

# High-Country Static

March 2016

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## News and Information Concerning

Welcome to the Coconino Amateur Radio Club (CARC) Monthly Newsletter. CARC is a non-profit club devoted to providing communication services to local volunteer agencies and events. Meetings are held the second Thursday of each month at the East side Sizzler Restaurant Highway 66 at Fanning Dr., Flagstaff, at 7:00PM. All persons interested in amateur radio, whether licensed or not, are welcome to attend.

Coconino SkyWarn meets 1900 every Monday evening on the Mount Elden 146.98 repeater and at 1930 on the Mount Elden and Navajo Mountain CACTUS repeaters and 146.480 simplex in Page.

*Coconino ARES meets 1900 every Wednesday evening on the Mount Elden 146.98 repeater and at 1930 on the Mount Elden and Navajo Mountain CACTUS repeaters and 146.480 simplex in Page.*

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### Next Business Meeting:

Our next business meeting will be **March10**, 2016 at the East side Sizzler at the corner of Highway 66 and Fanning. Dinner @1800 (optional) and meeting starts @1900.

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### Officers:

President: Sandy Meadowcroft KF4JHC

Vice-President: Tom Shehan KY7WV

Secretary: Erv Perelstein, KE7QFI

Treasurer: Pat Traber, KE7QFG

Public Information Officer: Janice Enloe, KI6WCK



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### Calendar of Events for 2016:

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|--------|-------|--|
| March: | 7     | STEM Celebration at NAU Skydome 5-7:30 PM                            |
|        | 9     | Northern Preparatory Academy high altitude balloon launch            |
|        |       | March 9 is launch date with March 10th and 11th backup dates         |
| April: | 2-3   | AUXCOMM class at the Alternate EOC/Flagstaff Business Accelerator    |
|        | 16    | Nevada 40-meter portable and NVIS antenna test                       |
|        | 16    | Amateur Radio Examinations at Northern Country Health Care           |
|        | 22    | PFAC Exercise – Backup date May 6                                    |
| May:   | 20-22 | Overland Expo: Demonstrations and Amateur Radio License Examinations |
| June:  | 4     | Sacred Mountain Prayer Run   |
|        | 25-26 | Field Day (KG7OH & Team)   |
| July:  | 4     | Munds Park Parade  |

17 Snow Bowl Hill Climb (KF4JHC)  
23 Amateur Radio License Exams at  
Williams Hamfest/Arizona State Convention (W7LUX)

August: 6 Toys for Tots/Fat Tire Bicycle Ride (Mike, Ron & Tom)  
13 Big Brothers/Big Sisters Run for the Magic (Bob Meadowcroft)  
28 Arizona Trail Marathon at North Rim  
\*\*Northland Preparatory Academy to ISS amateur radio contact during  
Aug-Sep-Oct

September: 5 Williams 10K Labor Day Run  
24-25 Flagstaff to Grand Canyon 100 Mile Run(KQ1S)

October: 8 Soulstice Mountain Trail Run (KF4RKS)  
15 Amateur Radio License Exams at North County Health Care (W7LUX)  
?? Northland Preparatory Academy solar observing (W7LUX)

November: ?? Arizona Division of Emergency Management Exercise  
?? Girls on the Run (KF4JHC)

December: 3 SkyWarn Recognition Day at NWS Belmont (UTC date) (KD8RQV)  
11 Christmas party- Sandy and Bob Meadowcroft's home

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### **Thank you and Help Wanted:**

Thank you to all who have run the Monday and Wednesday night nets:

Flagstaff: Tom KY7WV, Erv KE7QFI, Mike KD8RQV, Bob KF4RKS

Page: Lee KF7YRS and Vince WB7UWW

If anyone one would like to help with the nets, please let Tom know. It is good practice for radio skills and the script is written for you to use.

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### **Licensing Exams for 2015-2016:**

April: 16 North Country Health Care on 4th Street

May: 22 Overland Expo: Demonstrations and Amateur Radio License Examinations

July: 23 Radio Exam at Williams Hamfest

October: 15 Radio Exam at North Country Health Care

Remember to bring your HAM license and a copy (if you are upgrading your license), a government issued picture ID, a black ink pen, calculator with memory erased and fifteen dollars (exact change is appreciated).

You also need your SSN or a Federal Registration Number (FRN). You may register for an FRN at

<http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp>

Arizona Newsletter: <http://www.arrl.org>

Tutorials: <http://www.arrl.org/tutorials>

[http://www.arrl.org/exam\\_sessions/flagstaff-az-86004-1221-2](http://www.arrl.org/exam_sessions/flagstaff-az-86004-1221-2)

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## **Minutes of the Coconino Amateur Radio Club 2/11/2016**

Meeting Started: 19:00

**Secretary's Report:** Since the minutes of the February meeting were published in the newsletter there was no need to read them, Gary Loving moved and Kay Perelstein seconded a motion to accept the minutes as written. They were approved unanimously.

**Treasurer's Report:** Pat Traber, our club treasurer, was not in attendance so Sandy Meadowcroft, our club president gave the Treasurer's Report. The closing bank balance was \$3,505.82. Membership is 35 members, consisting of 31 paid members and 4 lifetime members. Erv Perelstein moved and Bob Meadowcroft seconded a motion to accept the Treasurer's Report as written. Unanimously accepted.

**Guests:** We had no guest speakers this month.

**President's Report:** After Introductions, Sandy told us about the Licensing Exams held on Saturday, Jan 16th. Several people earned their Technician License and one member upgraded from Technician to General Class License. Congratulations.

**Vice President's Report:** Tom Shehan told the club that the Toys for Tots/Fat Tire Race organizations were holding a dinner this Friday evening. Normally, Ron Gerlak, our coordinator for that race, would attend but he is still in the Valley so Tom and Dawnelle Shehan will attend and represent the club.

**New Business:** CARC was contacted by the National Weather Service people who would like us to host a SKYWARN Basic Spotter class for them. They would like to hold the class on Thursday evening, March 31st. They would like to gather a class of about 20 people. Sandy recommended that we could invite SAR and CERT people to attend with our people. NWS said if that goes well, they would be happy to teach a full Weather Spotters class sometime after the Basic Class. That class would probably take two evenings. Tom will get more information for us by the next meeting.

Science, Technology, Engineering and Math (STEM) will be holding another opportunity for Flagstaff to exhibit their STEM projects on Monday, March 7th at the NAU Dome. Tom and Sandy are planning to have an exhibit table concerning Amateur Radio. They invited all club members to come and talk to visitors about Ham Radio.

Erv gave a short talk about a Military Auxiliary Radio System (MARS) exercise that involves contacting Ham Operators to gather information during a disaster. The exercise will be held on this Friday, from 0500 to 1700 local time. Some club members have been telling the club how important our Ham Radios are when a disaster denies us the use of the power grid and the internet. Erv emphasized that all of the current MARS exercises insist on communications with radio only, no commercial power or internet use is allowed.

**Old Business:** Sandy reviewed the plans for our next Technician Licensing Class, which will be held starting March 5th and continues on 3/12, 3/19, 4/2, 4/9, 4/16, 4/23, and 4/30.

Last meeting we talked about holding a License Exam period for the students in Flagstaff High School. We still do not know the date of that class.

New CARC mail list: please use [carclist@googlegroups.com](mailto:carclist@googlegroups.com) to send emails to the entire group.

Sandy gave a review of the first few upcoming events on our calendar:

February XX Special Amateur Radio Exam for Flagstaff HS students. Joe coordinating.

March 9 -11 The upcoming Balloon Launch for Northland Preparatory Academy is scheduled for March 9th, with backup dates of 3/10 and 3/11. It looks like we will have 2 recovery vehicles, one driven by Tom and the other by Rob Gillette. Joe Hobart and Janice Enloe will go to the NPA School to setup the receive side of the APRS for the students.

April 16 Amateur Radio Exam at North Country Health Care. Joe coordinating.

April XX PFAC Wildland Fire Exercise, we still have no date established. Joe coordinating.

May 20-22 Overland Expo: Demonstrations and Amateur Radio Exams, Tom coordinating.

A new entry on our calendar is scheduled for Aug 28, the AZ Trail Jacob Lake Run. Tom, Sandy and Joe are co-coordinators. Since this is a new event, Joe made a motion that the club support this new event, Dawnelle seconded the motion. The vote was unanimous to support the event.

**ARES Report:** Tom brought in a portable APRS setup and talked to us about the hardware and software requirements, (UIView 32, Precision Mapping, APRS TNC, a GPS, and a 2-meter radio), to build an APRS communications system. He demonstrated connecting to the Mt Elden Digipeter, W7MOT-8, bringing up a map on the screen with his APRS display as well as other displays that were currently active. He told us we could see the current APRS map by logging on the APRS.FI website. This talk was partly in preparation for the

upcoming balloon launch on March 9th. Joe said the balloon's APRS will be transmitting on 144.390 MHz through the Mt Elden digipeter. Joe has an automated VHF system that can receive and relay packet messaging on 145.010 MHz that we are welcome to use to send and receive WINLINK email.

Joe reviewed the Mohave County Exercise that several club members supported on Wed, 2/10. Communication was excellent all around the state. Contacts were made with Page, Fredonia, Bullhead City, Lake Havasu, Papago Park, Scottsdale, Flagstaff, Kingman, Phoenix, etc. The Mohave Emergency Management was very pleased and appreciative with the response.

**50/50 Raffle:** There was no raffle this month.

There being no further business, Sandy moved and Kay seconded a motion to adjourn. Passed unanimously. Meeting Ended: 20:25.

**Presentations:** See ARES Report for Tom's presentation.

## AZ Repeaters Coconino County

The most common Operational modes:

(**O**)—Open (**A**)—Open auto patch (**CA**)—Closed auto patch (**L**)—linked (**E**)—Emergency power (**PL**)—PL Tone (**DPL**)—Digital PL (**RM**)—Remote (**R**)—Races (**EL**)—Echolink (**IR**)—IRLP (**AL**)—Allstar (**W**)—WIRES (**P-25**)—APCO (**TRBO**)—Mototrbo

Be sure and check the [Utah Repeaters List](#)

Frequency	Status	Location	Callsign	PL-Tone	Operation	Sponsor/comments
145.270	Active	Morman Mtn	KD7IC	-	O,E	KD7IC
145.410	Active	Flagstaff	K7NAU	151.4	O,PL	NAU ARC
146.780	Active	Bill Williams Mtn	K7NAZ	91.5	O,E,L,PL,IR	Bill Williams Mtn Radio Club IRLP Node <a href="#">3178</a> <b>Down for the winter</b>
146.960	Active	Navajo Mtn	W7WAC	100.0	O,PL,L	GCWA Glen Canyon Wireless Association (Page, AZ)linked with the Utah Intermountain Intertie
146.980	Active	Mt Elden	W7ARA	162.2	O,E,PL,A	<a href="#">ARA SKYWARN</a> <b>DOWN for winter - Antenna failure</b>
147.140	Active	Mt Elden	W7ARA	162.2	O,E,PL,L	<a href="#">ARA</a> link 147.36 Mt.Ord <a href="#">Rimlink</a>
147.300	Active	Jacobs Lake	W7NRC	None	O,L	Linked to 146.800 "Snowbird Link Sys" Also listed in <a href="#">Utah VHF Society</a>
147.320	Active	Hopi Pt	WB6JAA	None	O,E,L,PL	<a href="#">IRLP Node 3735</a>
440.400	Active	Flagstaff	W7LUX	100.0	O,PL	W7LUX
442.075	<b>Unknown?</b>	Hopi Pt	N7FHQ	None	O,L,PL	-
444.575	<b>Unknown?</b>	Tuba City	KD7KRA	100.0	O,PL	-
447.475	Active	Forest Lakes	W7NAZ	100.0	O,PL,E	David Holt
448.475	Active	Mt Elden	W7ARA	100.0	O,E,A,PL	<a href="#">ARA</a>
448.750	<b>Unknown?</b>	Navajo Mtn	NA7DB	None	O,E,RM,L	Also listed in <a href="#">Utah VHF Society</a>
448.875	Active	Mt Elden	W7ARA	100.0	O,PL,L,E	<a href="#">ARA</a>
449.325	<b>Unknown?</b>	Mt Elden	NO7AZ	103.5	O,PL,A,E,L	HF Link MotoTrbo (Closed)]
449.600	Active	Morman Mtn	KD7IC	162.2	O,E, PL	KD7IC
449.750	Active	Bill Williams Mtn	K6JSI	123.0	O,PL,L	<a href="#">WIN System</a>
449.925	<b>Unknown?</b>	Navajo Mtn	W7CWI	None	O	Lake Powell Amateur Radio Group / Also listed in <a href="#">Utah VHF Society</a>
927.0750	Active	Bill Williams Mtn	WB7BYV	218.1	O, PL	New

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Jan. 21,2016

## Ham Radio Technician Licensing Class

*The class is free.*

*The book is Ham Radio License Manual Level 1 Technician, third edition. Available from Amazon (\$23.03) Joe Hobart also has some books. Contact him if you wish to purchase one.*

*The licensing exam is \$15.00 (Date: TBA)*

This class is designed to help you understand the basics of amateur radio operation and prepare for the licensing exam.

While it is better to attend all the classes it is not mandatory. Participants are welcome to select specific classes to attend if they wish.

**Ham Radio Licensing Class - Technician Class** (Based on the ARRL Technician Instructor Manual)

Presented by the Coconino Amateur Radio Club (CARC) <http://coco-radio.club>

Location: North Country Health Care facility at 2920 N 4th Street, Flagstaff, AZ 86004.

Homework assignments will be to read the chapter(s) to be covered and especially study the practice test questions.

**For questions and to register:** Contact Sandy Meadowcroft - (928) 660-8323  
sandymeado2@yahoo.com

### **Class Dates 9:00 AM – 12:00 PM**

Mar. 5	Apr. 9
Mar. 12	Apr. 16
Mar. 19	Apr. 23
Apr. 2	Apr. 30





## 2016 ARCA / WILLIAMS HAMFEST JULY 22, 23 & 24, 2016

ADVANCED NOTICE



*Presented by the Amateur Radio Council of Arizona  
and the City of Williams*



ADVANCED NOTICE

WILLIAMS RODEO GROUNDS, RODEO ROAD, WILLIAMS, AZ  
GATES OPEN AT NOON THURSDAY, JULY 21 FOR SET-UP.  
HAMFEST OPENS AT DAWN FRIDAY, JULY 22.

### FREE ADMISSION!

### JULY 24, 2016 - GRAND CANYON TRAIN TRIP

MEETINGS, SEMINARS, ACTIVITIES,  
COMMERCIAL VENDORS,  
HUGE SWAP, VE TESTS

### PRIZES

DOOR PRIZES EVERY HOUR  
RAFFLE TICKETS

SATURDAY NIGHT BBQ DINNER  
AT RAILSIDE RV RANCH

RESERVATION INFORMATION  
available soon

SUNDAY GRAND CANYON TRAIN  
TRIP



Visit the ARCA Web Site  
[www.arca-az.org](http://www.arca-az.org)

Talk-In - 146.78 - (91.5 Pl)

On-Line Reservation Available on Web Site Soon  
Or Call - 602.881.ARCA (2722)

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## What the Numbers Mean, and Propagation Predictions--a brief introduction to propagation and the major factors affecting it.

*By Carl Luetzelschwab, K9LA*

The sun emits electromagnetic radiation and matter as a consequence of the nuclear fusion process. Electromagnetic radiation at wavelengths of 100 to 1000 Angstroms (ultraviolet) ionizes the F region, radiation at 10 to 100 Angstroms (soft X-rays) ionizes the E region, and radiation at 1 to 10 Angstroms (hard X-rays) ionizes the D region. Solar matter (which includes charged particles--electrons and protons) is ejected from the sun on a regular basis, and this comprises the solar wind. On a "quiet" solar day the speed of this solar wind heading toward Earth averages about 400 km per second.

The sun's solar wind significantly impacts Earth's magnetic field. Instead of being a simple bar magnet, Earth's magnetic field is compressed by the solar wind on the side facing the sun and is stretched out on the side away from the sun (the magnetotail, which extends tens of earth radii downwind). While the sun's electromagnetic radiation can impact the entire ionosphere that is in daylight, charged particles ejected by the sun are guided into the ionosphere along magnetic field lines and thus can only impact high latitudes where the magnetic field lines go into the Earth.

Additionally, when electromagnetic radiation from the sun strips an electron off a neutral constituent in the atmosphere, the resulting electron can spiral along a magnetic field line (it spirals around the magnetic field line at the electron gyrofrequency). Thus Earth's magnetic field plays an important and critical role in propagation.

Variations in Earth's magnetic field are measured by magnetometers. There are two measurements readily available from magnetometer data--the daily A index and the three-hour K index. The A index is an average of the eight 3-hour K indices, and uses a linear scale and goes from 0 (quiet) to 400 (severe storm). The K index uses a quasi-logarithmic scale (which essentially is a compressed version of the A index) and goes from 0 to 9 (with 0 being quiet and 9 being severe storm). Generally an A index at or below 15 or a K index at or below 3 is best for propagation.

Sunspots are areas on the sun associated with ultraviolet radiation. Thus they are tied to ionization of the F region. The daily sunspot number, when plotted over a month time frame, is very spiky. Averaging the daily sunspot numbers over a month results in the monthly average sunspot number, but it is also rather spiky when plotted. Thus a more averaged, or smoothed, measurement is needed to measure solar cycles. This is the smoothed sunspot number (SSN). The SSN is calculated using six months of data before and six months of data after the desired month, plus the data for the desired month. Because of this amount of smoothing, the official SSN is one-half year behind the current month. Unfortunately this amount of smoothing may mask any short-term unusual solar activity that may enhance propagation.

Sunspots come and go in an approximate 11-year cycle. The rise to maximum (4 to 5 years) is usually faster than the descent to minimum (6 to 7 years). At and near the maximum of a solar cycle, the increased number of sunspots causes more ultraviolet radiation to impinge on the atmosphere. This results in significantly more F region ionization, allowing the ionosphere to refract higher frequencies (15, 12, 10, and even 6 meters) back to Earth for DX contacts. At and near the minimum between solar cycles, the number of sunspots is so low that higher frequencies go through the ionosphere into space. Commensurate with solar minimum, though, is less absorption and a more stable ionosphere, resulting in the best propagation on the lower frequencies (160 and 80 meters). Thus, in general, high SSNs are best for high-frequency propagation, and low SSNs are best for low-frequency propagation.

Most of the disturbances to propagation come from solar flares and coronal mass ejections (CMEs). The solar flares that affect propagation are called X-ray flares due to their wavelength being in the 1 to 8 Angstrom range. X-ray flares are classified as C (the smallest), M (medium size), and X (the biggest). Class C flares usually have minimal impact to propagation. Class M and X flares can have a progressively adverse impact to propagation.

The electromagnetic radiation from a class X flare in the 1 to 8 Angstrom range can cause the loss of all propagation on the sunlit side of Earth due to increased D region absorption. Additionally, big class X flares can emit very energetic protons that are guided into the polar cap by Earth's magnetic field. This can result in a polar cap absorption event (PCA), with high D-region absorption on paths passing through the polar areas of Earth.

A CME is an explosive ejection of a large amount of solar matter, and can cause the average solar wind speed to take a dramatic jump upward--kind of like a shock wave heading toward Earth. If the polarity of the sun's magnetic field is southward when the shock wave hits Earth's magnetic field, the shock wave couples into Earth's magnetic field and can cause large variations in Earth's magnetic field. This is seen as an increase in the A and K indices.

In addition to auroral activity, these variations to the magnetic field can cause those electrons spiraling around magnetic field lines to be lost into the *magnetotail*. With electrons gone, maximum usable frequencies (MUFs) decrease, and return only after the magnetic field returns to normal and the process of ionization replenishes lost electrons. Most of the time, elevated A and K indices reduce MUFs, but occasionally MUFs at low latitudes may increase (due to a complicated process) when the A and K indices are elevated.

Solar flares and CMEs are related, but they can happen together or separately. Scientists are still trying to understand the relationship between them. One thing is certain, though--the electromagnetic radiation from a big flare traveling at the speed of light can cause short-term radio blackouts on the sunlit side of Earth within about 10 minutes of eruption. Unfortunately we detect the flare visually at the same time as the radio blackout, since both the visible light from the flare and the electromagnetic radiation in the 1 to 10 Angstrom range from the flare travel at the speed of light--in other words, we have no warning. On the other hand, the energetic particles ejected from a flare can take up to several hours to reach Earth, and the shock wave from a CME can take up to several days to reach Earth, thus giving us some warning of their impending disruptions.

Each day the Space Weather Prediction Center (a part of NOAA, the National Oceanographic and Atmospheric Administration) and the US Air Force jointly put out a Solar and Geophysical Activity Report. The current and archived reports are at [SWPC page](#). Each daily report consists of six parts. Part IA gives an analysis of solar activity, including flares and CMEs. Part IB gives a forecast of solar activity. Part IIA gives a summary of geophysical activity. Part IIB gives a forecast of geophysical activity. Part III gives probabilities of flare and CME events. These first three parts can be summarized as follows: normal propagation (no disturbances) generally occurs when no X-ray flares higher than class C are reported or forecasted, along with solar wind speeds due to CMEs near the average of 400km/sec.

Part IV gives observed and predicted 10.7-cm solar flux. A comment about the daily solar flux--it has little to do with what the ionosphere is doing on that day. This will be explained later.

Part V gives observed and predicted A indices. Part VI gives geomagnetic activity probabilities. These last two parts can be summarized as follows: good propagation generally occurs when the forecast for the daily A index is at or below 15 (this corresponds to a K index of 3 or below).



WWV at 18 minutes past the hour every hour and WWVH at 45 minutes past the hour every hour put out a shortened version of this report. A new format began March 12, 2002. The new format gives the previous day's 10.7-cm solar flux, the previous day's mid-latitude A index, and the current mid-latitude three-hour K index. A general indicator of space weather for the last 24 hours and next 24 hours is given next. This is followed by detailed information for the three disturbances that impact space weather: geomagnetic storms (caused by gusts in the solar wind speed), solar radiation storms (the numbers of energetic particles increase), and radio blackouts (caused by X-ray emissions). For detailed descriptions of the WWV/WWVH messages, visit [www.swpc.noaa.gov/noaa-scales-explanation](http://www.swpc.noaa.gov/noaa-scales-explanation).

Normal propagation (no disturbances) is expected when the space weather indicator is minor. A comment is appropriate here. Both the Solar and Geophysical Activity Report and WWV/WWVH give a status of general solar activity. This is *nota* status of the 11-year sunspot cycle, but rather a status on solar disturbances (flares, particles, and CMEs). For example, if the solar activity is reported as low or minor, that doesn't mean we're at the bottom of the solar cycle; it means the sun has not produced any major space weather disturbances.

In order to predict propagation, much effort was put into finding a correlation between sunspots and the state of the ionosphere. The best correlation turned out to be between SSN and monthly median ionospheric parameters. This is the correlation that our propagation prediction programs are based on, which means the outputs (usually MUF and signal strength) are values with probabilities over a month time frame tied to them. They are not absolutes; they are statistical in nature. Understanding this is a key to the proper use of propagation predictions.

Sunspots are a subjective measurement. They are counted visually. It would be nice to have a more objective measurement, one that actually measures the sun's output. The 10.7-cm solar flux has become this measurement. But it is only a general measure of the activity of the sun, since a wavelength of 10.7-cm is way too low in energy to cause any ionization. Thus 10.7 cm solar flux has nothing to do with the formation of the ionosphere. The best correlation between 10.7-cm solar flux and sunspots is the smoothed 10.7-cm solar flux and the smoothed sunspot number--the correlation between daily values, or even monthly average values, is not very acceptable.

Since our propagation prediction programs were set up based on a correlation between SSN and monthly median ionospheric parameters, the use of SSN or the equivalent smoothed 10.7-cm solar flux gives the best results. Using the daily 10.7-cm solar flux--or even the daily sunspot number--can introduce a sizable error into the propagation predictions outputs due to the fact that the ionosphere does not react to the small daily variations of the sun. Even averaging 10.7-cm solar flux over a week's time frame can contribute to erroneous predictions. To reiterate, for best results use SSN or smoothed 10.7-cm solar flux, and understand the concept of monthly median values.

For short-term predictions, the use of the effective SSN (SSNe) may be helpful. In this method, an appropriate SSN is input to the propagation prediction software to force it to agree with daily ionosonde measurements. Details of this method can be found at <http://www.nwra.com/spawx/ssne24.html>

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