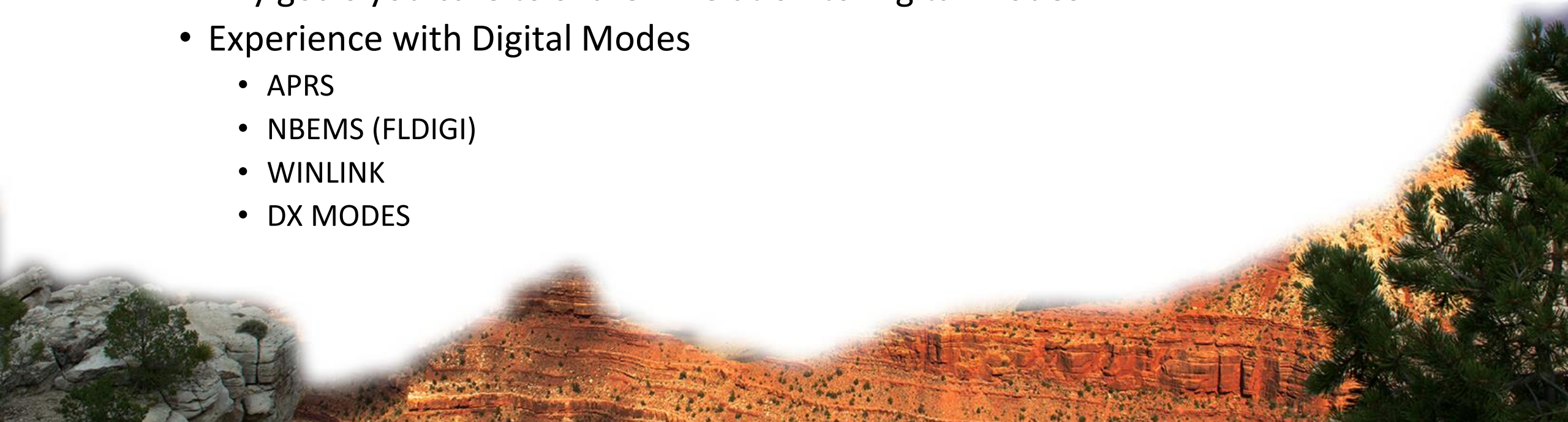

AG7GK
Digital Modes
Workshop
11/03/2018

Digital Mode Agenda

- Recap
- Equipment requirements
- Examples of Modes and Interactive Demos (Bring your stuff)
- Digital Net Planning

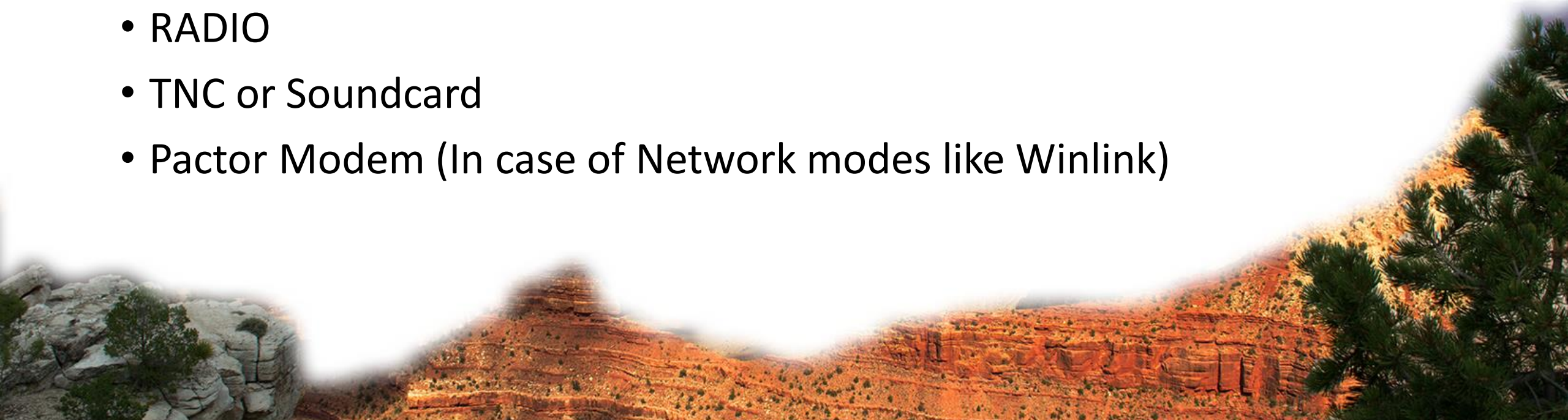
Introductions

- Aaron Jones – AG7GK first licensed in 2016 as KI7DUK
- Go around the room:
  - Name and Callsign
  - License level
  - Any goals you care to share in relation to Digital Modes
  - Experience with Digital Modes
    - APRS
    - NBEMS (FLDIGI)
    - WINLINK
    - DX MODES



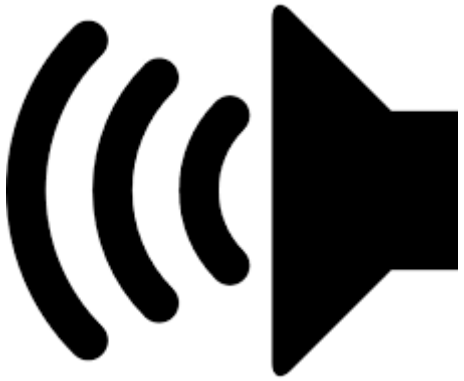
Equipment

- Computer OR Tablet / Phone
- Cables
- Radio with APRS
- GPS
- RADIO
- TNC or Soundcard
- Pactor Modem (In case of Network modes like Winlink)



HT Acoustical Coupling

- Tablet / Phone / Computer
- Apps:
  - Android SSTV
  - AndFLMSG
  - Droid PSK
- HT with HT specific cables
  - Baofeng HT
- APRS Specific Setup
  - HT
  - MOBILINK TNC and Cable
  - APRS Droid



HT / Audio Cable

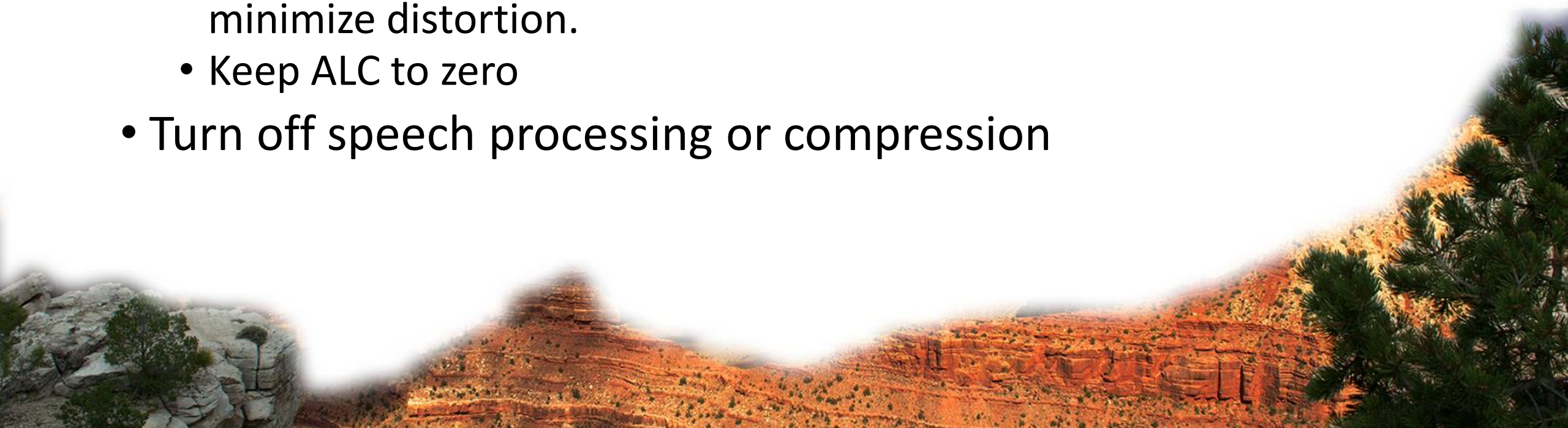
- Tablet / Phone / Computer
- Apps:
  - Android SSTV
  - AndFLMSG
  - Droid PSK
- HT with HT specific cables
  - Baofeng HT
  - Baofeng BT Tech APRS Cable using VOX PTT OR
  - Custom Audio interface cable to trigger PTT
- APRS Specific Setup
  - HT
  - MOBILINK TNC and Cable
  - APRS Droid

Basestation

- Computer / Tablet
- Soundcard either built in or USB
- Apps:
  - MMSSTV
  - FLDIGI- FLMSG-FLRIG
  - WSJTX
  - WSJT-X JTalertX
- Bastation
- Any Antenna – Mag Loop, Dipole, Vertical, anything to get a signal in and out

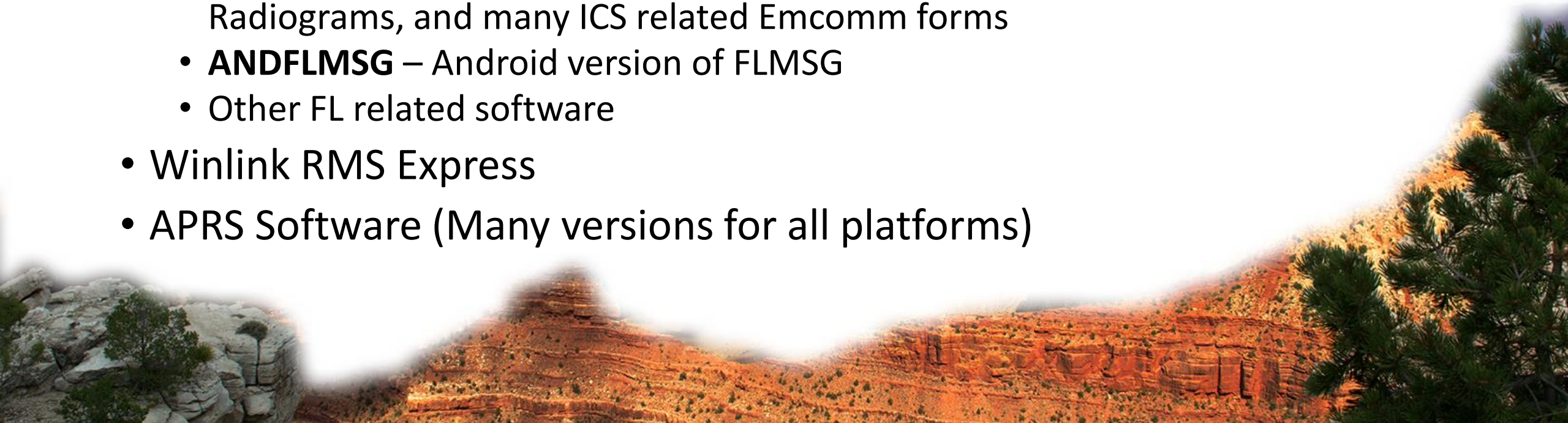
Warning about Duty Cycle

- Reduce your power!
  - Unlike SSB, these modes either run at 100% duty cycle, or use multiple tones sensitive to intermodulation distortion!
  - Be kind to your finals!
  - Keep **peak** power out well below key-down CW maximum to minimize distortion.
  - Keep ALC to zero
- Turn off speech processing or compression



Software

- WSJTX – used for FT8, JT Modes, WSPR, and Meteor Scatter
- MMSSTV – Used for Slow Scan TV
- FLDIGI – Many modes and options with companion software such as:
  - FLAMP - Amateur Multicast Protocol (One to Many Transmission of Files)
  - FLMSG – Message sending, one to many including CSV data, Text, Images, Radiograms, and many ICS related Emcomm forms
  - **ANDFLMSG** – Android version of FLMSG
  - Other FL related software
- Winlink RMS Express
- APRS Software (Many versions for all platforms)



Propagation Websites

- PSKreporter.info: https://pskreporter.info/pskmap.html
  - Use the stats page to see what modes are happening: https://pskreporter.info/cgi-bin/pskstats.pl
- Wsprnet for WSPR results; http://wsprnet.org/drupal/wsprnet/map OR alternative: http://wspr.aprsinfo.com/
- Hamspots.net: https://hamspots.net/
- APRS.fi: https://aprs.fi
- Online listing of hosted SDR receivers, great for verifying your signal on voice OR digital: http://websdr.org/

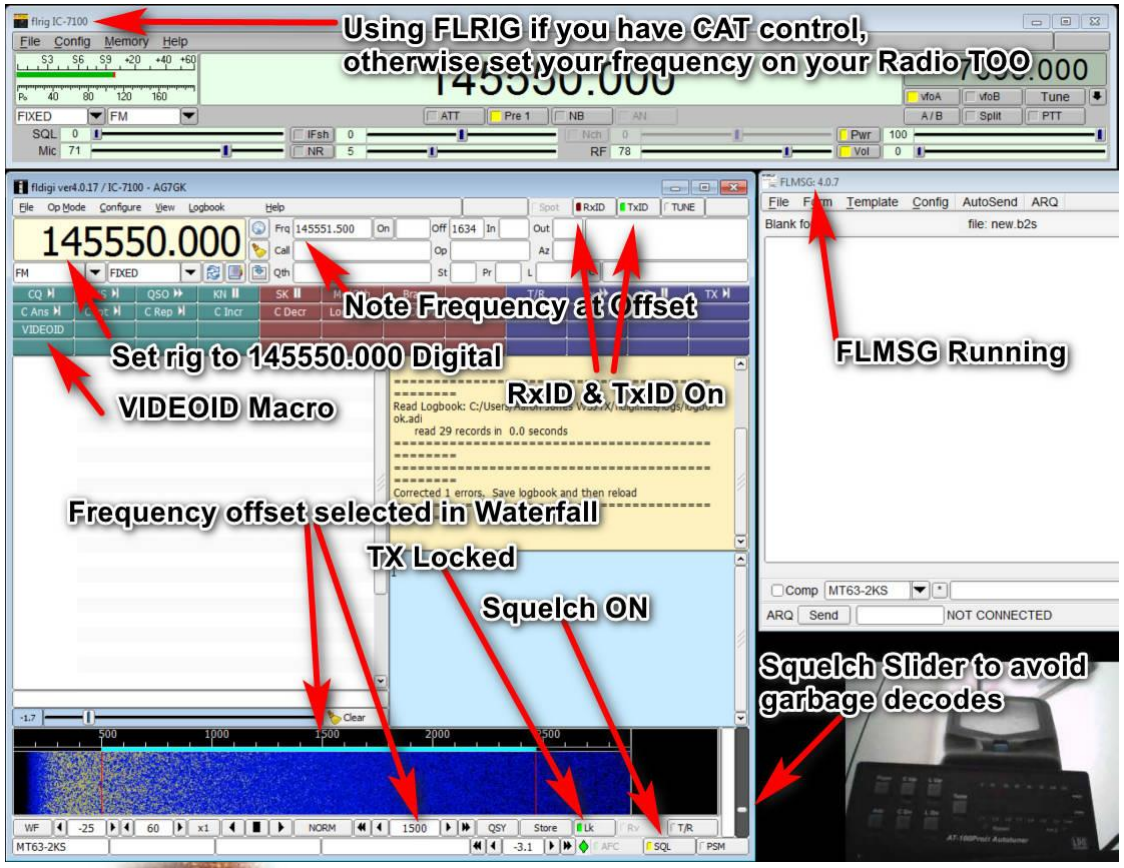
NBEMS / FL "Suite"

- Narrow Band Emergency Messaging System
- *http://www.w1hkj.com/NBEMS/NBEMS.ppt*
- Software (All free):
  - FLDIGI – Main application for mode selection, rig control, QSO's
  - FLAMP – Application for sending files in chunks, allows for retries and relays of missing chunks
  - FLMSG – Your go-to application for sending text and forms (Radiograms)
  - **ANDFLMSG** – Android version
  - FLRIG – Rig control application if you have a CAT control interface to your RIG

NBEMS - Demo

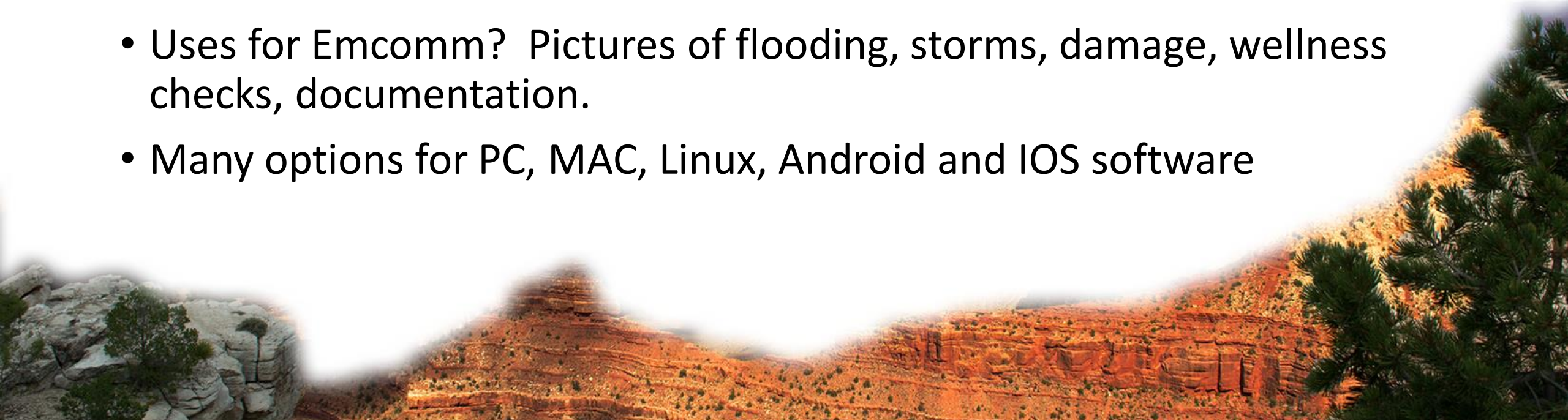
- FLDIGI Interactive Demo
- ANDFLMSG on a tablet and Handheld using Acoustic Coupling

NBEMS - Demo


Using FLRIG if you have CAT control,
otherwise set your frequency on your Radio TOO
Note Frequency at Offset
Set rig to 145550.000 Digital
VIDEOID Macro
RxID & TxID On
FLMSG Running
Frequency offset selected in Waterfall
TX Locked
Squelch ON
Squelch Slider to avoid
garbage decodes

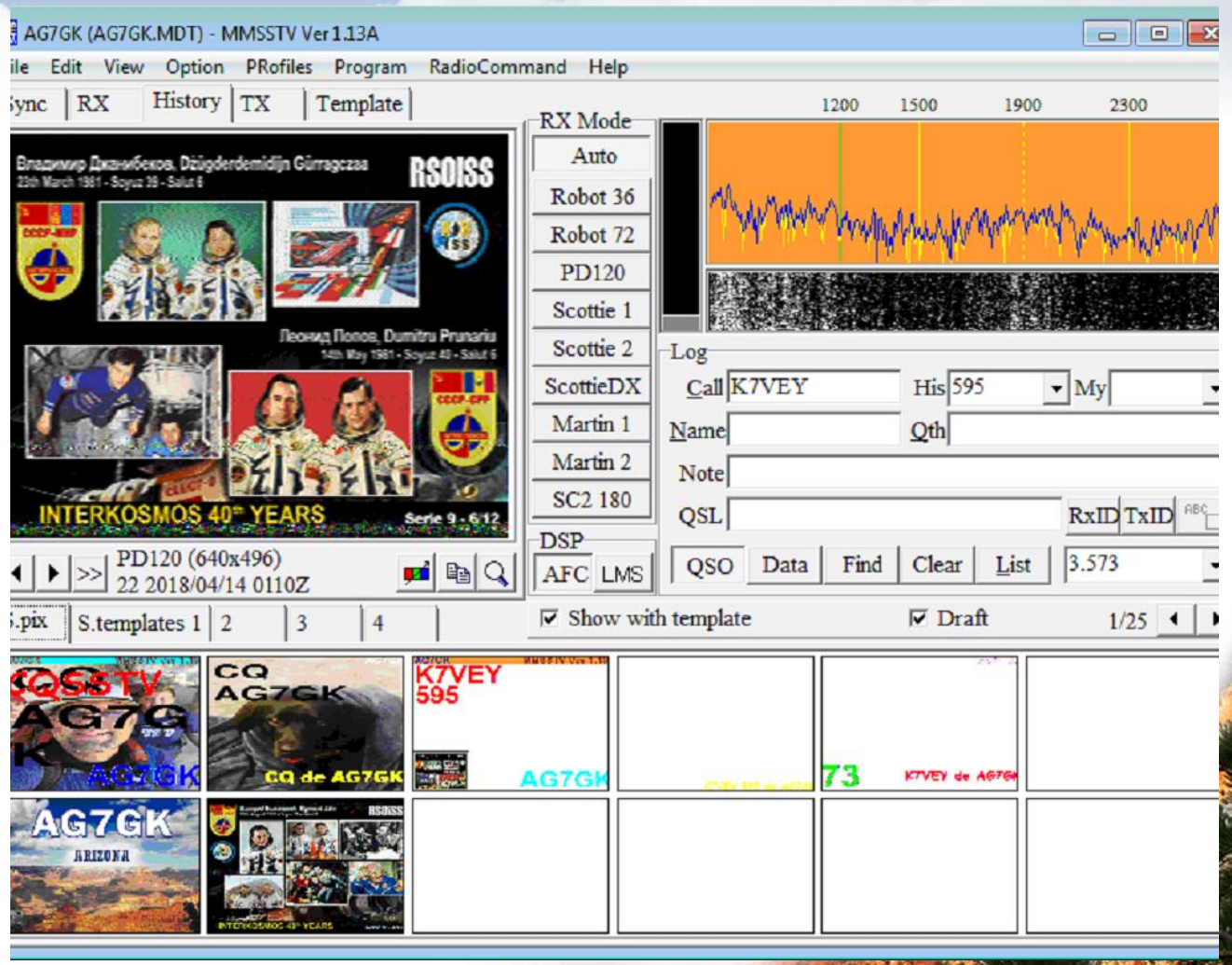
SSTV DEMO

- A single image is converted to individual scanned lines and those lines sent as variable tones between 1500 and 2300 Hz
- A color image takes about 2 minutes to transmit, depending on mode. Some black and white modes can transmit an image in under 10 seconds
- Uses for Emcomm? Pictures of flooding, storms, damage, wellness checks, documentation.
- Many options for PC, MAC, Linux, Android and IOS software



SSTV

- SSTV Software “MMSSTV”
- Captured on 145.500 Mhz VHF from International Space Station from Russian Cosmonauts celebrating 40 years in space
- Fun mode for sending pictures and various software options for computer, Android, and IOS

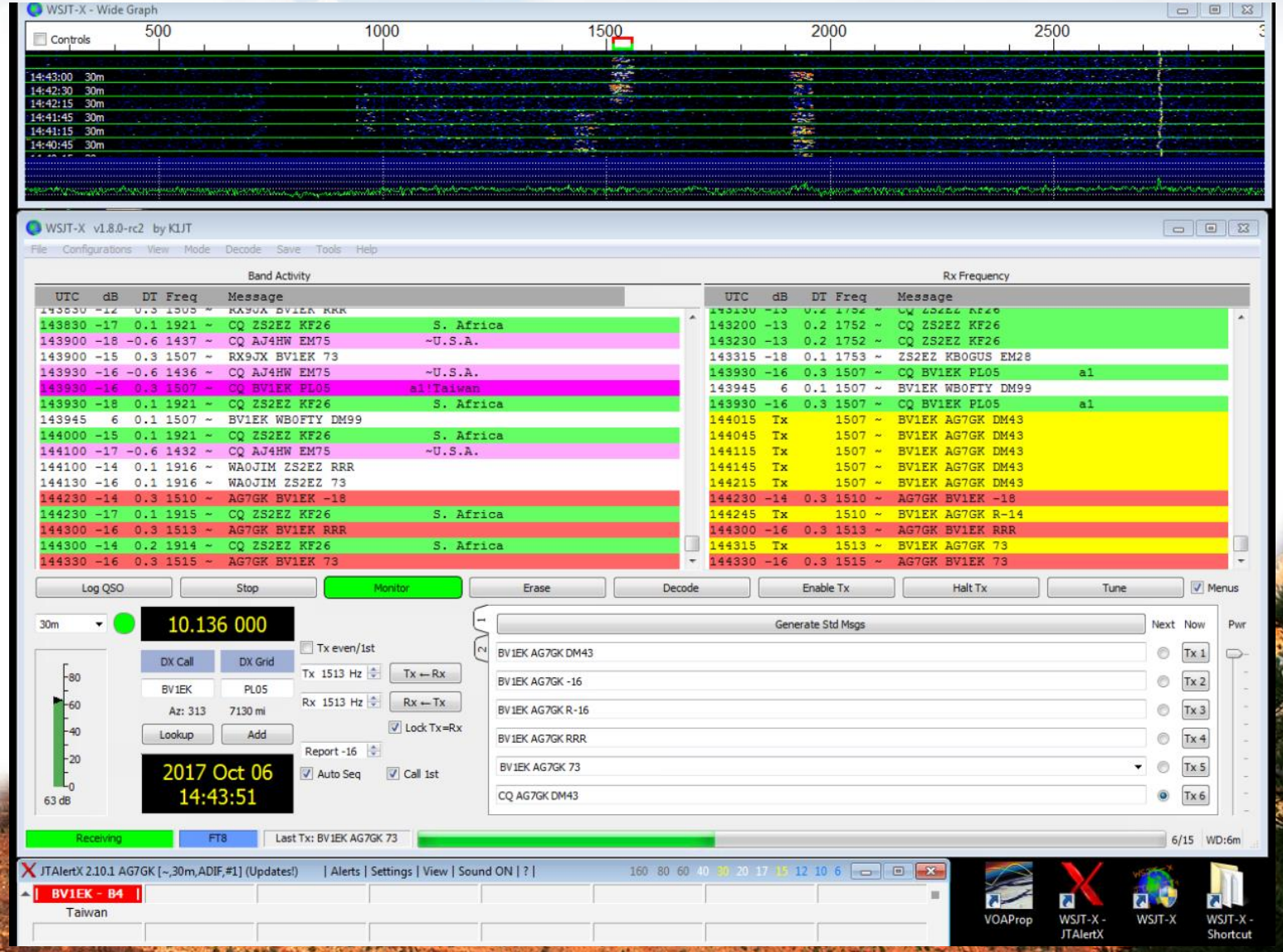


JT Modes (JT65, JT9, FT8)

- Origin: Created by Joe Taylor W1JT in 2003 for EME work
  - A way to have a QSO using a computer
  - A weak signal digital communications mode for Amateur Radio
  - A Multi-Frequency Shift Keying scheme employing Forward Error Correction with 65 tones
- Bandwidth: 50-180 hz
- Prevalence: Predominant modes for DX contacts
- Equipment requirements: HF Radio, Soundcard(ext/int), Computer, Rpi can work, WS-JTX software, other options exist
- Pros: Widespread, with FT8 very fast QSO's, SNR resilience
- Cons: Not conversational

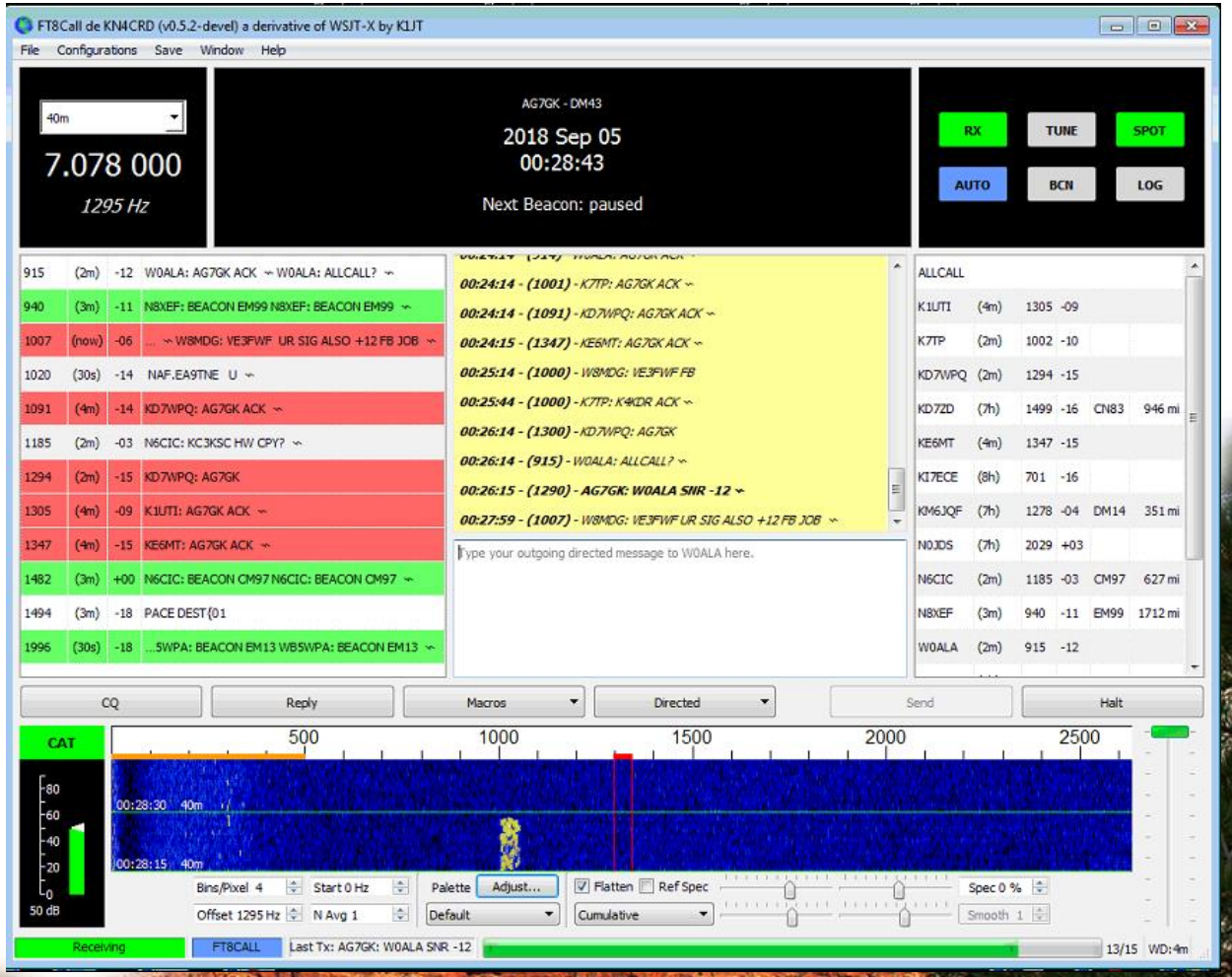
JT Modes (JT65, JT9, FT8)

- Exchange with TAIWAN
- 30 Meters
- Very weak signal, BV1EK reported my signal at -18 SNR and I reported his at -14



FT8CALL New Software

- New software being built TODAY
- Uses FT8 Protocol but allows keyboard to Keyboard Conversational Style
- Integrated with APRS to allow location updates and EMAIL-2 directed messages
- Getting Popular but get ready to WAIT, very slow.

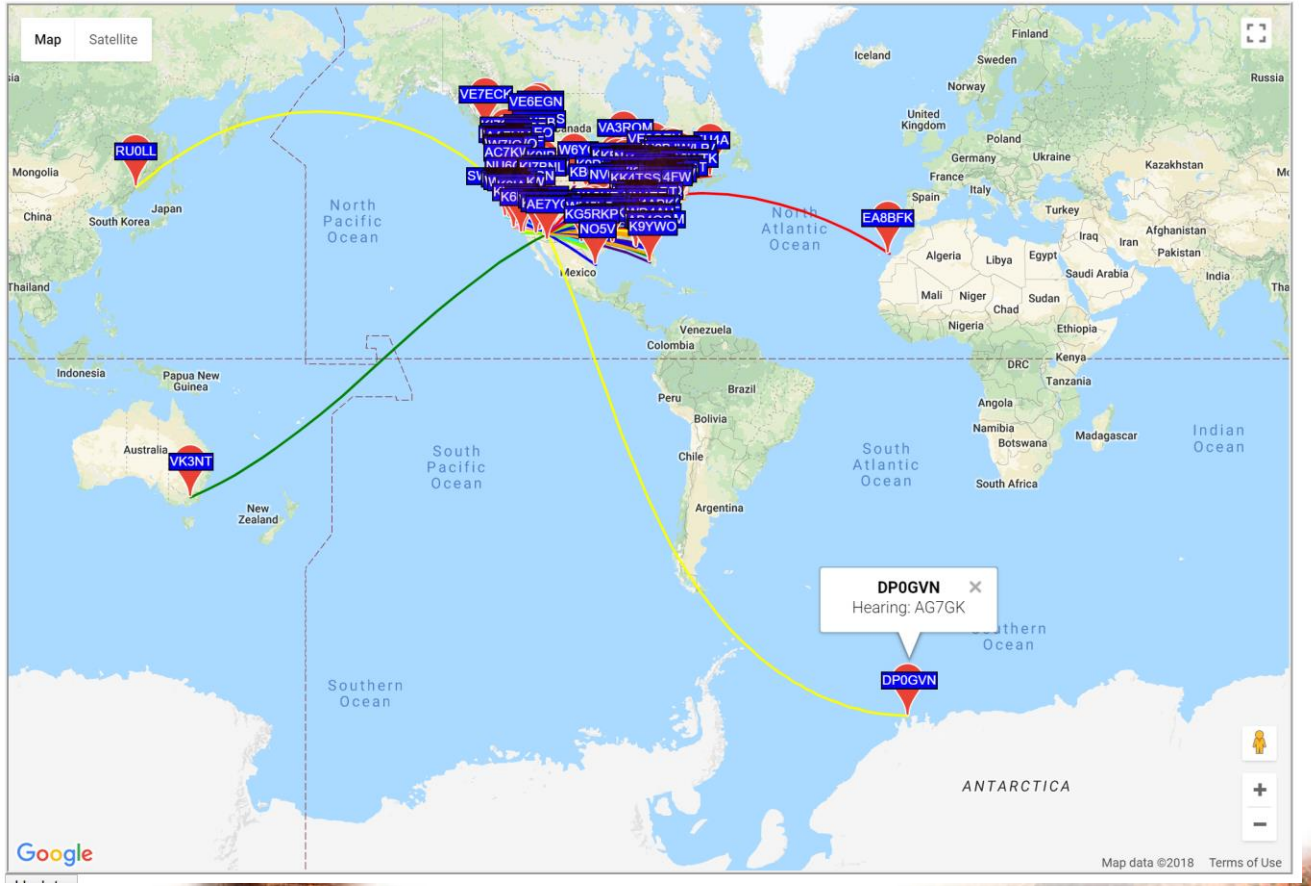


WSPR (Demo)

- Origin: 2008 by Joe Taylor
  - The Weak Signal Propagation Reporter
  - An automated system designed for sending and receiving low-power transmissions to test propagation paths on the MF and HF bands.
  - The program can decode signals with S/N as low as -28 dB
- Bandwidth: 6 hz
- Antenna propagation at: http://wsprnet.org/drupal/wsprnet/map OR http://wspr.aprsinfo.com/
- Equipment requirements: HF Radio, Soundcard(ext/int), Computer, Rpi can work, WS-JTX software, other options exist
- Pros: Great for seeing where your signal is going
  - “WSPR is about 11 dB better than ear-and-brain CW.
  - “For most operators, the difference is more like 15 dB."

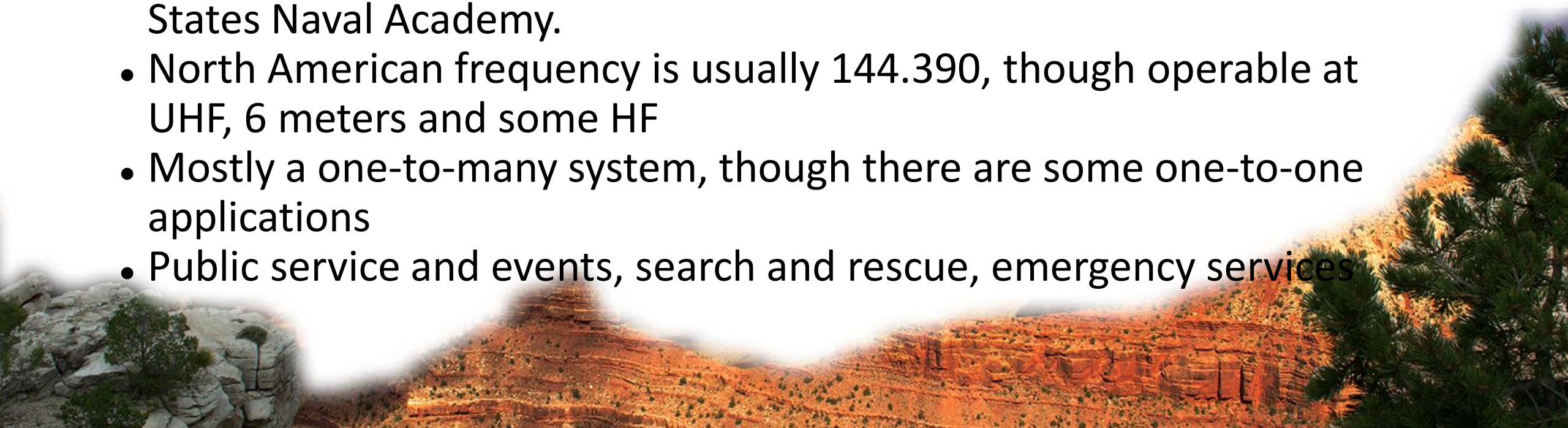
WSPR (Demo)

Map



APRS (Demo)

- **A**utomatic **P**acket **R**eporting **S**ystem
- Original Developed in 1984 to Map Navy Positions, with availability of GIS in the 90's became feasible for GPS integration
- The system is based on the AX25 Packet protocol, and was developed by Bob Bruninga WB4APR, a senior research engineer at the United States Naval Academy.
- North American frequency is usually 144.390, though operable at UHF, 6 meters and some HF
- Mostly a one-to-many system, though there are some one-to-one applications
- Public service and events, search and rescue, emergency services



Digital Net Discussion

- Interest
- Names / signup
- Examples
- Goals
- Netiquette
- Lessons Learned
- HF and VHF?

Useful Websites

- Comprehensive Guide to NBEMS / FLDIGI, equipment setup, instructions, etc: http://gblakesl.net/ARES/Basic-NBEMS-Workshop.pdf
- Presentation on Winlink: http://www.philsherrod.com/Winlink/Winlink_RMS_Express.pdf
- Excellent Presentation on NBEMS and FLDIGI: https://www.jeffreykopcak.com/drive/ham_radio/digital_modes/vhf_uhf_nbems_an_introduction_using_fldigi_and_flmsg_presentations/vhf_uhf_nbems.pdf
- Presentation on JT Modes: http://www.informationtechnologies.com.au/files/JT65%20Presentation.pdf
- WSPR Presentation: https://www.powershow.com/viewht/1a4552-ZDc1Z/What_is_WSPR_powerpoint_ppt_presentation
- Meteor Scatter Introduction: Link

More Useful Websites

- APRS: http://www.aprs.org/APRS-mobile.ppt
- A PRACTICAL EVALUATION AND COMPARISON OF SOME MODERN DATA MODES: http://www.qsl.net/zl1bpu/MFSK/datmodes2.pdf
- ARRL presentations on NBEMS (Narrow Band Emergency Message System) with FLDIGI
  - http://www.arrl.org/files/file/On%20the%20Air/Tutorials/Introduction_to_NBEMS_ARRL.pdf
  - http://www.arrl.org/files/file/On%20the%20Air/Tutorials/Advanced_NBEMS_3_0.pdf
  - *http://www.w1hkj.com/NBEMS/NBEMS.ppt*
- Digital Mode Comparisons from FLDIGI Help files: http://w1hkj.com/FldigiHelp-3.21/Modes/Compare.htm
- Signal ID Wiki – listing of all digital signals, explanations, samples:
- https://www.sigidwiki.com/wiki

Nerd Reading