043006 1100UT 5 AM MST

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Sferics, tweeks and tweek bursts. Weak whistlers. Total whistlers logged in 19 minutes: 53

10
8
6
4
2
0

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Whistler logged at 00:14.
Whistler is faint trace between two tweek bursts.

10
8
6
4
2
0

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Whistler logged at 00:22.
These are probably two-hop whistlers generated by the local sferics and the top of the whistler is hidden in the tweek burst.

Note: Once again the online version of the INSPIRE Journal will include sound files of spectrograms shown. Click on the "INSPIRE Audio File" button (right) to hear the natural radio sounds.

INSPIRE Audio File

10
8
6
4
2
0

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Whistler logged at 00:42 appears in the first gap. One logged at 00:43 is not visible. One logged at 00:49 is audible near the end, but not easily found in the spectrogram.

043006 1200UT 6 AM MST

10
8
6
4
2
0

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

INSPIRE
Audio File

Low density sferics. Some weak tweeks. As dawn approaches, the tweek level begins to drop, this is evidence of the changes taking place in the ionosphere as it begins to recharge to dayside levels. Whistlers logged in 57 minutes: 45

Whistler sampler of strong whistlers 12UT:

INSPIRE
Audio File

This file contains all whistlers shown separated by short periods of silence.

QuickTime™
F (LZW) decompressor
eeded to see this picture.

12:08:03 | 12:09:25 | 12:11:47 | 12:20:46

12:22:23 12:23:59 12:24:11 12:24:42

Quic
TIFF (LZW)
are needed to se

12:34:49 12:36:58 12:44:32 12:48:12 12:53:24

ckTime™ and a
V) decompressor
see this picture.

043006 1300UT 7 AM MST

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Low density sferics; no tweeks. Some low level 60 Hz hum. Whistlers logged in 12 minutes:11

Sunday, October 8, 2006

This was a very uneventful day for natural radio observing. No whistlers were observed. The following sound files illustrate the changing ionospheric conditions during the four hours of observing.

061008 1100UT 5 AM MST

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

Lots of tweeks.

10
8
6
4
2
0

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

The dashed line shows the tweek cutoff frequency of about 1750-1800 kHz.

061008 1200UT 6 AM MST

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

061008 1301UT 7:01 AM MST

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

061008 1400 UT 8 AM MST

INSPIRE Audio File

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Much quieter, no tweeks.

INSPIRE FIELD NOTES – 2006

Robert Bennett
Las Cruces, NM

27 - 28 April 2006

My intent for this monitoring period was to travel to my quiet monitoring site in the Cibola National Forest and spend two nights camping. During this period I planned to spend time conducting natural radio monitoring (Field Observations) for The INSPIRE Project. I planned four monitoring periods, Thursday evening, early Friday morning, Friday evening and of course early Saturday morning (the INSPIRE Coordinated monitoring session). I planned to fill the remaining time with VHF radio monitoring and photographing some of the local wild life. However, Mother Nature did not cooperate and I was unable to complete most of my planned activities.

I departed from home at about 10 AM on Thursday. The weather at home was very nice, temperature about 85^{o} F, clear skies and no wind. My monitoring location is about 120 miles from my home and at an elevation of approximately 7000 feet.

At the entrance to the forest, there was a warning posted indicating that Phase-Two fire precautions were in effect. All open fires including campfires, camp stoves and grills were prohibited. This was bad news as over half the food I brought required cooking! On the way to my monitoring site, I had to drive over about 20 miles of dirt road and trail. I noticed that the roads were very sandy; the vegetation was dry and brown. These are signs that there had not been any rain in the forest in several months. When I arrived at my site, the temperature was in the low 70's and the sky was partly cloudy. However there was a moderate wind of 10-20 MPH out of the west. I set up camp and as soon as I unpacked my scanner, I tuned to the local weather service. I immediately got more bad news. A cold front was moving into the area bringing with it cooler temperatures and high winds. These conditions were expected to continue through the weekend.

As I was already there, I decided to spend the night and hoped that conditions would improve on Friday. I spent Thursday afternoon listening to my PCR-1000 radio in the back of my truck. I had a rather successful time monitoring the VHF/UHF frequencies. I delayed eating dinner until after dark (about 8 PM) hoping that the wind would die down enough that I could use a camp stove. However, the wind did not cooperate and I had to eat a cold dinner.

About 9 PM, I did the first natural radio monitoring session. I found the sferic and tweek levels to be very high and there was a constant problem with wind noise. The winds did not die down after dark but increased; the wind averaged about 20 MPH with gusts to 40 MPH. Nevertheless, I had a good monitoring experience and recorded several whistlers.

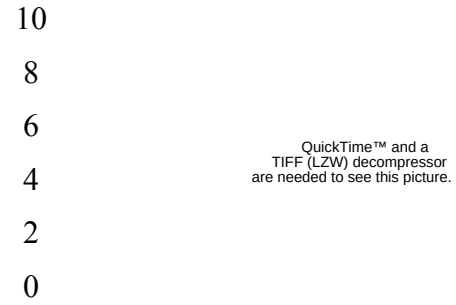
Note: Once again the online version of the INSPIRE Journal will include sound files of spectrograms shown. Click on the "INSPIRE Audio File" button (right) to hear the natural radio sounds.

INSPIRE Audio File

042706 2100MDT
042806 0300UT

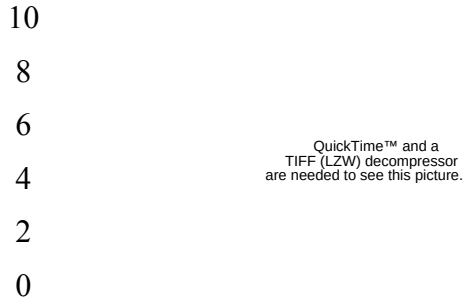
Dense sferics and tweeks.

INSPIRE Audio File



Whistler logged at 0304:45

INSPIRE Audio File



Whistlers logged at 0308:52

INSPIRE Audio File

I spent a very cold night trying to sleep in the back of my truck. The wind made putting up my light tent out of the question. The temperature dropped to the mid 30's and I had not come prepared for cold weather, I was expecting temperatures near 50 degrees. I was getting ready to start monitoring at 0500 MDT Friday and discovered that the high winds overnight had broken

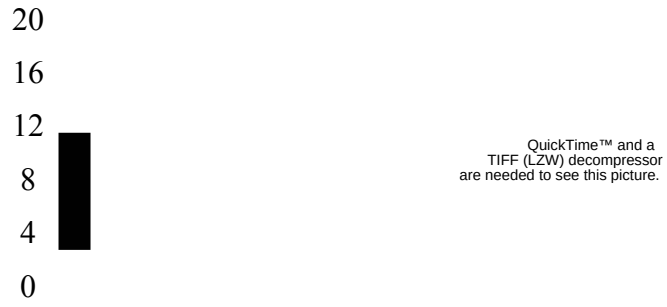
my antenna. I did a hasty repair job and by using electrical tape to hold the whip sections together, I was able to start monitoring at about 0515 MDT. I found the sferic and tweek levels to be very high again but did not detect any whistlers.

I conducted additional monitoring sessions at 0600, 0700, 0800 and 0900. I obtained the same results; no whistlers, very strong sferics and tweeks, and wind noise becoming ever more sever. By 0900, I estimate the wind speed was near 40 MPH constantly.

042806 1115UT 5:15 AM MDT

INSPIRE Audio File

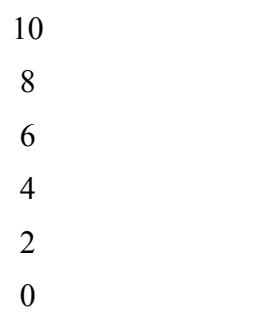
Strong dense sferics, some tweeks, no whistlers.
0-22 kHz frequency range is used here to show Russian ALPHA signals. Russian ALPHA signals are transmitted from five stations in Russia. The signals consist of a repeating pattern of tones using 5 frequencies between 11.9 kHz and 14.9 kHz. These frequencies are above the hearing range of many people, but sometimes the tones appear at lower frequencies.



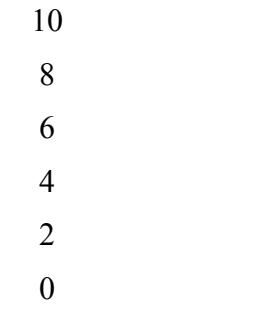
Top set of tones (dashes on the spectrogram) are the transmitted frequencies. These frequencies are shown by the white bar. The lower set of tones, shown by the black bar, are artifacts. It is the lower set of tones that is audible in the sound file.

042806 1200UT 6AM MDT

INSPIRE Audio File



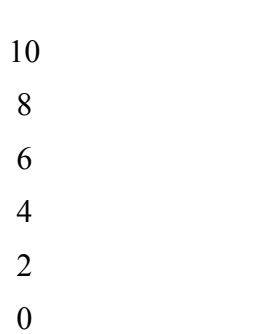
Dense sferics.



First 30 seconds. The dots showing up are artifacts of Russian ALPHA signals.

042806 1300UT 7AM MDT

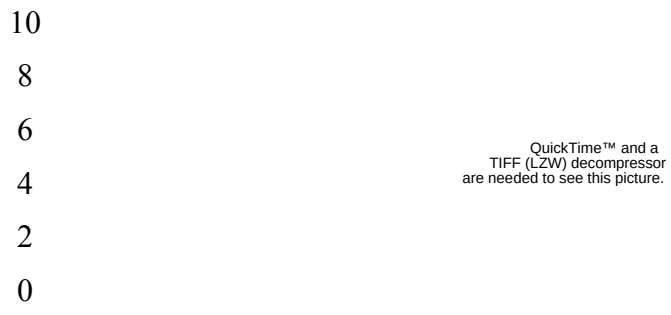
INSPIRE Audio File



Levels down. No ALPHA audible or on the spectrogram.

042806 1400UT 8AM MDT

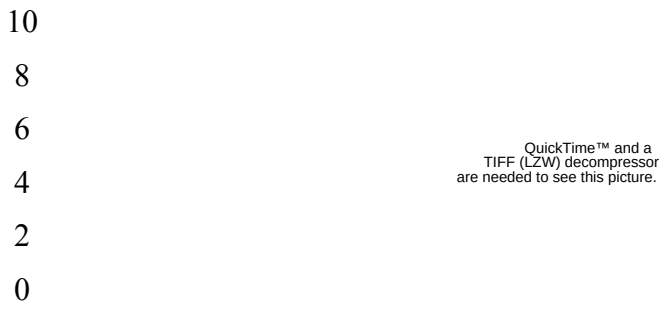
INSPIRE Audio File



Sferics only (plus wind noise).

042806 1500UT 9AM MDT

INSPIRE Audio File



I was debating what to do after the 0900 session. I was considering spending the day hoping conditions would improve. The decision was taken out of my hands when a forest ranger visited my campsite around 1000. He informed me that they had initiated Phase-Three fire procedures because there was a good chance of lightning induced fires that afternoon. He said the forest was now closed to all visitors and asked me to pack up and leave the forest as soon as I could. Oh well, there is always next October to look forward to!

27 – 29 October 2006

I supported the October INSPIRE coordinated monitoring events from a primitive camp in the Cibola National Forest. I planned to support INSPIRE as part of a three day mini-expedition. Besides INSPIRE, I planned to monitor various radio communications and do some experimentation.

The monitoring site I chose is a mountain plateau in the Cibola National Forest located about 100-miles north of my home in Las Cruces. The site is at an elevation of 7000 Feet MSL and is ideal for radio monitoring; it has a clear area for a tent and antennas, does not have tall trees and is a long way from power lines and inhabited areas. The site offers very good propagation coverage toward the northeast and provides MF/HF coverage of most the USA and Western Europe. There are also some interesting VHF/UHF targets within line of sight.

I arrived on site Friday about 1400 local time. To get to the site, I had to transverse about 25 miles of unimproved desert trails and steep narrow mountain roads. It required over two hours of careful driving to cover the 25 miles. The roads are intentionally not maintained because the road crosses a primitive area and a wilderness area. The road was muddy in many places and was washed out in three areas. Southern New Mexico received an immense amount of rain in August, September and October. This is the second wettest year on record. The site was damp, overgrown with weeds and home to a lot of insects. However, the insects were a problem only in the late afternoon when temperatures reached about 70^{o} F.

I spent most of Friday afternoon pitching my tent, setting up my radio monitoring station in the tent and deploying antennas. I deployed a 10-foot vertical whip for INSPIRE, a 3 foot whip for WWV, a VHF/UHF Discone on a 20 foot mast and a 1000 foot long beverage antenna.

After setting up camp, I spent until about 2000 MDT building a campfire, cooking dinner, cleaning up the cooking utensils and securing my food in an animal proof metal container.

Friday Monitoring

My first INSPIRE natural radio monitoring session occurred Friday at 2200 MDT (0400Z). I immediately noticed I was receiving a powerful interfering signal. Figure 1 is a spectrum plot of the signal. I didn't have sufficient test equipment with me to measure the parameters of the signal but it seemed to be pulsed in nature and was rich in harmonics. The

interference was not Loran or power grid harmonics. It sounded similar to electric fence interference I have observed in the past. However, there are no electric fences in the area. The signal disappeared sometime Friday night and did not reoccur. It remains a mystery. The Friday night natural radio signals consisted of intense frequent tweeks and sferics. I didn't detect any whistlers. When I later analyzed the recording, the communications and navigation signals between 10 and 20 KHZ were very evident and much stronger that I normally observe. Besides the interference and communication signals, I didn't observe anything else of interest.

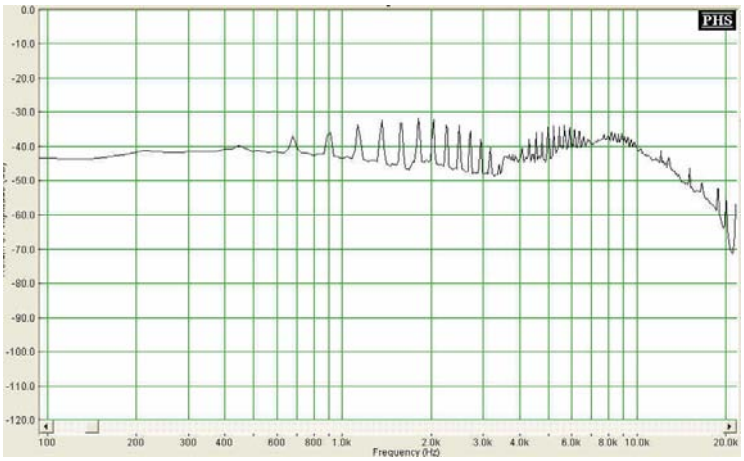


Figure 1

Spectrum plot of mysterious signal

102806 04UT 102706 10PM MDT

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Dense tweeks. Constant hum – probably the horizontal lines on the spectrogram.
The brief gap at the beginning was due to a short delay in switching in the receiver.

Saturday Monitoring

I reluctantly crawled out of my sleeping bag at 0500 MDT. It was very dark, a light wind was blowing and the temperature inside the tent was 34^{o} F. In just a few minutes I became very cold. My recorder was cold and acted a little sluggish. I warmed it by placing a chemical hand warmer on top of it and wrapping in a towel.

The first Saturday recording started at approximately 0530 MDT. The previous evening's interfering signal was absent. There was no evidence of Loran signals and no 60 Hz related

power line interference. The natural radio signals consisted of intense frequent tweeks and sferics. I did not detect any whistlers.

102806 1121UT 5:21AM MDT

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Dense sferics and tweeks.

The second session followed immediately at 0600 MDT. The natural radio signals were the same as described above. No whistlers were detected. By the end of the second session, it was getting light outside and the temperature had risen to 38^{o} F. Unfortunately, dew had started forming on most exposed surfaces. A hot cup of coffee during this session went a long way toward warming me up.

102806 12UT 6AM MDT

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Sferics and a few tweeks.

The third session started at 0700 MDT. The results were similar to the two earlier sessions. I thought I detected a whistler during the session but subsequent analysis at home did not reveal it. I probably confused a strong tweek with a whistler. I did notice that the intensity and frequency of the tweeks were decreasing. Sunrise occurred at about 0700.

102806 13UT 7 AM MDT

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

Levels continue to drop.

The last Saturday morning session occurred at 0800 MDT. It was much like the earlier sessions except that the levels were noticeable weaker.

102806 14UT 8AM MDT

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

Levels down more.

Starting at about 0700 MDT, I observed large numbers of vehicles passing my campsite and obviously looking for places to camp. This traffic continued all day and peaked about 1500 MDT. I thought there was a 4-wheel drive rally of some kind going on. However, around noon a Game Warden stopped by my camp and asked to see my hunting license! He informed me that deerhunting season started at 0700. He also inquired about what I was doing with all the antennas and radio equipment. It seems that some deer had been fitted with radio collars and he wanted to be sure that I was not trying to track them for the hunters. I explained the purpose of INSPIRE and played back one of the recordings made earlier. The warden was satisfied with my

answers and before he departed warned me not to venture away from camp without wearing brightly colored clothing.

By nightfall, about a hundred hunters were camped in the area and there were two families camped close to me. They visited just before dark and shared my campfire for an hour or so. I had the opportunity to explain my activities again. The only downside to hunters being in the area was that many people were walking around my camp and two people walked into my beverage antenna. To avoid injury, I took the antenna down and this limited my ability to work MF DX Saturday evening.

The last Saturday monitoring session occurred at 2130 MDT. This session produced some intense tweeks and one possible whistler. I made a slight change to the antenna for this and future sessions. I replaced the coax feed line between the VLF-3 and the antenna with an open wire line. This increased the natural radio signal levels some. No interference from either Loran or the power grid was observed.

102906 0330UT
102806 9:30PM MDT

10
8
6
4
2
0

INSPIRE Audio File

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

Evening session. Dense sferics and tweeks.

Sunday

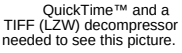
Daylight savings time ended early Sunday morning and the local time was an hour earlier than Saturday. Saturday night was milder that was Friday night. There was no wind and the overnight low was only 40^{o} F. I got up at 0500 MST, fixed myself a pot of coffee and got ready to monitor.

The first monitoring session started at 0600 MST. I immediately observed two alternating audio tones. They were strong and I thought that one of the nearby campers was using some electronic device that was generating interference. When I analyzed the tape, I observed that the audio tones were in sync with the Russian Alpha navigation signals. I now suspect that the interference was produced by the Alpha signals and is the result of the VLF signals being strong enough to overload the VLF-3's input stage. Otherwise, the natural radio signals consisted of frequent intense tweeks. No whistlers were noted.

Editor's note: I agree with Bob. The ALPHA signals captured in his data are the strongest I have ever heard. Receiver overload seems to be a logical explanation.

102906 13UT 6AM MST

20
16
12
8
4
0



Dense sferics and occasional tweeks and tweek bursts.
Prominent series of tones from ALPHA. The audible ones are artifacts.

INSPIRE Audio File

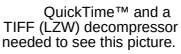
By 0630 MST, it was light enough outside to move about without a flashlight.

The final Sunday monitoring session occurred at 0700 MST. I noted that the alternating audio tones were still present but much weaker that at 0600. There was some weak Loran interference. The tweeks were still frequent and intense but a little weaker that at 0600. I noted three weak and diffuse whistlers. When I examined the recording at home, I found that there were several weak whistlers on the tape. I counted 10 of them and am sure I missed a few.

102906 14UT 7AM MST

10
8
6
4
2
0

INSPIRE Audio File



Sferics. ALPHA present but not as strong as previous hour. LORAN present.

I had intended to monitor at 0800 and 0900 on Sunday. However, by 0730, there were many hunters moving around the area both on foot and in ATV's. Someone started a generator near my camp and it produced interference. Finally around 0800, I started hearing gunshots close to my camp. I decided it would be prudent to remove myself as a potential target and so packed my gear and departed the area. Due to frequent stops to wait on approaching traffic, I required almost three hours to travel the 25 miles to the freeway. The roads in the forest are single lane and only one vehicle at a time can cross many of the narrow areas.

Experimentation

I also used some of my time to experiment with my INSPIRE receiving setup. The first thing I wanted to do was check out the utility of a redesigned natural radio antenna. Figures 3 and 4 show the new antenna.

Figure 3

I was using a telescoping whip antenna mounted on a short length of board. I fastened the antenna to whatever support I could find in the area. I wanted an easier and more reliable way to mount the antenna. I modified the antenna by adding an extension board, changing the feed point arrangement and modifying the extension so that it would fit in a commercial wheel mount antenna holder. The feed point is in a small metal box and provides both a BNC coaxial connection and pair of binding posts. This arrangement allows either use of a coax feed line or open wire feeders. The metal box can either be grounded or left floating.

I discovered that the antenna was easy to deploy, tolerated the wind very well and worked as well as any other antenna I have tested.

Figure-4

The other experiments I conducted focused on using a computer as a part of the natural radio monitoring setup. I basically wanted to evaluate two issues. First, can the computer soundcard be used to make real time recordings thus eliminating the stereo recorder? Second, is a computer useful in the field for immediate analysis purposes?

I attempted to digitize and record the VLF-3 output using the computer sound system. The computer is an older IBM model T21 Laptop. Initially, I ran the computer on its internal battery pack. There was a fair amount of computer-generated noise being picked up by the VLF-3 and I was not happy with the result. I could not relocate the computer far enough away from the VLF-3 to reduce the noise to acceptable levels. I did successfully record some natural radio signals but the quality was very poor. Next, I attempted to operate the computer from a 12 volt battery using a DC-to-DC converter. This was a disaster! The DC-DC converter generated high-level noise that wiped out the VLF, MF and HF bands. I have to rethink the computer recording issue and try something else.

I installed GRAM software on the computer and was successful at playing a recording into the computer for analysis. This will be useful to check on the quality of the recordings.

My monitoring equipment is shown in Figure-5. The equipment is set up on a makeshift table inside the tent. I discovered that during the daytime, the sun is bright enough inside the tent to make reading the laptop screen difficult. I placed the computer inside a cardboard box to shade the screen.

Coordinated Observation Schedule

The Coordinated Observations will be held on the first weekend of October and the last weekend in April. This schedule will apply to all future Coordinated Observations. All data is welcome and should be submitted even if the conditions are quiet. Any data you can contribute is valuable. The procedure to use for Coordinated Observations will be as follows:

1. Use the Data Cover Sheet and Data Log forms found at the end of the *Journal*. (Make copies as needed.)
2. Put a voice introduction at the start of each session indicating your name, your INSPIRE Team name, the date, local time and UT time.
3. Record for 12 minutes at the start of each hour that you can monitor on the specified days. Keep a detailed written log of all signals that you hear and indicate any items of interest. When you submit your tapes, spectrograms will be made of any parts of the tape that you indicate.
4. Place a time mark on the tape on the hour and each two minutes for the next 12 minutes. Use Coordinated Universal Time (UTC) for all time marks.

Local Time to UT Conversion Table

EDT + 4 = UT
CDT + 5 = UT
MDT + 6 = UT
PDT + 7 = UT

Next Coordinated Observations:

April 28 - 29, 2007
October 6 - 7, 2007

5. Record at 8 AM and 9 AM **LOCAL** time.
6. In addition, record on other hours to compare results with those in neighboring time zones. For example, an observer in the Central Time Zone might record at 7 AM (8 AM EDT), at 8 and 9 AM CDT and at 10 AM (9 AM MDT).
7. Use 60 minute tapes (30 minutes per side) with two sessions per side. It is preferred that you record on one side of the audio tape only.
8. Label all tapes and logs to indicate the sessions monitored and send to:

   Bill Pine
   1348 Quince Avenue
   Upland, CA 91786

9. Your tapes will be returned with spectrograms of your data. An article reporting on the results will appear in the next *Journal*.
10. SPECIAL NOTE: If you are hearing whistlers, replace the data tape after 12 minutes with a "Whistler" tape and continue recording with time marks every two minutes. If we get whistlers, this would be a good opportunity to try to determine the "footprint" of a whistler (the "footprint" is the geographical area where a whistler can be detected).

Field Observation Schedule

Field observations may be made according to the following schedule:

ANY TIME!

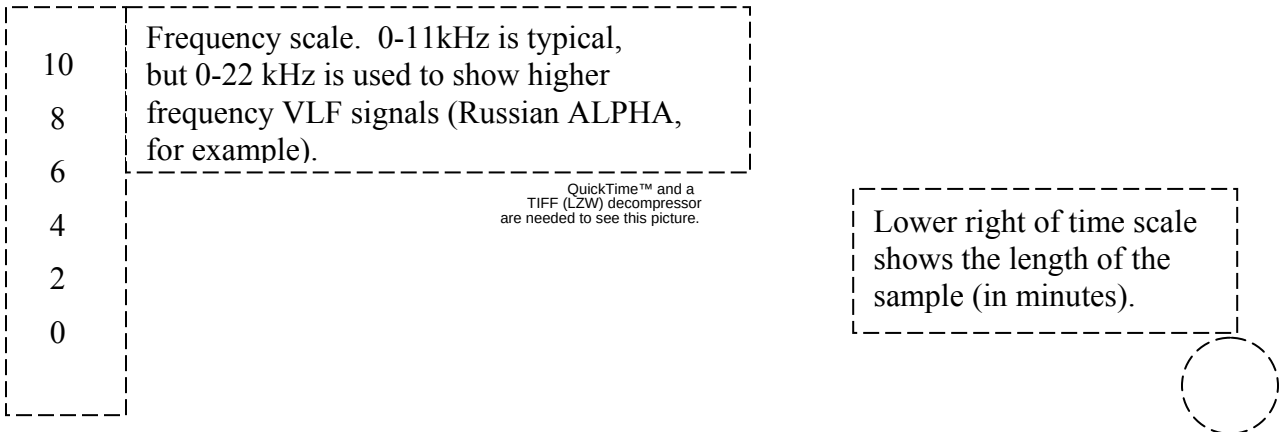
In addition to an article reporting on the Coordinated Observations, will be an article on Field Observations. These observations may be made at any time and submitted for inclusion in the next *Journal*.

Use the same procedure as described for Coordinated Observations (previous page). Since field observations can be made any time of year, the following table is provided for conversion from local time to Coordinated Universal Time (UTC).

Local Time to UT Conversion Table

EST + 5 = UT	EDT + 4 = UT
CST + 6 = UT	CDT + 5 = UT
MST + 7 = UT	MDT + 6 = UT
PST + 8 = UT	PDT + 7 = UT

Sample Spectrogram:



This spectrogram is for two minutes using a frequency range of 0 - 11 kHz.

Data Log Cover Sheet (copy as needed)

INSPIRE Observer Team _____

Equipment: Receiver _____

Recorder _____

Antenna _____

WWV radio _____

Site description: _____

Longitude: _____° _____′ W Latitude: _____° _____′ N

Personnel: _____ _____ _____

_____ _____ _____

Team Leader address: Name _____

Street _____

_____

City, State, Zip, Country _____

email: _____

Local Time to UT Conversion Table

EST + 5 = UT	EDT + 4 = UT
CST + 6 = UT	CDT + 5 = UT
MST + 7 = UT	MDT + 6 = UT
PST + 8 = UT	PDT + 7 = UT

INSPIRE Data (copy as needed)

INSPIRE Observer Team ______________________________

Observation Date: _____________ Receiver ________

Tape Start Time (UT) _____________ Tape Start Time (Local) _____________

- -

Local weather: ____

Code: M - Mark (WWV or Voice) S - sferics T - tweek W - whistler A - Alpha C – chorus
Sferic Density: D: ___ Scale of 1-5 (1 – Very Low, 3 – Medium, 5 – Very High)

Time (UT)	Entry		Observer
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________
___________	M-WWV M-V S T C W___________________________	D: ___	_____________