Results from Geophone Field Test Comparison for 2D Survey, Colombia

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Single Sensor Vs Bunched, 6-Geophone Array

- Overview & brief summary
- Field-test parameters & geometry
- 6 views of comparisons of the 2 data sets
- Conclusions

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Field Test To Compare 2D Data Acquired Using Single Sensor Versus Bunched, 6-Geophone Array

Objective: To determine if there is a practical difference in data quality using a high-sensitivity, single geophone versus a bunched array of 6 geophones in series at each station.

Procedure: Place 2 lines of receiver stations side-by-side, 1 line comprised of 6 phones bunched in series, 1 line comprised of single geophones at each station. Shoot common shots into each. Compare the data in various ways.

Observation: No practical data quality difference.

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Geophone Field Test Information

2D Field Test Conducted April, 2011, in the Eastern Colombian Llanos

Acquisition Parameters			
Source Spacing (m)	60	No. Source Stns	158
Receiver Spacing	15	No. Rcvr Stns	628
Maximum Fold	24		
Min. No. Live Rcvr Stns	96	Max. No. Live Rcvr Stns	192
Nearest Offset (m)	7.5	CMP Spacing (m)	3.75
Source Line Length	9.42	Full-Fold Rcvr Line Length (km)	6.6
Sample Rate (ms)	2	Nyquist Filter (Hz)	200

Geophone Specifications		
Geophone Type	SM-24	GS-One
Natural Frequency (Hz)	10	10
Distortion (%)	0.1	0.05
Sensitivity (V/m/sec)	28.8	85.8
Maximum Frequency (Hz)	240	240
Max Coil Excursion (mm)	2	2.54
Weight (gm)	74	130
Manufacturer	I/O Sensor	Geospace

(Sensitivities listed are not at same level of damping.)

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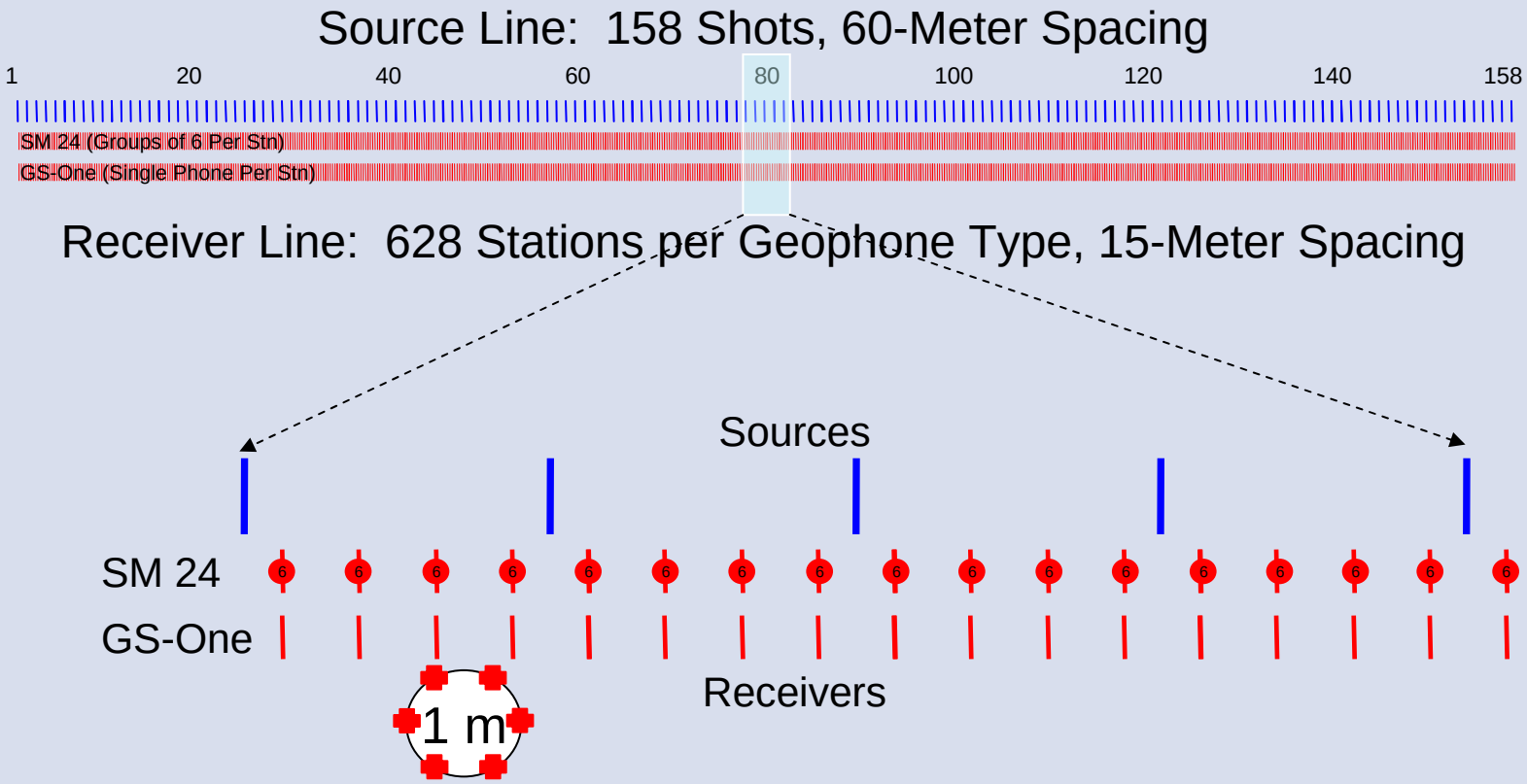
Geophone Test Line Geometry



6 SM 24 geophones were bunched in a group around a 1-meter-diameter circle.

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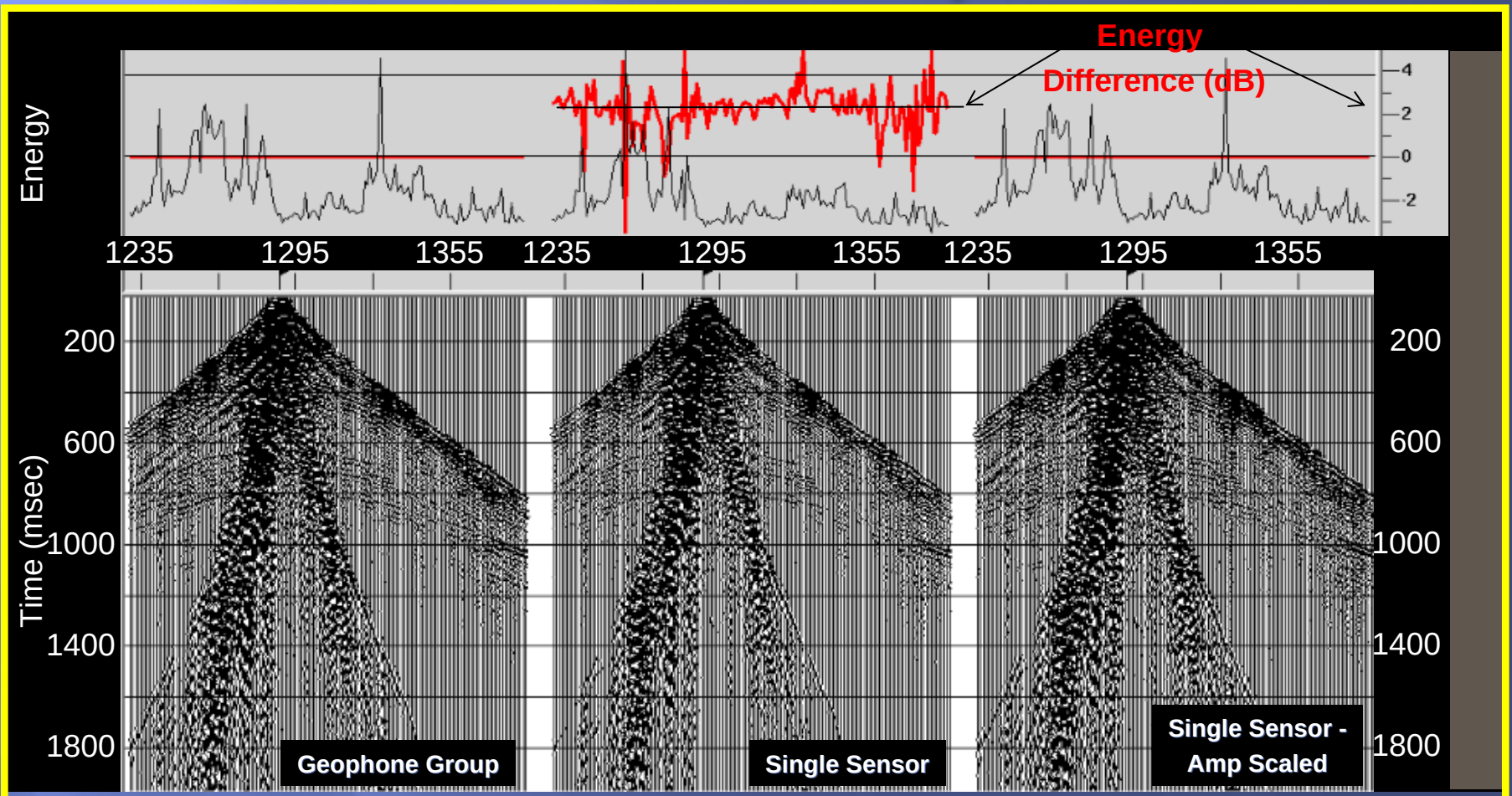
Raw Record Comparison



Geophone Group has 2 – 3 dB higher energy level
(1 – 1.5 dB higher amplitude level) than Single Sensor

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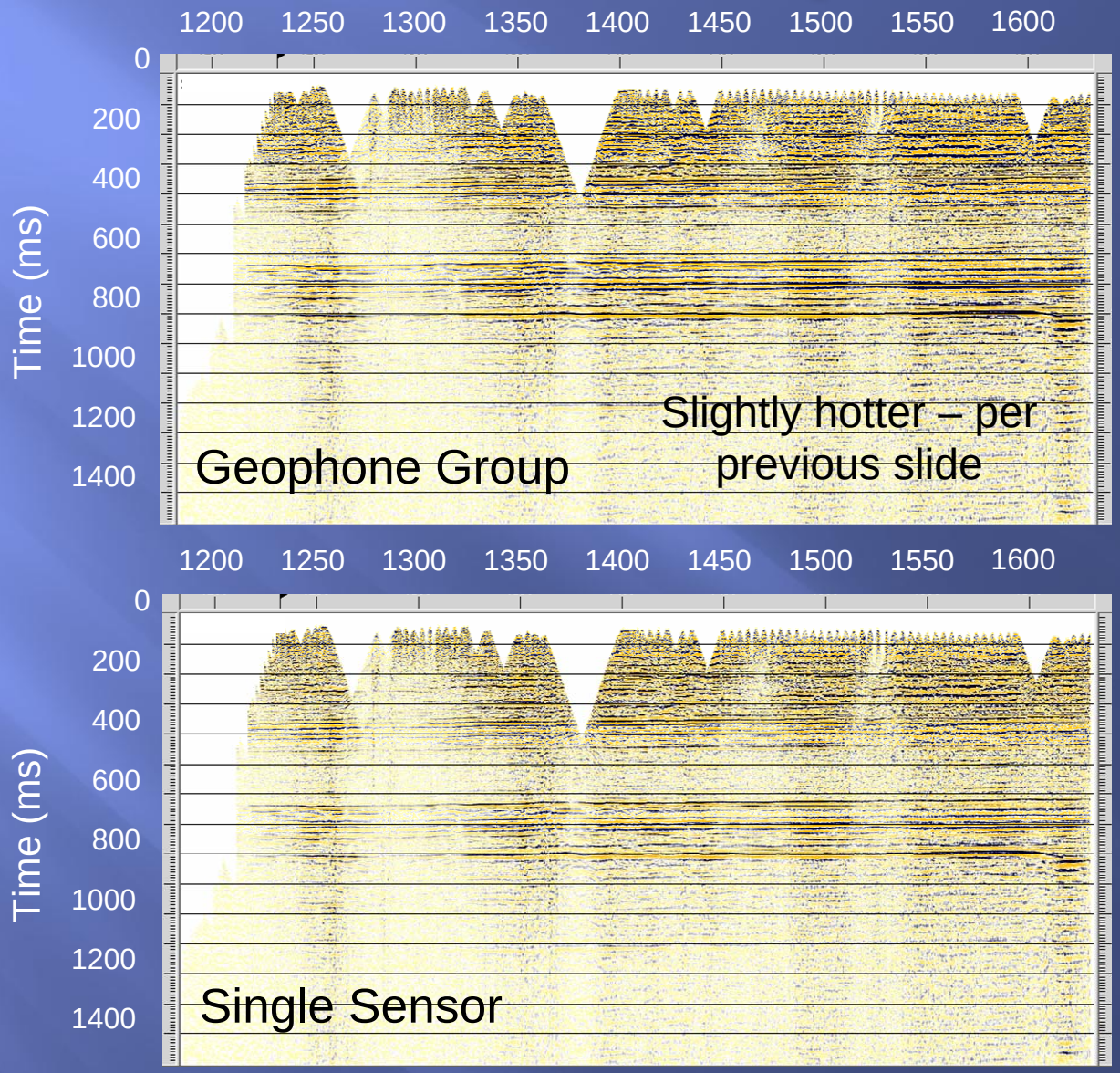
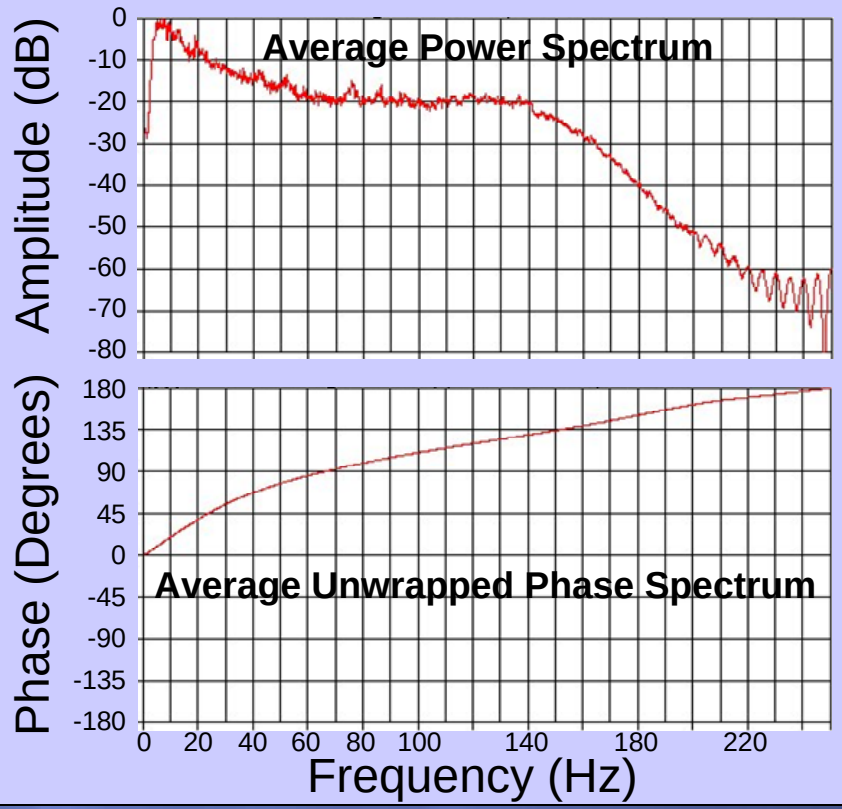
Brute Stack Comparison

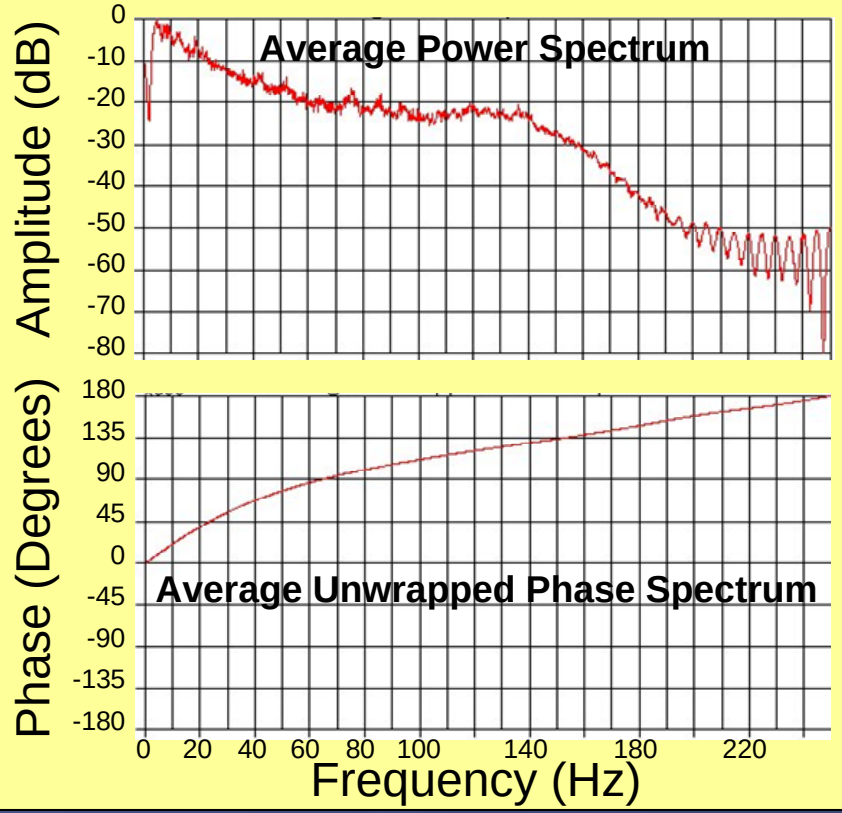


Average Amplitude & Phase Spectra

Geophone Group



Single Sensor



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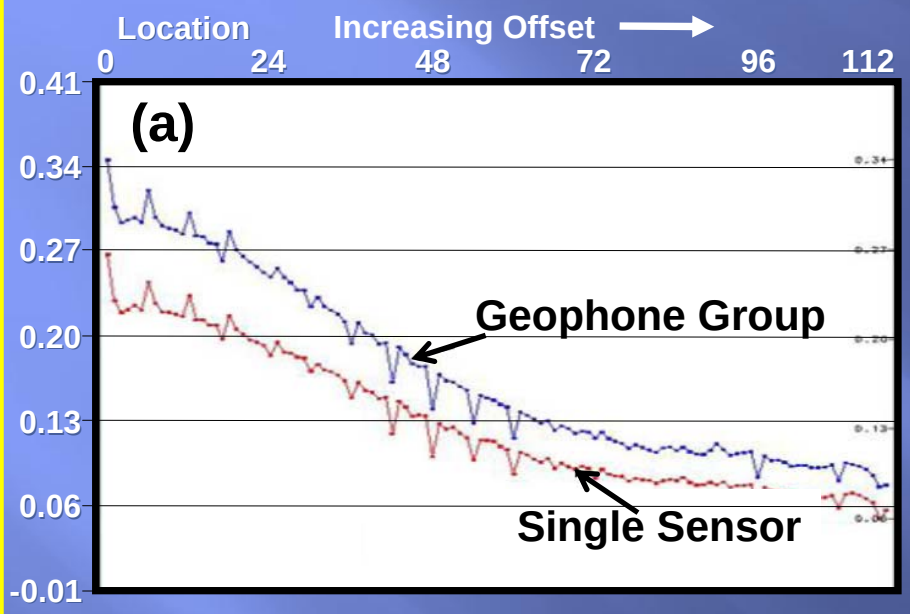
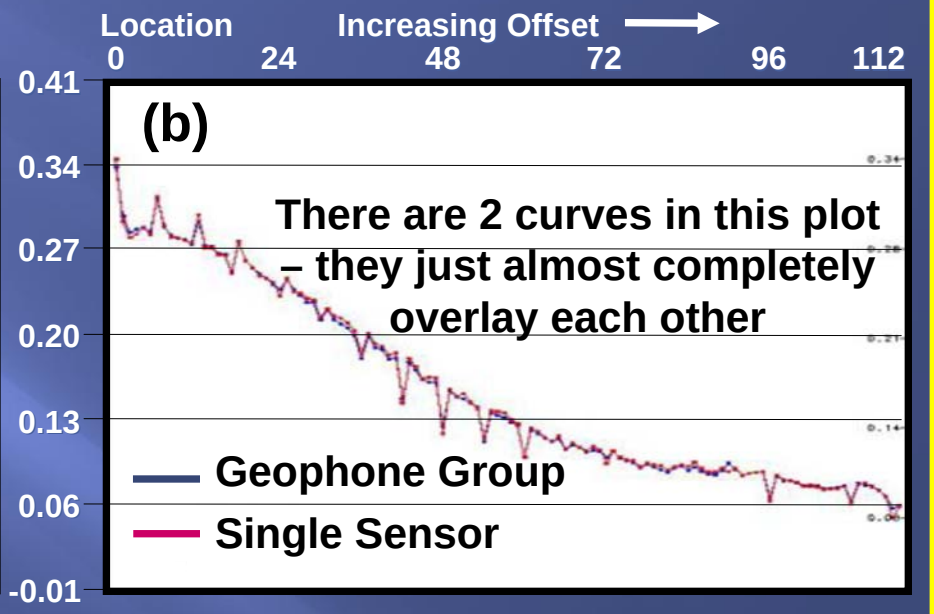
Amplitude-Versus-Offset Comparison



Amplitude-versus-offset for both sets of data for a window from 0 to 4 secs



Amplitude-versus-offset for both sets of data for a window from 0 to 4 secs after Single Sensor amplitudes have been scaled by a factor of 1.3

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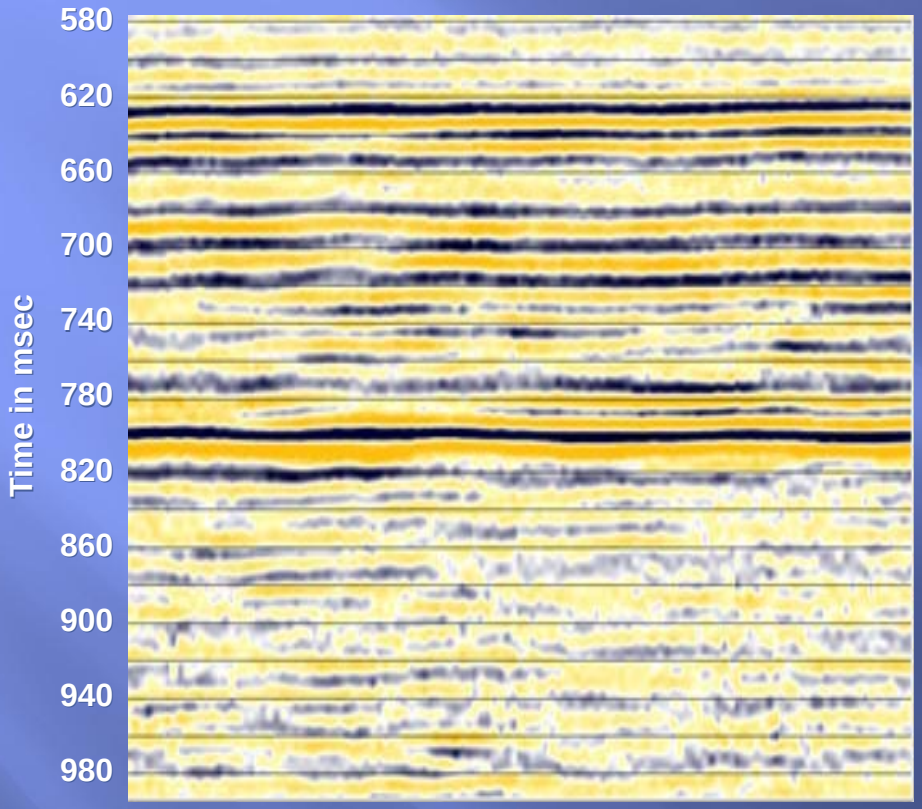
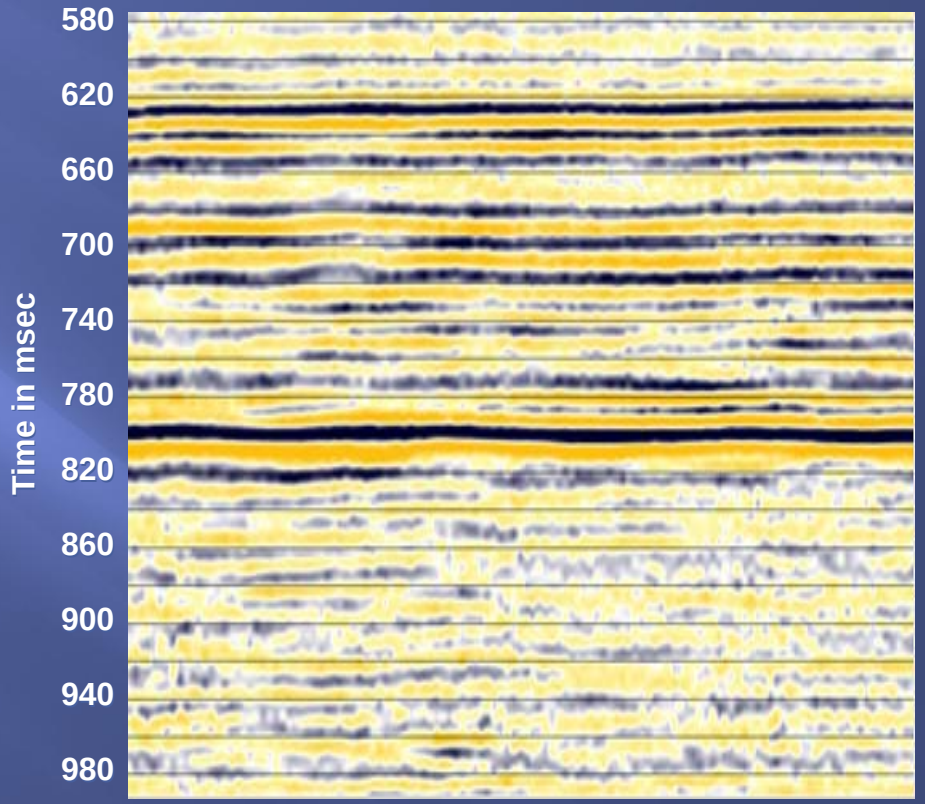
PSTM Of Detail At Seismic Target

Geophone Group



Single Sensor



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Conclusions

1. Geophone Group sensitivity was measured at 125 V/m/s using a string tester. Single Sensor sensitivity was 85.8 V/m/s.
2. Theoretical sensitivity ratio from (1) is 1.46.
3. Measured ratio from RMS amplitudes in the data was 1.3.
4. Amplitude & phase responses the same.
5. Attenuation with distance & travel time the same.
6. From practical point of view, no data differences seen.
7. Single Sensor required about ½ the personnel required for Geophone Group operations.

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