

# HF Overview for Emergency Communications



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MCARES

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# Scope of today's meeting

My intro to HF: shortwave!

Radio propagation modes, line of sight and skywave

Antennas for HF

Simplex comms with 300 mile radius: 60m NVIS

Demos:

FT-8 & WSJTX for diagnosing your rig and conditions

Winlink over HF with Vara

More HF topics & activities (for the interested)

# Shortwave radio: my gateway to HF



Backpacking activity - listening to music and voices around the world

[WWV](#) on 10 & 15 MHz - Hawaii and Colorado

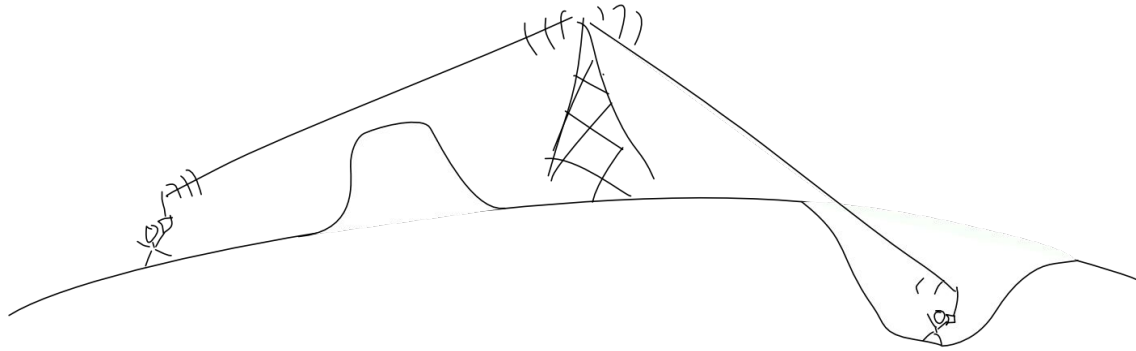
Never know what you're going to hear or on what band or frequency - mostly static so lots of patience and time required

All of this from a small telescoping antenna!

# Radio propagation for VHF & UHF



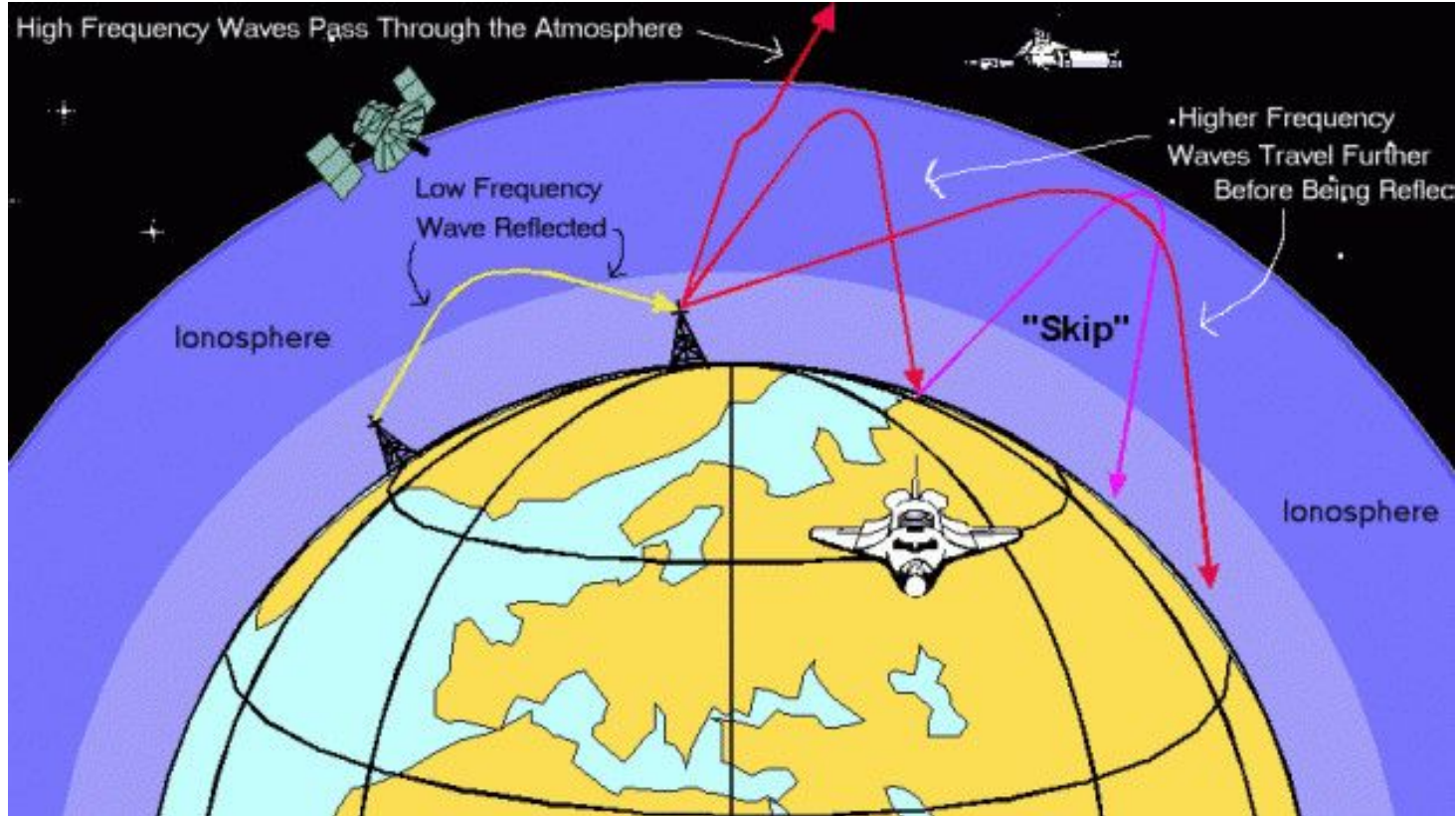
Simplex



Repeater

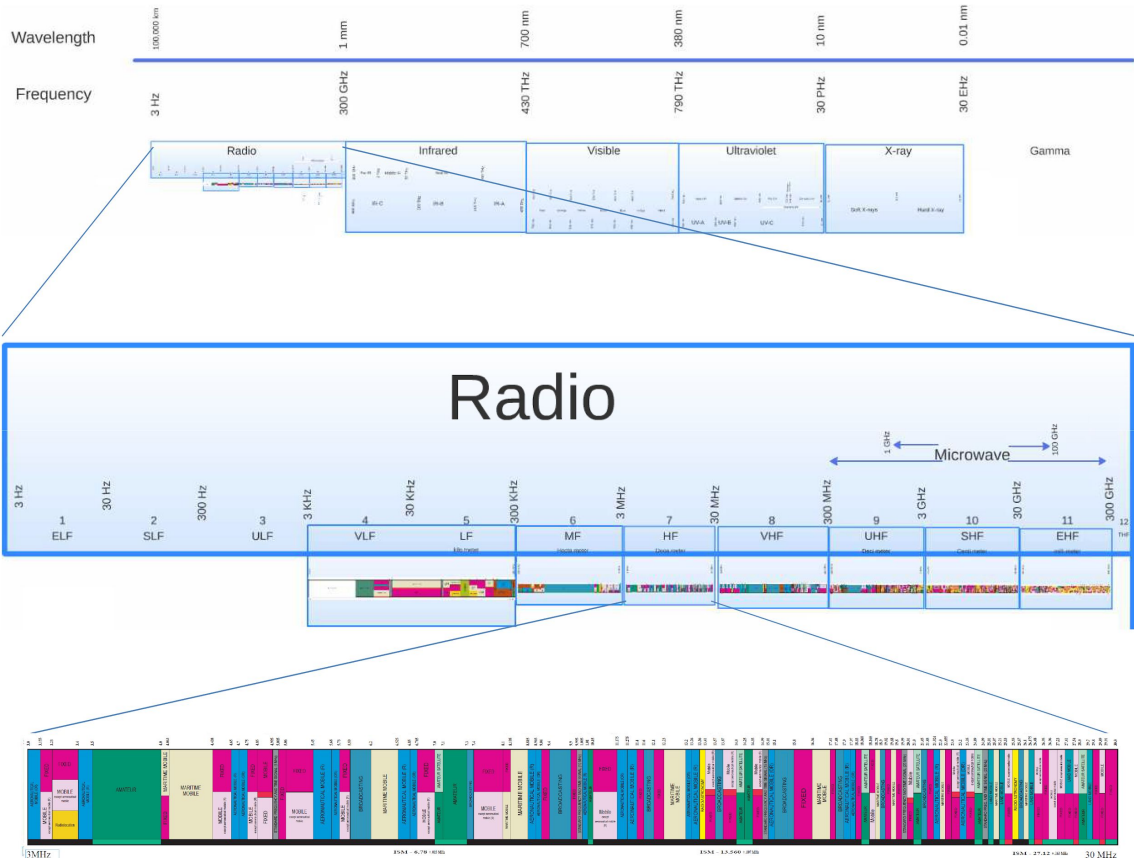
Both of these are “line of sight” propagation - either directly or with the repeater

# “Skywave” propagation bounces signals off the ionosphere



From <https://www.swpc.noaa.gov/phenomena/ionosphere>

# What are the HF frequencies (& wavelengths)?



“High frequencies” (HF) are  
3 - 30MHz

wavelengths 10m - 100m

Diagram from  
[https://en.wikipedia.org/wiki/High\\_frequency](https://en.wikipedia.org/wiki/High_frequency)

# VHF & UHF Antennas

My VHF/UHF antenna:

J-Pole - 2m, 70cm

“One and done”



in contrast to ...

# My HF antennas



G5RVJr

6m J-pole

60m NVIS

# My HF Antennas: so many bands, so many options

## Fixed station HF Antenna:

- G5RVJr - 15m, 17m, 20m, 30m, 40m

## Portable antennas

- Alpha magnetic loop (20m, 40m, 80m)
- 6m J-Pole (via WA7FWC)
- 60m NVIS

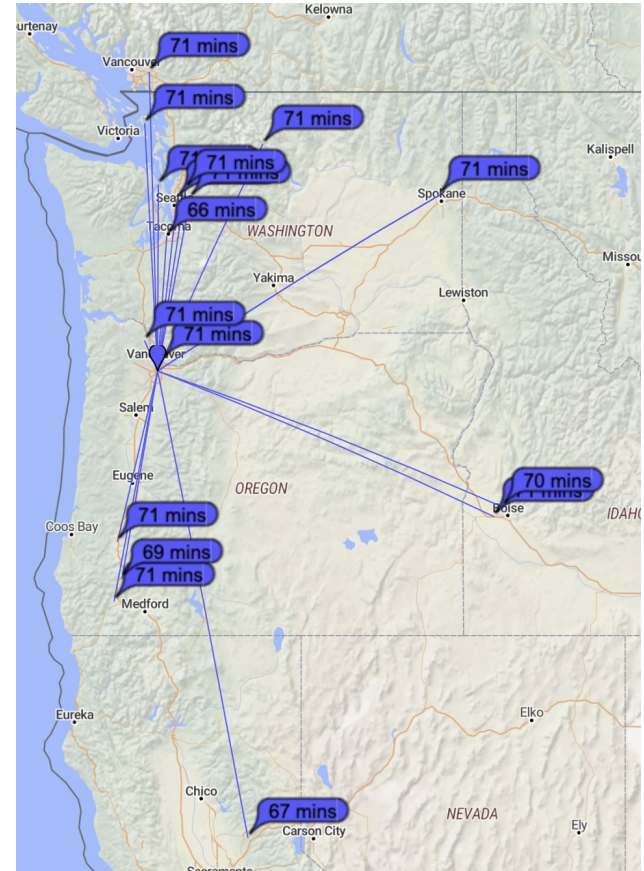
“Still collecting”

# Let's do some demos

FT8 & WSJTX - <https://wsjt.sourceforge.io/wsjt.html>

- Reliable source of audibly-recognizable signals on most bands - good to check if “the band is open” and you can receive
- Enabling transmit, then checking <https://pskreporter.info/> lets you know if you are being heard. Here's my signal propagation from 5 minutes of FT8 on 40 meters:

**Winlink over Vara HF**



# Two special bands: 6 meters and 60 meters

6 meters is a weird groundwave band - it seems to “bend” around some obstacles

60 meters is used by our FEMA regional exercises

- it's in the NVIS sweet spot (which is between 40 & 80 meters)
- 60 meters isn't crowded
- antennas for 60 meters aren't discussed much

## NVIS

- 300 mile range, with low power
- “Take off angle” - make it steeper to bounce and come back “nearby”
- For horizontally polarized dipoles, lower the height to 10-20 feet.

# Cool topics I won't dive into here, but ... if you're curious!

## Earth's ionosphere

- Influenced by changes in geomagnetic activity and solar weather

## Solar weather

- Solar wind, coronal mass ejections, sunspots, ...

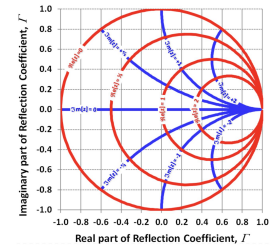
## Groundwave propagation - propagation through the earth

Are radio conditions good now?

<https://hamradiofornontechies.com/current-ham-radio-conditions/>

## Antenna analysis

- Standing wave ratio - how well “tuned” your antenna is
  - Watch out - you can hurt your radio with a high SWR!
- Smith charts - great entry point to understanding antennas



**That's it – thanks!**

As always, I'm happy to receive feedback, your favorite resources, ideas for future training topics, etc.