS	
	KD8NJW	(15)

Brain Teaser answers: (G) 1-c, 2-d, 3-d

Ham Radio Forms Space Weather Sensor Network

from EOS (AGU) by Kristina Collins David Kazdan, and Nathaniel A. Frissell

Space weather events, triggered by solar emissions and their interactions with Earth's atmosphere, can have significant effects on communications and navigation technology and on electric power systems. As with terrestrial weather events, the economic impacts of space weather–related disruptions can be substantial, affecting satellite systems as well as systems on the ground. A severe geomagnetic storm (on the order of the **Carrington Event** of 1859) could have a **catastrophic effect** on modern infrastructure. Even solar storms of more ordinary size can induce currents in the power grid that drive up energy prices, affecting manufacturing and commerce.

Considerable interest exists in developing space weather forecasting technologies that use Earth's ionosphere as a sensor for events in its neighboring atmospheric layers. The ionosphere occupies a privileged niche in the geospace system, as it is coupled into both the terrestrial weather of the neutral atmosphere below and the space weather of the magnetosphere above.

Although we have a good understanding of ionospheric climate—diurnal and seasonal variations are well known, as are the rhythms of the sunspot cycle—there are new and vital areas of research to be explored. For example, it is known that the ionosphere—and near-Earth space—experiences variability (e.g., radio signals can fade in and out over periods of seconds, minutes, or hours due to changes in ionospheric electron densities along signal propagation paths), but this variability has not been sampled or studied adequately on regional and global scales.

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WCARC Weekly Net

Tuesdays at *2100* all year

147.18 MHz 67 Hz PL

Net Control Roster

Mar 2	*N1RB*
Mar 9	*KG8FH*
Mar 16	*KD8VWU*
Mar 23	*KD8NJW*
Mar 30	*WB8NQW*
Apr 6	*N1RB*

NEXT MEETING

Breakfast Meeting

Saturday

March 6

TIME: 9:00 AM

PLACE:

Frisch's Big Boy
N. Main St. & E. Poe Rd.
Bowling Green, OH

10 meter Net

informal group meets

Sunday

@ 20:30

on 28.335 MHz

Fusion Net

Thursday

@ 19:30

on 442.125 MHz

67 Hz PL on analog

Informal net

minutes—from p. 1

protocol in place to guard against jammers and other ne'er-do-wells. Contact him for details.

New Business:

- Bob (NQW) reported that he had downloaded a list of all the amateurs in the 43402 zip code area, and was amazed at how many there were. He mentioned that he thought the Club could participate in many more activities with more "hands" available. He suggested that the Club should try to recruit them to become members. One suggestion was to send out a simple postcard, another was to include a Club brochure along with a cover letter of invitation. Motion was made to implement the latter (RB/ALM). Motion carried.
- Tom (TOM) suggested that we also try recruiting the local amateur RC hobbyists.

Program:

Several members of Lucas County ARES (KC8UFV, W8MAL, W8ALM), who are interested in implementing the AREDN mesh protocol for local communications needs, delivered a talk and a demonstration of the new application. They set up a mini-mesh along one of the mall corridors and demonstrated voice and text messaging equipment that is portable and that can be set up in a few minutes' time.

The group has participated in local events such as the Glass City Marathon and Toledo Air Show, where they activated security cameras on the mesh. All operation at present is on 2.4 GHz and 5.8 GHz. Typical network speeds can range up to 29 Mbps. The mesh is capable of handling just about anything that one can do using the internet.

Chrissy demonstrated her spiffy go-kit which allows her to join the mesh on battery power with a very minimal antenna. The group is quite willing to help any of us in Wood County who have an interest.

Eric (LEI) mentioned that one of his goals is to link Wood, Lucas, Hancock and any other nearby counties in a mesh for emergency communications.

Adjournment: at 8:30 PM (LEI/TOM) ■

Ham radio—from p. 4

To fully understand variability on small spatial scales and short timescales, the scientific community will require vastly larger and denser sensing networks that collect data on continental and global scales. With open-source instrumentation cheaper and more plentiful than ever before, the time is ripe for **amateur scientists** to take distributed measurements of the ionosphere—and the amateur radio community is up for the challenge.

The Ham Radio Science Citizen Investigation (**HamSCI**) is a collective

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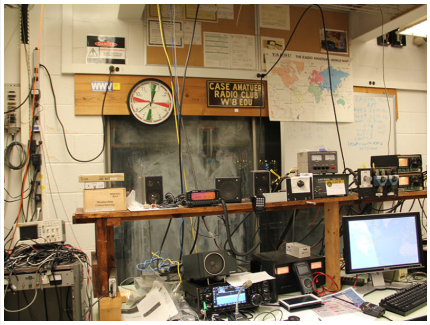
that unites amateur radio operators with the research community in the space and atmospheric sciences. This confederation of scientists, engineers, and hobbyists holds **annual workshops** during which ham radio operators and space scientists share findings. A new HamSCI effort, the **Personal Space Weather Station** project, aims to develop a robust and scalable network of amateur stations that will allow amateurs to collect useful data for space science researchers. The next HamSCI workshop will be held virtually 19–21 March 2021, and it will focus on midlatitude ionospheric measurements.



Equipment belonging to the Case Western Reserve University amateur radio club. Credit: Kristina Collins

A Ready-Made Volunteer Community

From a communications point of view, the electromagnetic spectrum is a finite resource. Signals from broadcasting, telecommunications, and navigation all have their own demands of bandwidth and range. Spectrum allocations are managed by government agencies, such as the Federal Communications Commission (FCC) in the United States. Most countries allot some of the available spectrum to amateur users for the purposes of recreation, experimentation, and the promotion of international goodwill. There are more than 760,000 licensed amateur radio operators and uncounted shortwave listeners in the United States alone.

Amateur radio operators have an empirical knowledge of space weather because they want to know when and on what frequencies they can establish communications—and when and where they cannot. Changes in the ionosphere like those caused by the **day–night transition** or by solar activity can impede or aid communications on various frequencies. For example, the 20-meter band (14–14.35 megahertz) usually has its longest transcontinental reach during daylight hours, but the 40-meter band (7–7.3 megahertz) often works best at night. Amateur radio frequency allocations are distributed throughout the electromagnetic spectrum, enabling useful propagation experiments for any frequency range.

In the pursuit of the hobby, many an amateur operator (or "ham") has experienced hearing the high-frequency (HF) bands (3–30 megahertz) go quiet right after sunset or has swapped frequencies to reach a distant station. Hams greatly value forecasts of **space weather conditions** and real-time information about propagation, and the community has a high level of scientific literacy on the topic. Resources like **spaceweather.com** and a weekly podcast by Tamitha Skov (the "**Space Weather Woman**," whose amateur call sign is WX6SWW) are regularly consulted

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today by hams looking to achieve a distant contact.

Ham radio is currently experiencing a technical renaissance, thanks to the advent of inexpensive single-board computing platforms (a complete computer built onto a single circuit board, such as a **Raspberry Pi**) and open-source software. Such computer-based systems serve as virtual radio repeaters, connecting computers via the Internet to actual ham radios in the real world to enable remote control and data collection. Beyond the old-fashioned pursuit of voice communication, the lure of **maker movement** projects and the removal of the **Morse code requirement** from the amateur licensing exam have led to a greater number of licensed amateurs than ever before.

Out of this increasing technical sophistication, digital communications networks, such as the **Automatic Packet Reporting System** (APRS), the **Weak Signal Propagation Reporter** (WSPR), and the **Reverse Beacon Network** (RBN), enjoy wide membership and serve the amateur community while collecting propagation data at rates and resolutions that were previously impossible. The reach of these crowdsourced systems, and the support of the amateur community, offers tremendous opportunities for scientific measurements.

One such measurement took place at sunset on 17 October 2017, when amateur station **W8EDU** in Cleveland transmitted the Morse code for "TEST TEST TEST DE W8EDU W8EDU W8EDU" on frequencies in the 20-, 40-, and 80-meter bands. A map of the automated listening stations in the RBN that picked up, or "spotted," this signal shows all of the spots with extant propagation paths (Figure 1). In this case, the result clearly shows that the 40-meter paths go primarily to the nightside of the terminator (the moving boundary between regions in daylight and those in darkness), and the 20-meter paths primarily to the dayside.

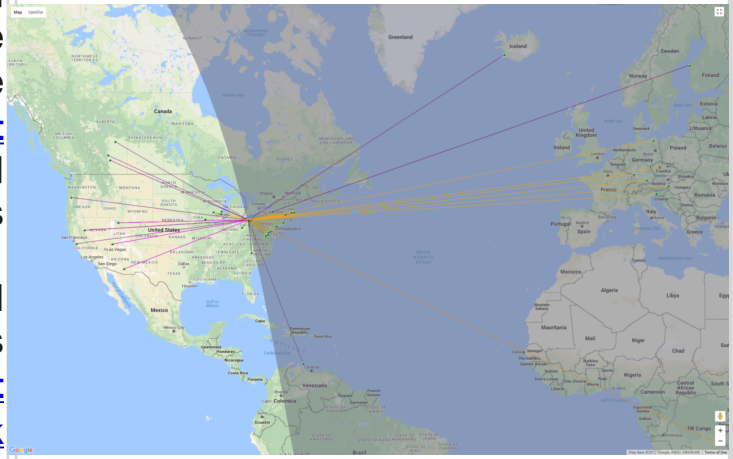

Fig. 1: RBN map of W8EDU spots

Harnessing the Data for Science

How can ham radio signals tell scientists about energy and particles originating in the Sun and traveling millions of miles through space? The answer lies in the ionosphere, the electrified atmospheric region that can refract radio signals back to Earth. This is a complex region heavily influenced by the solar wind, extreme ultraviolet ionizing radiation, and geomagnetic disturbances, and even by the lower and middle neutral atmosphere.

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From the perspective of scientists studying the ionosphere, ham radio data become most interesting in aggregate. All the data in the RBN, from 2009 to the present, are archived at **reversebeacon.net** and can be freely downloaded. For scale, the earlier-referenced Cleveland transmission represented only a small subset of the 168,713 radio spots that were recorded on 17 October 2017, each one representing a propagation path between two points on a given frequency at a given time.

HamSCI encouraged amateur operators to generate data on the RBN during the North American **eclipse of 2017**. Later analysis confirmed that the RBN data were consistent with physics-based ionospheric models, indicating the promise of this system for collecting propagation data.

A further advantage of collecting data through the amateur community is that these observations tend to naturally fulfill the requirements of **FAIR data**: findable, accessible, interoperable, and reusable. Amateur operators are prohibited by the strictures of licensure from earning money through the act of operating, so most data used by operators are open and accessible at their creation. Because much of the amateur community is technically literate, databases and records are structured around machine readability. Most important, amateur radio has a global and persistent identifier woven into the metadata of every recorded contact: Each licensed operator or club has a unique call sign, tied to a physical address in its respective government database.

"At the Tone, the Time Will Be…"

Just outside Fort Collins, Colo., lies the heartbeat of the electromagnetic communications spectrum—and one key to precision measurements of the interactions between ham radio and solar weather. The sound of **radio station WWV**, the time and frequency standard of the National Institute of Standards and Technology, is familiar to any shortwave listener. It is the oldest continuously operating radio station in the United States, having been on the air since 1919. Today WWV and its sister station WWVH in Hawaii broadcast the familiar "At the tone, the time will be…" message on 2.5, 5, 10, 15, and 20 megahertz, with the frequencies calibrated to at least nine significant digits.

These stations supply listeners with standardized time information, high-seas weather forecasts, and other programming. Station WWVB, located at the same Colorado site, transmits on 0.060 megahertz and provides timing information to radio-controlled "atomic" clocks. In recent months, WWV's precise, cesium-controlled carrier has found another use as a beacon for ionospheric measurements.

Radio signals provide a window into the changing ionosphere. The various

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signals from WWV, reflecting off the ionosphere, undergo changes in path length as the ionospheric electron density profile changes. This results in changes to the observed frequency of radio signals at receiving points, akin to the rise and fall in pitch of a passing train whistle.

Comparing the received radio signal with a precision local frequency standard, such as a **GPS-disciplined oscillator**, allows a user to measure these ionospherically induced frequency shifts. This measurement is prepared and recorded with **open-source software**. Numerous data sets recorded simultaneously from multiple locations offer information—when these data sets are examined both individually and collectively—about the ionosphere at the time the data are taken. This information includes the movements of **traveling ionospheric disturbances** and other important phenomena at various scales.

The Festival of Freq. Measurement

On 1 October 2019, HamSCI celebrated the **centennial** of WWV with a Festival of Frequency Measurement. HamSCI issued an **open call** to amateur radio operators and shortwave listeners to gather Doppler shift data, and about 50 stations responded. We presented the results of this experiment at AGU's Fall Meeting 2019, and the data from the experiment are **freely available**. These data are rich with signatures of ionospheric dynamics, including coherent wave-like disturbances with periodicities at night of about an hour. The observations are more quiescent during the day.

WWV was never intended to provide these data, but the station's exceptional precision, high power, and guaranteed continuous availability make it a perfect beacon. Thanks to the advent of inexpensive GPS-disciplined oscillators and single-board computers, amateur scientists can assemble complete prototype systems to collect such data for less than $200, or they can build systems from existing equipment. Thus, the amateur community, mobilized on a national scale, can generate a large-scale, novel data set for ionospheric study.

Data collection campaigns during the solar eclipses of 2020 demonstrated the potential for scientists to engage with the amateur community. Dubbed the Eclipse Festivals, these events followed the template of the WWV centennial event on a global scale, using 10-megahertz time standard stations. **The June 2020 Eclipse Festival**, built around the **annular solar eclipse** across eastern Africa and Asia on 21 June, ran for 3 days and included volunteer participation from 50 stations in 19 countries. The **December 2020 Eclipse Festival**, a 7-day campaign built around the **total solar eclipse** across South America on 14 December, drew data submissions from over 80 stations. The strong participation in these events demonstrates the community's interest in community science and the potential for deployment in science campaigns. ■

FOR SALE

Yaesu FT1XDR.

Will not connect to Wires-X. Does all other FM and Fusion

ASKING: $100.00

CONTACT: WD8JWJ, Bill

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WOOD COUNTY ARC
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BOWLING GREEN, OH
43402
