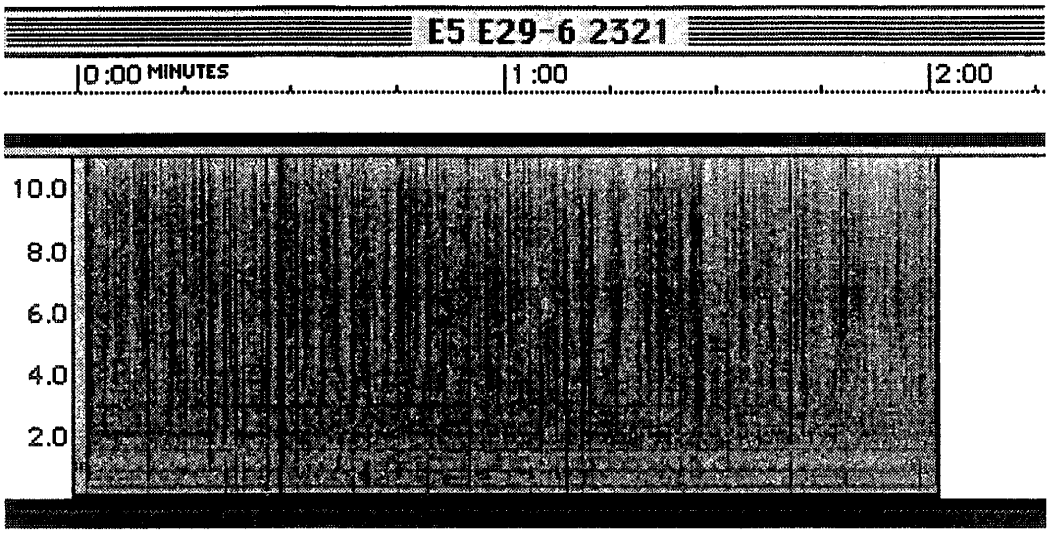
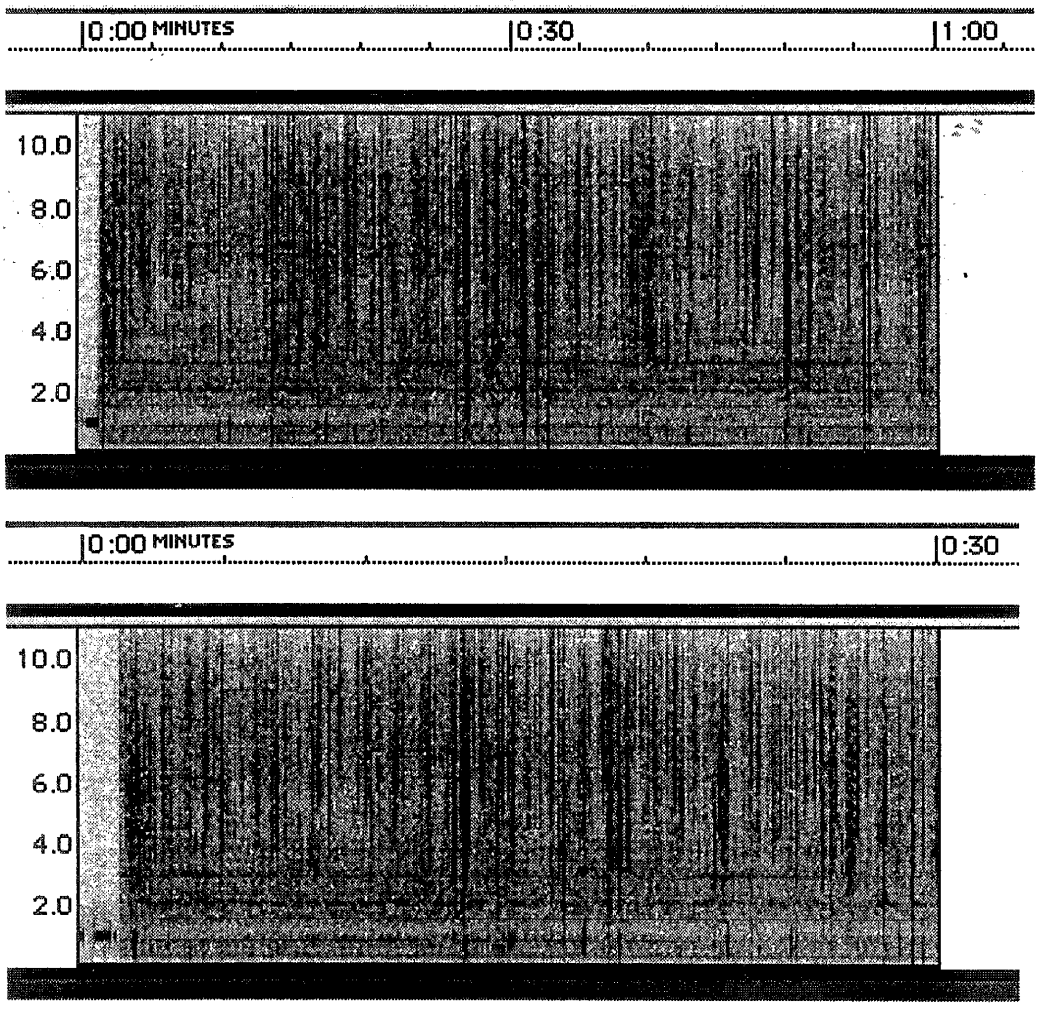
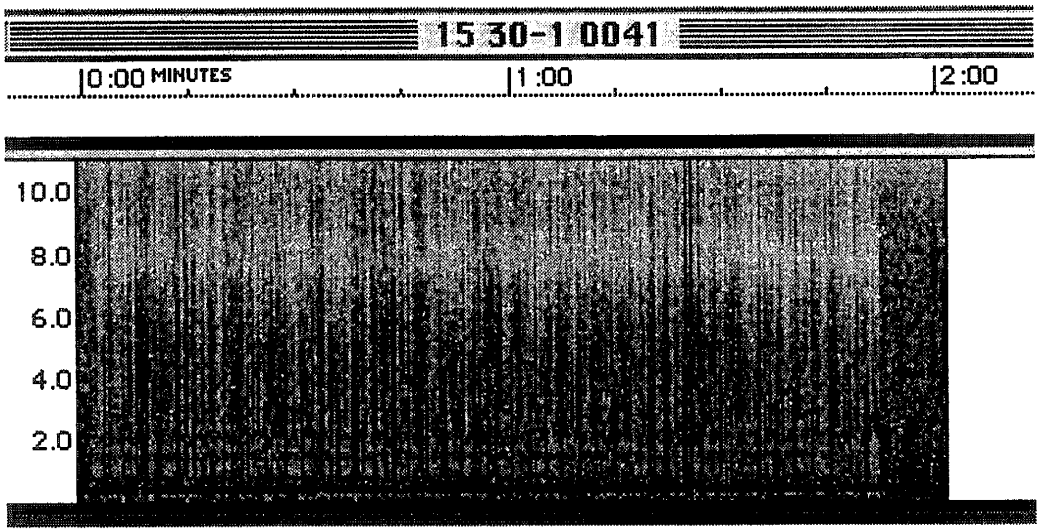
E29-6



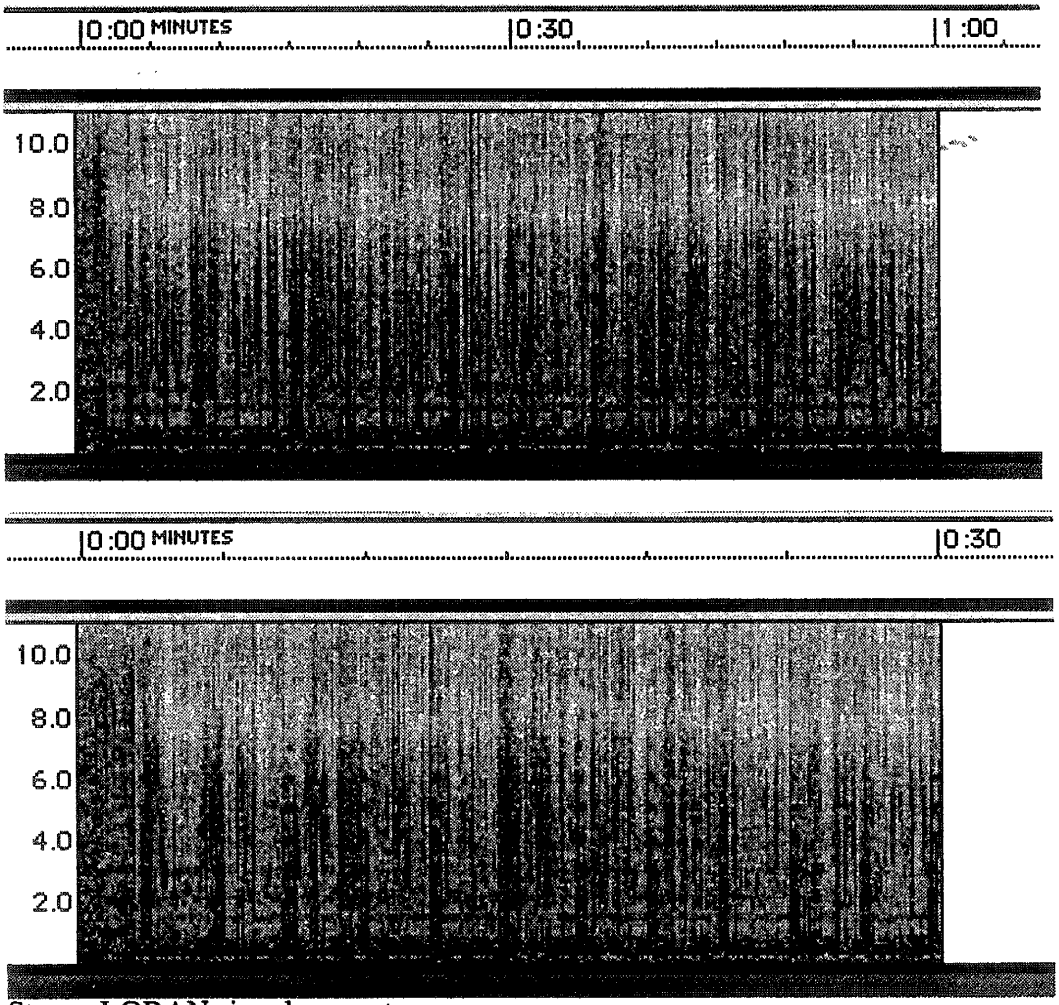
Team E5 Renato Romero, Cumiana, Italy.



30-1

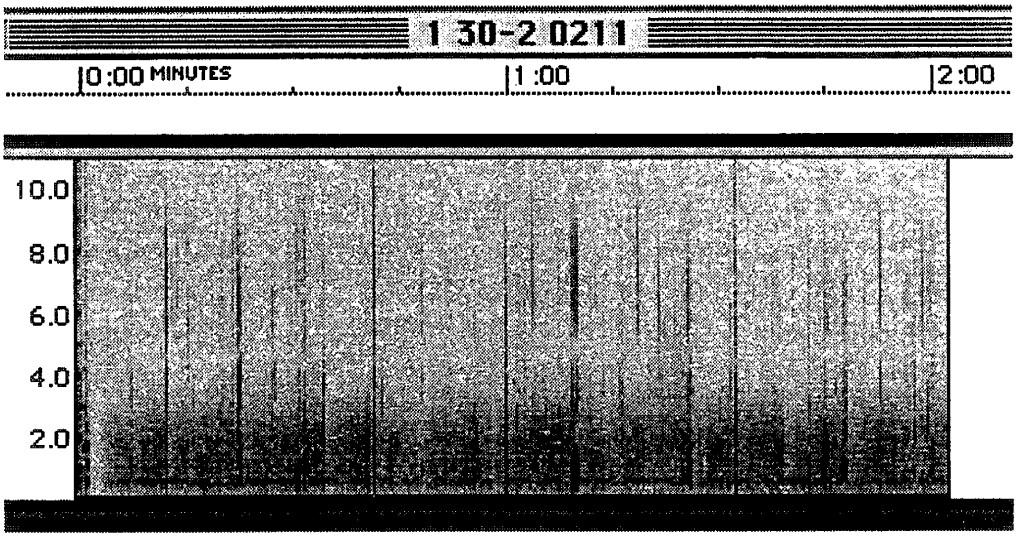


Team 15 Robert Bennett, Las Cruces, New Mexico. Dense sferics and tweeks.

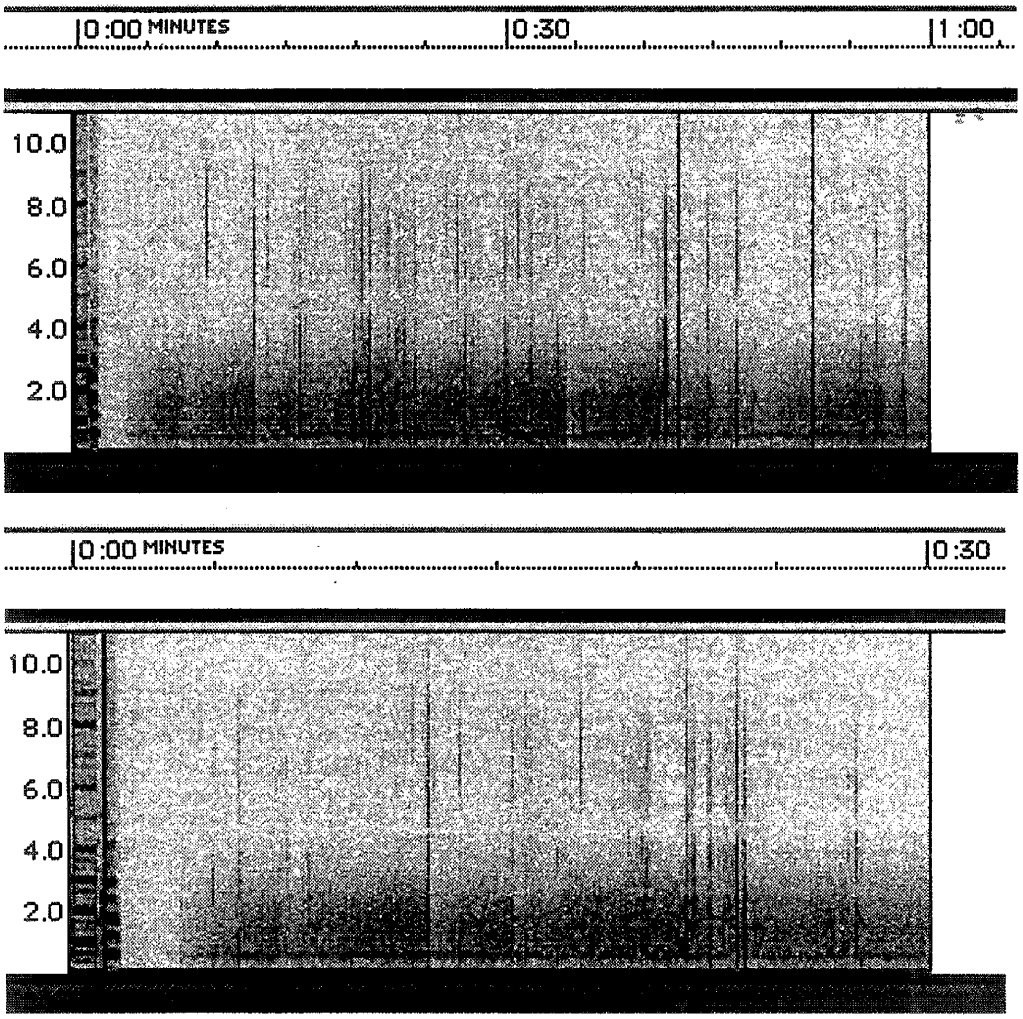


Strong LORAN signal present.

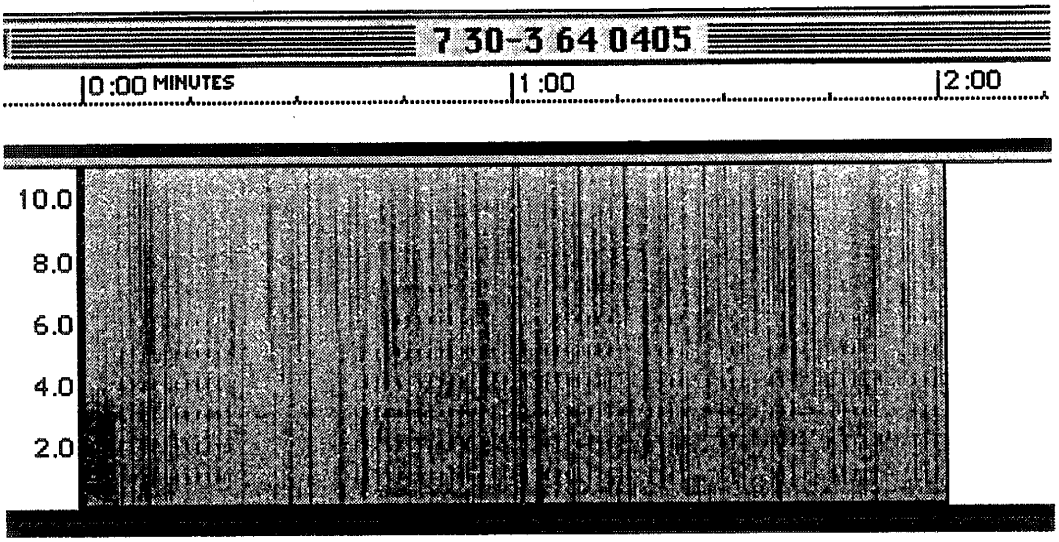
30-2



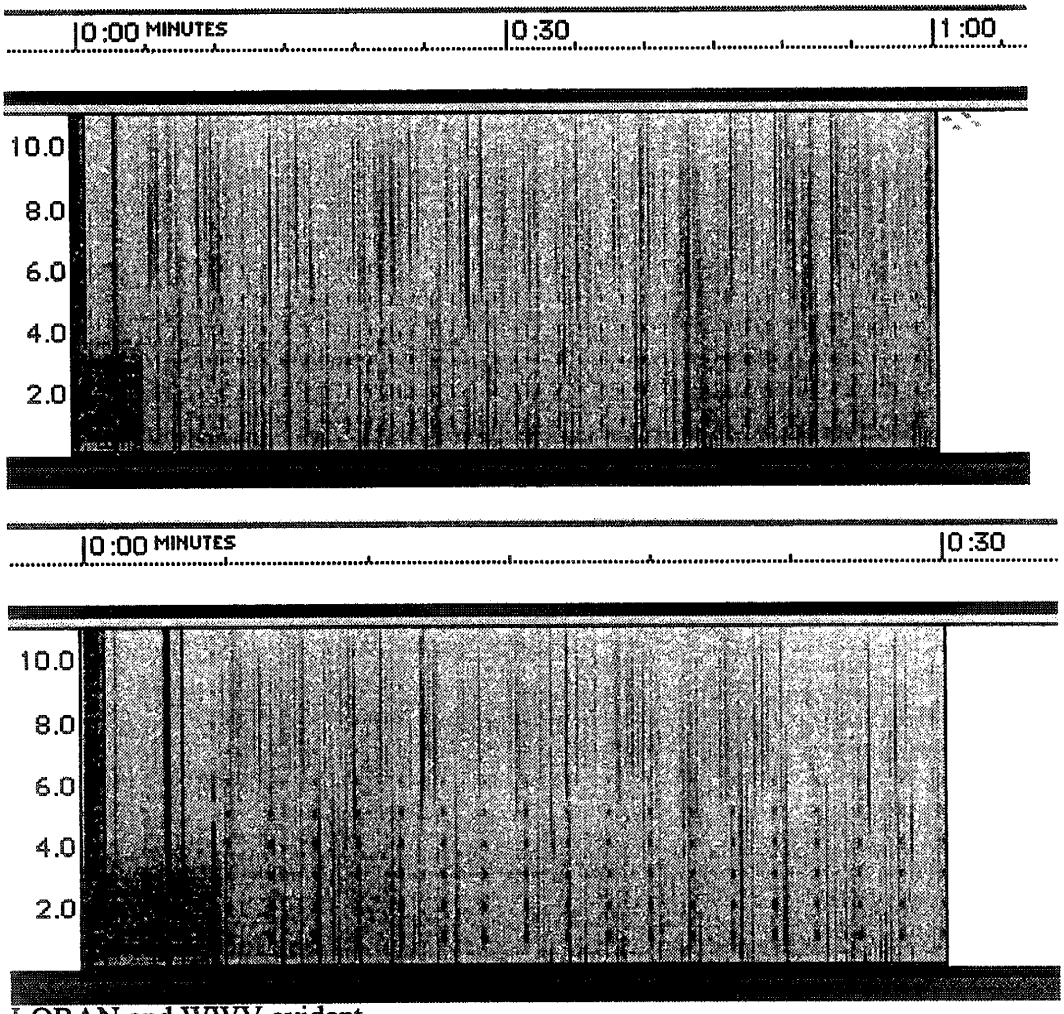
Team 1 Jack Lamb, Belton, Texas. Low density, strong sferics.



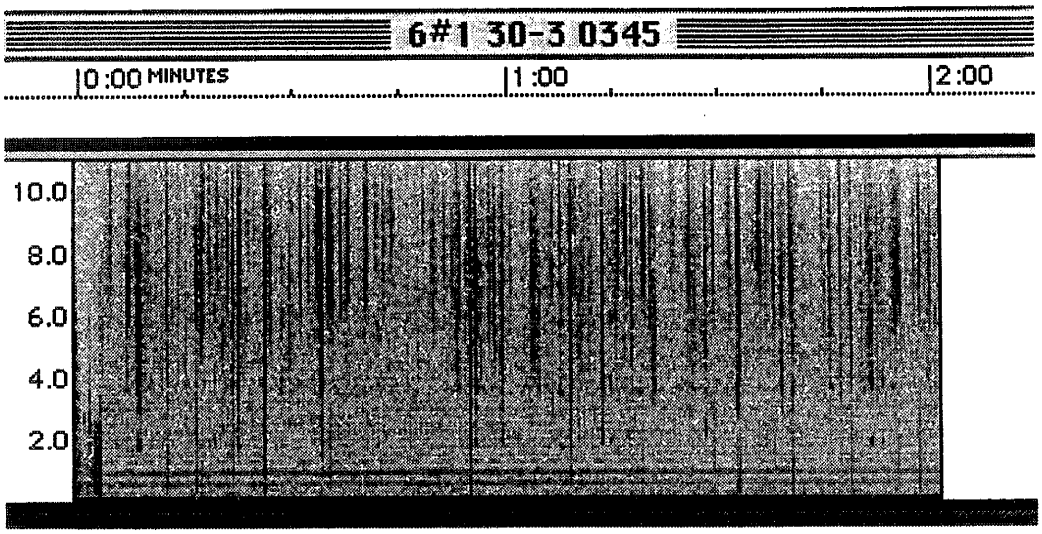
30-3



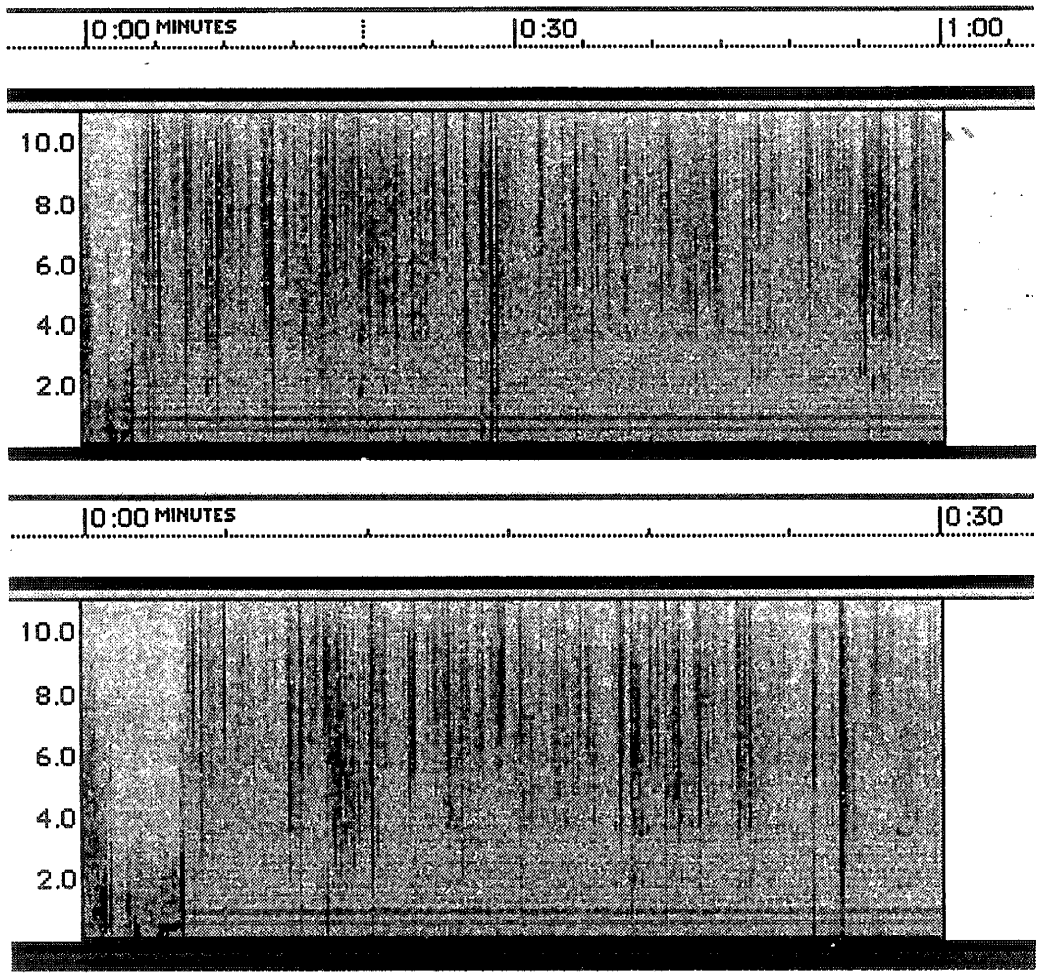
Team 7 Dean Knight, Sonoma Valley High School, Sonoma, California. Strong LORAN.



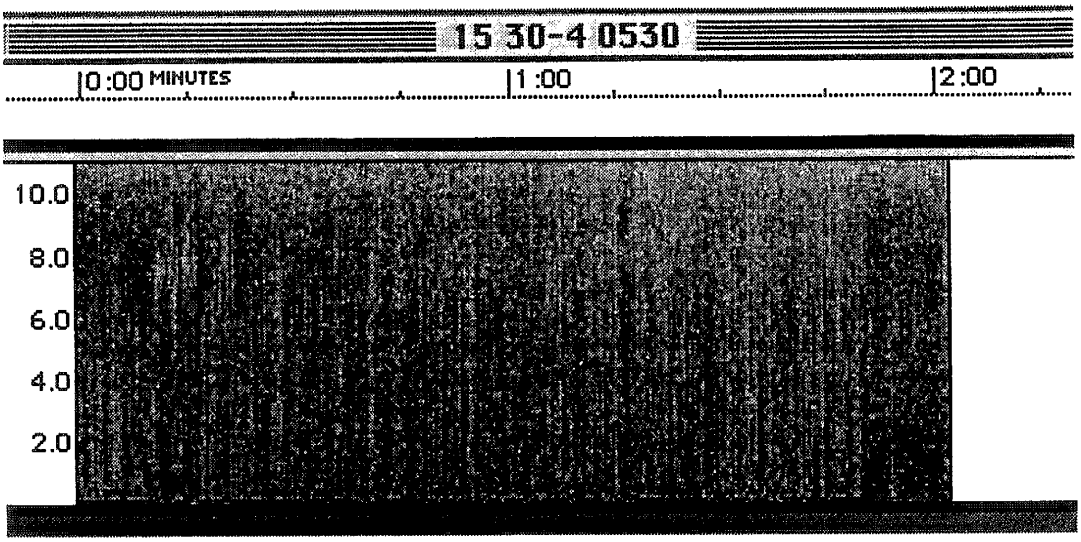
LORAN and WWV evident.



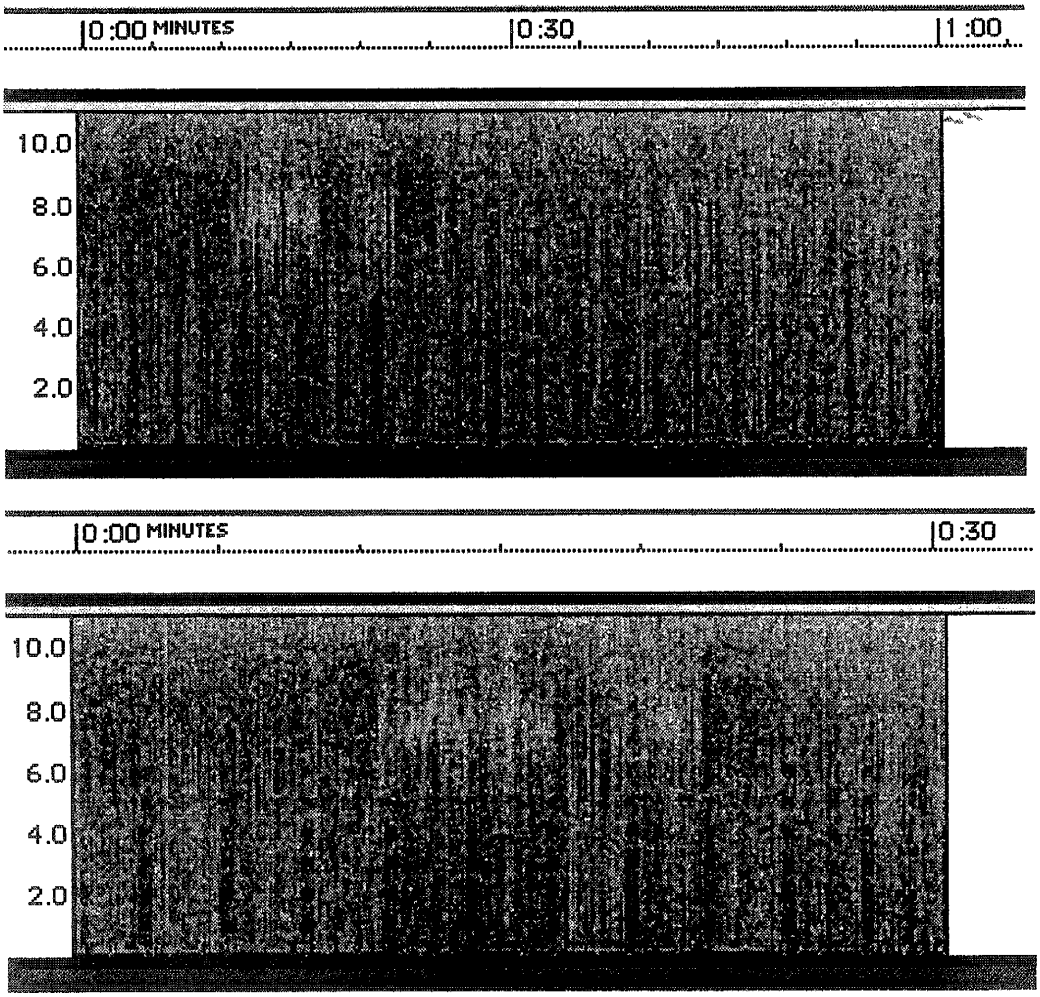
Team 6 Bill Pine, Chaffey High School, Ontario, California.
This is the same operation as the previous one which was recorded about 700 kilometers north of the Team 6 location.



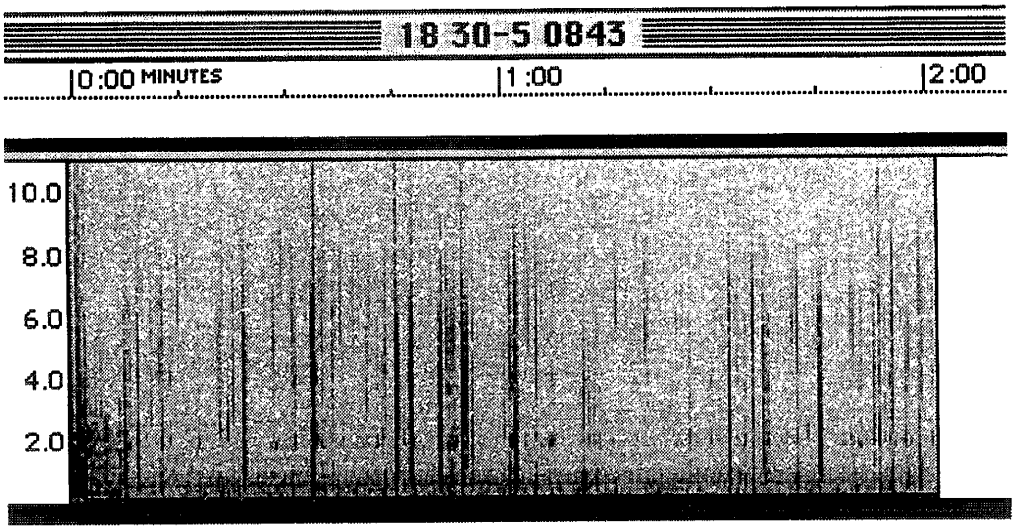
30-4



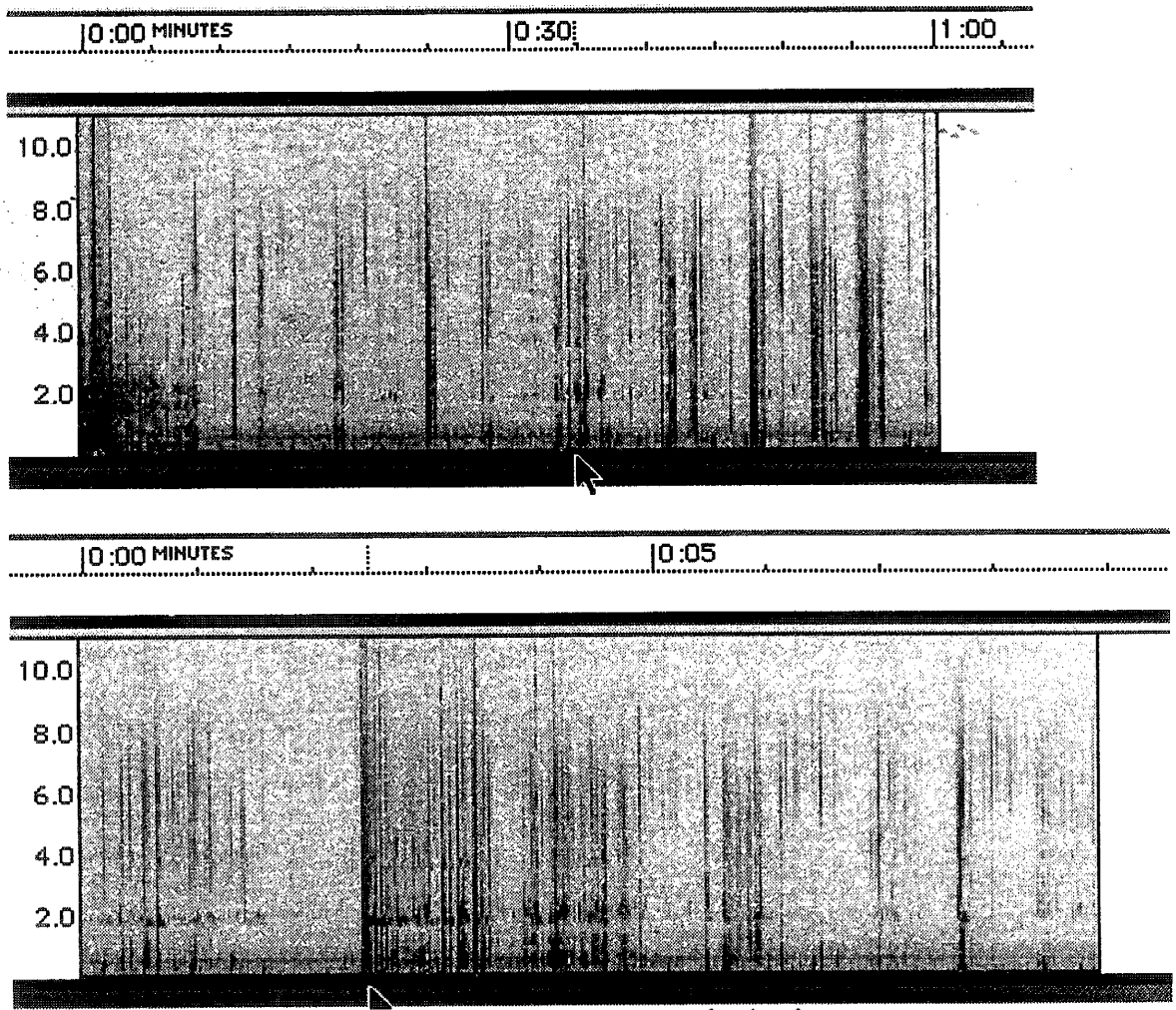
Team 15 Robert Bennett, Las Cruces, New Mexico. Strong LORAN present.



30-5



Team 18 David Jones, Columbus, Georgia. Medium density sferics and tweeks.



closeup of a burst of tweeks indicated by the arrow on the 1-minute spectrogram.

Notes From the Field

Communications from INTMINS Participants

Edited by Bill Pine
Chaffey High School
Ontario, CA

Data submissions are often accompanied by notes and messages from INTMINS participants describing various aspects of their experiences as observers. As an ongoing feature, some of these communications will be summarized in *The INSPIRE Journal*. The following summaries are in the approximate order in which the data was received by INSPIRE. In addition, some communications will be included from INSPIRE participants who did not record and submit data.

Team 1 Jack Lamb Belton, TX

Jack is one of the most faithful observers for INSPIRE. He was able to record two sessions in November/97. On one occasion he was assisted by his grandson, Matt Haley; on the other occasion, his assistant was his wife, Mildred. Jack's site is near Lake Belton in a park with no nearby powerlines. There is some persistent hum on his tapes, but the level is sufficiently low to allow detection of the INTMINS signal if that is possible.

Team 25 Norm Anderson Cedar Falls, IA

Norm is the newest INTMINS observer, though he has participated in past operations. Welcome, Norm!

Team 18 David Jones Columbus, GA

I gathered up the equipment and made a reconnaissance of the big field on Fort Benning. I noticed many pickups two of them with a half dozen young itinerant farm workers. The field is usually deserted so I was curious to know what was going on. Back in town a secretary said that Saturday morning the twenty-second was the first day of deer season. I planned to record ISTOCHNIK starting about midway through morning twilight. On a previous opening day, someone with a deer rifle shot the antenna. I had heard the splintering a split second before the rifle crack. No one volunteered to accompany me Saturday morning.

Friday night I spent listening to NOAA weather radio. Thunderstorms and heavy rain continued for hours. A tornado, sighted by radar near the intended field, damaged a church and some houses northeast of there.

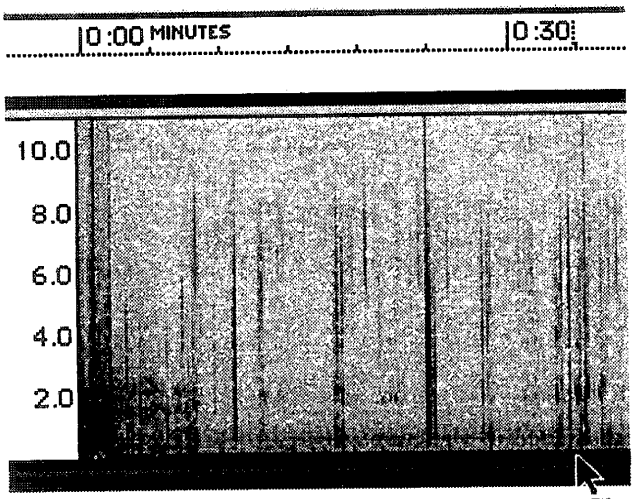
Later, on the way to the field, pickups and orange vests appeared in the headlights. The rain had stopped and no wheel tracks marked the dirt road that bisects the field. I was competing with no one for its middle. Fog sometimes hid the distant pines. I remember that the Army once used the field for mortar practice. Duds were likely.

By the time I set up, the start hack time had passed. I hacked a minute late at forty-six. I missed the next hack while puzzling over the minute hand. It split the minute as the sweep-second hand crossed 12 o'clock. WWV was audible as a falling noisy roar as I tuned through it. I managed to record its tone only for 12:13, 12:14 and 12:15. The voice announcement is inaudible for those hacks. The voice hack at T-time may be one second early. The final hack nearly coincided with local sunrise: 12:15Z. I selected the whip antenna, and no filter. I set the RS4 gain at 5 and the recorder level at ten (max). Weak dawn chorus chirped through the whole ELF recording. There

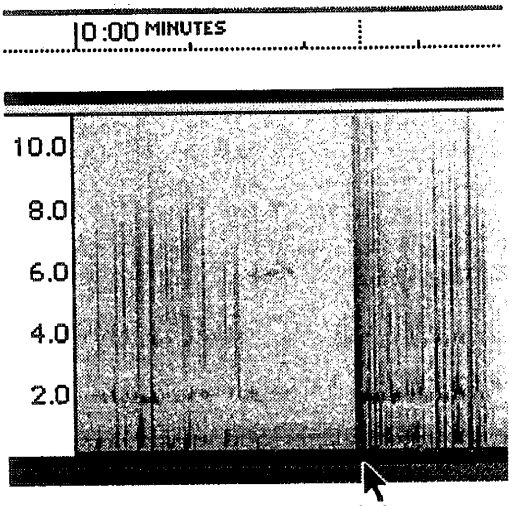
were several weak whistlers and at one point loran-C clack was audible. Hum was strong considering that the power lines were two miles away. I suspected wet, conductive ground. Ten-twenty Hertz lasts through the recording. That's the seventeenth harmonic of powerline freq. Conceivably it could mask the ISTOCHNIK signal. I didn't hear the tone from MIR. Maybe I will record it next week, on Sunday, Thanksgiving weekend.

Sunday, the rain quit before I set up for 30-5. It discouraged the deer hunters however. That is, for the T-time of 0843Z no hunters were there. I arrived an hour early at 2:43 A.M. EST I didn't miss any hacks this time. Conditions were wet ground, no wind and 60 degrees. You may be able to hear the frogs croaking on the announcement. I heard a few very weak whistlers but no sign of ISTOCHNIK. Later, about three Sunday afternoon, I ran the T-time hack through Mike Cooke's FFTDSP42u. There, parallel to the 1020 Hz powerline harmonic, was a 1000 Hz signal for about a minute. It occurred just before and just after the hack. I was elated. Trouble was, no breaks occurred in the signal. It is the feed-through of ten-megahertz time-and-frequency station; BPM. I assume it radiated from the short-wave speaker. I had turned on the radio a little early and left it on a while. Maybe you can find the real signal.

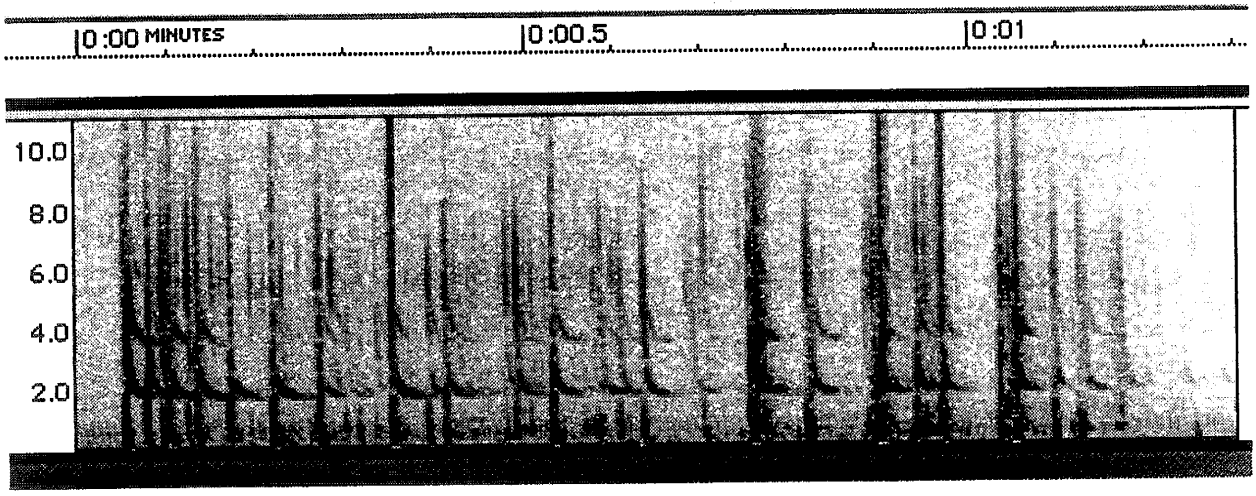
The data was high quality, but no INTMINS signal was detected. Below are a couple of spectrogram from David's data showing dense tweeks.



The arrow points to a burst of tweeks.



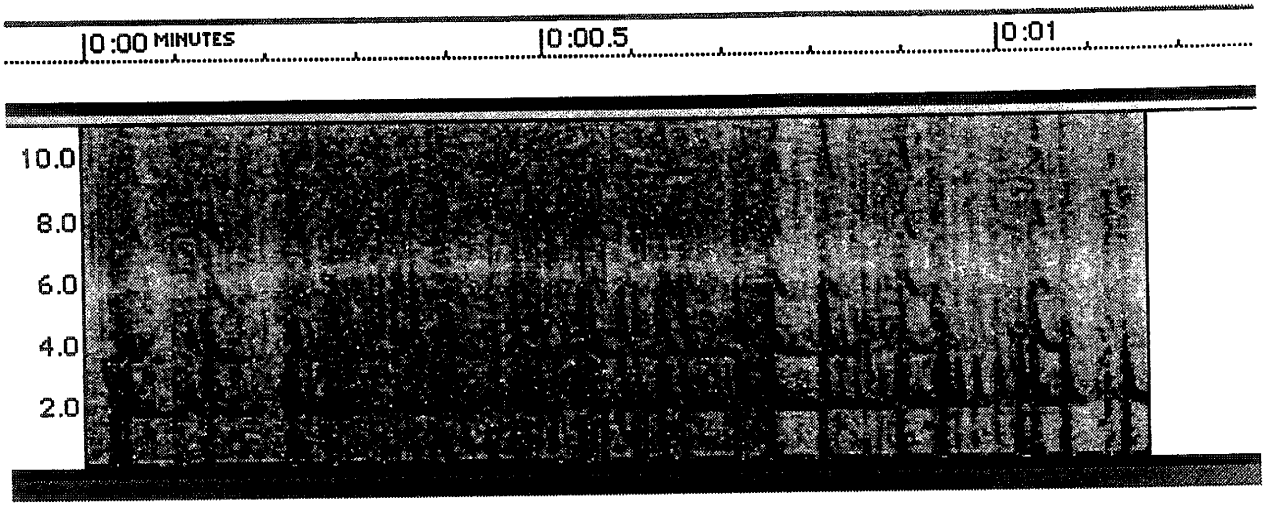
Close-up of tweeks. Each time mark is one second.



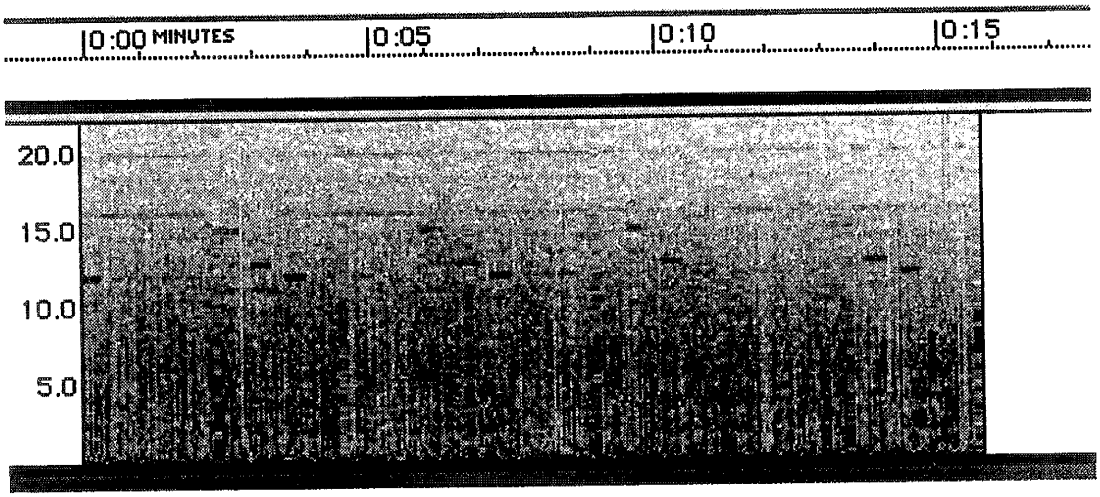
One-second interval showing more than 20 strong tweeks and several more weaker ones. Note that the tweeks include a sferic line that extends well below 2 kilohertz. There is a strong tweek "hook" at about 2 kHz with harmonics present at 4, 6 and 8 kHz.

Team 15 Robert Bennett Las Cruces, NM

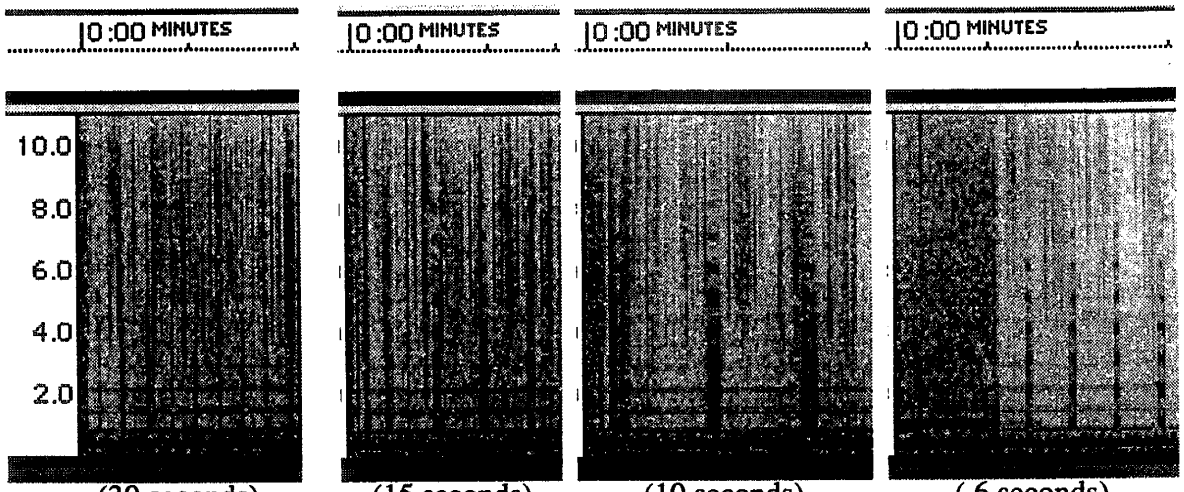
Robert recorded 11 operations in November, including one of the European passes! His data quality is consistently outstanding and his logs are a data analyst's dream. His site is very quiet which allows him to use extremely high gain on his receiver. Below are some sample sonograms from Robert's tapes.



Close-up of a tweek burst. Note that the bottom "hook" is somewhat below 2 kHz and the sferic line does not extend strongly below the hook. The hook represents the cutoff frequency of the sferic which is determined by the distance between the surface of the earth and the reflecting layer in the ionosphere. Notice that there are harmonics of the hook extending up to just below 10 kHz.



This is a spectrogram using the maximum frequency range of the software: 0-22 kHz. This frequency range uses the CD sampling rate of 44.1 kHz. Since this range extends up above 11 kHz it makes it possible to see the signal from the Russian ALPHA navigation system (their counterpart to OMEGA) which operates between 12 and 15 kHz. The repeating pattern of horizontal dashes is the ALPHA signal. The pattern appears to have a period of about 3.5 seconds.



(30 seconds) (15 seconds) (10 seconds) (.6 seconds)

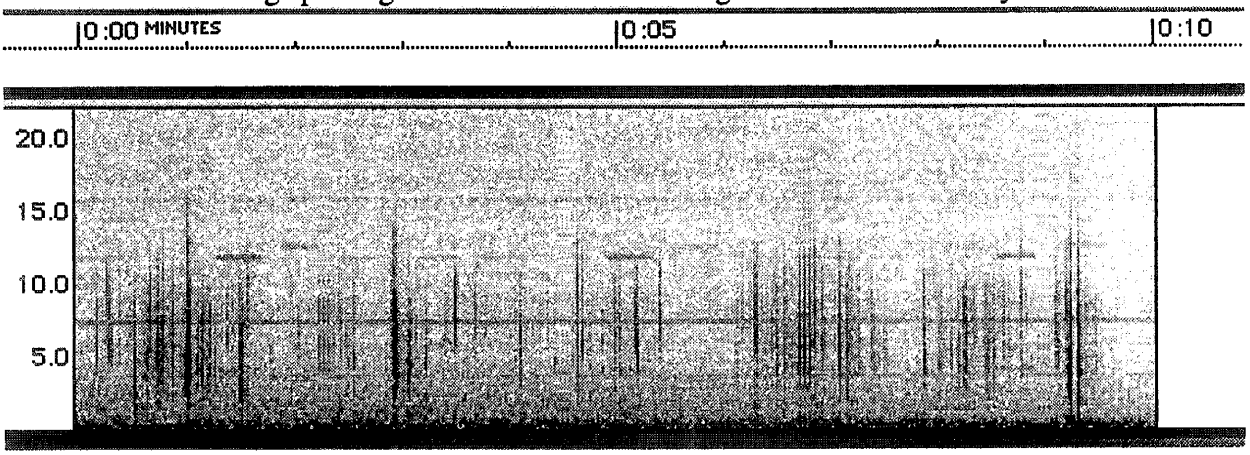
These are successive close-ups of a brief part of one tape showing the LORAN navigation signals. LORAN sounds like a clicking in the headset, and a spectrogram reveals a periodic short 1 kHz tone with harmonics above that. The last panel shows that the frequency of the clicks is about 20 per second. The start of this last panel shows the 1 kHz WWV tone.

Team 22 Rick Campbell Brighton, MI

My recording preparation began a few days before the actual recording date. I was determined to find a quieter site than the one I had recorded at before. The last site I tested proved to be the best. We have a large park in the area called Kensington Metro Park. I chose a promising site near the shore of a small lake by some picnic tables I planned to use for my equipment. The park director, Mr. Shafer, was kind enough to arrange access for me at 11:00 PM Friday night because the park was usually closed to visitors at 10:00 PM. The pass I was to record began at 12:18 AM so I needed time to prepare my setup. During the day I did not notice a few large mercury vapor lights near a building 100 meters away. The noise in the recording is not overwhelming, but it could have been better if I had noticed them and moved to another area. Well, next time! The weather was about 30° and it was snowing lightly. Warm clothing and a thermos of hot chocolate proved an adequate defense. I was pleased I had found a better site and the picnic table was an added benefit. I have my eye on another site in the park for the next recording session that may prove to be electrically quieter. I also plan to modify my setup by isolating the WWV signal input and buying a WWV receiver so I don't have to drag my short-wave radio outside.

Team E7 Alessandro Arrighi Florence, ITALY

The following spectrogram shows the ALPHA signal as recorded in Italy.

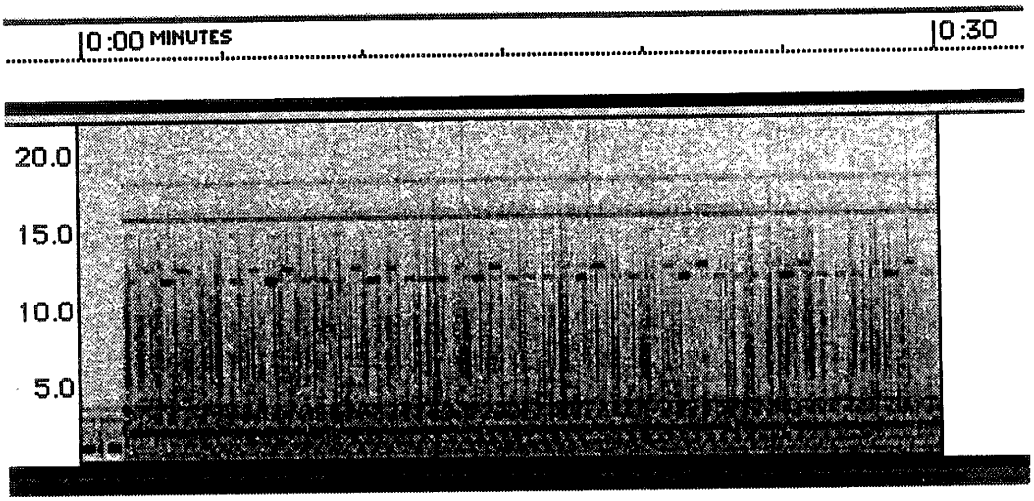


Team 21 Phil Hartzell Aurora, NE

I only had a chance for one session. I look forward to building the new receiver for the next session. My 22-2 session was very typical. No major events. My weather was good. Listening was very typical for that time of year. It was lonesome not having that dear friend OMEGA to comfort me! But the show must go on! See what the spring brings!

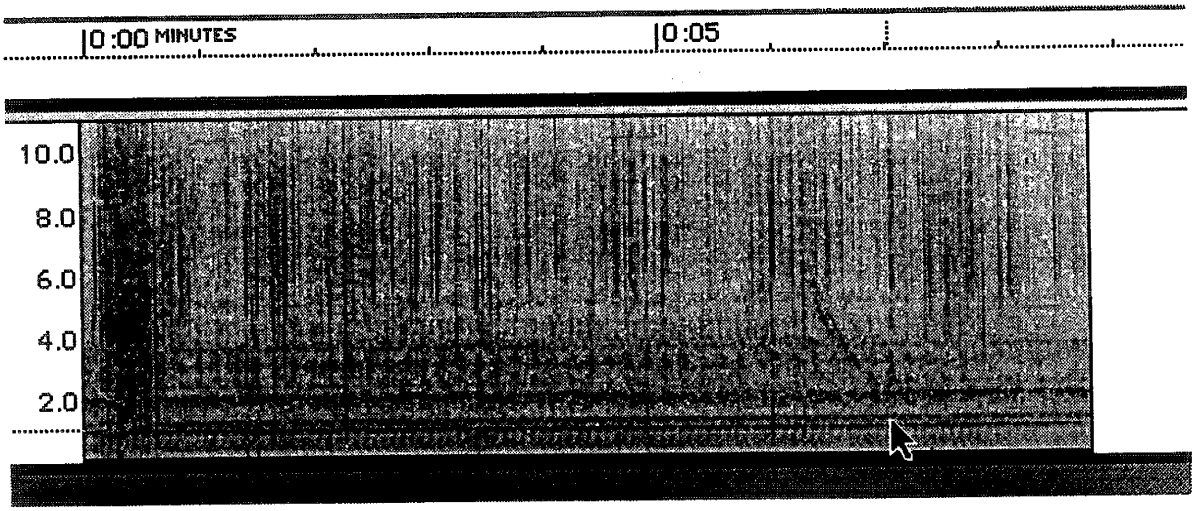
Team E5 Renato Romero Cumiana, ITALY

The spectrogram below show the ALPHA signal recorded by Renato.

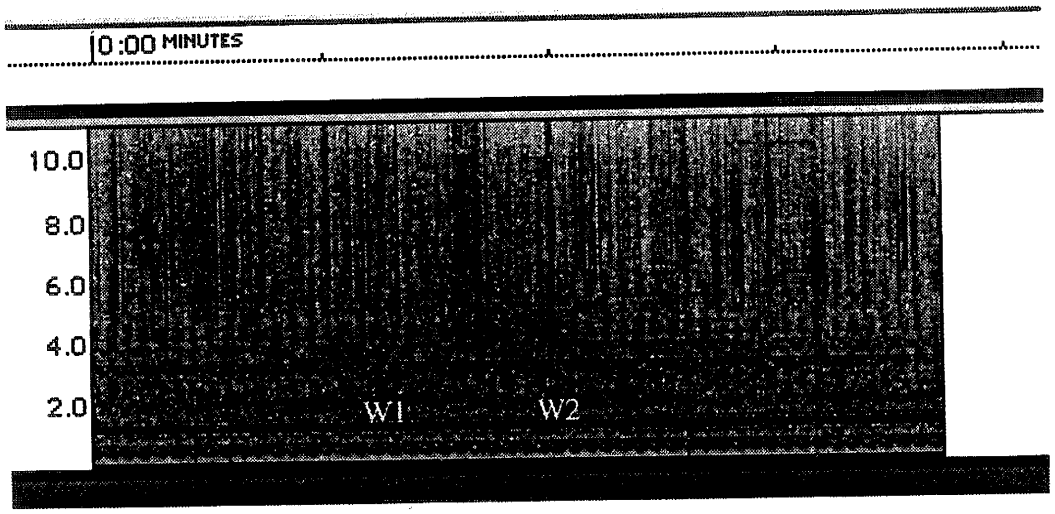


Also shown at the beginning of the spectrogram is the MSF code tone for the European time station.

Renato also captured several whistlers during his sessions. Below are some samples.



E21-1 Whistler logged at 231556 UT. Note the pronounced manmade noise at the bottom of the spectrogram, but yet the sferics and whistlers are clearly heard. This is an example of a site that is not quiet, but is still very good.



E22-1 Double whistler logged at 010040 UT. This is not a two-hop whistler; it is two separate whistlers close in time. Both whistlers show about the same dispersion (the time to slide from high frequency to low frequency) and the second (W2) is stronger than the first (W1).

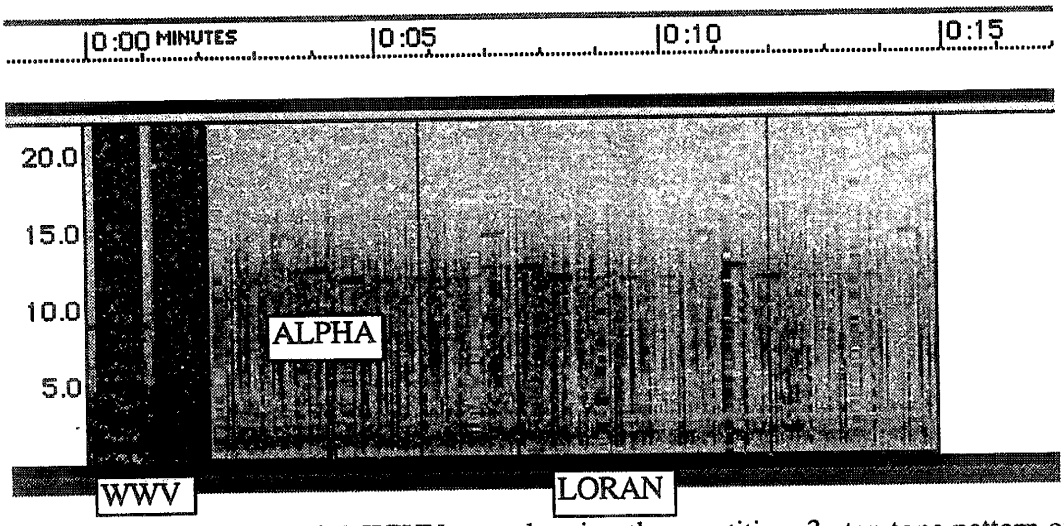
Team 7 Dean Knight Sonoma, CA

I am sending a sample log for each tape - since in spite of the weather we had am "few" students.

Unfortunately, Pass 30-3 was missed since we received your notice on the following Monday - Thanksgiving took its toll on school days at the end of the week and ... Maybe email would work best for last minute changes. I can make sure on the days leading up to the pass to check my email each day (normally I check my email once or twice a week). In included the 30-3 tapes anyway since here might be something interesting on them. There are only two tapes for 30-3 since the "RS" receiver was acting up.

Also in the logs you will notice OMEGA was indicated where it was probably LORAN instead since OMEGA has been terminated.

(Editor's notes: In the future email will be used for last minute updates and schedule changes. What was logged as OMEGA was probably ALPHA, the Russian navigation signal. Below is a spectrogram from Operation 23-2 showing both LORAN and ALPHA.)



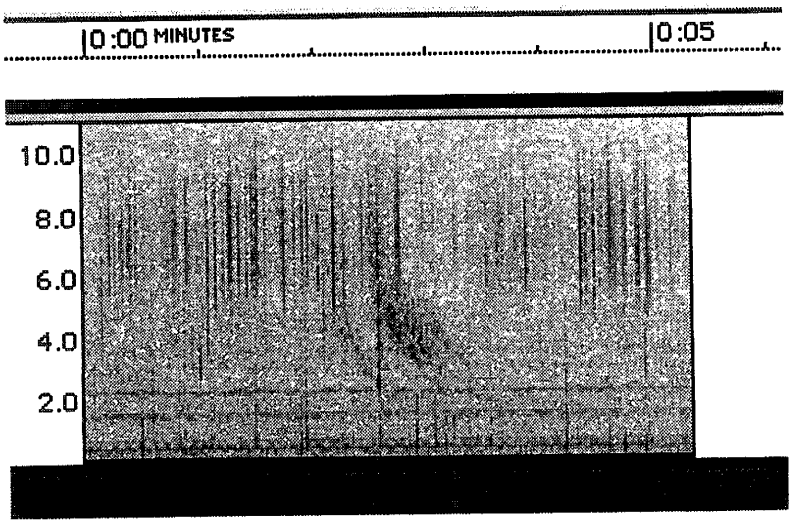
First 15 seconds after 0602 WWV tone showing the repetitive, 3-step tone pattern of ALPHA. LORAN is also present.

Student participants from Sonoma Valley High School included:

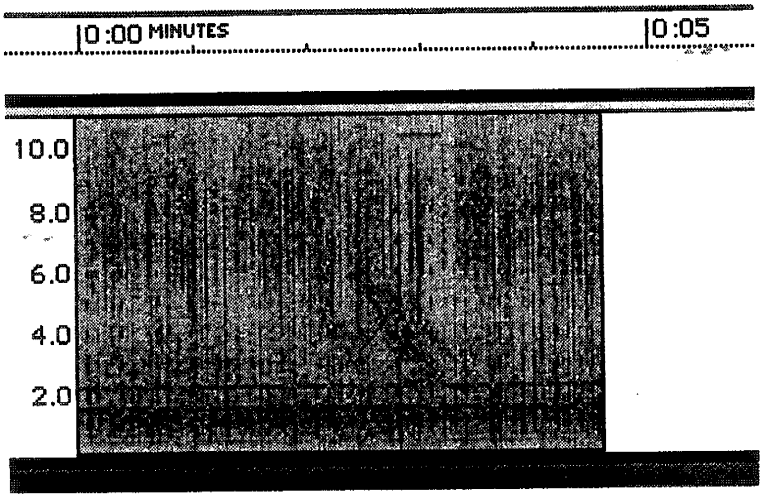
PASS	22-3	23-2	23-3	30-3		PASS	22-3	23-2	23-3	30-3
Evan Adams	x	x	x			Bryan Israel		x	x	
Morgan Ahlborn				x		Sierra Jenkins		x	x	
Mark Allander		x				Kate Jensen	x	x	x	x
Allison Andrew			x			Daniel Kane	x	x	x	
Alicia Andrieux	x	x		x		Povilas Karkauskas		x	x	x
Ethan Baldinger				x		Devin Katayama	x	x	x	x
Amy Barrot	x	x	x	x		Amy Kelly	x	x	x	x
Chandra Bertrand		x	x			Angie Kelly	x	x	x	
Kerry Brady				x		Patrick Krauss	x	x	x	
Audra Brocco		x	x	x		Alan Kruezenberger	x	x	x	
Jenny Brocco				x		Johanna Lacoe				x
Danny Campbell		x	x			Sarah Leighton	x	x	x	x
Brennan Chesley	x	x	x			Holly London		x	x	x
Frank Dang		x	x	x		Colleen Malayter		x		
Aaron Daniels		x	x	x		Matt Marek	x			
Jesse Day		x	x			Meghan McKearney		x	x	
Gen Deighton				x		Caitlin Mouille	x	x	x	x
John Denson	x	x	x	x		Ryan Muzzy	x	x	x	x
Sophie Donnely	x					Mia Nordquist	x	x		
Jim Dougherty	x	x				Loren Palenchar	x	x	x	
Barbie Duncan		x	x			Marylouise Pels				x
Leslie Ealy		x	x			R. J. Pels				x
Danny Fay	x					Jenny Radloff	x			
Sara Gallagher	x					Bryan Rasmussen	x	x	x	x
Doug Gardner				x		Brianna Reagan	x			
Holland Gilmore				x		Devin Roth		x	x	
Gillian Goggin	x	x	x	x		Duane Schoenfeld	x			
Ben Goldberg		x	x			Kathleen Schuerman	x	x		x
Louis Gropman				x		Coty Slater			x	
Caleb Guest	x					Nicole Steach				x
Jordan Hale	x					Jessica Stinson	x	x	x	
Brad Haley	x					William Subaie		x	x	x
Katherine Hanson		x	x	x		Kristin Van Fleet				x
Heather Hensic	x	x	x			Amanda Wayson		x		x
William Hipkiss	x			x		Adriana Westerbeke				x
Angela Hover	x	x	x	x		Jesse Witcowicki	x	x		

That's a total of 80 student participants, many of whom recorded all four passes that were near Sonoma. When Dean said a "few" students were able to participate, his tongue was firmly in cheek! The Sonoma Valley High School Team sets up three receivers using different antenna arrangements including long wires in different orientations. Their recordings are consistently high quality. The receivers are all INSPIRE RS4 receivers and are identified by their different recorders as the "RS", "64" and "65" receivers.

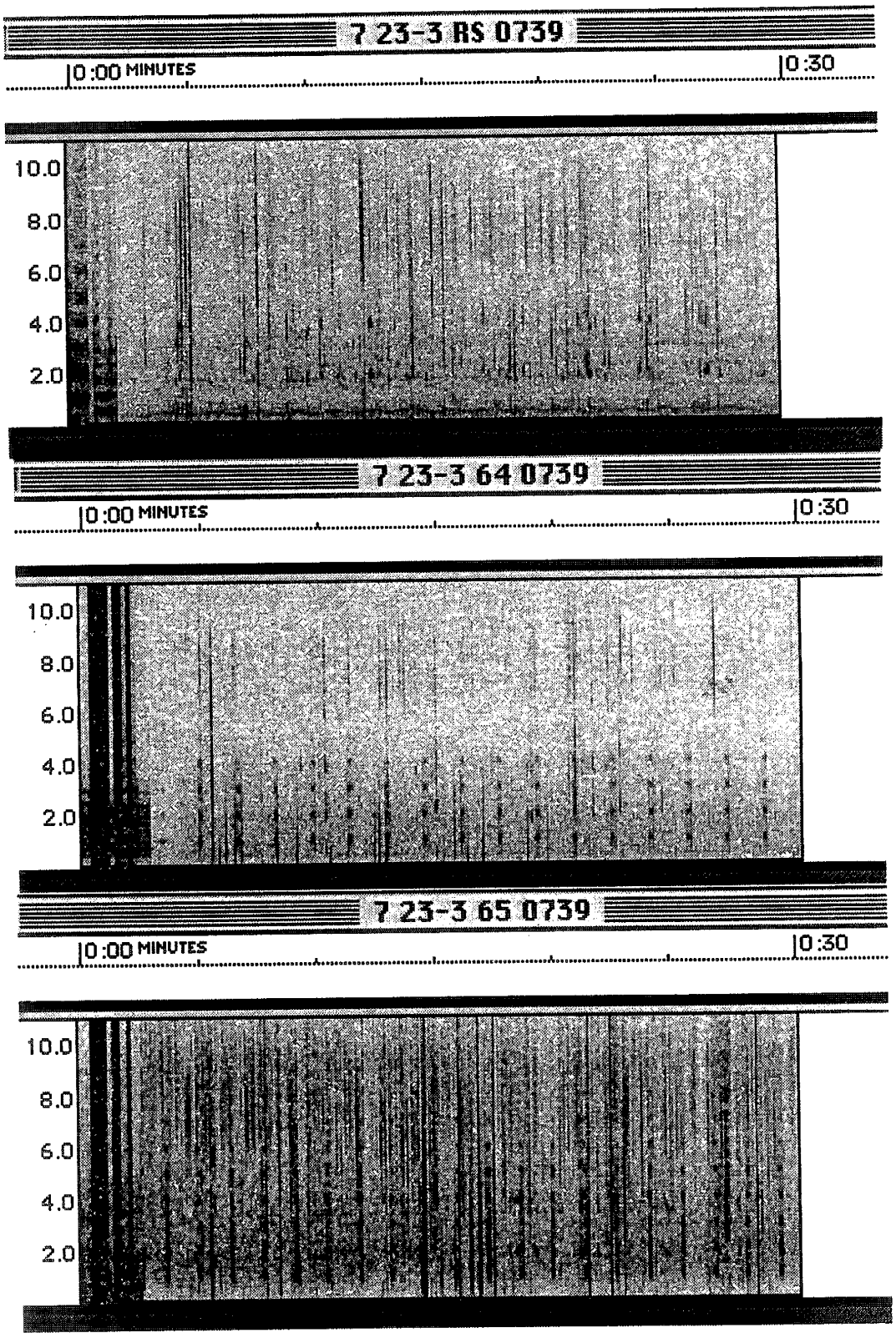
The following are some sample spectrograms from the Sonoma Valley High School sessions.



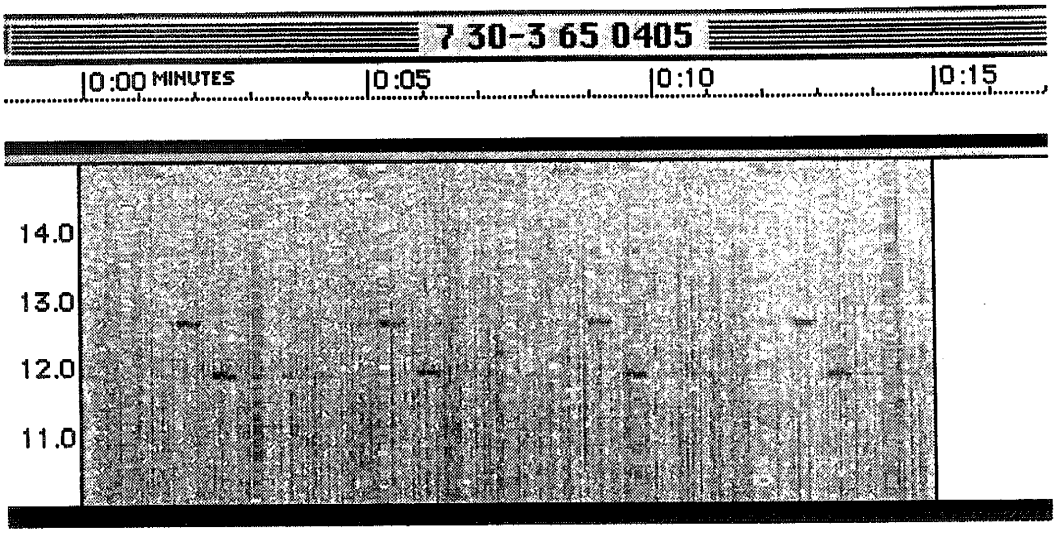
Close-up of a double whistler at about 0554 UT from the 23-2 "RS" tape. This whistler was barely audible on the "64" tape and did not show up on the spectrogram. I think the levels were set too low on the 64 recorder and receiver.



Operation 23-3. Whistler at 0554 from the "65" tape.



Comparison of the outputs of the three Sonoma Valley High School INSPIRE receivers. Each starts with the 0739 WWV tone. LORAN is easily seen on the last two spectrograms.



A close-up view of the 10-15 kHz frequency range showing detail of the ALPHA signal.

Team 5 — Jean-Claude Touzin — Quebec, CANADA

I don't think I heard ISTOCHNIK. These two sessions were really a pleasure to do. I finally managed to build myself a 3 ft. by 5 ft. cabin. With a small propane heater I can now warm myself in cold weather. So keep the recording sessions coming. It does not seem to be an easy life onboard MIR. They really seem to be unlucky for the time being. - JCT

Team E10 — Sarah Dunkin, UK Coordinator — London, ENGLAND

I thought I'd update you on the number of participants in the UK. At the moment there are 11 schools with INSPIRE, but I am unsure as to whether all of them have actually built the kits and taken data yet. They were certainly all informed of the last INTMINS run, so I hope that some of them at least took part.

Boston Boys' Grammar School	Lincs	PE21 6JY
Oakham School Physics Department	Rutland	LE15 6QT
Oundle School Physics Department	Peterborough	PE8 4AT
Plymouth College of Further Education	Plymouth	PL2 2BD
St. Clement Danes School	Herts	WD3 6EW
King Edward VI School	Suffolk	IP33 3BH
King Edward VI School for Girls	Birmingham	B15 2UB
Harrogate Ladies College	Harrogate	
Leeds Grammar School	Leeds	LS6 1AN
Bromley High School for Girls	Kent	BR1 2TW
Hartismere high School	Suffolk	IP23 7BL

I have heard from an enthusiastic teacher in Zambia who would very much like to take part in the INSPIRE project. I think I can send him a kit that has already been built for free, but I think he may also buy a kit from you at some point as he seemed keen to be able to construct it with his pupils.

Banani International Secondary School	Lusaka	Zambia

I am also in contact with a Turkish school who also seem keen to join INSPIRE. I imagine they will come under Flavio's co-ordination.

I will be displaying some of the INSPIRE info at a small meeting of the Royal Astronomical Society this Friday, for those interested in public outreach. The display will be unmanned unfortunately (I don't think I can make it), but I'll be leaving lots of info for people to take away if they want to.

That's about it for now, I think. I will not have much time to devote to INSPIRE activities over the next few months because of work commitments, so I won't be able to push for more schools to take part here. I will of course keep the schools already participating informed of INSPIRE activities and try to get them in touch with one another too.

I hope this info is of use to you!

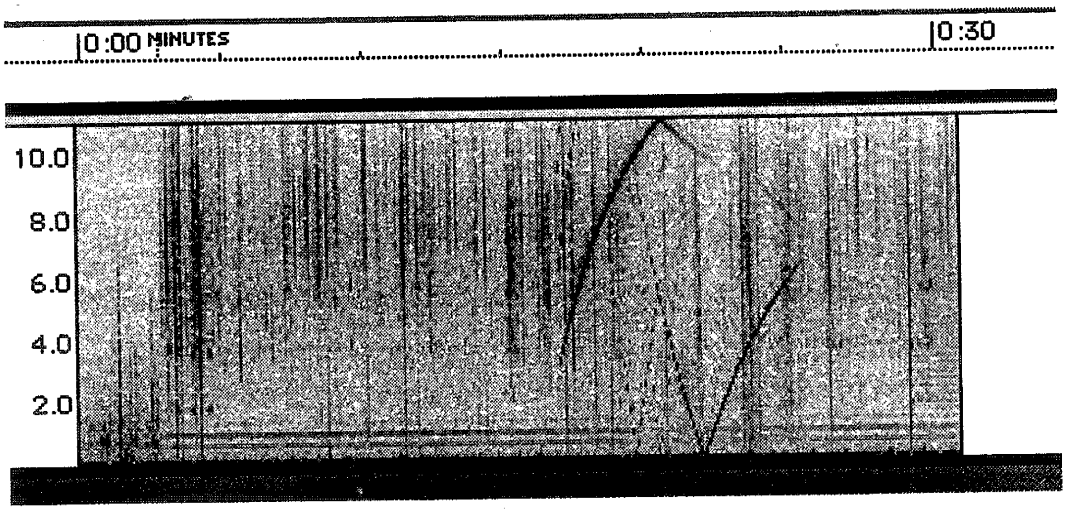
Best wishes, Sarah

Team 6 Bill Pine Ontario, CA
Chaffey High School

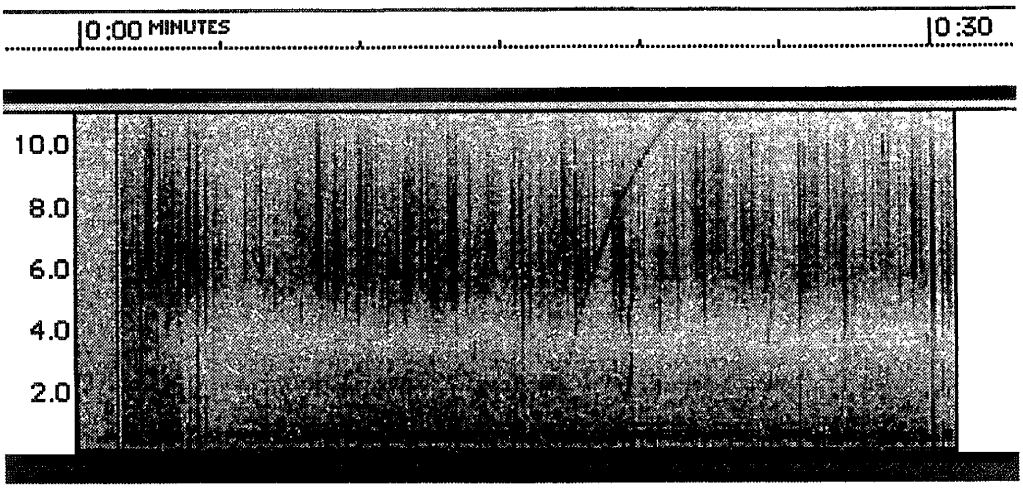
Members of the Chaffey High School Team for the November/97 observations included:

Chris Chapman
Maria George
Sarah Pine
Eric Reed
Sarah Somorai
Megan Souter

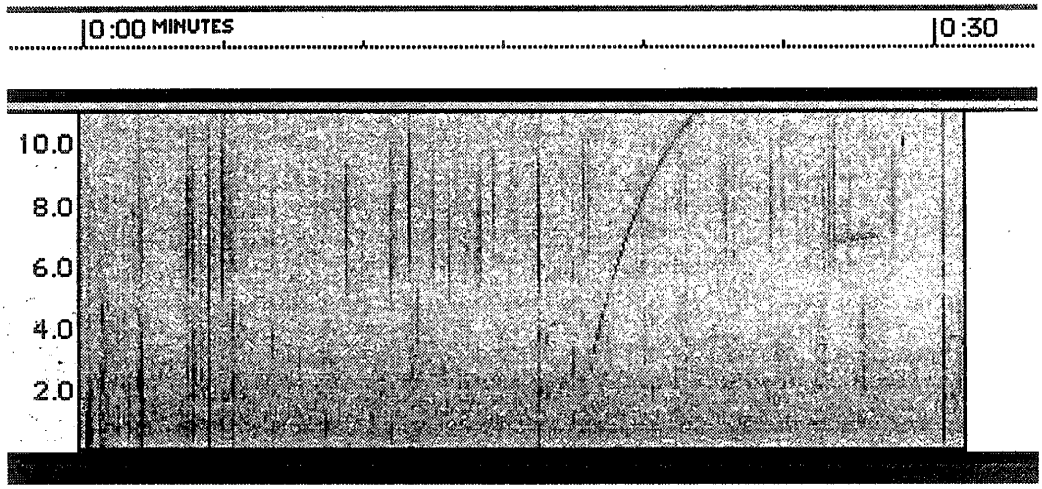
Three receivers were operated for Operations 22-3 and 30-3. The sessions were characterized by dense sferics with many tweeks. No whistlers were heard. While taking photographs of the students they heard a noise through the receiver after the picture was taken. We have heard a similar noise before with other cameras and the noise was easily identified as the signal from the film advance motor. This time, however, a digital camera was being used, so there is no film to be advanced. There is also no audible noise from the camera during the period right after a picture is taken. The students heard a distinct motor-type sound in the headset, however. Spectrograms of the noise from the digital camera are shown below.



This view is using the ACTIVE receiver with loop antenna. The loop antenna is especially sensitive to the magnetic field component of signals and motor noise is always easily heard. This receiver picks up the signal from the ignition systems of cars passing more than 50 meters away.



This spectrogram is using the VLF2 receiver with a 2 meter whip antenna.



This spectrogram is using the RS4 receiver with a 2 meter whip antenna.

Since there is no film to mechanically advance in a digital camera, it is not obvious what the source of the radio signal is. The signal must come from the electrical circuitry involved with processing the digital image and preparing for the next exposure.

IN CONCLUSION:

INTMINS November/97 was another success! Success, in this case, is not measured in terms of detection of the signal from MIR (wouldn't that be nice, though?). Instead, success is measured in terms of the enthusiastic involvement of students and others in a serious and significant scientific endeavor. INTMINS observers are becoming more and more expert at meeting the unforgiving schedules associated with science using instrument on orbiting platforms. Their expertise at operating the receivers and recorders is growing. Data acquisition formats and procedures are becoming second nature. All of this is a worthy end in itself, but it can also be seen as valuable preparation for the time that a manmade, space-based signal does prove to be detectable. At that time INSPIRE participants will be more than ready to continue to contribute to the growth of scientific knowledge.

Data Log Cover Sheet (copy as needed)

INSPIRE Observer Team _____ Receiver _____

Operation _____

Date _____ Tape Start Time (UT) _____

****

Operation details: Tape start time: _____ UT _____ local

Operation start time: _____ UT _____ local

Operation type: _____

Operation stop time: _____ UT _____ local

Tape stop time: _____ UT _____ local

Equipment: Receiver _____ WW V reception:

Recorder _____ _____

Antenna _____ _____

WWV radio _____ _____

Site description: _____

Longitude: _____° _____ ' W Latitude: _____° _____ ' N

Local weather: _____

Personnel: _____ _____ _____

_____ _____ _____

Team Leader address: Name _____

Street _____

_____

City, State, Zip, Country _____

INSPIRE Data (copy as needed)

INSPIRE Observer Team ______________________ Receiver ________

Operation ______________

Date ____________ Tape Start Time (UT) __________

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Code: S - sferics 0 1 2 3 4 5 M - Mark T - tweek W - whistler O - OMEGA C - chorus
L M H

Time	Entry		Observer
________	______________________________	S: 0 1 2 3 4 5	__________
________	______________________________	S: 0 1 2 3 4 5	__________
________	______________________________	S: 0 1 2 3 4 5	__________
________	______________________________	S: 0 1 2 3 4 5	__________
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