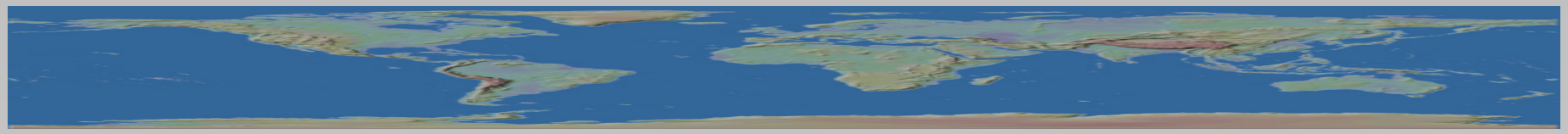
Technician Licensing Class

Lesson 2

presented by the

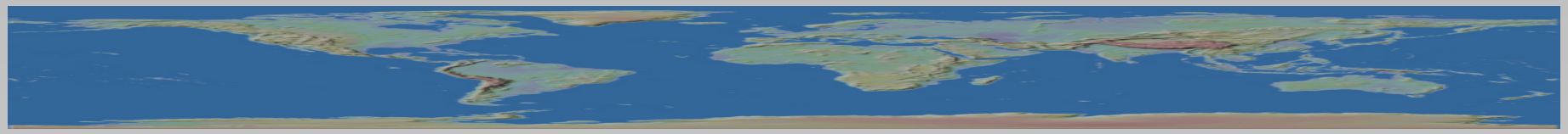
Arlington Radio Public Service Club

Arlington County, Virginia



Quiz

Sub elements T1 & T2



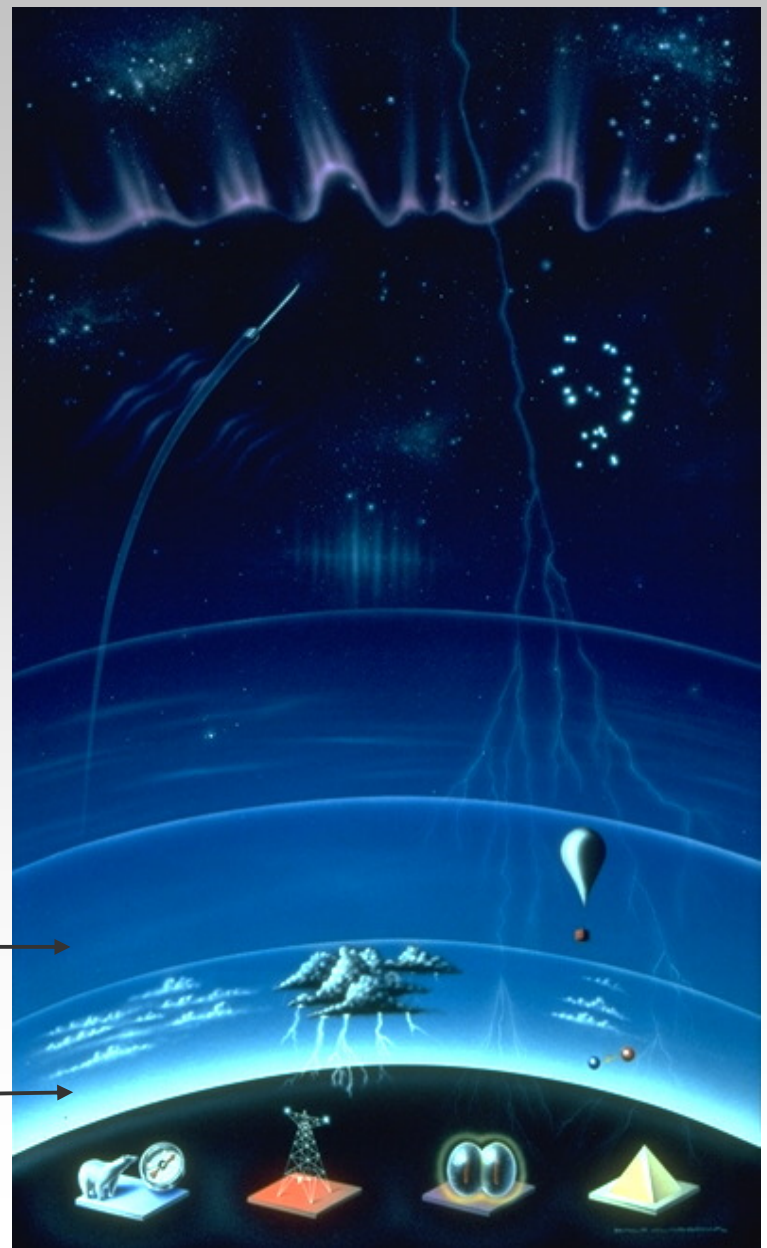
Radio Phenomena

Sub element T3

HF Propagation

It is the unpredictable nature of HF propagation that makes the HF bands so much fun!

Atmospheric Layers

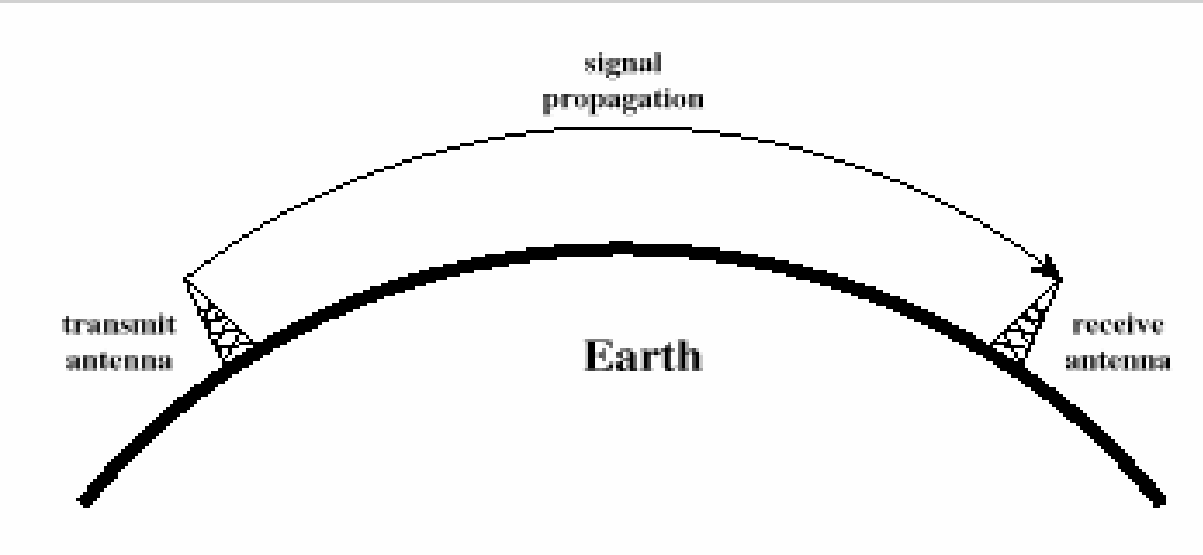


Ionosphere
31 – 400 miles

Stratosphere
6 – 31 miles

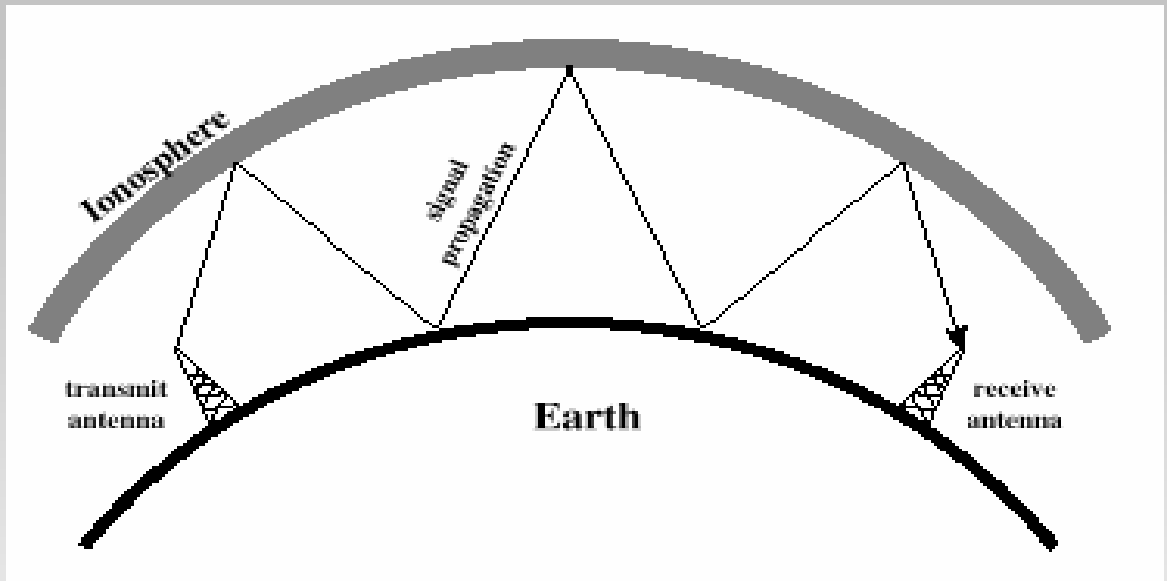
Troposphere
0 – 6 miles

Ground-Wave Propagation



Ground Wave signals travel along the surface of the earth.

Sky-wave Propagation



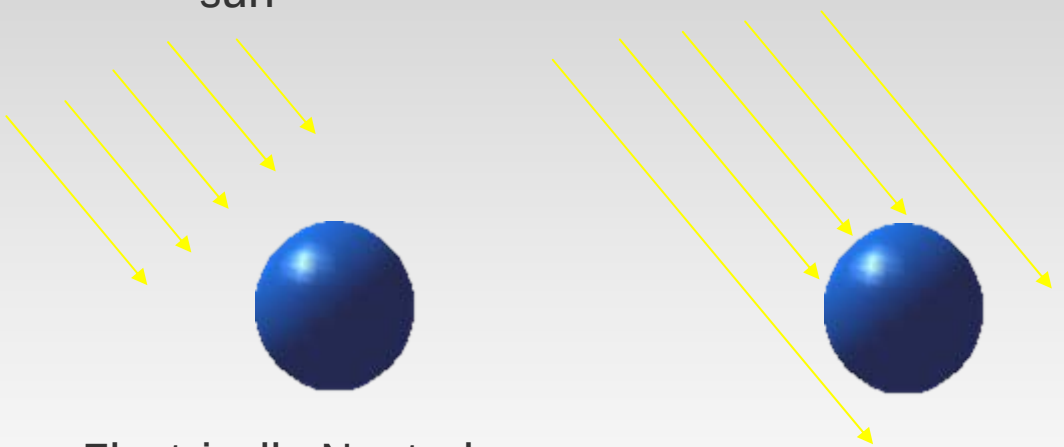
- Sky Wave signals are bent back to earth by the ionosphere
- In Multi-hop propagation, radio signals bounce several times between the ionosphere and the earth's surface
- Sky-wave propagation range is much greater than ground-wave propagation
- Sky-wave propagation least often occurs in the UHF frequency range

How the Ionosphere is Formed

Ultraviolet and other radiation from the sun

Strike atoms in the upper atmosphere

Releasing an electron forming positive & negative ions



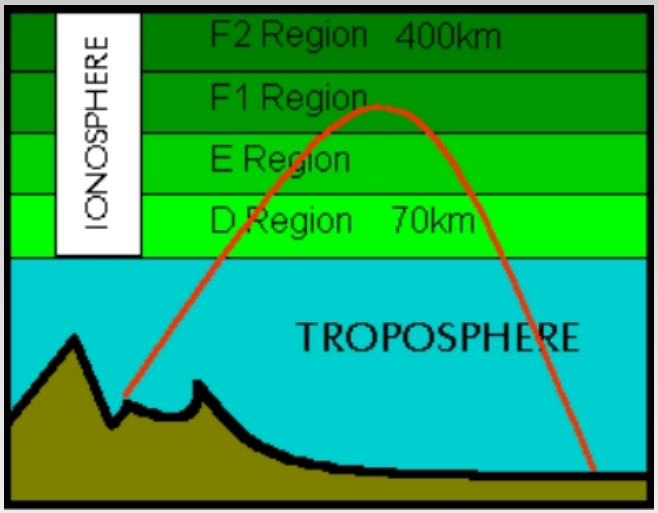
Electrically Neutral Atom

Electron (Negative Ion)

Positive Ion

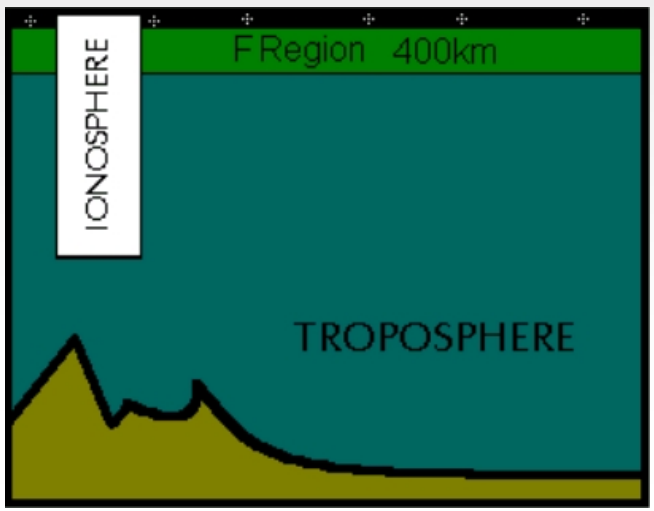
Ultraviolet radiation is most responsible for ionization in the outer atmosphere.

Regions in the Ionosphere



During the day….

- The “D” Region is closest to Earth
- The “D” Region absorbs MF/HF radio signals
- The “F2” Region is most responsible for long distance communication



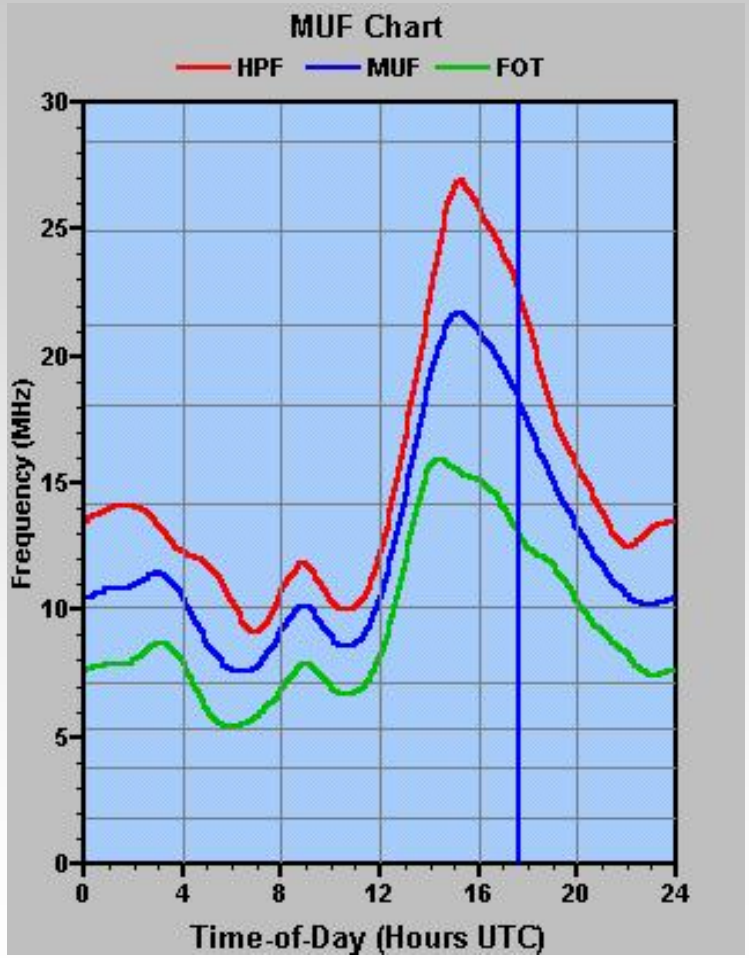
At night….

- The “D” & “E” Regions disappear
- The “F1” & “F2” Regions combine into one with reduced ionization

Critical & Maximum Usable Frequency

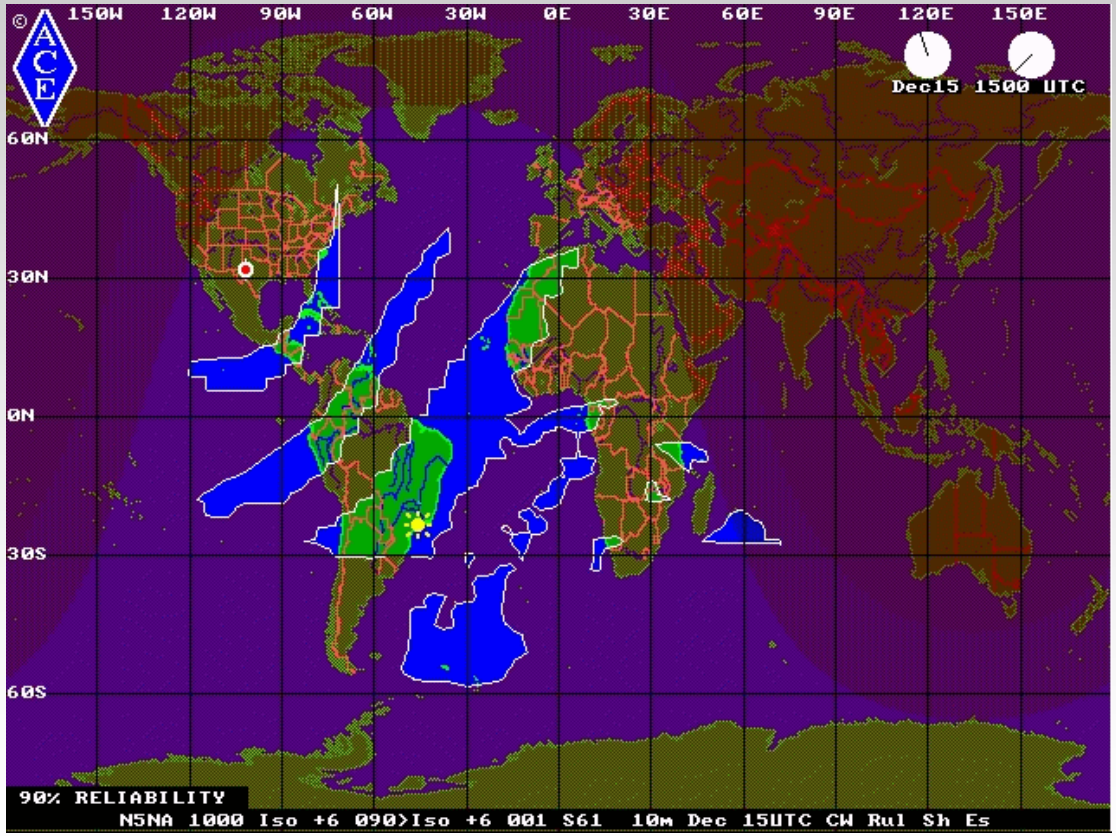
The lowest frequency at which a signal sent vertically will pass right through the ionosphere is called the **critical frequency.**

The frequency at which communication just starts to fail is known as the **Maximum Usable Frequency** or **MUF**. It is dependent upon the layer being used and the angle of incidence.



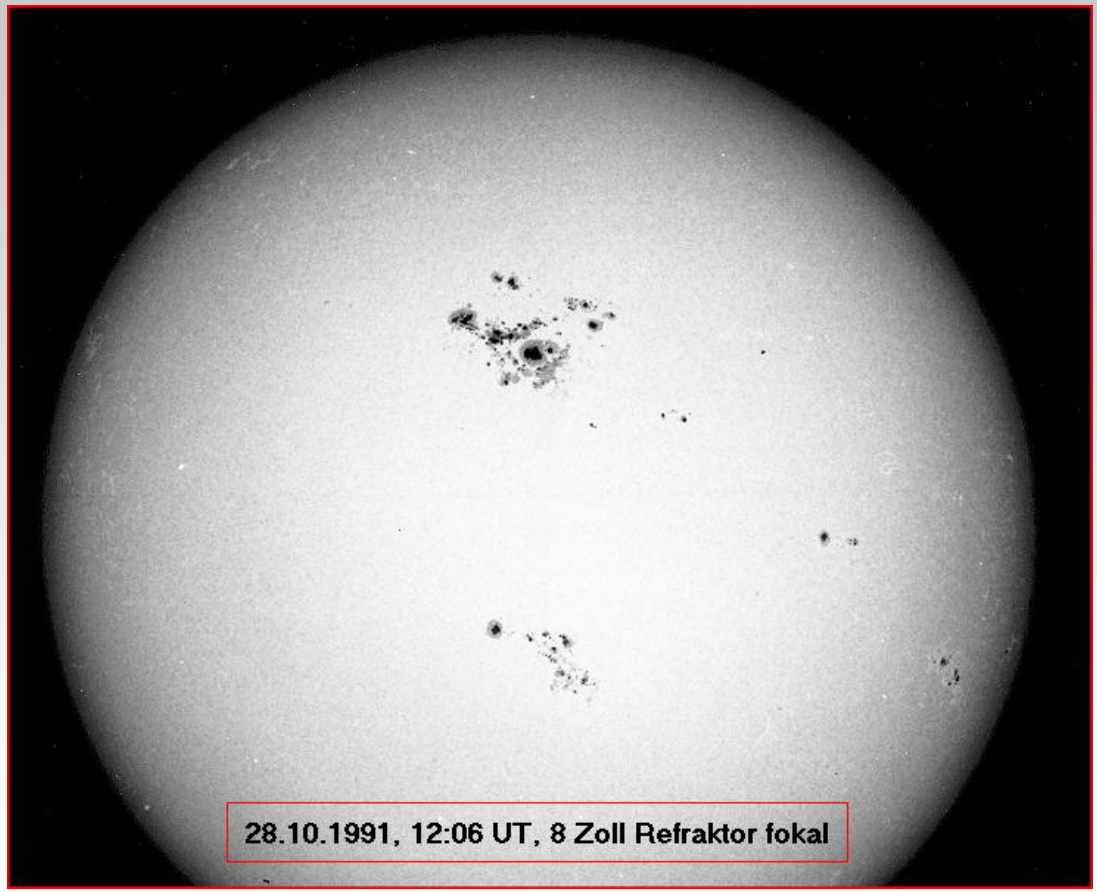
Predicted Propagation for 10m on Dec 15, 2003

- Ionization is at a minimum just before sunrise
- Ionization peaks at mid-day
- Notice the prediction of multi-hop propagation



Sunspots

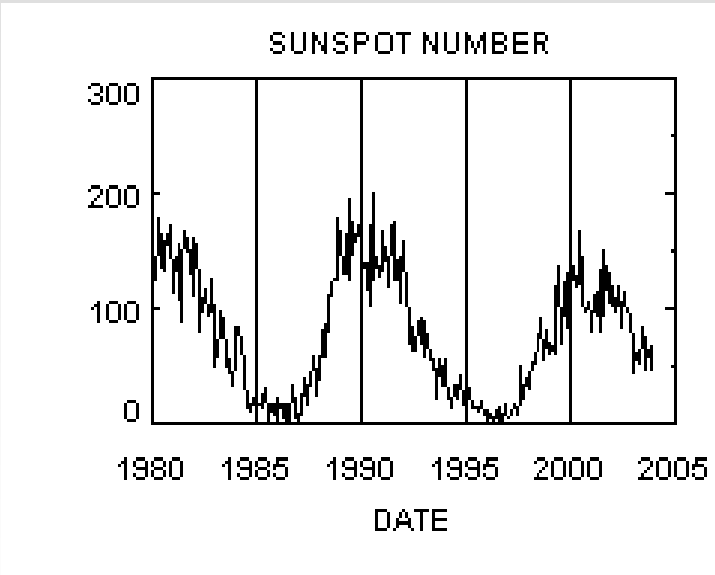
- The more sunspots there are, the more ionization occurs in the atmosphere
- Thus, higher sunspot counts support a higher Maximum Usable Frequency (MUF)

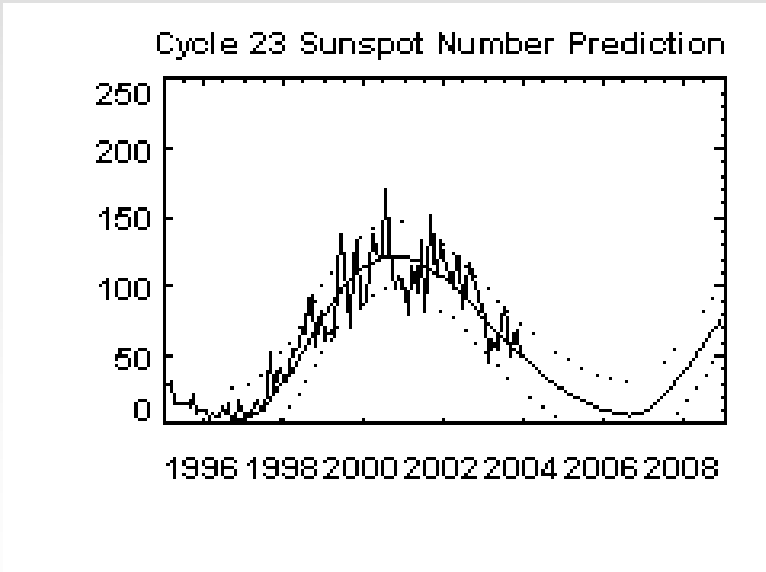


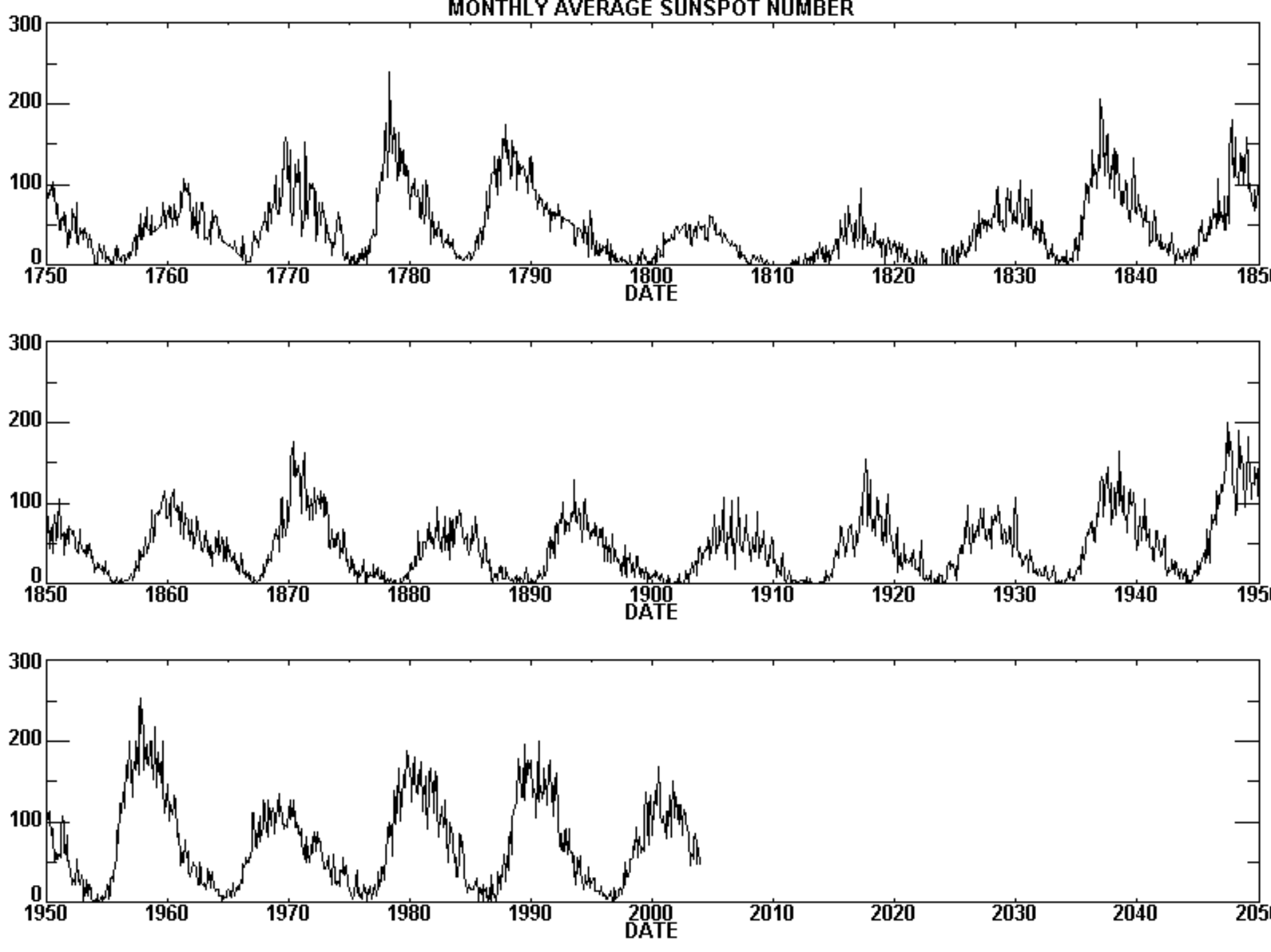
Hams LOVE sunspots!

Sunspots

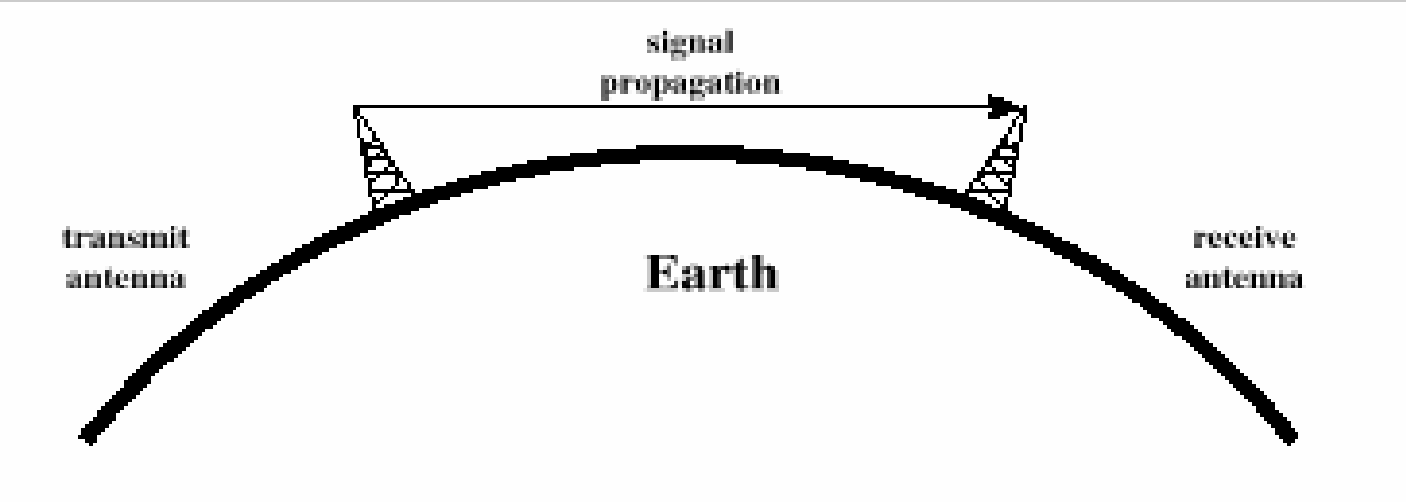
Sunspots peak and subside in 11-year cycles.






MONTHLY AVERAGE SUNSPOT NUMBER
300
200
100
0
1750
1760
1770
1780
1790
1800
1810
1820
1830
1840
DATE
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050

Line-of-Sight Propagation

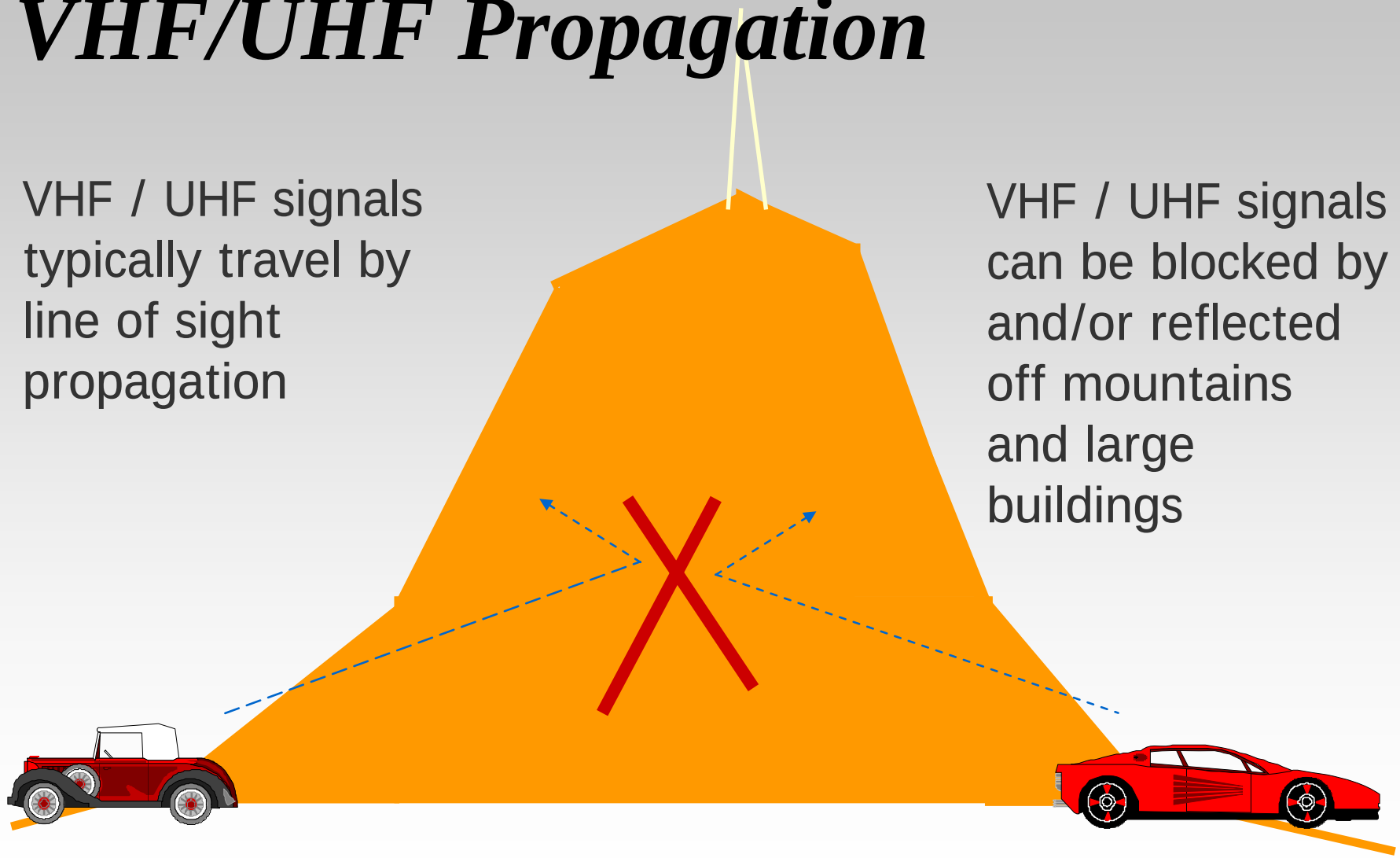


Line of sight propagation is when radio signals travel in a straight line from one antenna to another.

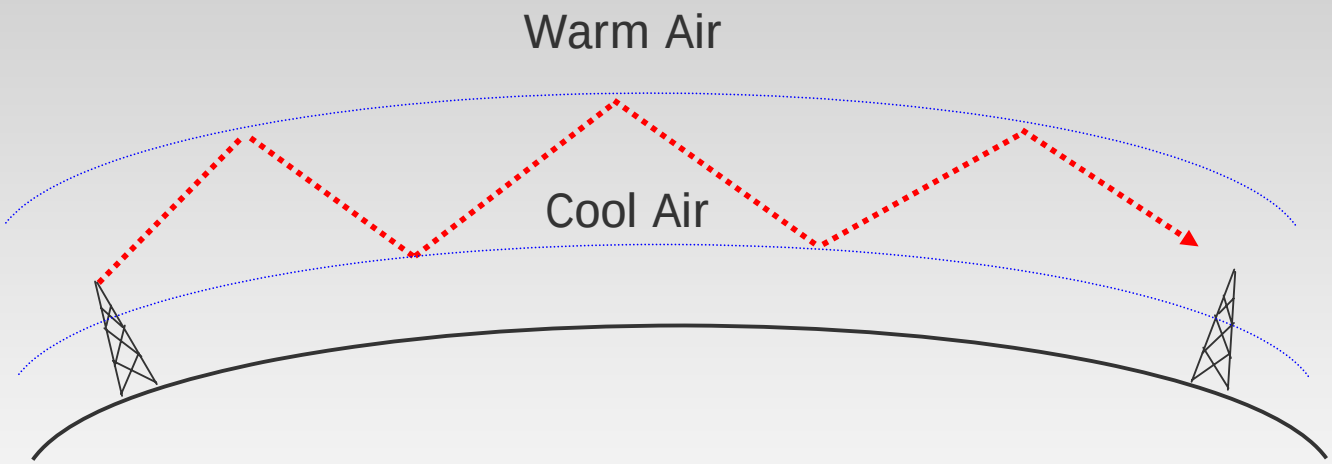
VHF/UHF Propagation

VHF / UHF signals typically travel by line of sight propagation

VHF / UHF signals can be blocked by and/or reflected off mountains and large buildings

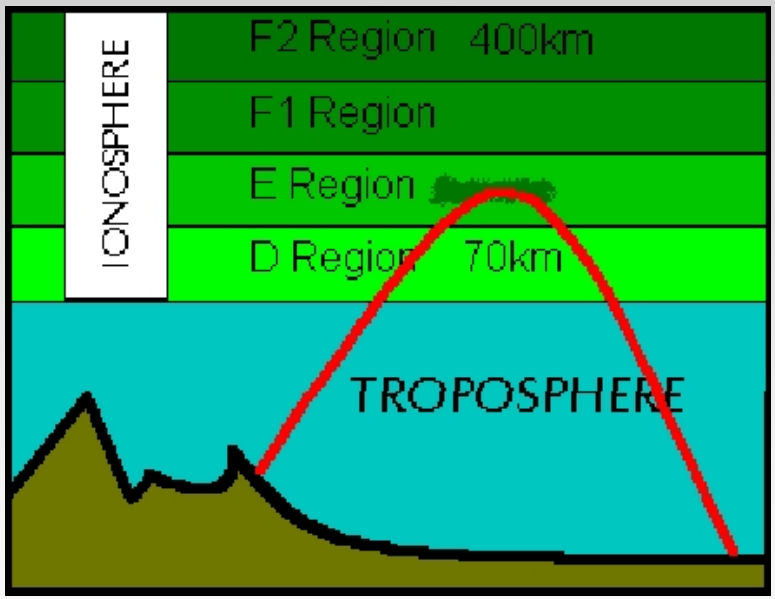


Tropospheric Ducting

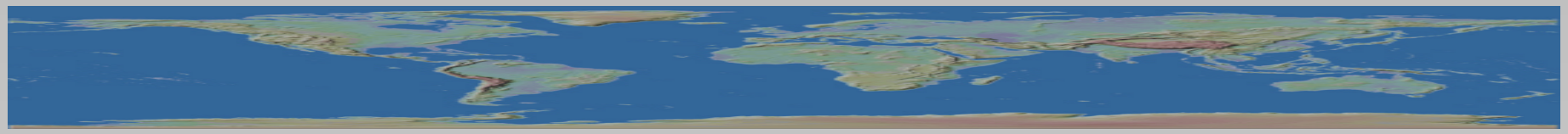


Tropospheric ducting may occur when a warm air mass overruns a cold air mass. This is called a temperature (or thermal) inversion and can produce long range VHF & UHF propagation.

Sporadic “E” Propagation

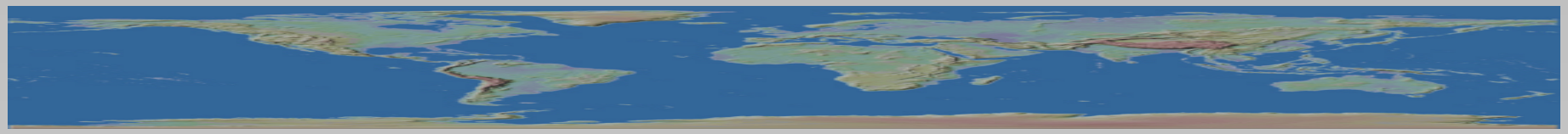


- Small areas of the “E” Region can become highly ionized
- Allows long distance sky-wave propagation on the VHF bands
- Most likely to occur on the 6 meter band in the summertime
- By its name, it is “sporadic”



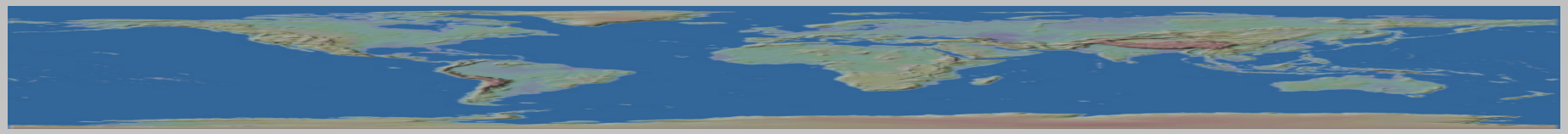
Station Licensee Duties

Sub element T4



Keep the FCC informed...

- An amateur operator must have a current U.S. postal mailing address to follow the FCC rules and receive mail from the FCC
- If your address is not correct, your license could be revoked
- If you move, update your address online or fill out an FCC form 605, attach a copy of your license, and mail it to the FCC in Gettysburg



Where may you operate?

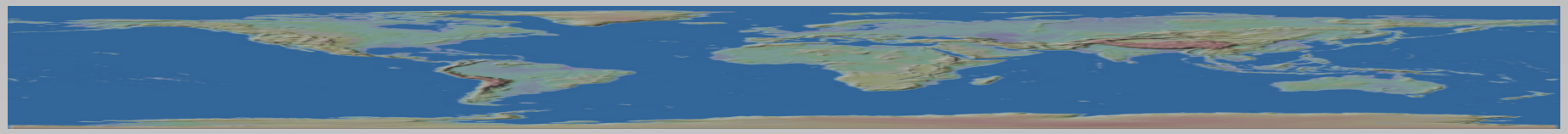
- You may operate from anywhere in the US whenever you want
- You may operate aboard a cruise ship with the approval of the master of the ship and not using the ship's radio equipment
- You may operate aboard an aircraft with the approval of the pilot in command and not using the aircraft's radio equipment
- Wherever the location is under the control of the FCC, and whenever the FCC rules allow

Antenna Height

- You may install an antenna up to 200' without registering with the FCC & FAA
- If you plan to erect an antenna exceeding 200' you must notify the FAA and register with the FCC

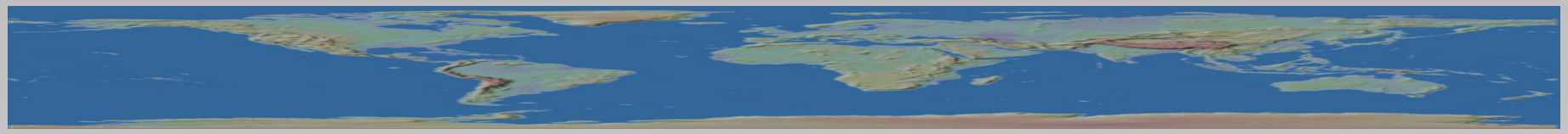
A Control Operator....

A Control Operator is an amateur operator who is responsible for ensuring that the station's transmissions are in compliance with FCC rules



Control Operator Function

- A station must have a control operator any time the station is transmitting
- The location where the control operator function is performed is called the “control point”
- The FCC considers you in control whenever transmissions are made with your call sign
- You may be control operator for “any number” of transmitters at the same time



Station Access

To keep unauthorized persons from using your station you could:

- At home – Use a key-operated on/off switch in the main power line
- In your car – Disconnect & remove the microphone when not using it

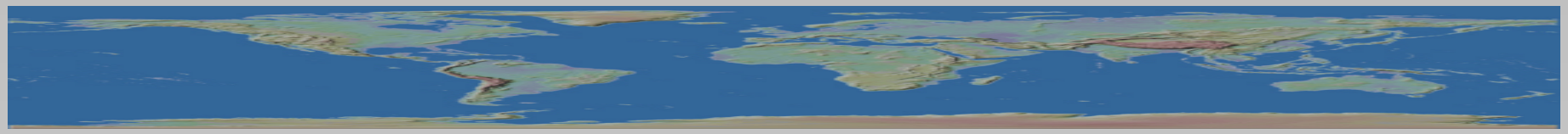
Emergency Communications

- If disaster disrupts normal communications, an amateur station may make transmissions that are necessary to meet essential communication needs and facilitate relief actions
- In an emergency you are allowed to help on any frequency outside your privileges in any way you can
- The FCC may declare a temporary state of communication emergency and may set forth special conditions and rules to be observed

Emergency Calls

- In a life or property threatening emergency, you are allowed to transmit “SOS” or “MAYDAY”
- If you are in contact with another station and you hear an emergency call, you should stop your QSO immediately and take the emergency call

- If you need to interrupt a repeater conversation for an emergency say “BREAK” once and then your call sign



Emergency Operations

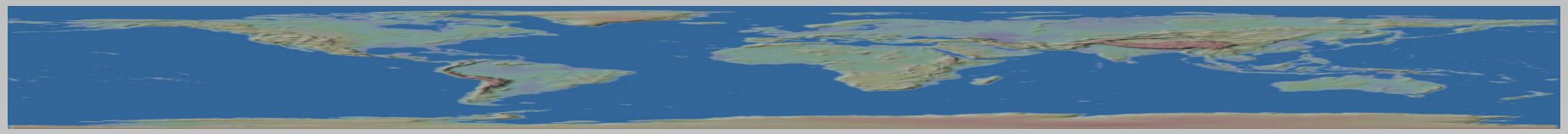
- It may be a good idea to have your own source of power for your station so that you can provide emergency communications even when commercial AC power isn't available
- When using a hand-held radio in an emergency, it is important to have several sets of charged batteries available
- A dipole antenna is a good choice for HF portable operations in an emergency because it is easy to transport and set up

Emergency Operations (Cont'd)

- The use of “tactical” call signs such as “Command Post” or “Weather Centre” are efficient and help coordinate public service communications
- Messages concerning the immediate safety of human life are called “Emergency Traffic”
- Messages concerning a person's wellbeing are called “Health & Welfare Traffic”

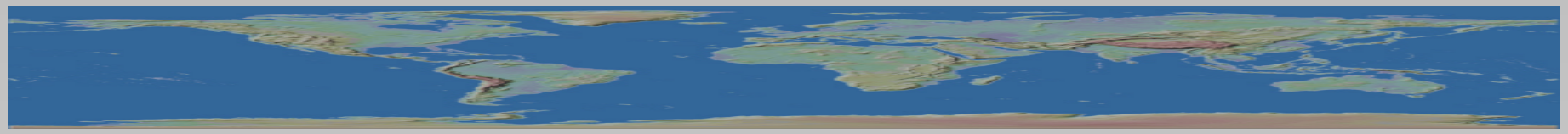
RACES

- RACES (pronounced RAY-sees) is the Radio Amateur Civil Emergency Service
- Before you can participate in RACES drills, you must register with the responsible Civil Defence organization
- Messages sent during a RACES drill must be identified as “drill” or “test messages”
- RACES is active in Arlington County, Virginia. Go to www.w4ava.org for more information



Control Operator Duties

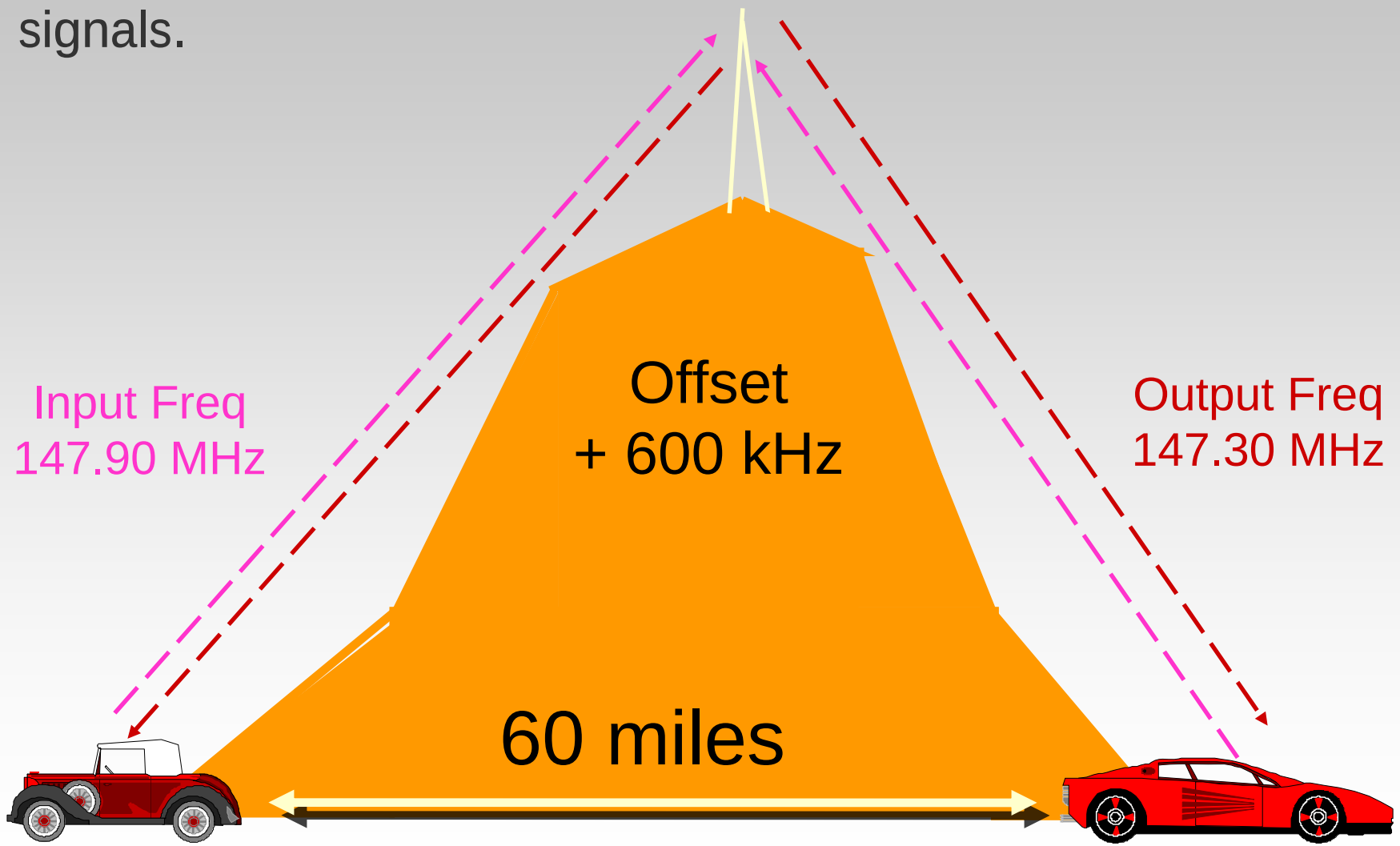
Sub element T5

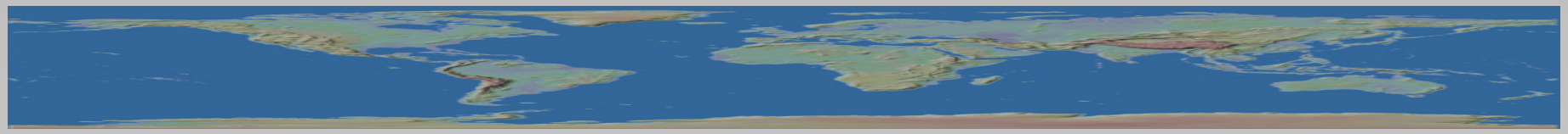


You're the Control Operator

- You must be at the control point when transmitting unless the station is under automatic control
- If you have a dual-band transceiver and set it up as a cross-band repeater, there must be a control operator at the control point
- You do not have to be at the control point of an automatically controlled station
- An unlicensed family member may not use your equipment if you are not present
- A detailed list of your operating privileges and rules & regulations may be found in FCC Part 97

A Repeater is a device used to retransmit amateur radio signals.



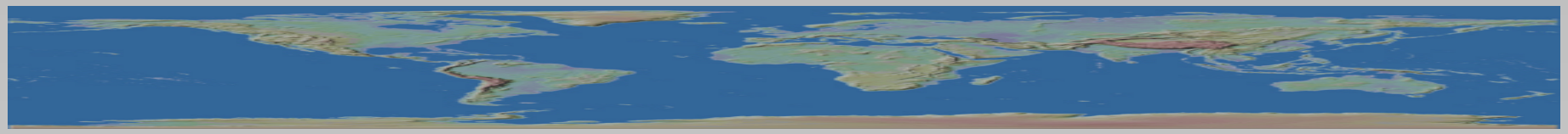


Operating Another Station

- You may operate any amateur equipment within your license privileges
- If you are operating from another amateur's station, both you and the other amateur are responsible
- When a higher license class amateur operates your station, the privileges of the higher license are allowed
- When a Technician licensee operates the station of a General class licensee, he or she must stay within the limits of a Technician class license

Station Identification

- You must identify with your call sign at least every 10 minutes during and at the end of a contact
- If you are using a language other then English, you must identify in English
- CW (Morse code) may always be used for identification regardless of the transmitting frequency
- If you communicate with someone without identifying, you have made an unidentified communication



Don't do this!!!

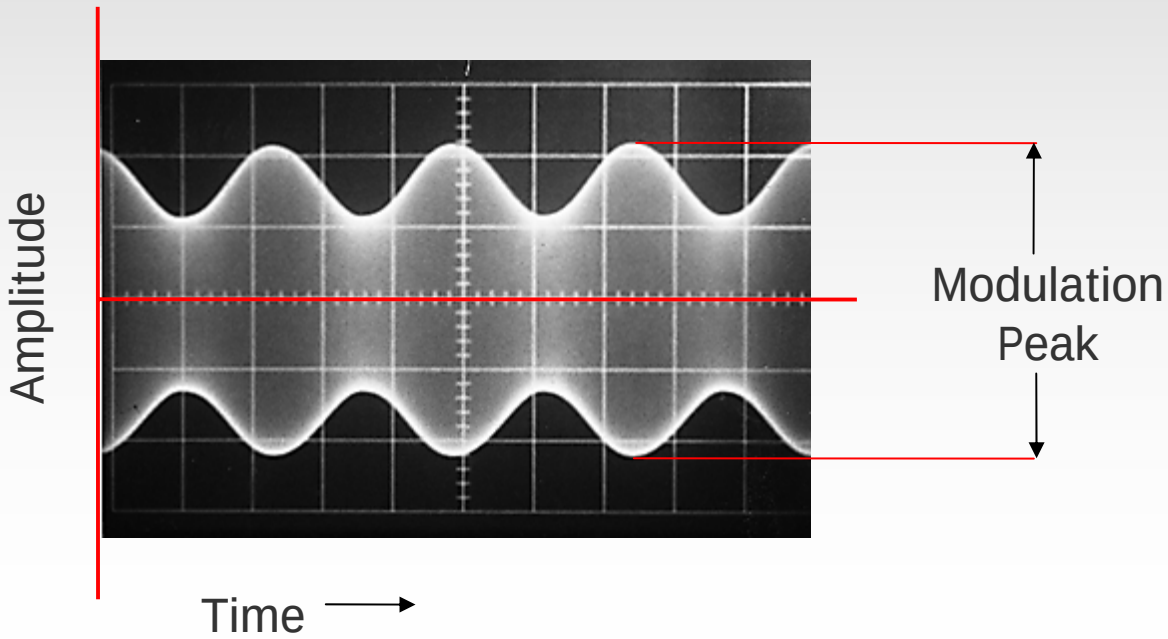
- Cause harmful or malicious interference by repeatedly (and intentionally) transmitting on a frequency already occupied
- Perform an illegal unidentified transmission by transmitting a test to a repeater without identifying
- Contact someone on the air without giving your call sign. This would be an unidentified communication.

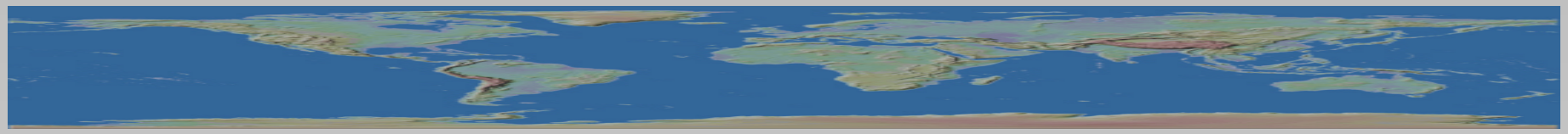
Radio Control of Model Craft

- An example of one-way communication permitted by the FCC is radio control of model craft
- Station identification is not required if the transmitter is labeled with the licensee's name, address, and call sign

Peak Envelope Power (PEP)

Peak Envelope Power (PEP) is the average power supplied to an antenna transmission line during one RF cycle at the crest of the modulation envelope.



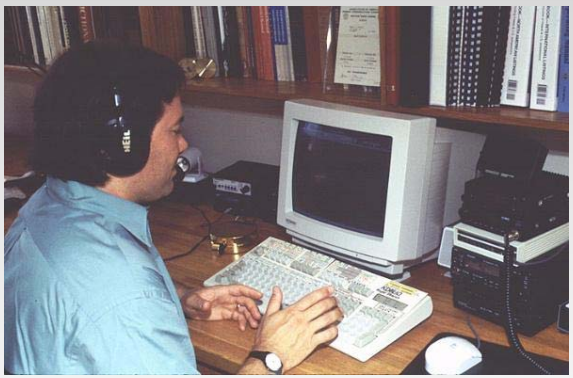


Maximum Transmitter Power

- A Technician (w/Morse) licensee may use up to 200 watts (PEP) on the 80, 40, 15, & 10 meter bands
- On most other bands, a Technician licensee may use up to 1500 watts PEP
- In all cases, *use the minimum power required to make a reliable contact*

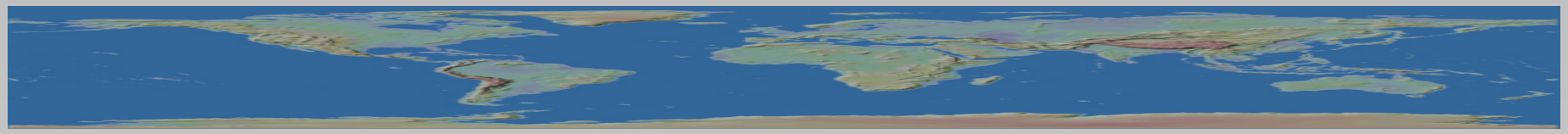
Third Party Communications

A message from an amateur station (1st party) to another amateur station (2nd party) on behalf of another person (3rd party)



Examples include:

- Passing a message
- Making a phone patch
- Allowing an unlicensed person to talk on the radio



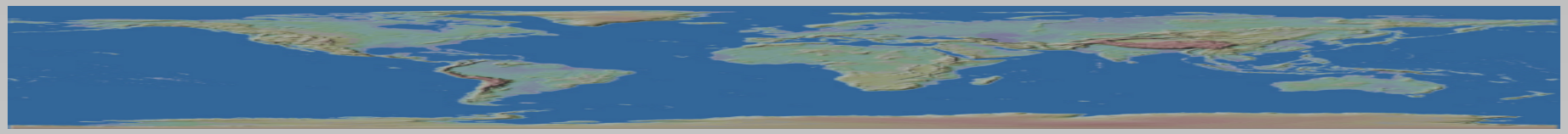
Third Party Communications

- When talking to a station in a foreign country, be sure there is a 3rd party agreement between the US and the other station's country before handling 3rd party traffic

  Some countries we have 3rd party agreements with are:

Cuba	Ecuador	Columbia	Panama
Jordan	Argentina	Peru	Turkey
Canada	Mexico	Israel	Ghana

- When handling international 3rd party communications, the U.S. station must transmit both call signs at the end of each communication
- No payment may be accepted for handling 3rd party communications



Homework

- Study Sub elements T3, T4, & T5 of the question pool
  - **Read the *Question* and the *Answer* Three Times**
- **Read Chapters 3, 4, & 5 in “Now You're Talking”**