Winter Nights at Solar Minimum – When NVIS Really Shines

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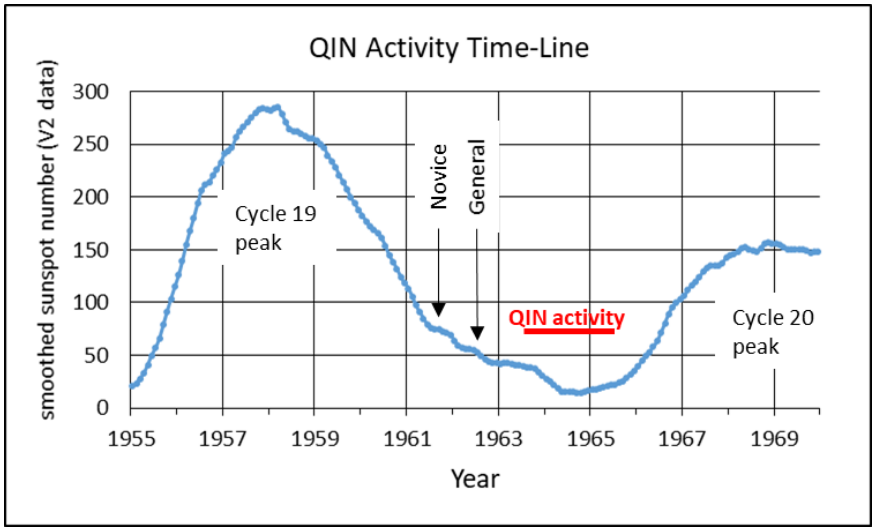
About one year after receiving my General license in May 1962, I became active in traffic handling on 80-Meter CW. I checked into QIN (the Indiana CW traffic net), 9RN (the Ninth Region CW traffic net) and CAN (the Central Area CW traffic net) on a regular basis. These nets were after sunset in the winter months.

Looking at my old logbooks brought back memories of the net control stations on QIN in the early 1960's, including K9DHN (now K0AD), W9QLW (SK), W9TT (SK), K9ZLA (still K9ZLA), WA9AUM (now K1TN), WA9BWY (now W9RE) and many, many others. Eventually I became a net control station on QIN (as WA9AVT back then), and that continued until I headed off to Purdue in September 1965.

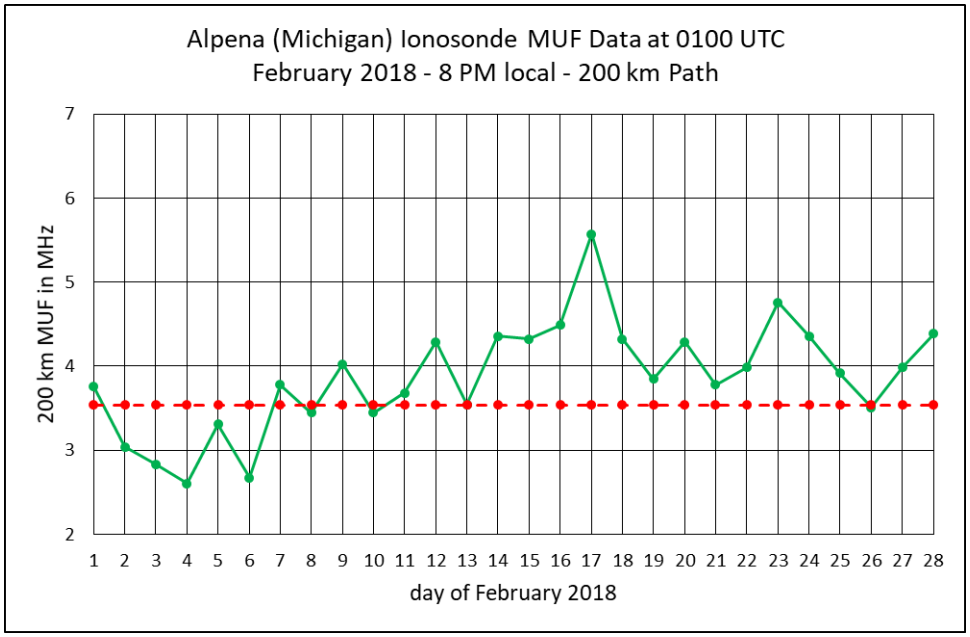
The following is a time-line of my early NTS (National Traffic System) years with respect to Cycles 19 and 20.



As can be seen, my QIN (and 9RN and CAN) activity was just before and at solar minimum between Cycles 19 and 20. What stands out in my mind after all these years is the occasional winter nights when we struggled on QIN due to very weak (or non-existent) signals. What happened was the MUF (maximum useable frequency) for short-distance contacts (high elevation angles) within Indiana on 80-Meters was too low – below 3.5 MHz. And back then, we had no alternative but to suffer through those nights until a better night came along.

Fast-forward to today. I'm again active on QIN, and we occasionally still have problems on winter nights on 80-Meters – especially around solar minimum (where we are now). But nowadays we have a Plan B – we move to 160-Meters, and signals are strong there indicating the MUF is above 1.8 MHz for our high-angle signals. As we move into spring, we don't have problems with a low MUF – but we could have problems with QRN as we move into summer.

Is there a way to forecast if the MUF will be high enough for QIN on 80-Meters? I looked at this using the Alpena (Michigan) ionosonde. It's several hundred miles north of Indiana, but we can apply a 'fudge factor' to its data for a more southerly location (Indiana). We can then use the Alpena data to estimate if short-distance QSOs within Indiana are possible. I chose 200 km as the typical QSO distance, which is a good assumption for Indiana stations. I went through this exercise for February 2018, with the following results.



The green curve is my estimate of the MUF for a 200 km path in Indiana at the QIN time of 8:00 PM local. The red curve is 3.535 MHz (the QIN frequency). In early February, running QIN on 80-Meters might have been a problem. Indeed, comparing my notes of what actually happened confirmed that we did QSY to 160-Meters on those nights.

Now I can go to https://www.ngdc.noaa.gov/stp/IONO/rt-iono/realtime/AL945_foF2.png prior to the net to visually assess where foF2 (the F2 region critical frequency) will be at net time. Then I multiply this foF2 by my 'fudge factor' of 1.35 (which takes the more southerly location of Indiana into account and the MUF for a 200 km path into account). It's not perfect, but it gives us a heads-up to realize 160-Meters may be the place to be on that night.

To help out on 80-Meters and 160-Meters, I use low-height inverted-vees. The 80-Meter inverted-vee has its apex at 35 feet, and the 160-Meter inverted-vee has its apex at 45 feet. These antennas put much radiation at the higher NVIS (Near Vertical Incident Skywave propagation) elevation angles required for QIN operation.