

Cycle 25 Update

and what to expect in the near future



Cycle 25 is alive!

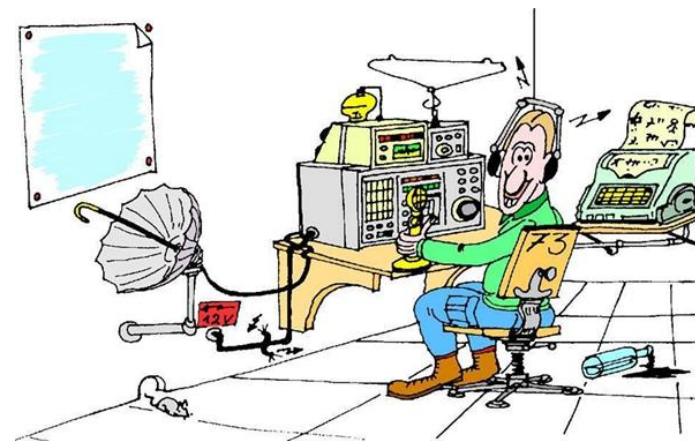
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What We'll Cover

- Brief review of October 2021 presentation
- Early and revised forecasts of Cycle 25
- Latest data on Cycle 25
- What to expect during the next year or so
 - HF
 - 6m



Previous Presentation October 2021

- Cycle 25 was just starting
- What is a solar cycle and why is a solar cycle important
- Solar radiation, the ionosphere and ionosondes
- Space weather
- Antennas for 15m, 12m, 10m and 6m
- Early Cycle 25 data
- NVIS evaluation

Get Ready for Fun on the Higher HF Bands



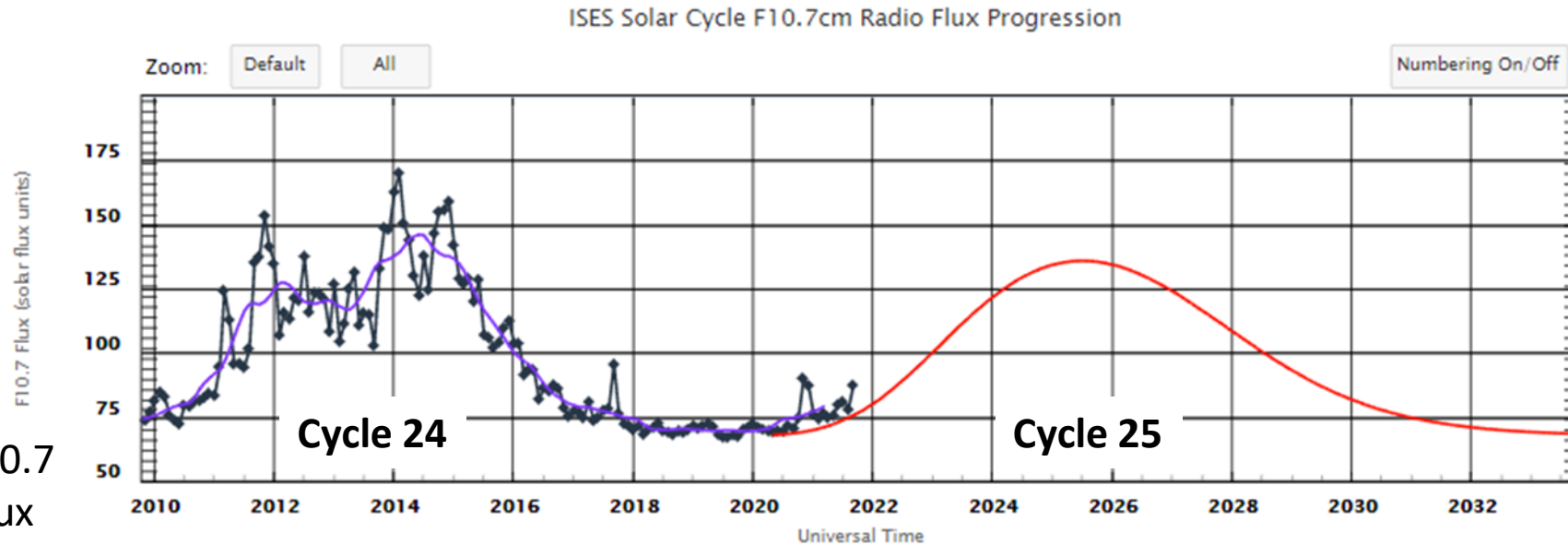
Cycle 25 is waking up

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Early Forecast – NOAA/NASA

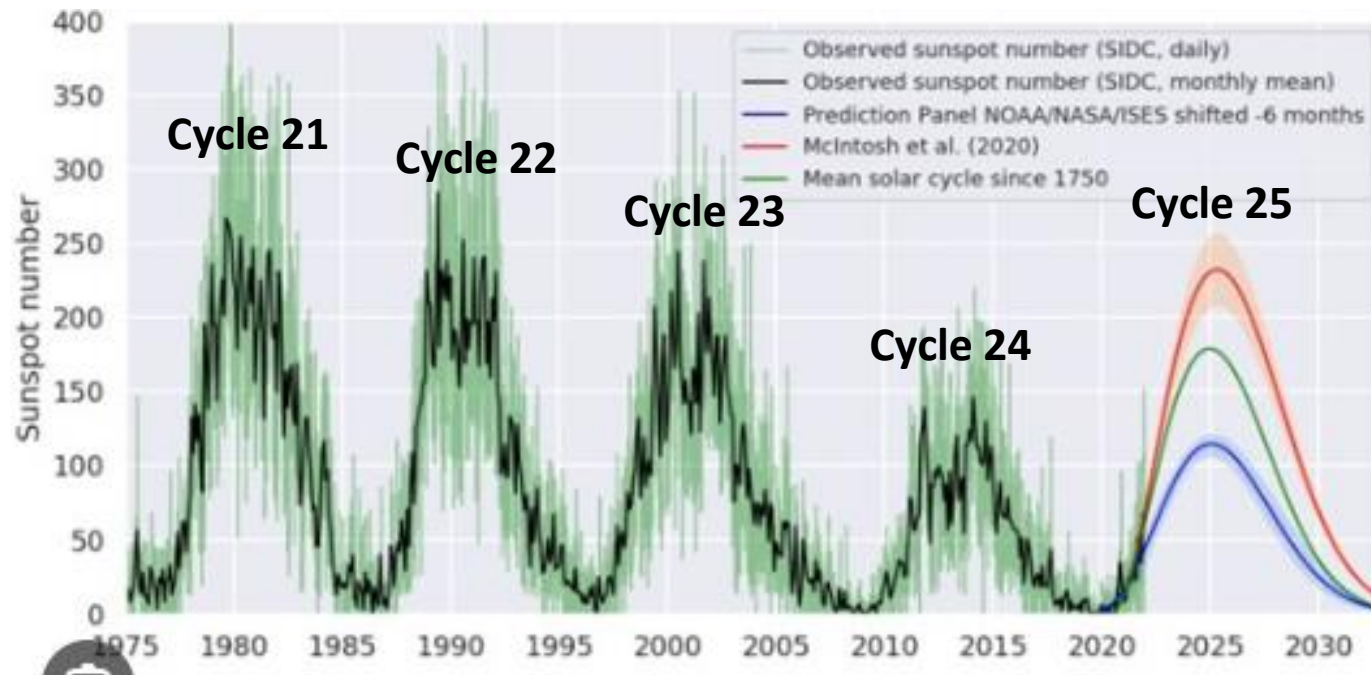
- Cycle 25 was just starting to ascend
- Here's the first forecast (4/2019) from NOAA/NASA
- Very similar to Cycle 24
 - Smallest in our lifetimes, 4th smallest in recorded history



SFI is the 10.7 cm solar flux index

Early Forecast – Dr. Scott McIntosh

- McIntosh first forecast (6/2020) - red line – similar to Cycles 21 and 22
- NOAA/NASA first forecast – blue line
- Average solar cycle – green line



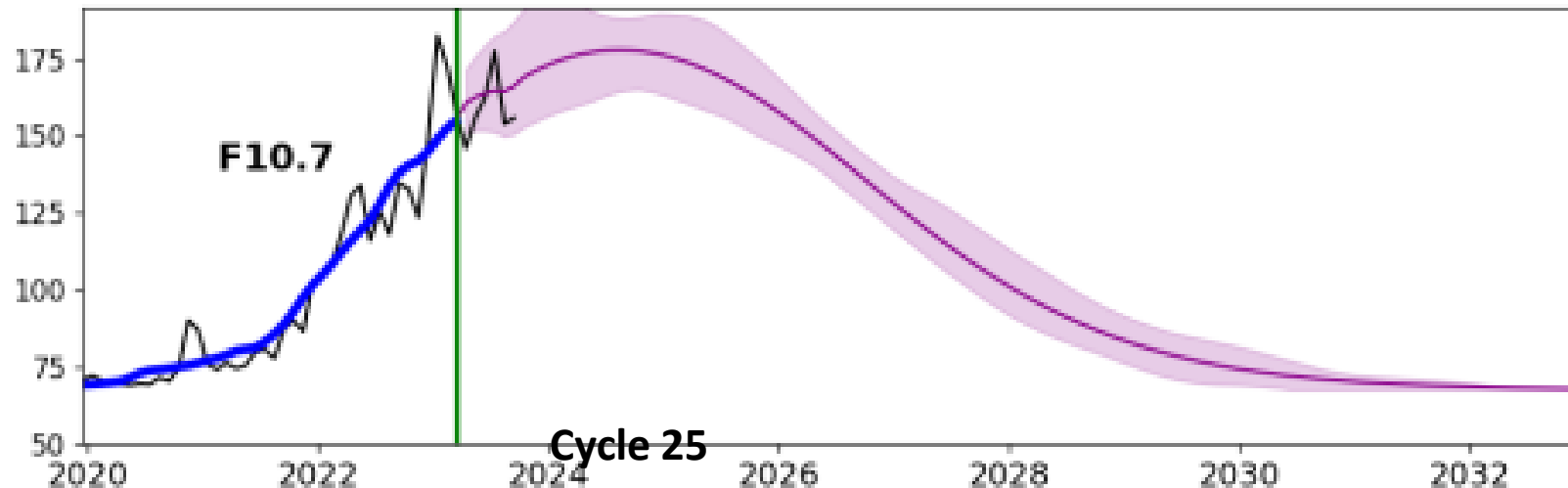
Solar Cycle Forecasts

- There were more than 50 for Cycle 24
- There are more than 50 for Cycle 25
 - From a small cycle to a big cycle – why so many?
- We don't fully understand the sunspot cycle process
 - We know it has to do with how magnetic fields and plasma flow inside the Sun – but the nitty-gritty details are not yet fully clear
- Thus many methods are used to make a forecast
 - Precursor appears to give the best results now
 - For example – the length of the previous solar minimum period
 - The future – the physics inside the Sun



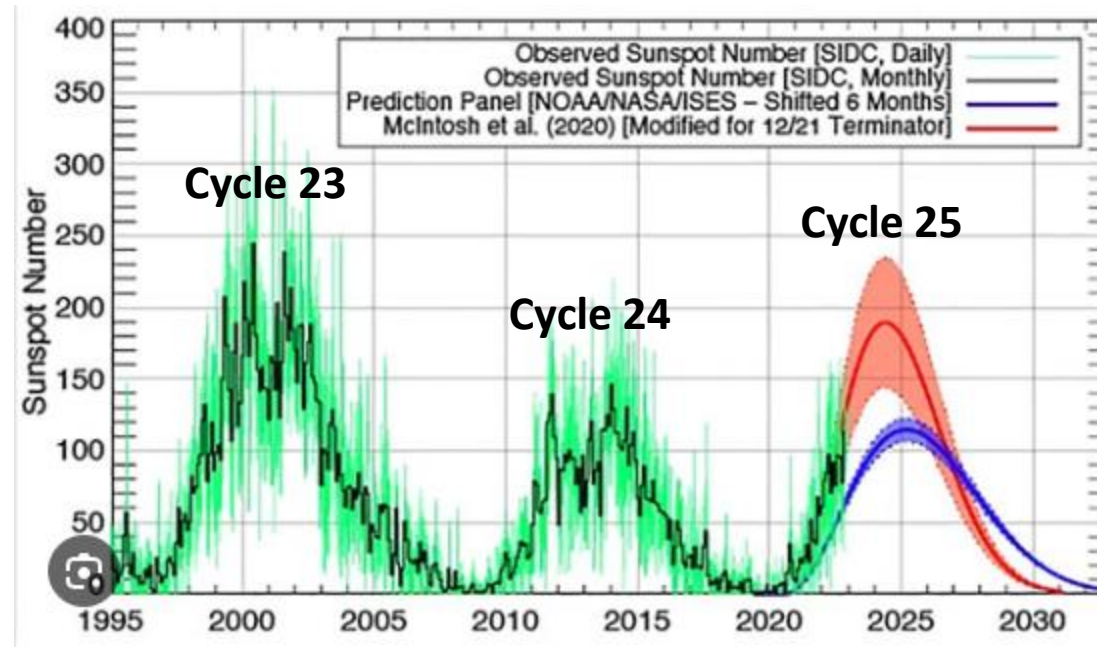
NOAA/NASA Second Forecast

- Forecast revised in 10/2023
- Max SFI up from 135 to 175 (29.6 % increase)
 - Still below an average cycle



Dr. Scott McIntosh Second Forecast

- Forecast revised in 12/2021
- Max sunspot number down from 230 to 190 (17.4 % decrease)
 - Just above an average cycle



NOAA/NASA vs McIntosh

- Note that the forecast from NOAA/NASA is in terms of the 10.7 cm solar flux (SFI) and the forecast from Dr. McIntosh is in terms of the sunspot number
- How do the two forecasts compare?

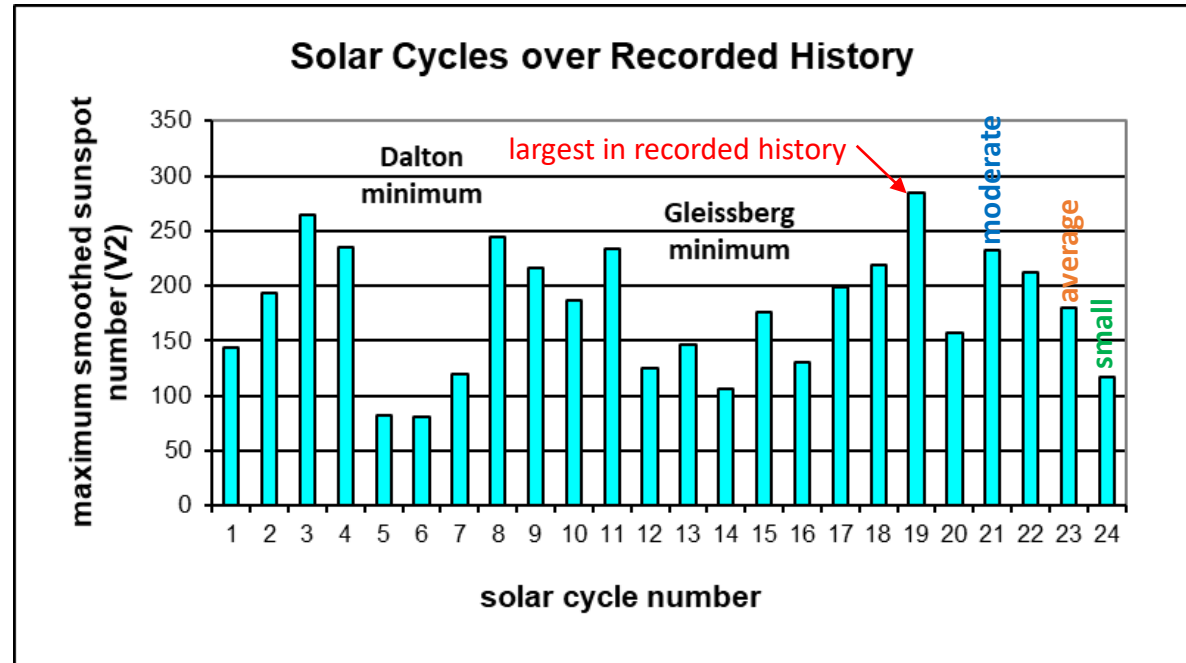
	In terms of SFI	In terms of sunspot number
NOAA/NASA	175	130
Dr. McIntosh	230	190

- Quite a difference – NOAA/NASA forecasts a smaller cycle than McIntosh
- All we can do is wait to see what happens
- Enough on forecasts – let's look at actual data



But First - All Previous Solar Cycles

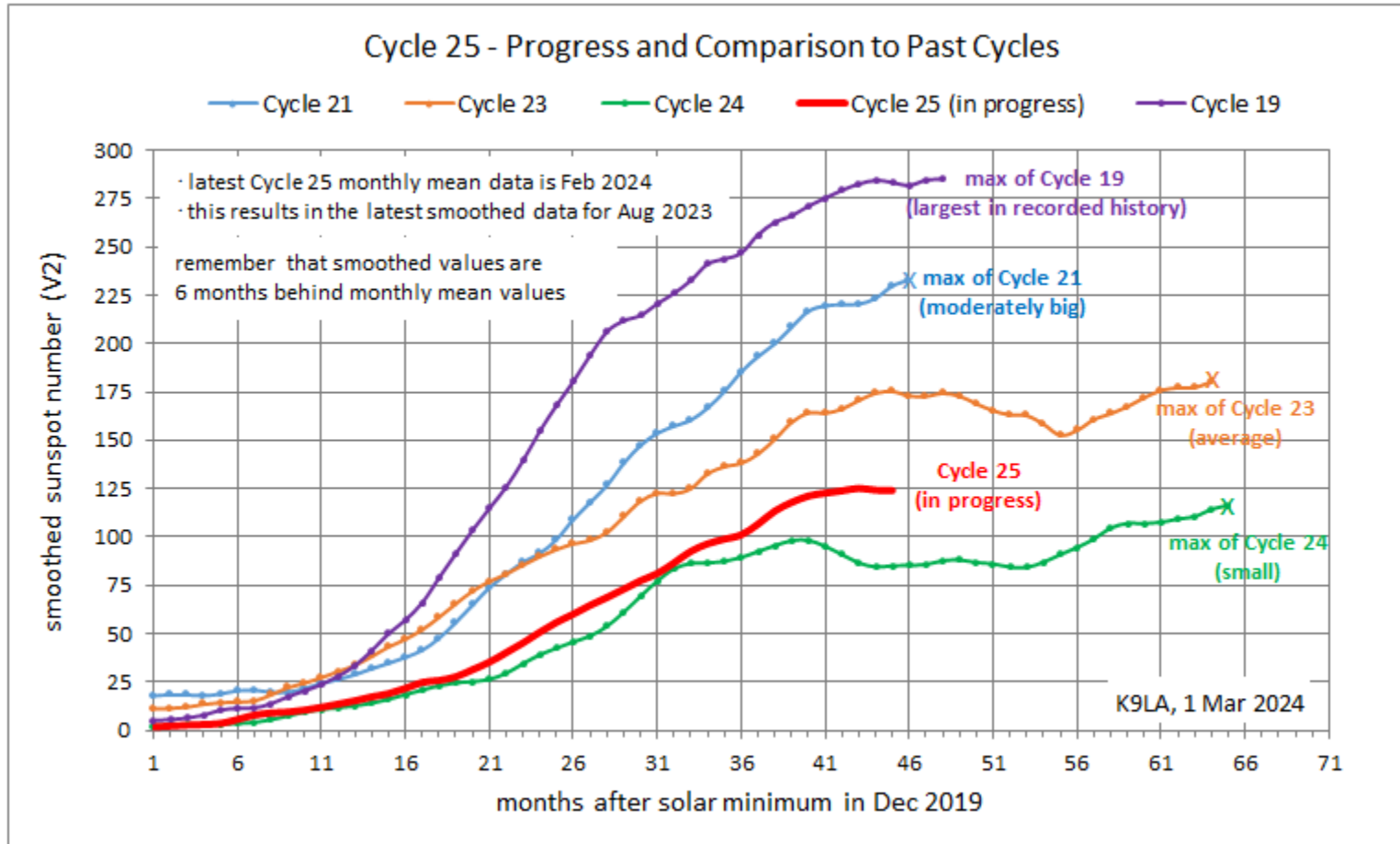
- Cycle 1 began in 1755
 - Maunder Minimum (few sunspots) occurred from 1645-1715
- We've gone through 3 periods of big solar cycles
- We've gone through 2 periods of small solar cycles
- We appear to be in a third period of small solar cycles



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

Here's The Latest Cycle 25 Data

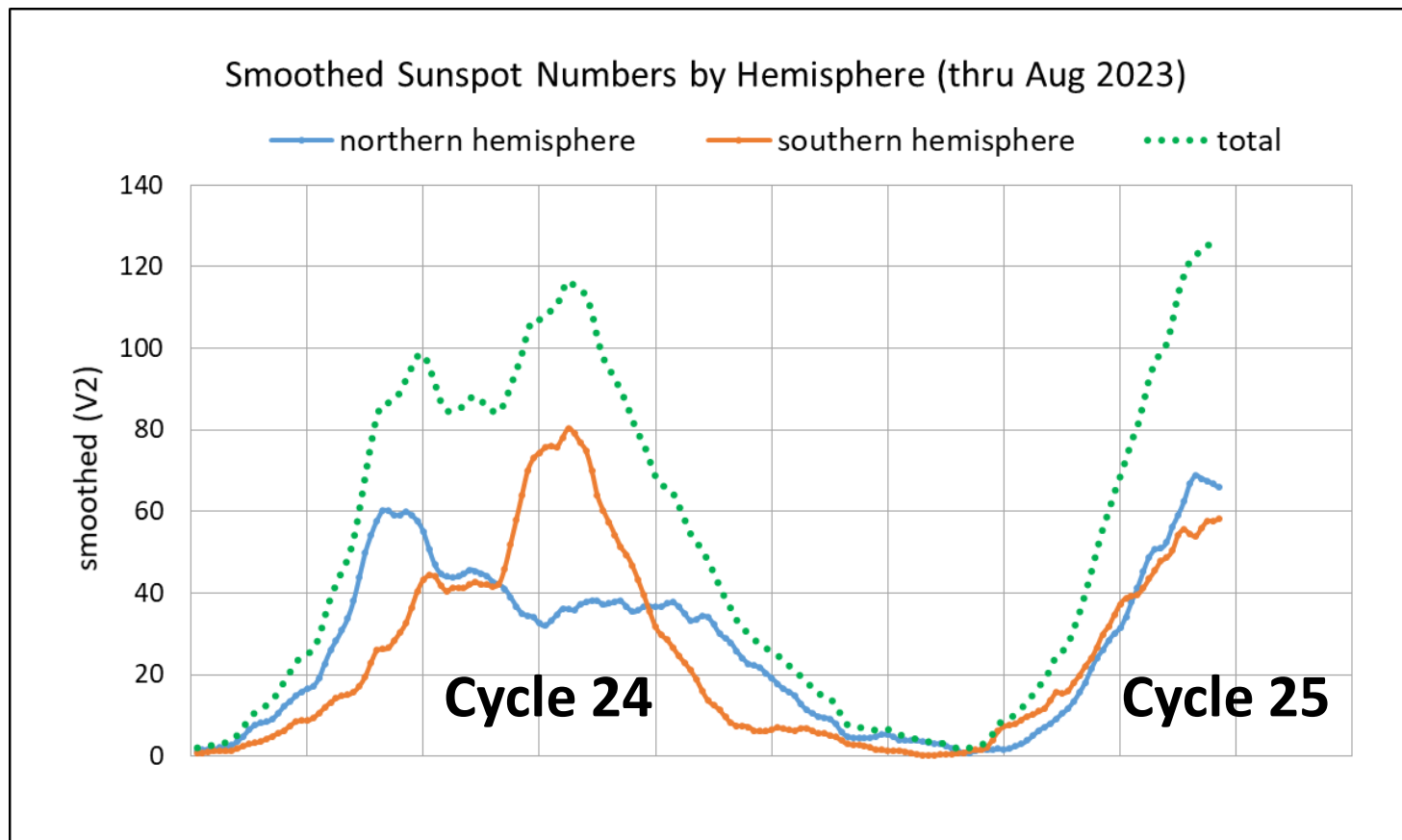
with comparisons to other solar cycles



- Cycle 25 has surpassed Cycle 24
 - But not by much so far
- Will it make it up to an average cycle like Cycle 23?
 - Perhaps



Cycle 25 – One Peak or Two Peaks?



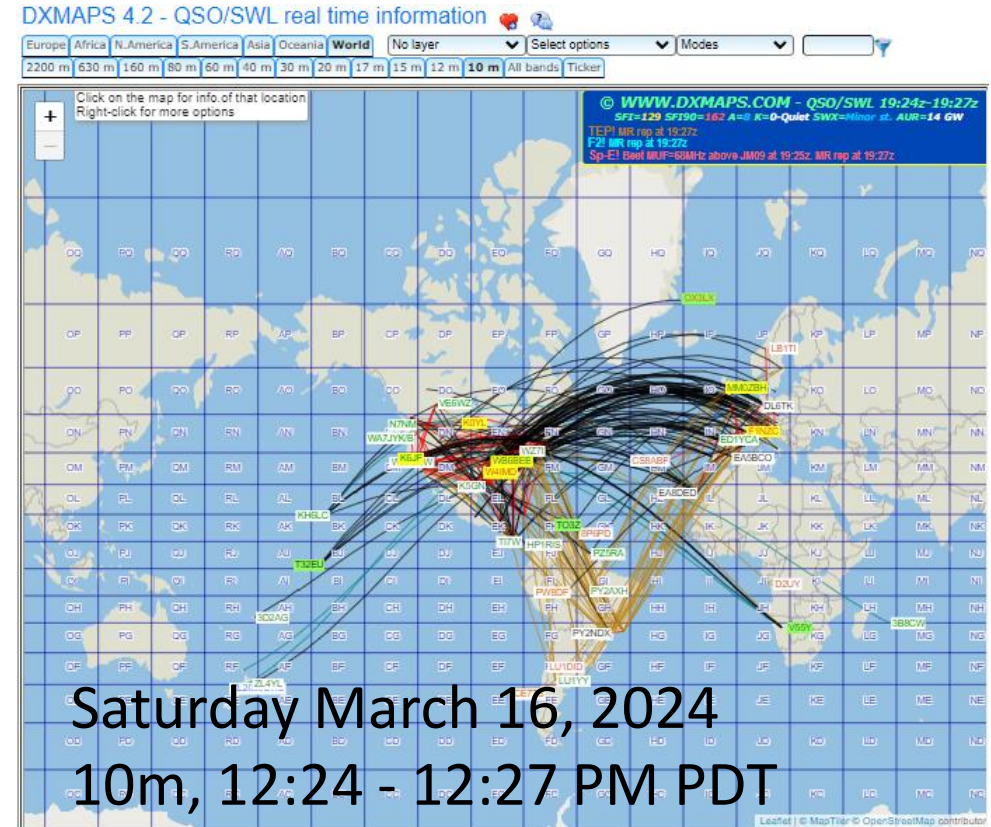
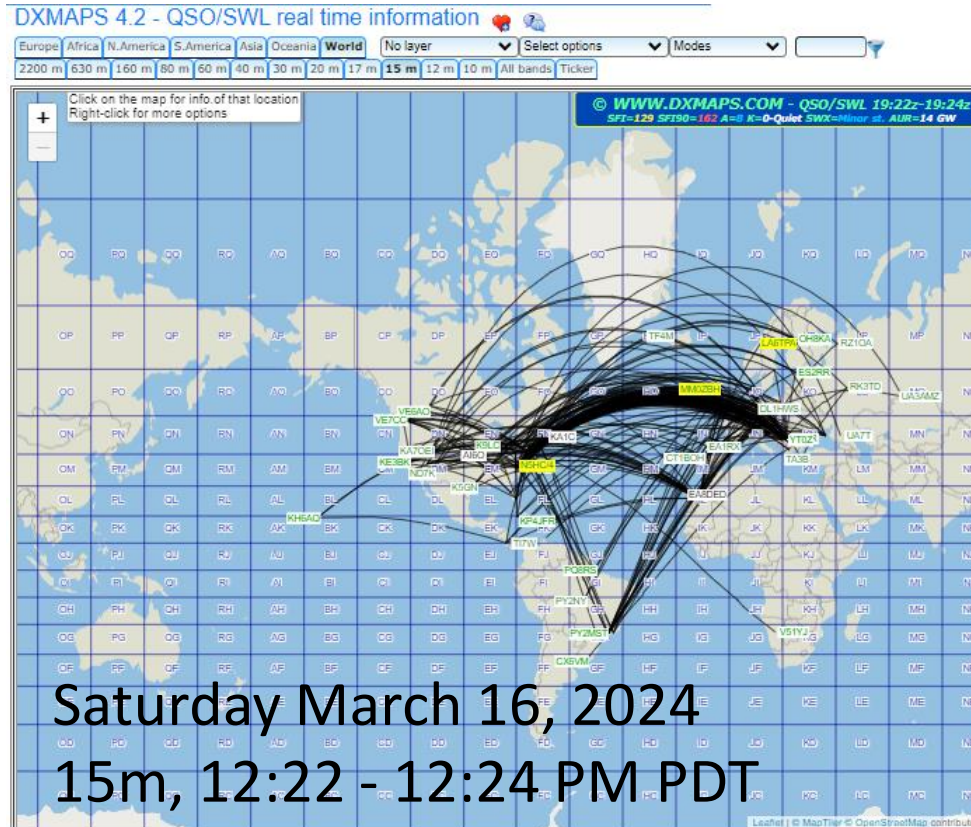
- Cycle 24 (and Cycle 22 and Cycle 23) had two peaks
- Best guess right now is one peak for Cycle 25 due to the two solar hemispheres working together
- We'll see what happens in the next several months with respect to the two hemispheres

Use SFI and K to Assess Propagation

- For propagation on the higher HF bands (15m, 12m, 10m)
 - Best around solar maximum in fall/winter
 - Desire long-term SFI greater than 100 and K less than or equal to 3
 - For propagation on the middle bands (30m, 20, 17m)
 - Good throughout a solar cycle
 - SFI not a big issue and desire K less than or equal to 3
 - For propagation on the low bands (160m, 75/80m, 60m, 40m)
 - Best around solar minimum in fall/winter
 - Desire long-term SFI less than 80 and K less than or equal to 3
 - For F2 propagation on 6m
 - Best in the fall/winter months around a big solar maximum
 - Desire long-term SFI greater than 200 and K less than or equal to 3
- ***Right now the long-term SFI is about 160***
 - ***These are just guidelines – check out the next two slides***

Real-Time Propagation

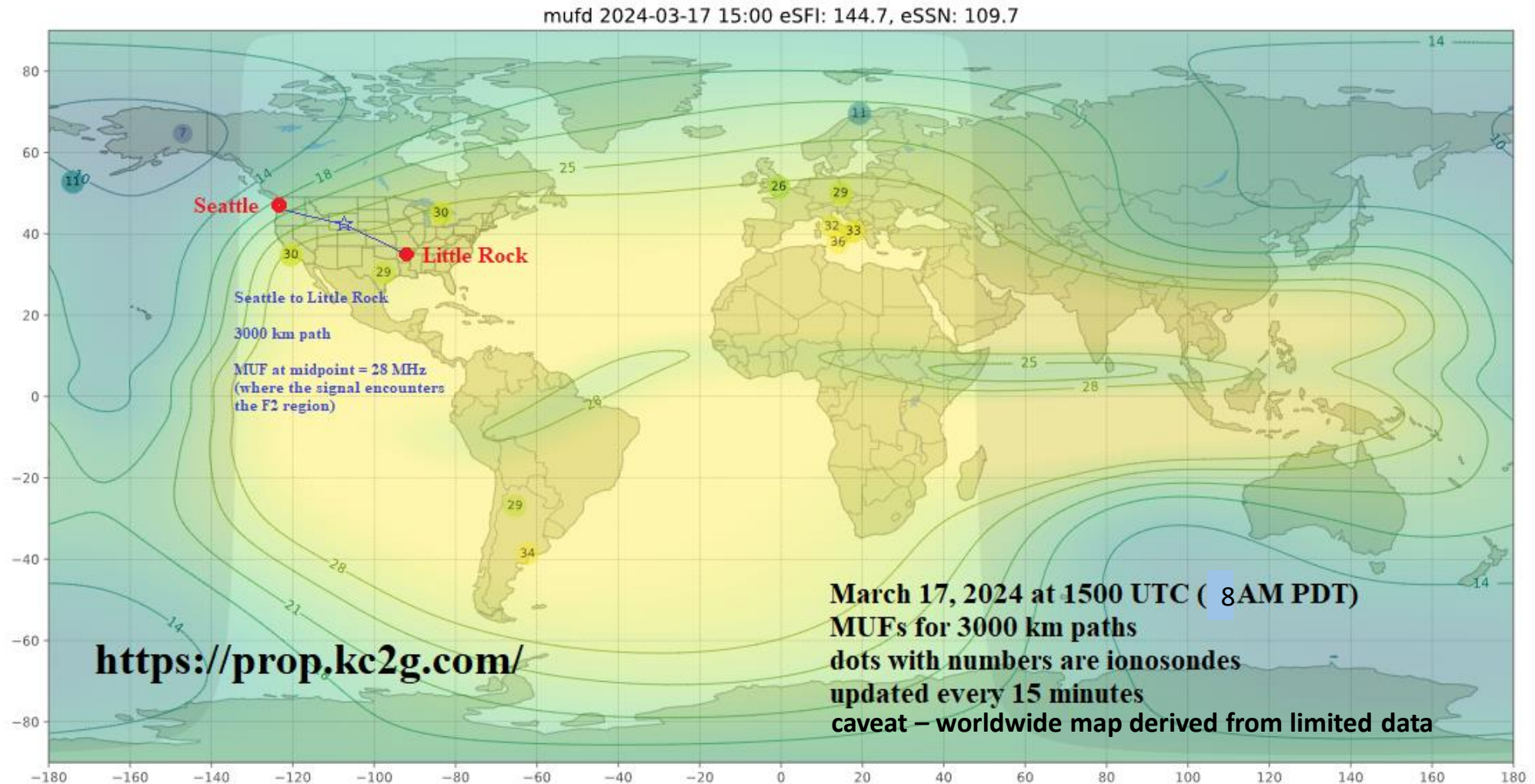
- Visit dxmaps.com and select view & band



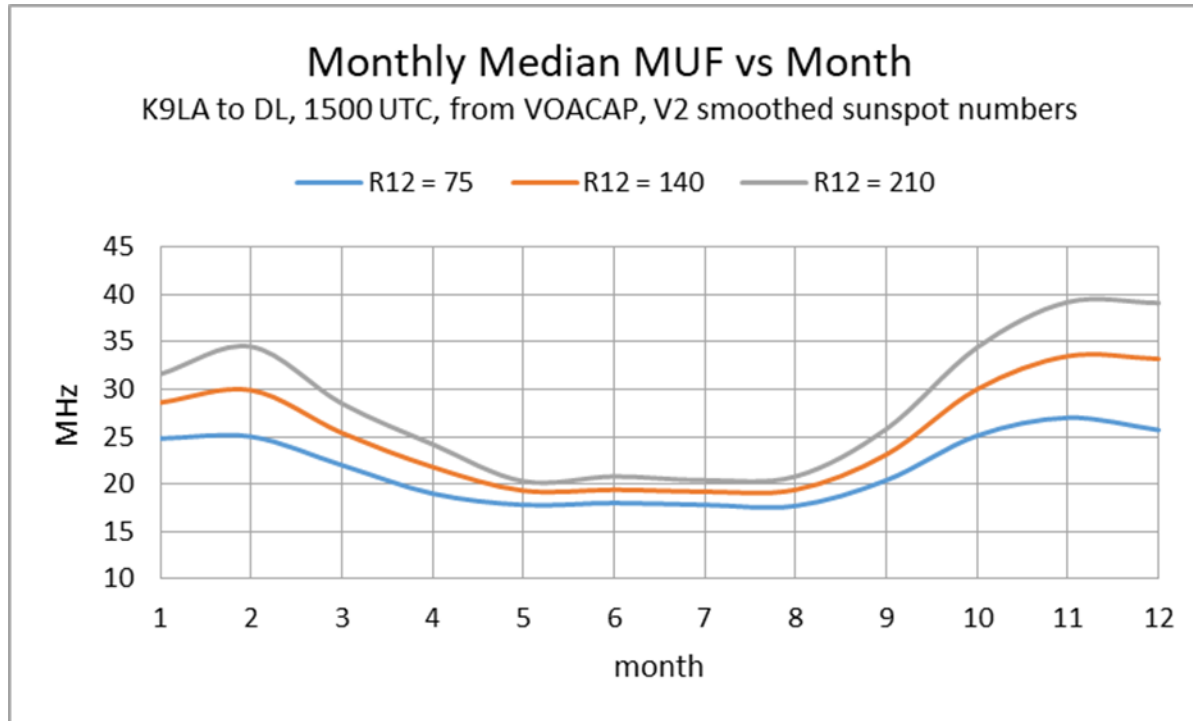
Aurora	Aurora-E	Back-Scatter	EME	Sporadic-E	Multihop Sp-E	FAI
Iono-Scatter	MS	TEP	Tropo	F2	Aircraft Scat.	Unknown

- Other methods
 - WSPRnet, PSKreporter, IARU/NCDXF beacons, Reverse Beacon Network, others

Real-Time MUFs



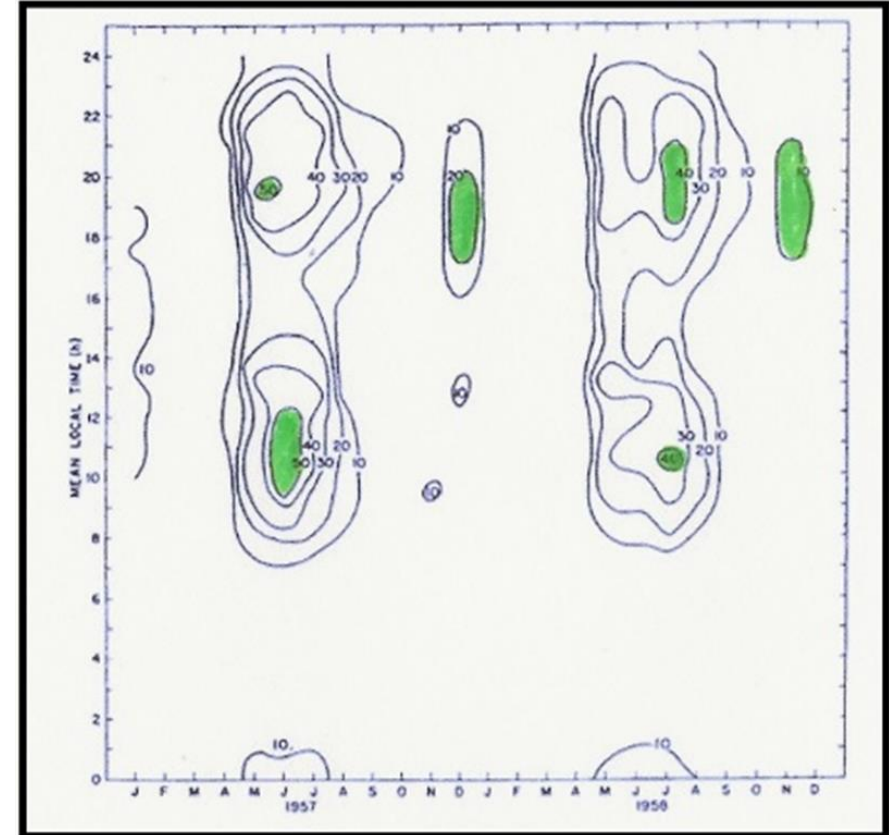
Propagation Over a Year



- In the northern hemisphere, there are lower daytime F_2 region MUFs in summer than in fall/winter
- This is caused by a change in the composition of the atmosphere
 - Decreased O/N_2 ratio in the summer
 - Increased O/N_2 ratio in the winter

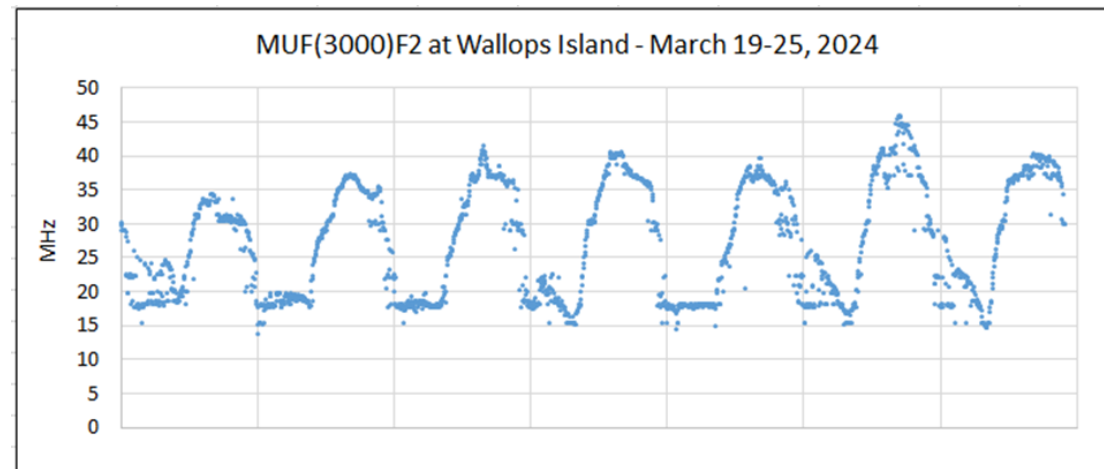
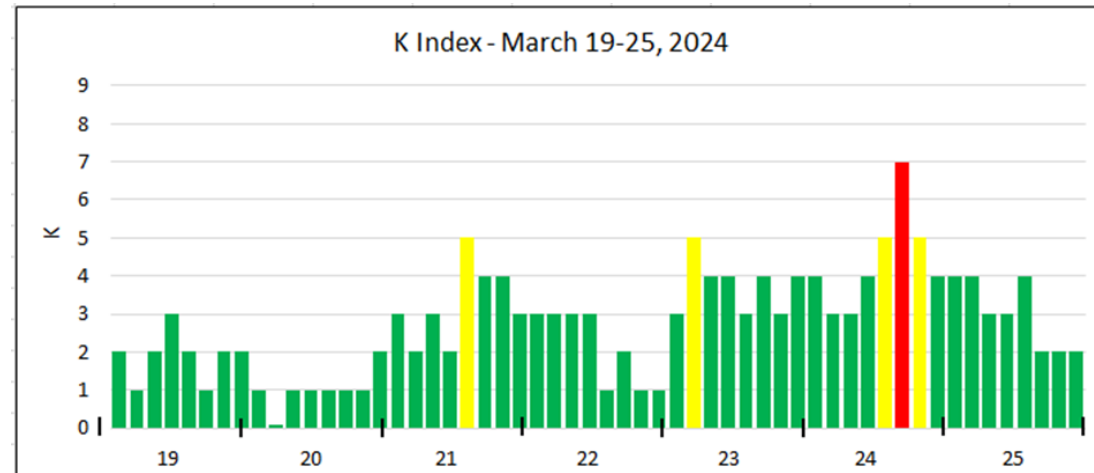
More Details on 6m Propagation

- Terrestrial weather appears to have an impact on sporadic-E
- Space weather has an impact on F2 propagation
- Expect sporadic-E this summer
 - Best in June, July, August
 - Late morning and early evening
- Expect some F₂ propagation this coming fall and winter
 - Not much because Cycle 25 is small
 - Why fall and winter?
 - To reiterate, highest MUFs (maximum useable frequencies) in the northern hemisphere



Short-Term Enhancements

- Check the higher HF bands and 6m when there is a moderate spike in the K index
- We had one of these on Sunday (March 24)
- Note what happened to the MUF on March 24



Propagation References

- Propagation chapters of the ARRL Handbook and ARRL Antenna Book
- Here to There: Radio Wave Propagation
 - <https://home.arrl.org/action/Shop/Store>
- The Little Pistol's Guide to HF Propagation – Bob NM7M (SK)
 - https://k9la.us/NM7M_The_Little_Pistol_s_Guide_to_HF_Propagation.pdf
- The CQ Shortwave Propagation Handbook – 4th Edition
 - <https://store.cq-amateur-radio.com/shop/the-cq-shortwave-propagation-handbook-4th-edition-cd/>
- Radio Propagation Explained – GØKYA
 - <https://www.amazon.com/Radio-Propagation-Explained-Steve-Nichols/dp/1910193283>
- Ham SCI – <https://hamsci.org/> and <https://hamsci.org/seqp-faqs>
- K9LA web site – <https://k9la.us/>

Summary

- Cycle 25 has leveled off for now
- Is this is just a pause or will it go higher?
- Expect excellent worldwide 15m/12m/10m propagation until summer and then again next fall and winter
- Get on the air and have fun!
- Don't forget the solar eclipse on Monday April 8
 - For Dallas, totality around 1:41 PM CDT