

Cycle 25, Space Weather, Simple Antennas, Field Day Propagation

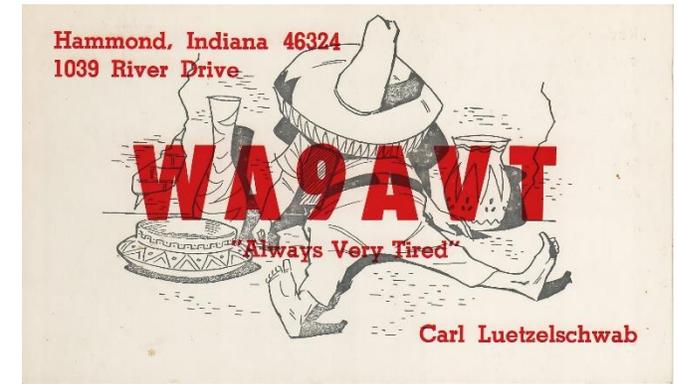
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website: <https://k9la.us>

Who Is K9LA?

- Novice in October 1961 – WN9AVT
 - General (WA9AVT) in May 1962, Extra (K9LA) in 1977
- Electrical Engineer out of Purdue University
- RF design engineer (mostly solid-state RF power amplifiers)
 - Motorola in Schaumburg, IL and Ft. Worth TX (1974 to 1988)
 - Magnavox/Raytheon in Ft. Wayne, IN (1988 to 2013)
- Enjoy propagation, DXing, contesting, antennas, vintage equipment
- Currently the Director of the ARRL Central Division
- Wife is Vicky AE9YL



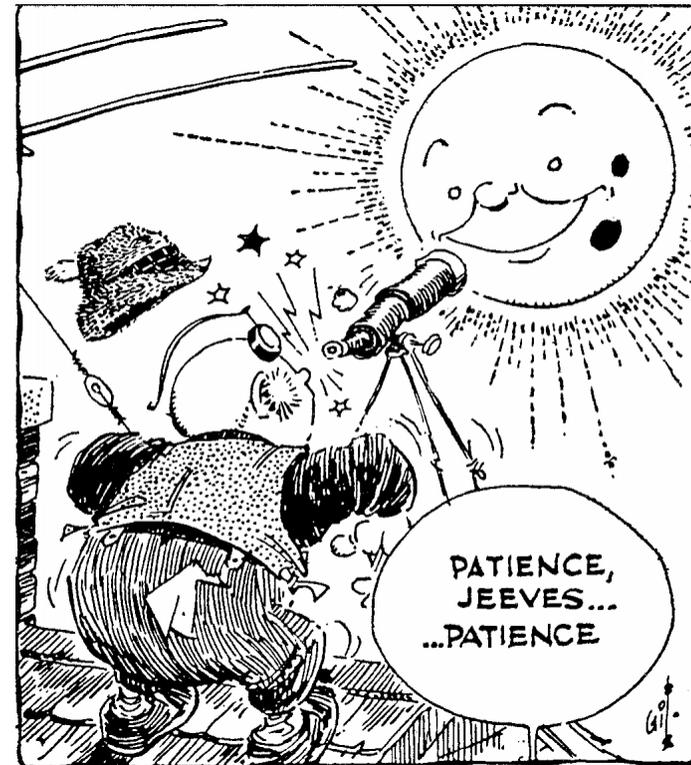
Agenda

- Cycle 25
 - Historical data
 - Predictions
 - Latest data
- Space weather
 - Parameters and what we desire
 - Assessing real-time propagation
- Simple antennas for the higher HF bands
 - 15m, 12m, 10m
- Field Day propagation
 - HF and 6-meters



Whew! A lot of stuff!

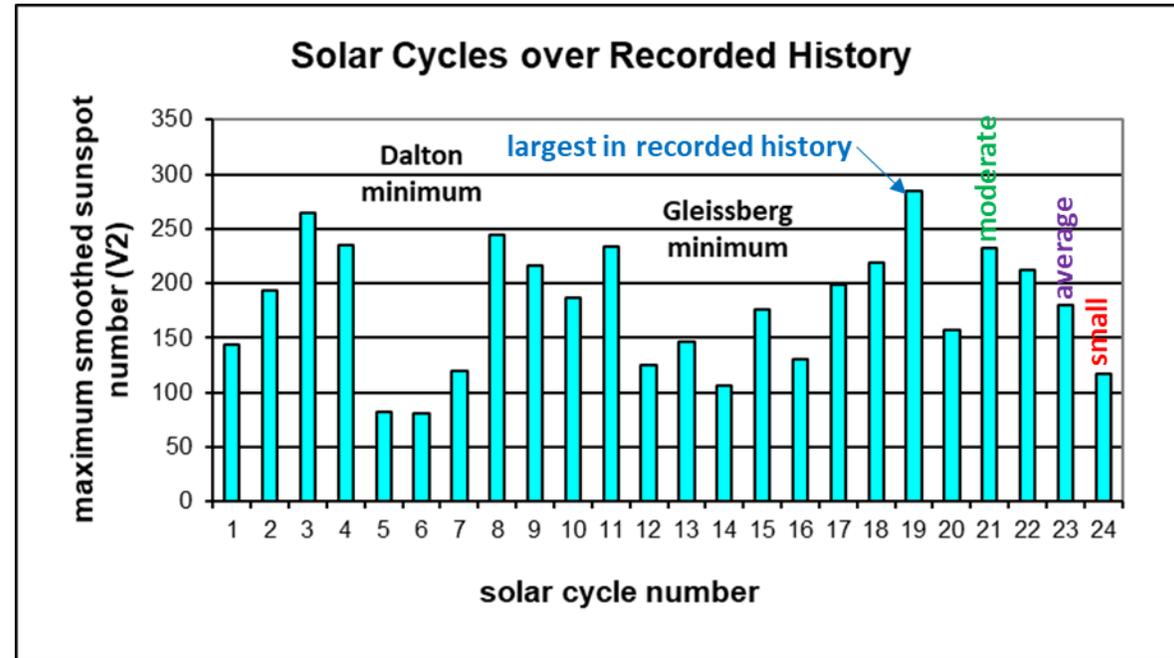
Cycle 25



from arrl.org

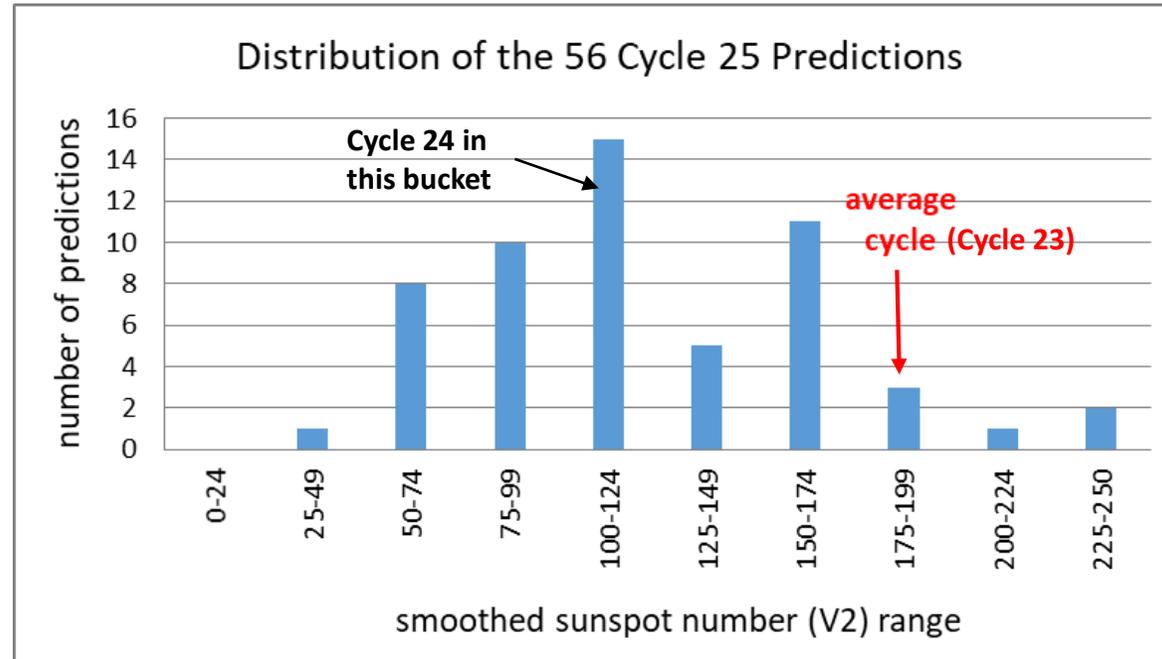
Historical Look at All 24 Cycles

- Cycle 1 began in 1755
 - Maunder Minimum occurred from 1645-1715 with few sunspots
- We've gone through three periods of 'big' solar cycles
 - Cycles 1-4, 8-11, 17-23
- We've gone through two periods of 'small' solar cycles
 - Cycles 5-7, 12-16
- With Cycle 24, we appear to be in a third period of small solar cycles



Will Cycle 25 get us out of this third period of small solar cycles?

There Is a Consensus (doesn't mean it's correct)

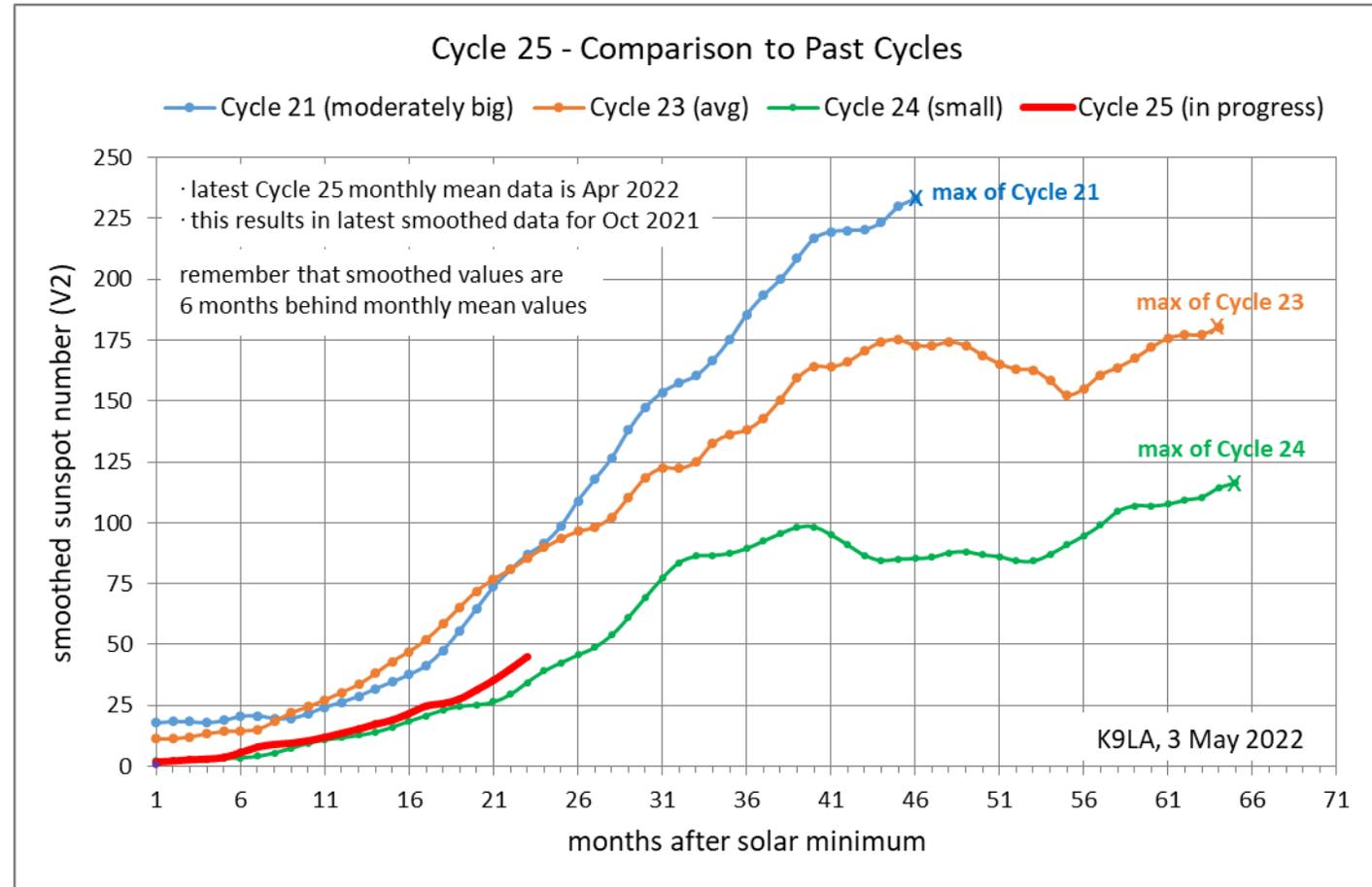


average cycle is 179

- 50 of the 56 predictions (89%) are for a below average cycle
- 3 are for an average cycle
- 3 are for a larger-than-average cycle
 - In Aug 2021, the McIntosh (et al) prediction was revised down to an average cycle

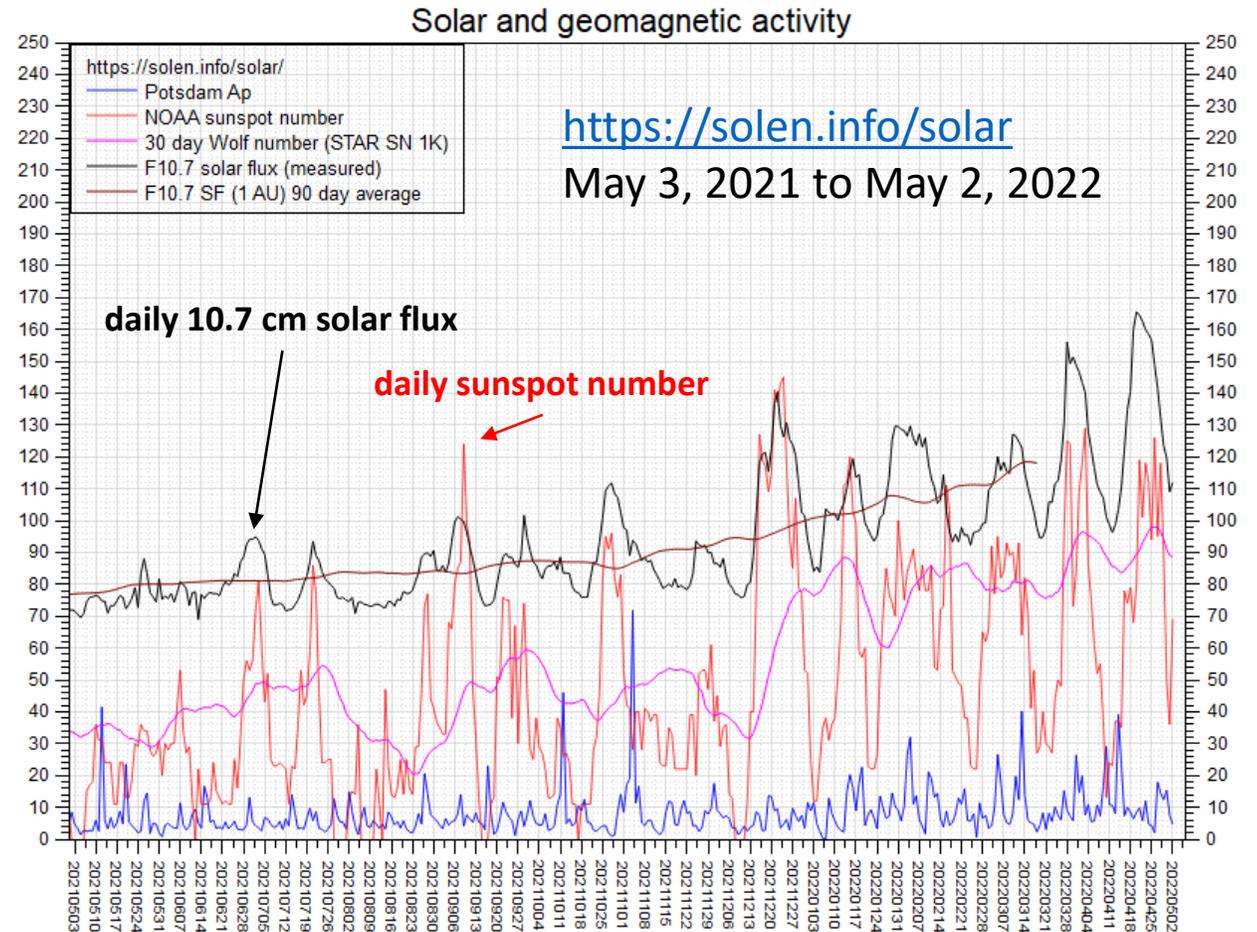
How Is Cycle 25 Doing?

- Smoothed sunspot number minimized in December 2019
- We currently have 23 months of smoothed sunspot number data
- So far we appear to be tracking the small Cycle 24
- Need more sunspots for daily worldwide 15m, 12m and 10m propagation

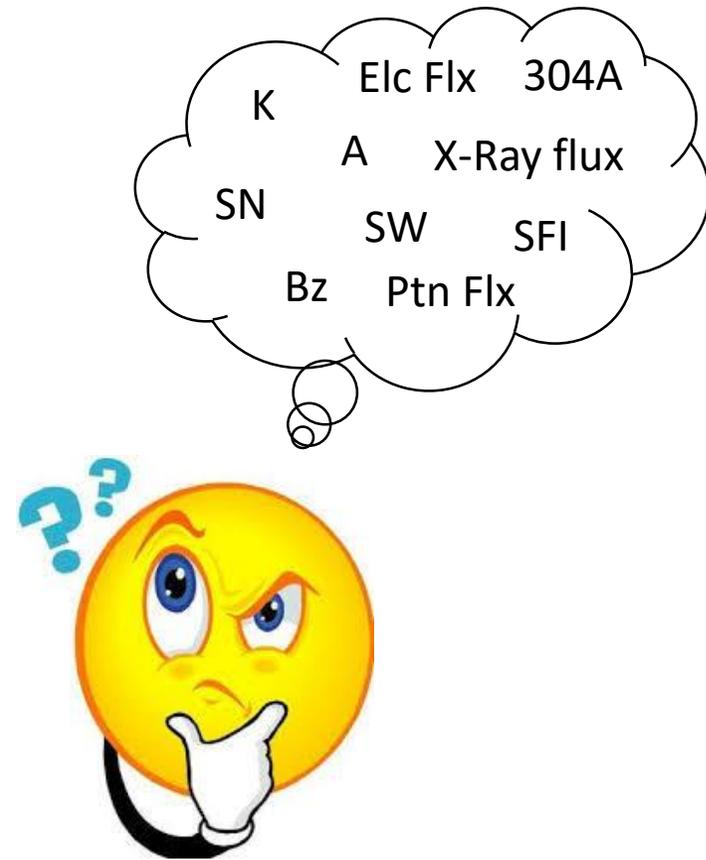


Short-Term Propagation Opportunities

- To reiterate, we still have a way to go before 15m, 12m and 10m will be open daily on a worldwide basis
- Keep an eye on the daily sunspot number and 10.7 cm solar flux
 - When they spike up, can give us short-term openings on these higher HF bands

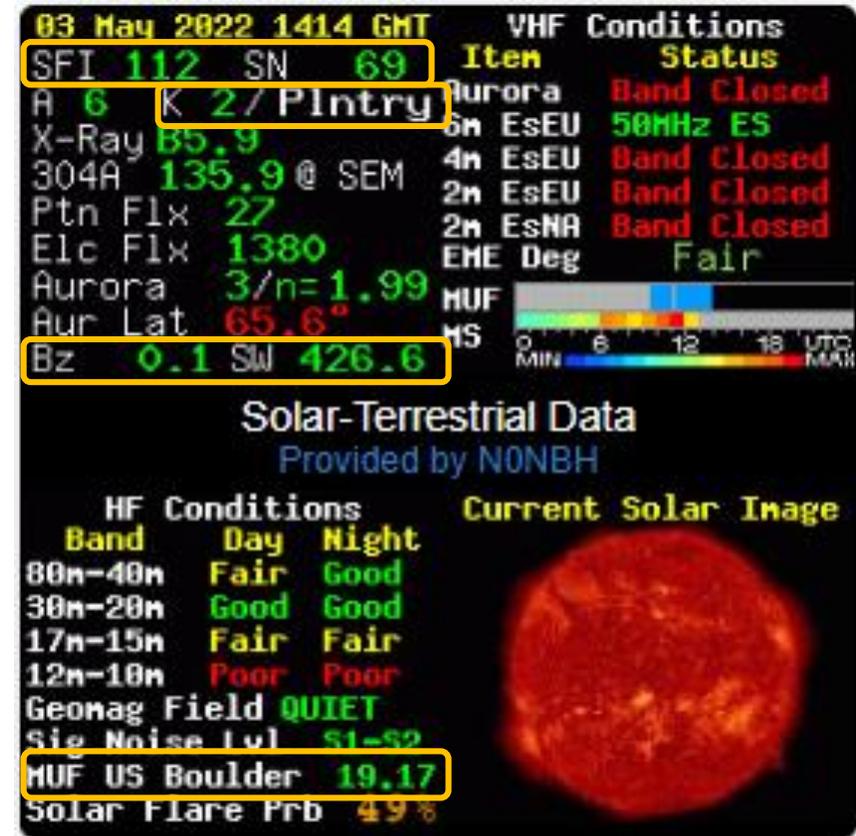


Space Weather



NØNBH Banner and What We Desire

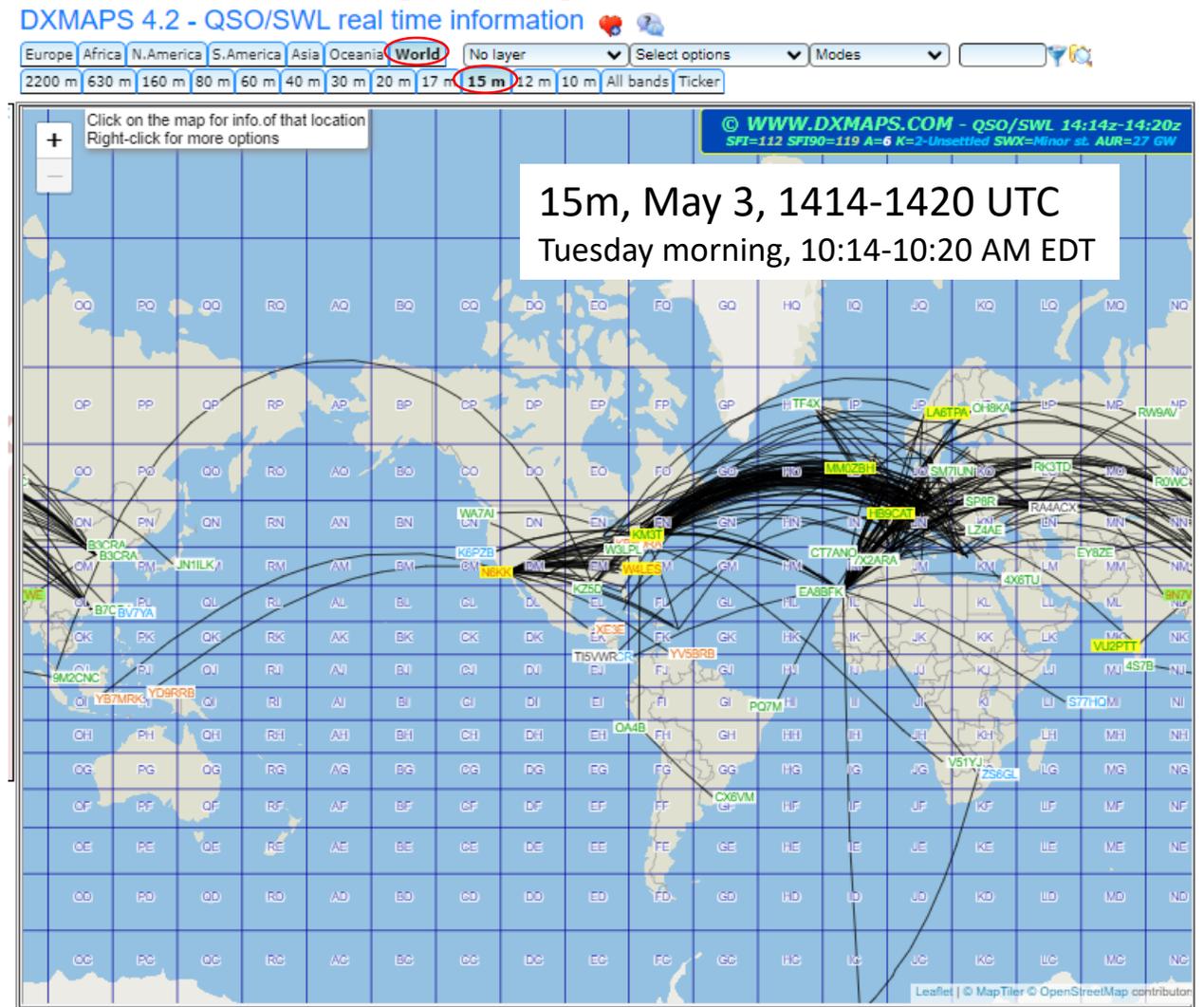
- SFI
 - > 90 for a long time for daily & worldwide 15m
 - > 120 for a long time for daily & worldwide 10m
- SN
 - > 35 for a long time for daily & worldwide 15m
 - > 70 for a long time for daily & worldwide 10m
- MUF US Boulder
 - As necessary for the band of interest
- $K \leq 3$
- Bz positive
 - slightly negative (0 to -10) is okay
- SW not too much greater than 400 km/sec



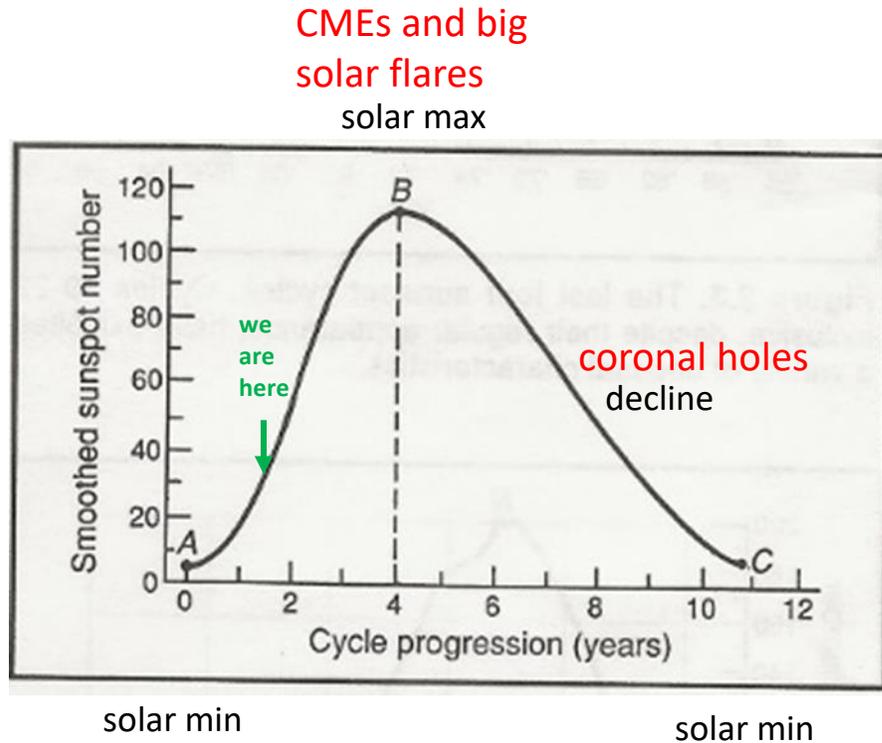
from www.qrz.com

What Are the Bands Doing Right Now?

- Go to dxmaps.com
- Select a view
 - World, NA, Europe, . . .
- Select a band
 - 2200m to above 432 MHz
- Other methods
 - KC2G MUF map
 - PSKreporter
 - WSPRnet
 - Reverse Beacon Network
 - IARU/NCDXF beacons



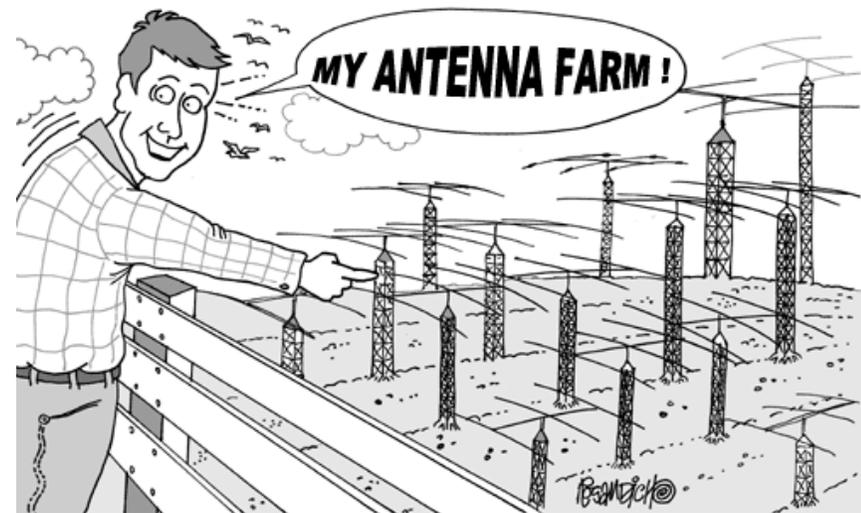
When Do Disturbances Occur?



- We have to take the bad (CMEs and big solar flares) with the good (great propagation on the higher HF bands)
- CMEs most prevalent around solar max
 - Geomagnetic storms
- Big solar flares most prevalent around solar max
 - Solar radiation storms – polar cap
 - Radio blackouts – daylight side of Earth
- Coronal holes most prevalent during the decline of a solar cycle
- Quietest time is during the ascent of a solar cycle
 - Where we are right now

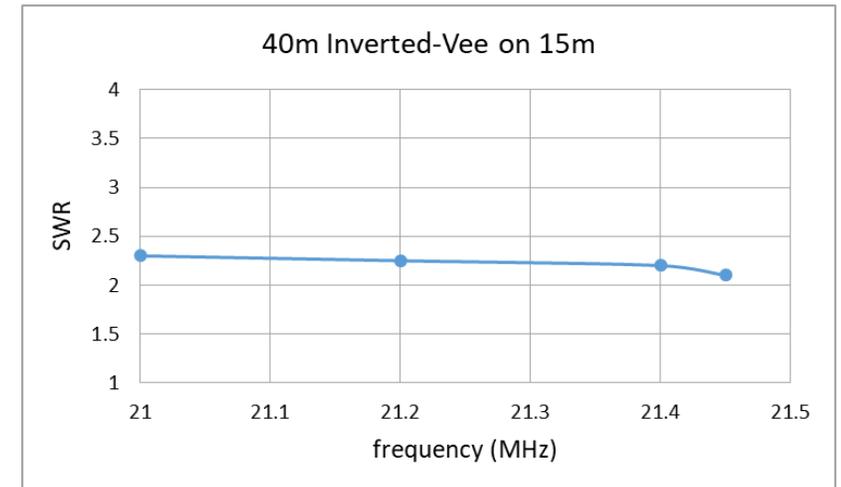
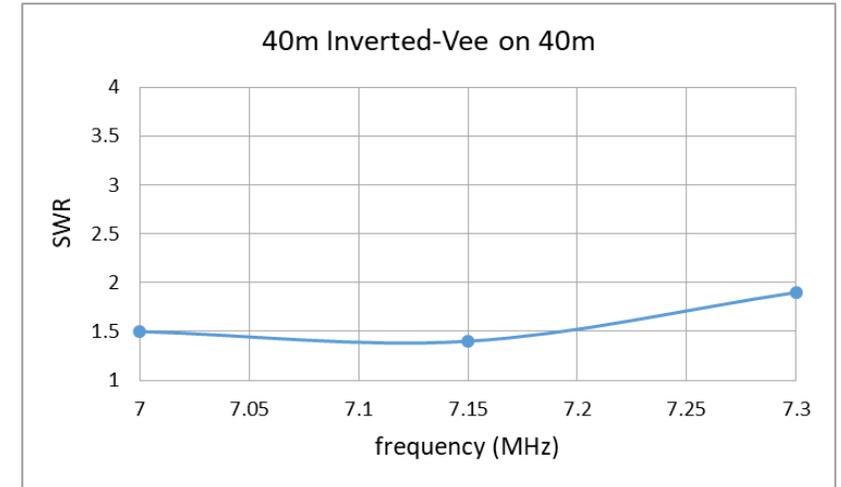
Simple Antennas for the Higher HF Bands

general comment – horizontal antennas pick up less man-made noise than vertical antennas and are not as dependent on ground as vertical antennas



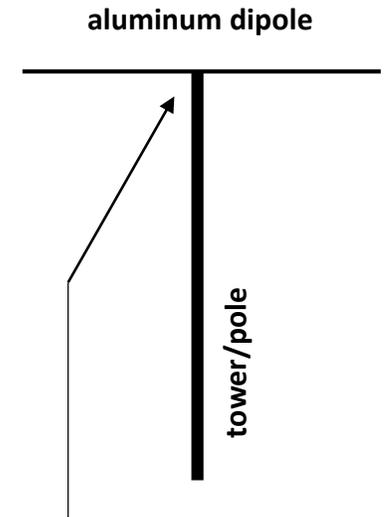
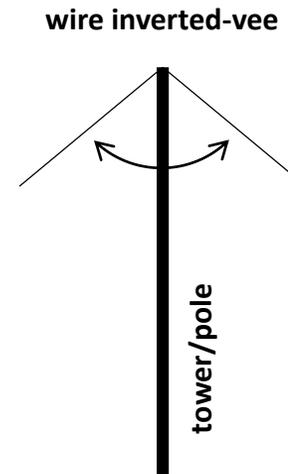
15-Meters

- Use your 40m dipole/inverted-vee
 - Works as a 3/2-wavelength antenna
 - A bit of gain in some directions
 - Lowest SWR on 15m will likely be above 21.450 MHz
 - Probably need to use a tuner – either your rig's internal tuner or an external tuner
- Vertical with a couple elevated radials
- 15m dipole/inverted-vee
 - Overall length about 22 feet (11 ft each side)
 - Put it up at 20 feet
- 2-element Yagi
 - 6 foot boom, 22 foot elements, need rotator



12-Meters

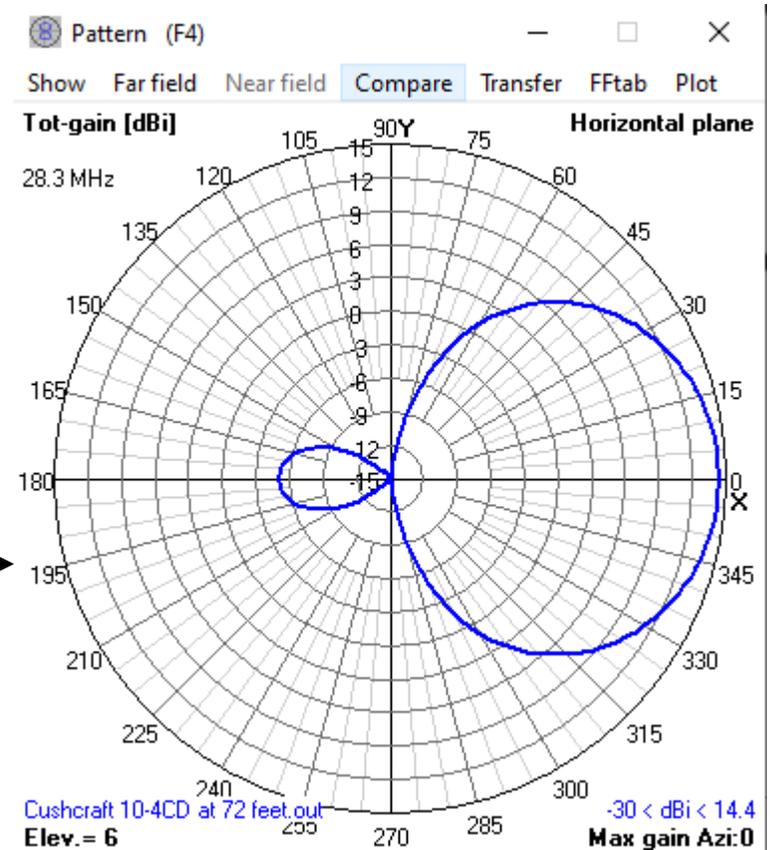
- Inverted-vee
 - Each side about 9.25 feet
 - Keep angle > 90 degrees
- Dipole made with aluminum tubing
 - About 18.5 feet from tip-to-tip
- 2-element Yagi
 - A bit smaller than a 15m Yagi
- 3-element Yagi
 - More gain
 - Better F/B ratio



element split in the middle – use a piece of fiberglass inside the two pieces of aluminum tubing

10-Meters

- Dipole (made of aluminum) is relatively small
 - About 16.5 feet tip-to-tip
 - It will give great results at 15-20 feet high
- Multi-element Yagis are quite reasonable
 - I have a 4-element Cushcraft 10m Yagi →
 - 16 foot boom, elements about 17 feet tip-to-tip
 - Used it to work many stations with my homebrew QRP (1W PEP) 10m DSB transceiver during the big Solar Cycle 22



about 7 dB over a dipole

Field Day Propagation

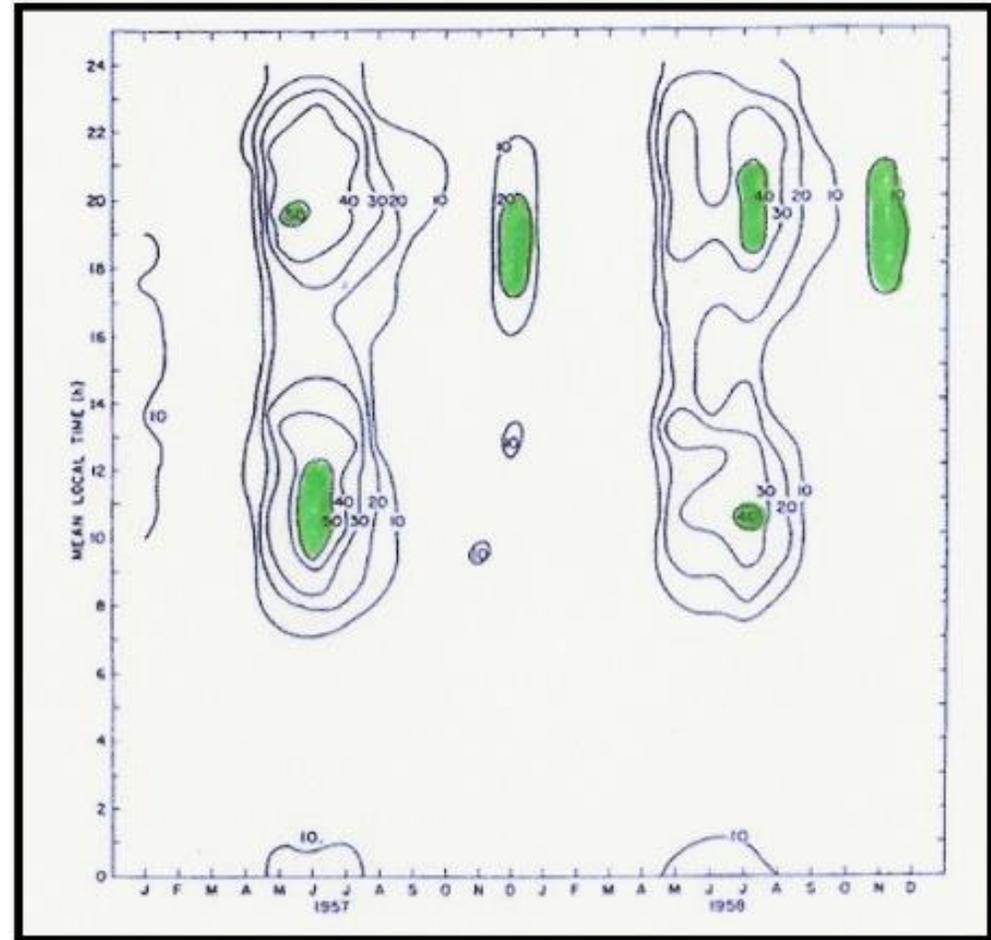


HF Propagation

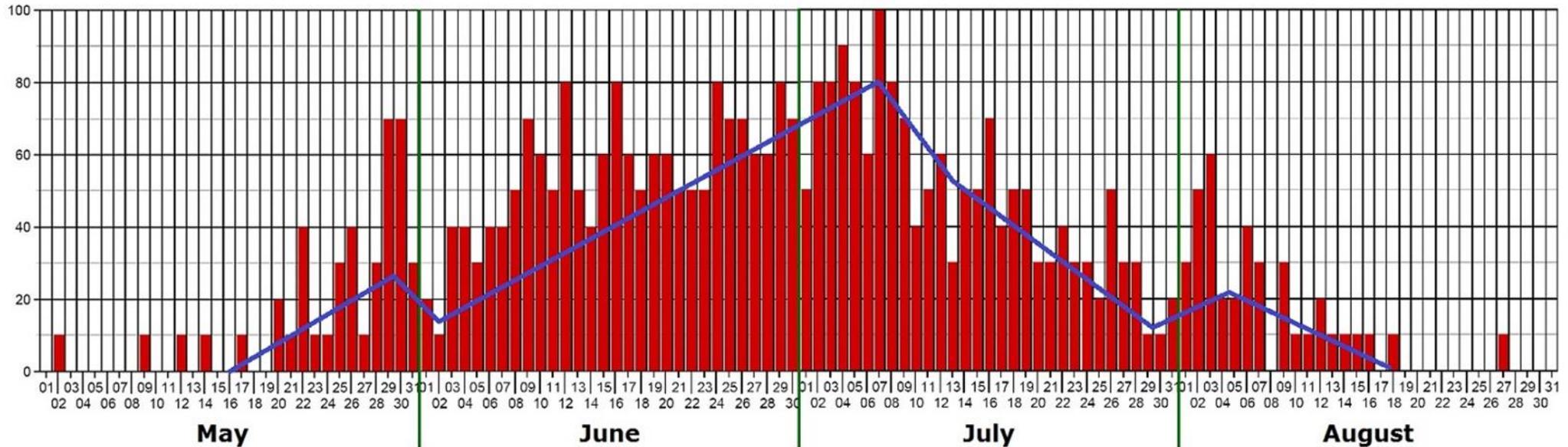
- 160m and 80m
 - Should be good at night unless there are thunderstorms
 - Would help to have a 'receive' antenna to minimize noise – small loop
- 40m
 - Should be good during the day for shorter distance QSOs
 - Should be good at night for longer distance QSOs
- 20m
 - Should be good during the day
 - Enough sunspots for nighttime?
- 15m and 10m
 - If Es doesn't occur – look for mostly north-south paths in the daytime
 - If Es does occur – look everywhere (next slide identifies best times)

6-Meter Propagation

- Sporadic-E (Es)
- Probability vs month and local time
 - Green areas are highest probability
- Best summer local times are
 - Late morning
 - Early evening
 - Always monitor in-between, too



VE3EN 6-Meter Es Data



- 2004-2014 (11 years of data)
- Eastern-Western Europe to Eastern Half North America
 - USA 1/2/3/4/8/9 call areas + Canada VO1,VE1,VE2,VE3,VE9,VY2
- 5 or more contacts between multiple stations
- Y-axis is the % of the 11 years that QSOs were made
 - Late June has had 6m Es openings on about 8 of those 11 years

Summary

- Cycle 25 is in its ascent – solar maximum around 2025
- So far it kind of looks like another small cycle
 - We'll either confirm or refute that as we near 2024
- Even if it is a small cycle, solar maximum should offer worldwide propagation on a daily basis with modest power and modest antennas on the higher HF bands and on 6-meters in the fall/winter months around solar maximum
- The digital modes offer an advantage over CW and SSB
 - Can decode a signal farther down in the noise
 - This is a significant advantage on 10m and 6m – especially now
- There are tools on the internet to determine what the bands are doing right now

References

- Space weather websites
 - NØNBH banner at www.qrz.com
 - Dr. Tony Phillips – <https://spaceweather.com/>
 - NOAA – <https://www.swpc.noaa.gov/>
 - VE3EN – <https://www.solarham.net/>
 - WX6SWW - <https://www.spaceweatherwoman.com/>
 - Many other websites out there
- Information about the Sun - <https://solarscience.msfc.nasa.gov/>
- Propagation and antenna references
 - ARRL Handbook and ARRL Antenna Book
 - The CQ Shortwave Propagation Handbook – 4th Edition (updated 2021)
 - The Little Pistol's Guide to HF Propagation (1996) by NM7M (SK)
 - Out of print but it's on my website (15 Mb file)
 - Many other references out there