A LOOK AT PROPAGATION FOR THE 2017/2018 CONTEST SEASON

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THANKS TO THE WWROF FOR SPONSORING THIS WEBINAR

And thanks to Ken K4ZW for facilitating this Webinar
AGENDA

• Cycle 24, Cycle 25, solar minimums
• Disturbances to propagation
• Mitigation for disturbances
• Band-by-band summary
• DX contest strategies as Cycle 24 declines
• K4ZW’s XW dilemma
CYCLE 24 STATUS

- Smallest in our lifetimes
- We still enjoyed the short second peak of Cycle 24
  - Even had 6m F2 openings
- Still have about 2 years to solar minimum
OUR PREDICTION FOR CYCLE 25

• 3 periods of big solar cycles
• 2 periods of small solar cycles
• It appears that we’re entering another period of small cycles
• Solar scientists so far are in agreement
DURATION OF SOLAR MINIMUM

- The longer we’re at solar minimum, the smaller the next cycle
- Conversely, the smaller the cycle, the longer the solar minimum preceding that cycle
WE’VE BEEN SPOILED

• Most of our solar minimums were about 2 years . . .

• Except for the minimum prior to Cycle 24
  • Almost 5 years!

• We may be in for another long solar minimum since Cycle 25 is expected to be small
X-ray radiation from M or X class solar flare can result in more absorption on the daylight side of the Earth.

Protons from M or X class solar flare can result in more absorption in the polar cap.

Elevated K indices can decrease F region MUFs at high and mid latitudes both day and night – but can enhance low latitude ionization.

Elevated K indices can cause increased auroral ionization (more absorption and VHF aurora).

X marks the spot – the North magnetic pole.

G = Geomagnetic storm

R = Radio blackout

S = Solar radiation storm
GEOMAGNETIC ACTIVITY VS SOLAR CYCLE

- **Ap** highest (most disturbed) at solar max and especially during the declining phase
- **Ap** lowest (quietest) at solar min and initial ascent
- Frank will have more on this
MITIGATION TO DISTURBANCES

• Geomagnetic storms (most of the time a depleted F2 region)
  • Cause: CMEs (most prevalent at solar max) and coronal holes (declining phase)
  • Mitigation: QSY to lower freqs, look for enhanced low latitude paths, look for skewed paths on the lower bands

• Solar radiation storms (energetic protons into the polar cap)
  • Cause: M and X-Class solar flares (most prevalent at solar max)
  • Mitigation: avoid polar paths, look other way around (long vs short path)

• Radio blackouts (radiation at X-ray wavelengths)
  • Cause: M and X-Class solar flares (most prevalent at solar max)
  • Mitigation: QSY to higher freqs (less loss & possible enhancement), look for paths in darkness
ADAPTING YOUR DX CONTEST STRATEGIES TO THE STEADILY DECLINING SOLAR CYCLE

• Spotless days are now much more frequent
  • Probably more than 100 spotless days this year
  • Many more spotless days during the next five years

• Solar flux will continue its decline to much lower levels
  • 60s and 70s will be increasingly common for at least five years

• Frequent geomagnetic disturbances until Solar Minimum
  • at least until the onset of solar minimum in about 2019
  • Mostly driven by frequent -- often intense -- coronal hole activity
  • Solar flares and coronal mass ejections (CMEs) will be much less frequent
  • Geomagnetic disturbances will be much less frequent after solar minimum in about 2019
MAJOR IMPROVEMENT IN 160 METER WORLDWIDE PROPAGATION

- Stronger DX signals
- More reliable DX openings especially to Europe and Japan
- Lower absorption
  - During increasingly common periods of less intense geomagnetic activity
  - Especially for a few years after solar minimum during about 2020-2022
- Less daytime D layer absorption
  - DX openings begin just before sunset and continue just after sunrise
- Less intense night time E layer absorption as the E layer MUF drops
MAJOR IMPROVEMENT IN 160 METER WORLDWIDE PROPAGATION

• Continuous openings to Europe, Mid-east and north Africa 2200-0830Z
• Frequent strong JA openings at sunrise mid-Nov to mid-Feb 1200-1230Z
• More frequent direct short path polar opening to central Asia 2300-0100Z

• More crowded band conditions
  • Especially when there is no strong 40 and 80 meter propagation to Europe
SIGNIFICANTLY IMPROVED
80 METER WORLDWIDE PROPAGATION

• Stronger DX signals
• Much more reliable DX openings especially to Europe and Japan
• Consistently low absorption
  • During increasingly common periods of less intense geomagnetic activity
  • Especially for a few years after solar minimum during about 2020-2022
• Less daytime D layer absorption
  • DX openings begin well before sunset and continue well after sunrise
SIGNIFICANTLY IMPROVED
80 METER WORLDWIDE PROPAGATION

• Continuous east coast USA openings to Europe, Mid-east and north Africa
  • 2130-0830Z
• Regular strong east coast USA to JA openings at sunrise mid-Nov to late Feb
  • 1130-1300Z
• Direct short path polar opening to central Asia will be much more frequent
  • 2130-0200Z
• Much more crowded band conditions
  • Especially when there is no strong 40 meter propagation to Europe
NEARLY 24 HOUR WORLDWIDE 40 METER PROPAGATION

• Much less daytime D layer absorption
• Nearly 24 hour DX openings during CQWW CW in late November
• DX openings to Europe will often begin before east coast USA mid-afternoon
  • Especially from mid-November through late February
• But DX openings to Europe will often end shortly after sunset
  • Especially from mid-November through late February
  • Direct short path to Europe often opens again at European sunrise
• Trans-polar propagation will become much less frequent
  • East coast US to East Asia propagation will often be via the South West skew path
  • Strong direct short path often opens at east coast sunrise
NEARLY 24 HOUR WORLDWIDE 40 METER PROPAGATION

• Europe, Mid-East and north Africa propagation
  • Activity QSYs to 40 meters before mid-afternoon ~1930Z
  • Don’t miss the strong mid-afternoon/evening openings 2000-0200Z
  • Propagation often fades/fails a few hours after sunset 0200-0600Z
  • Strong openings usually resume at sunrise in Europe ~0600-0900Z

• Japan, Far East and Central Asia propagation
  • Brief direct short path opening at JA sunset 0800-0900Z
  • Weak skew path opening at about 240° azimuth ~0900-1130Z
  • Strongest short path JA opening from the east coast ~1130-1300Z
  • Strong long path Asia signals at 150° azimuth 2130-2215Z
  • VK/ZL and southeast Asia long path at 90-150° azimuth 2100-2300Z
  • Southeast and central Asia long path at ~240° azimuth ~1130-1300Z
SHORTER DURATION
WORLDWIDE 20 METER PROPAGATION

• Mostly a daytime DX band from November to late February
• All DX propagation usually ends well before midnight on the east coast
  • Especially from mid-November through late February
• DX openings to Europe usually begin about an hour before east coast sunrise
• But DX openings to Europe usually end shortly after sunset in Europe
  • Especially from mid-November through late February
• Much shorter duration east coast USA propagation to east and central Asia
• US to central and east Asia propagation will often be via the South West skew path
  • Especially from 1200-1400Z at 240 degrees azimuth
SHORTER DURATION
WORLDWIDE 20 METER PROPAGATION

• All DX propagation usually ends well before midnight ~0300Z
  • Sporadic, weak night time Africa & south Pacific openings 0500-0700Z
• Europe, Mid-East and north Africa propagation
  • from before east coast USA sunrise until mid-afternoon ~1000-1900Z
    • the opening is sometimes delayed until after sunrise
    • the opening ends much earlier in the afternoon than in recent years
• Japan, Far East and central Asia propagation
  • short evening short path opening 2100-0100Z
  • morning short path opening 1300-1500Z
    • both openings are much shorter than in recent years
• South Asia and Mid-East morning long path 1300-1500Z
• VK, ZL and south Pacific mid-afternoon long path 1900-2200Z
MUCH SHORTER DURATION
WORLDWIDE 15 METER PROPAGATION

• Usually a daytime only DX band from November to late February
• All DX propagation usually ends shortly after sunset on the east coast
  • Especially from mid-November through late February
• DX openings to Europe usually begin about an hour after east coast sunrise
• But DX openings to Europe usually end shortly before sunset in Europe
  • Especially from mid-November through late February
• Very short duration east coast USA propagation to east and central Asia
  • Sometimes via the long path at 150 degrees azimuth
MUCH SHORTER DURATION WORLDWIDE 15 METER PROPAGATION

- Europe, Mid-East and north Africa propagation
  - from about an hour after our sunrise until early afternoon 1300-1800Z
  - shorter openings than we’ve enjoyed in recent years
- Japan and Far East propagation
  - weak unreliable late afternoon short path opening 2130-2300Z
    - sometimes only via long path to 150 degrees azimuth 1300-1400Z
    - much shorter openings than we’ve enjoyed in recent years
- 15M usually closes shortly after our sunset ~2200Z
  - always stays closed all night
NO LONGER A WORLDWIDE DX BAND
10 METER PROPAGATION

• **Strictly** a daytime only DX band
• **All DX propagation** ends before sunset
• There are no short path DX openings to Europe
  • There are weak scatter openings at 140 degrees azimuth
• But DX openings to Europe usually end **shortly before sunset in Europe**
  • Especially from mid-November through late February
• There are no short path DX openings to Asia
  • Rare very weak signal scatter openings to east Asia at 230 degrees azimuth
NO LONGER A WORLDWIDE DX BAND
10 METER PROPAGATION

- South America, Caribbean and Central America
  - PY and LU activity has increased significantly in recent years
  - usually opens about an hour after our sunrise ~1300Z
  - opening can fade for an hour or two, then return much stronger in the afternoon
  - usually closes about an hour before our sunset ~2100Z

- Europe and north Africa
  - very weak signals on the SE skew path at 110-150° azimuth ~1400-1700Z

- VK/ZL and South Pacific
  - A fairly reliable weak signal opening ~1900-2100Z

- Japan, North Pacific and Far East
  - rare morning weak signal long path at 150° azimuth ~1300-1400Z
  - rare evening very weak signal skew path 200-240° azimuth 2100-2200Z
**DX CONTEST STRATEGIES FOR DECLINING LOW SOLAR ACTIVITY**

- High antennas are much more important during solar minimum
- Improve your low band transmitting and receiving antennas!
- Start every DX contest on 40 meters
  - The European opening begins before mid-afternoon
  - the strong European opening *often ends a few hours after sunset*

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DX CONTEST STRATEGIES
FOR DECLINING LOW SOLAR ACTIVITY

• Capitalize on improved 160 and 80M propagation 2200-0830Z
  • especially important when 40 meters is not strongly open to Europe
• Strong 40 meter opening after sunrise in Europe 0600-0900Z
• 160, 80 and 40 meter openings to VK, ZL and JA 0900-1230Z
• 20M European opening starts before sunrise 1000-1900Z
• 15M European opening starts about an hour after sunrise 1200-1800Z
• 10 meters opens primarily to the south 1300-2100Z
• Strong 40M afternoon/evening openings to Europe 2000-0300Z
• 20 meter evening openings to Japan 2100-0100Z
K9LA
K4ZW’S DXPEDITIONS TO XW

• XW4ZW – January 23-30, 2015
  • 159 NA on 80m, 8 NA on 160m, 1947 total on 80m and 160m

• XW4ZW – January 16-22, 2016
  • 49 NA on 80m, 11 NA on 160m, 987 total on 80m and 160m

• XW4ZW – January 9-15, 2017
  • 52 NA on 80m, 1 NA on 160m, 1233 total on 80m and 160m

• XW to NA is a tough path
K4ZW’S OBSERVATIONS

- Ken says it’s pretty quiet to the south (long path) towards NA
- NA signals on 80m are often right at the noise
- Ken says he is being heard much better than he is hearing
- What’s the problem?

If we believe the ITU Radio Noise document, XW4ZW’s noise on 80m is about 20 dB worse than noise at W1 – that could contribute to non-reciprocity

From USAF Handbook of Geophysics (1960)
MORE BEER MONEY AND A DECK OF CARDS?

• When the noise is in the same direction as your target location, there’s not much you can do

• Other possible “RF” causes
  • Charly HSØZCW observes that short path signal strengths from HS on 20m are stronger in EU and NA than the other way
  • The author of a NATO report on the ionosphere says most paths are non-reciprocal in signal strength due to polarization mismatch

• Conclusion: For his next trip, Ken may have a lot of extra time for vices 😊
SWEEPSTAKES

• Although we talked about DX contests, propagation for Sweepstakes and other forthcoming contests will be similar
  • Higher bands not too productive
  • Lower bands best
• All of this could also apply for the next 2-5 years
  • Depends on the duration of the next solar minimum
Q & A