Priddis 2014 broadband surface and walkaway VSP seismic experiment

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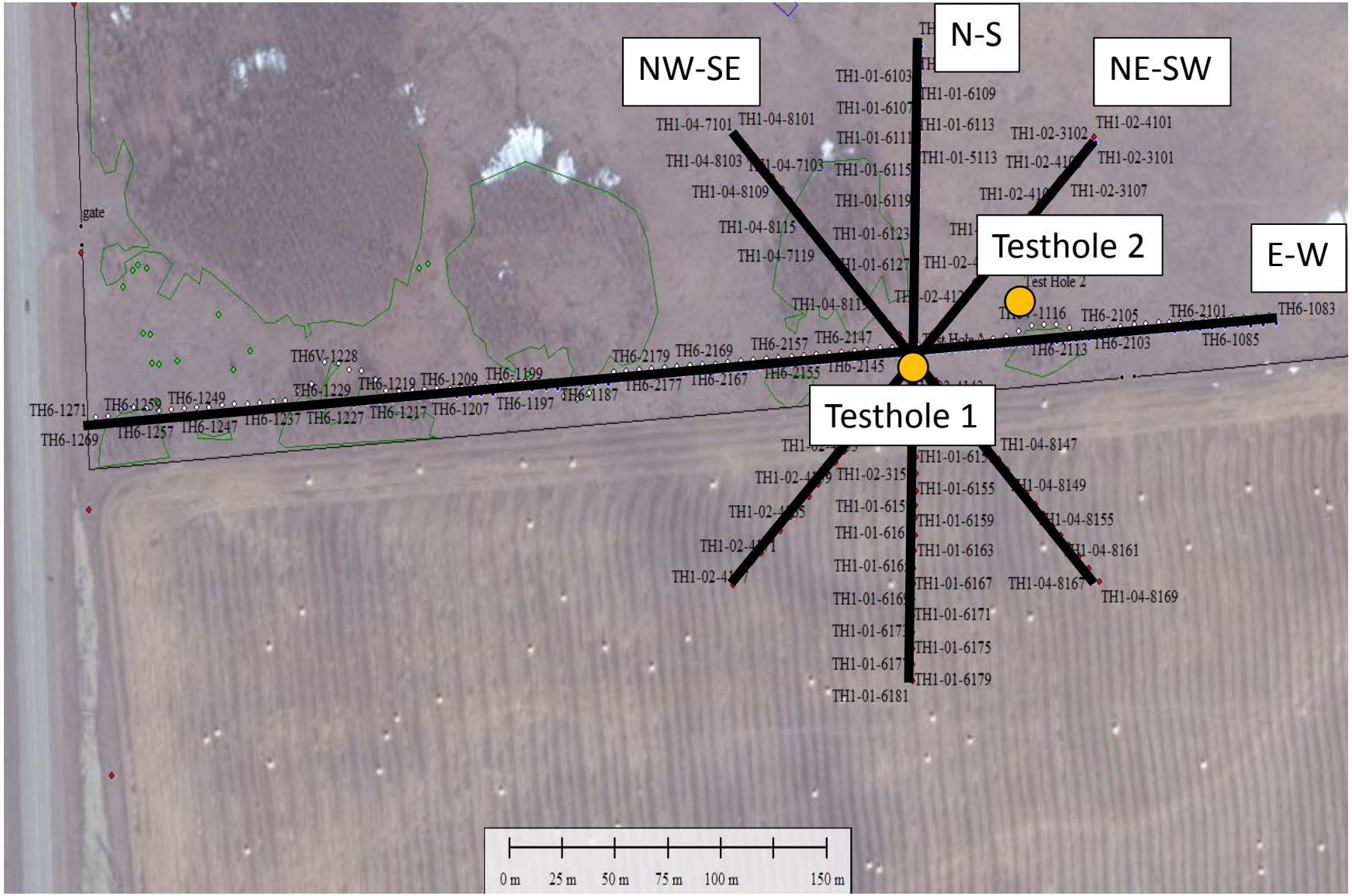
Objectives

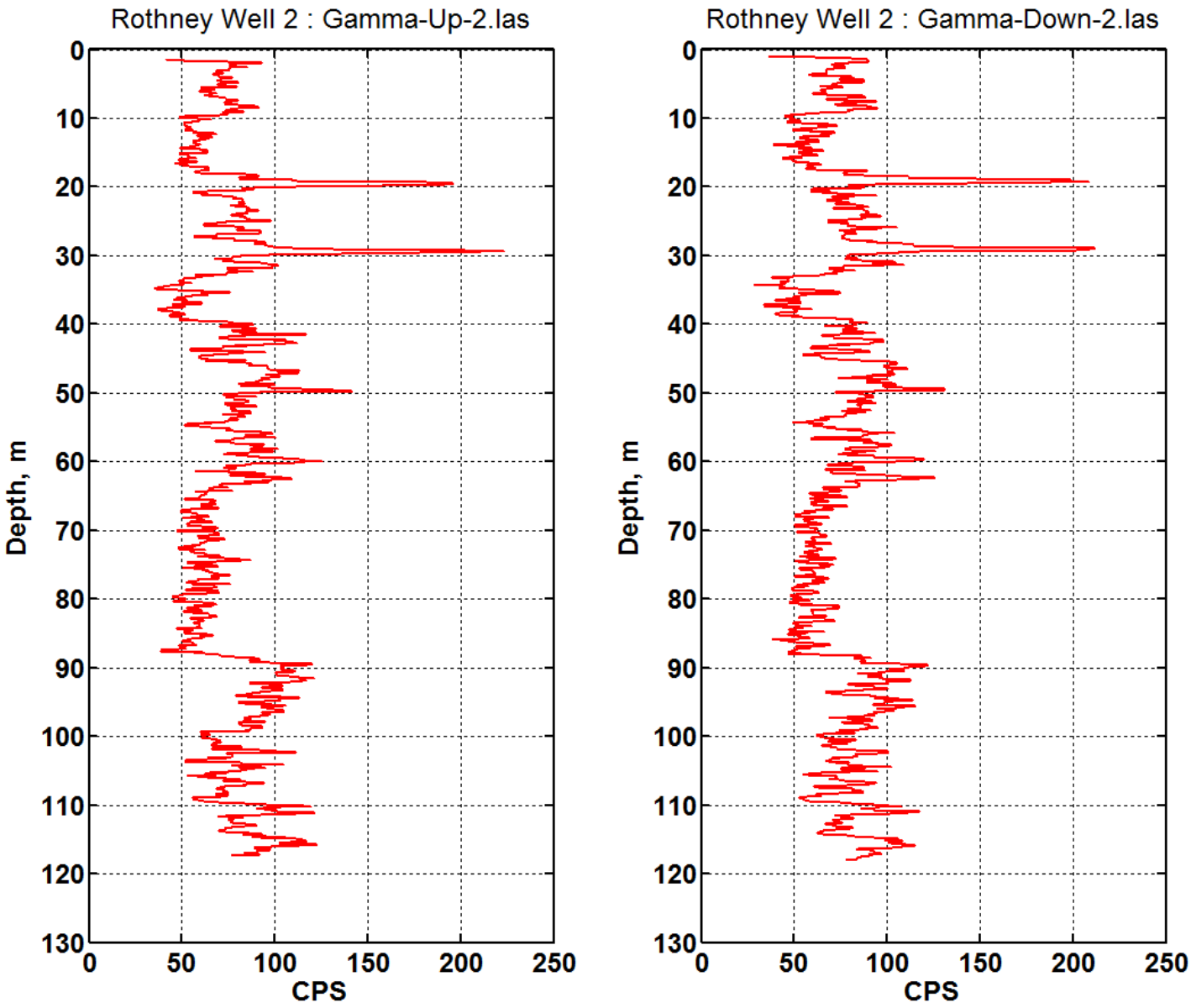
- Obtain many closely spaced dynamite shots from many azimuths into the permanent geophones in Testhole 1
- Hi-resolution 2D surface seismic lines at a variety of azimuths
- Deploy USSI fibre optic system in Testhole 2. This is the first time we have deployed this system.
- Source tests (Dynamite vs. Vibe)
- Receiver tests (Geophone versus Accelerometer, planting methods).

Geometry


N-S
NW-SE
NE-SW
E-W
Testhole 2
Testhole 1
gate
Test Hole 2
TH1-01-6103
TH1-01-6109
TH1-01-6107
TH1-01-6113
TH1-01-6111
TH1-01-5113
TH1-01-6115
TH1-01-6119
TH1-01-6123
TH1-01-6127
TH1-04-7101
TH1-04-8101
TH1-04-8103
TH1-04-7103
TH1-04-8109
TH1-04-8115
TH1-04-7119
TH1-02-3102
TH1-02-4101
TH1-02-3101
TH1-02-3107
TH6-1083
TH6-1085
TH6-2101
TH6-2105
TH6-2103
TH6-2113
TH6-2147
TH6-2157
TH6-2145
TH6-2155
TH6-2179
TH6-2169
TH6-2177
TH6-2167
TH6V-1228
TH6-1229
TH6-1219
TH6-1209
TH6-1199
TH6-1187
TH6-1271
TH6-1259
TH6-1249
TH6-1269
TH6-1257
TH6-1247
TH6-1237
TH6-1227
TH6-1217
TH6-1207
TH6-1197
TH1-02-3151
TH1-01-6155
TH1-01-6159
TH1-01-6163
TH1-01-6167
TH1-01-6171
TH1-01-6175
TH1-01-6179
TH1-01-6181
TH1-04-8147
TH1-04-8149
TH1-04-8155
TH1-04-8161
TH1-04-8167
TH1-04-8169
0 m
25 m
50 m
75 m
100 m
150 m

Mount Sopris, Natural gamma tool

Natural gamma logs, Testhole 2



Mount Sopris, Full waveform sonic tool

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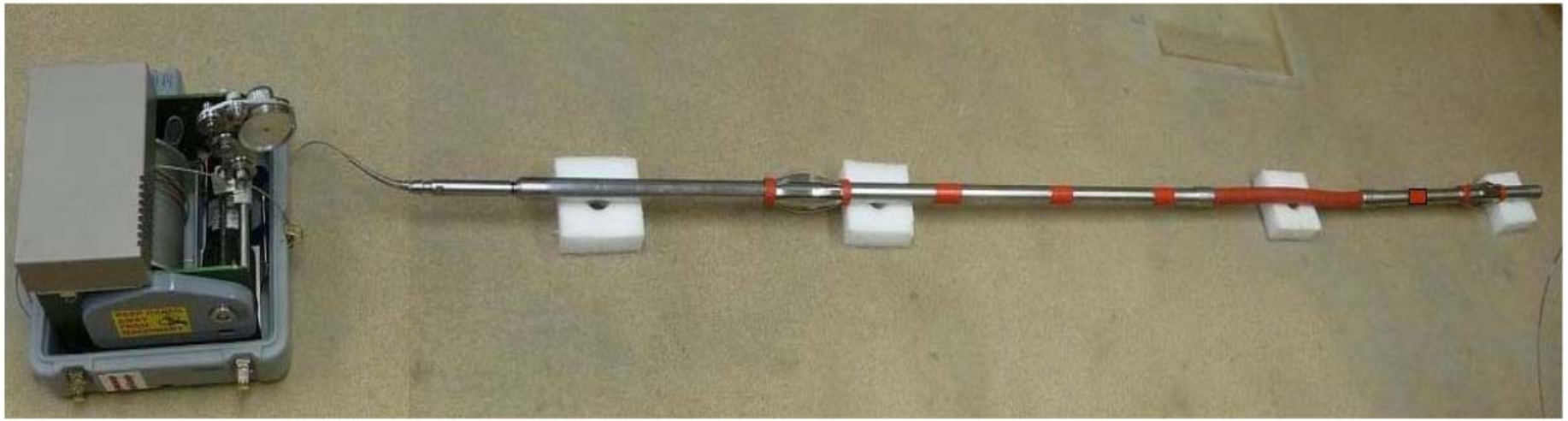
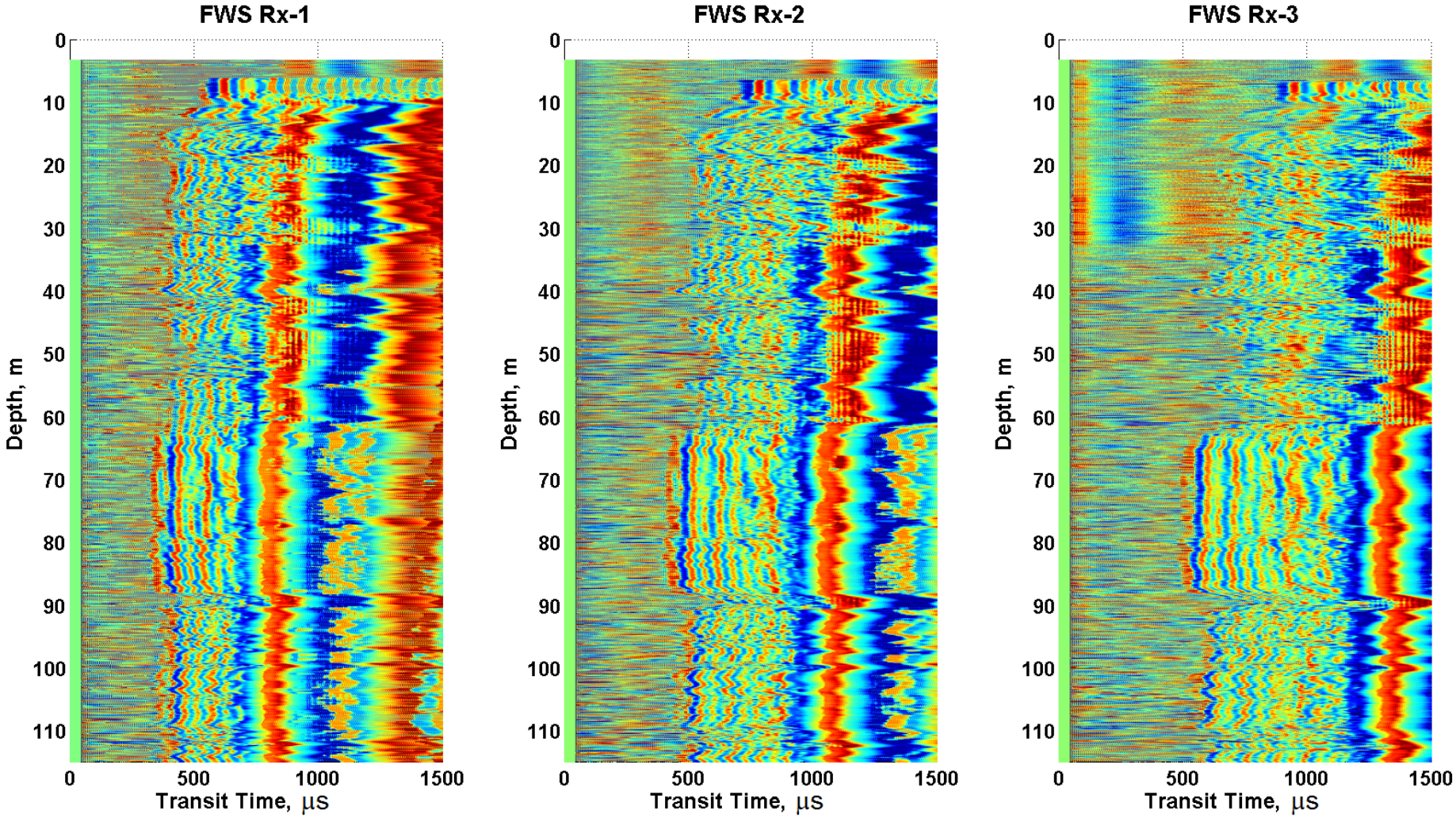
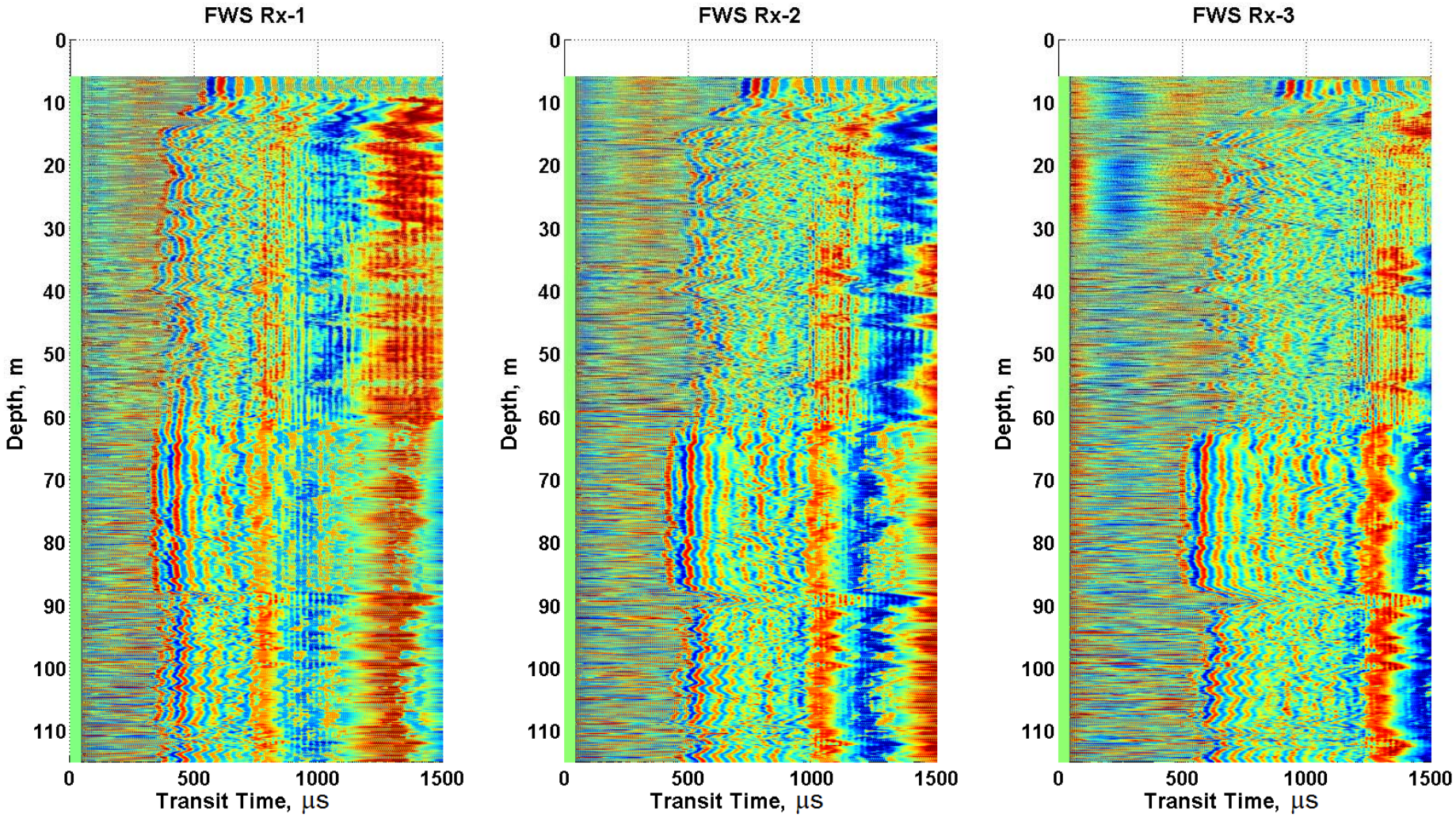


FIG. 1. The full waveform sonic logging tool. The long red section is the acoustic isolator. The transmitter is the small red band just to the right of the acoustic isolator. The three receivers are the three red bands just to the left of the acoustic isolator.

Full waveform sonic, Testhole 2, 7 kHz



Full waveform sonic, Testhole 2, 20 kHz



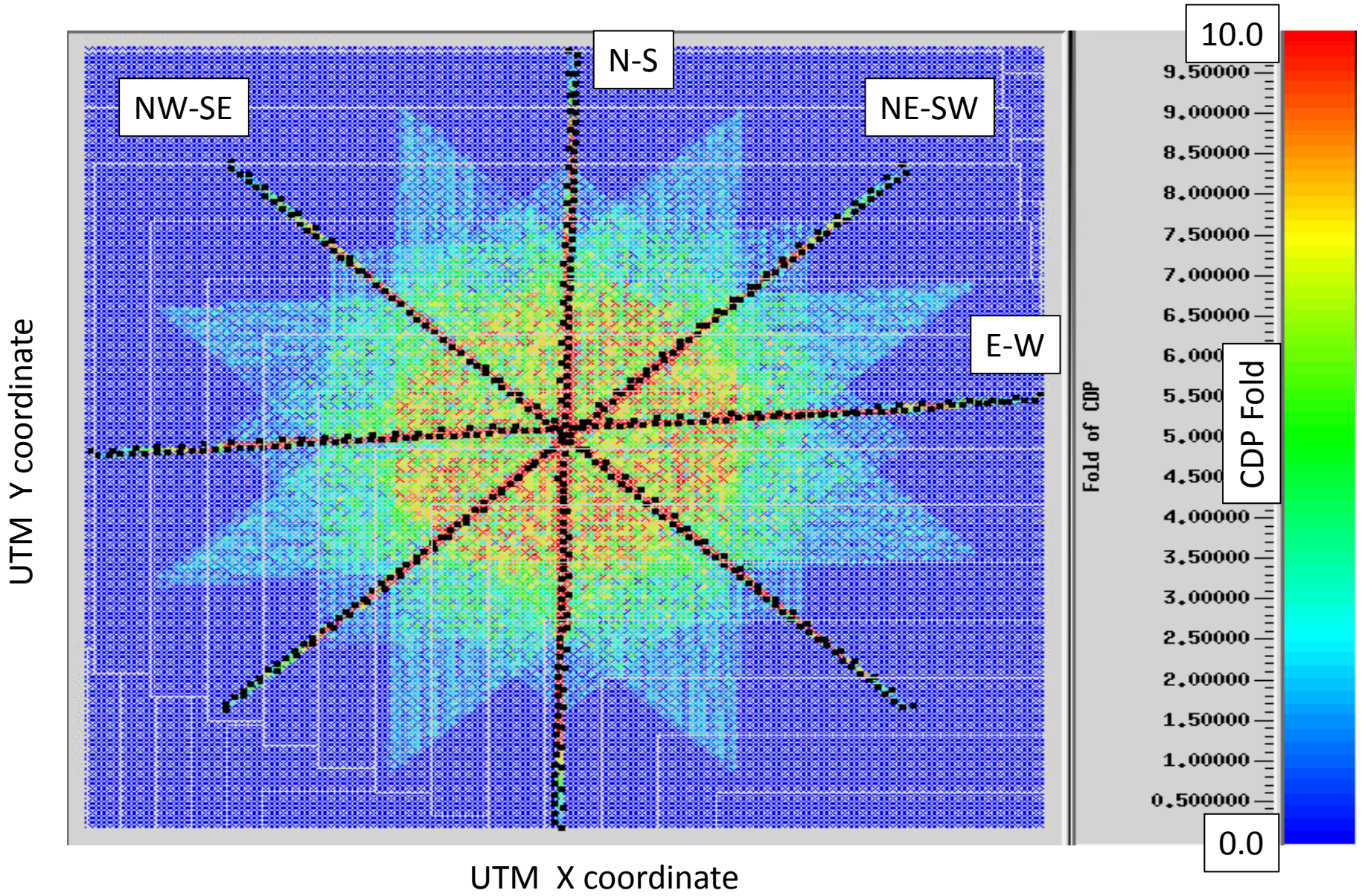
Recorders/Sensors

Recorder	Sensor
Inova (ARAM) Aries SPML #1	3C SM-7 10 Hz geophones, surface
Inova (ARAM) Aries SPML #2	3C SM-7 10 Hz geophones, ground screws
Inova (ARAM) Aries SPML #2	3C GS-14-L9 28 Hz geophones, Testhole 1
Inova Hawk	*1C SL11 accelerometers*
Inova G3i	*1C SM-24HS 10 Hz geophones, surface*
USSI	OptiPhone 3C accelerometers, Testhole 2

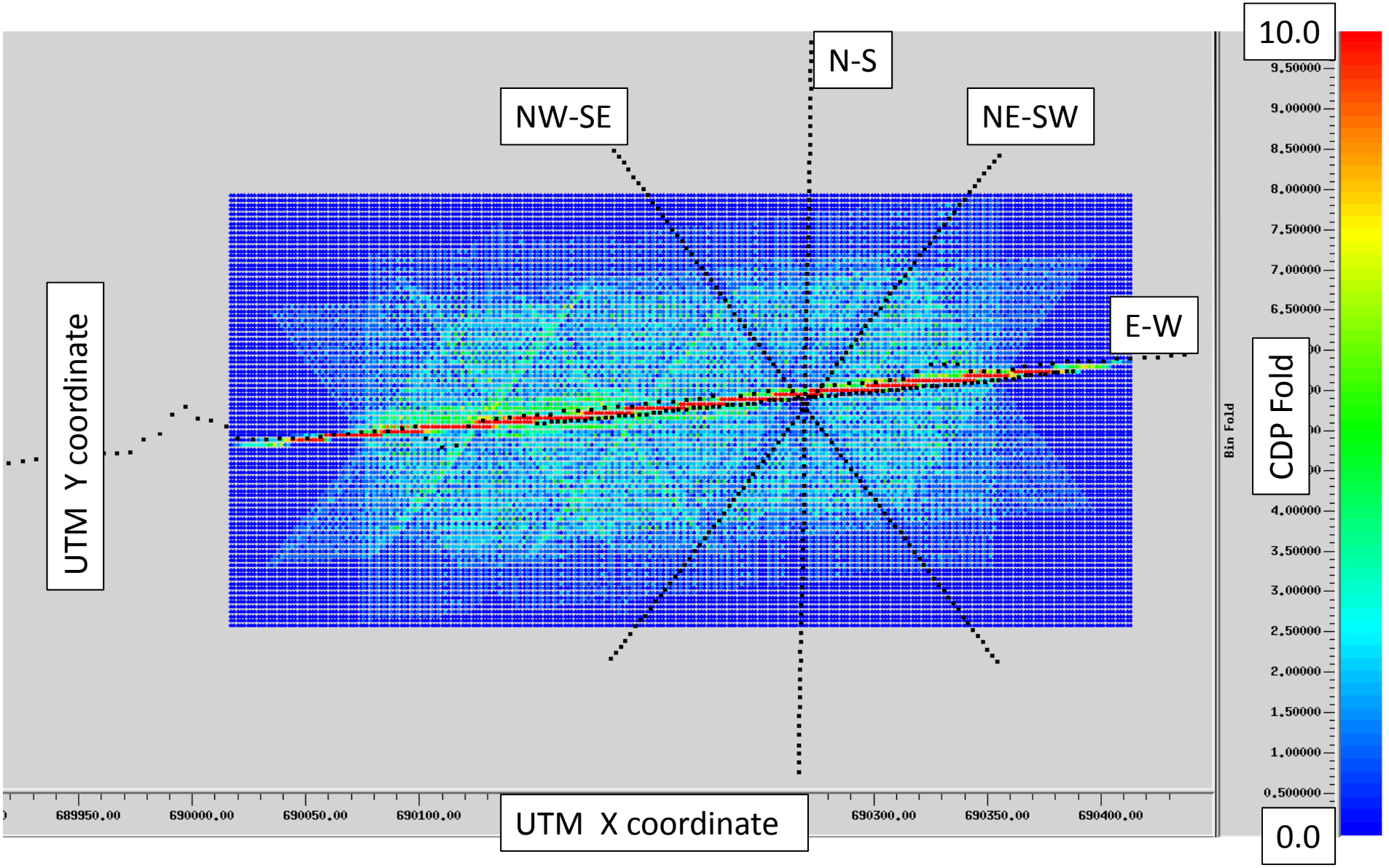
Sources

Source	Details
Dynamite	0.125 kg at 5 m depth
Inova Univib	1.5-180.0 Hz linear sweep, 16 s

Dynamite CDP fold, 1.5x1.5 m bins



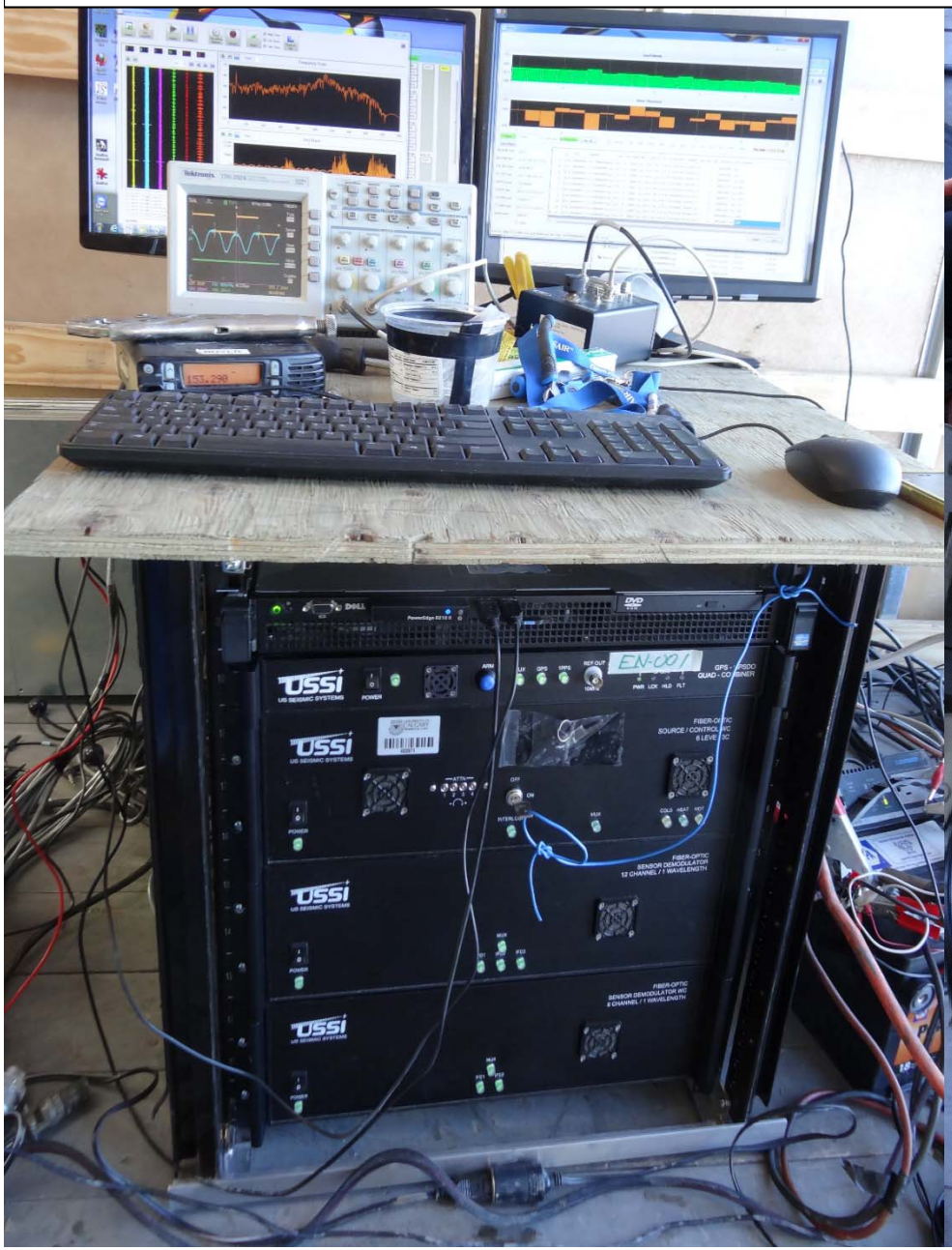
Univib geometry, 1.5x1.5 m bins

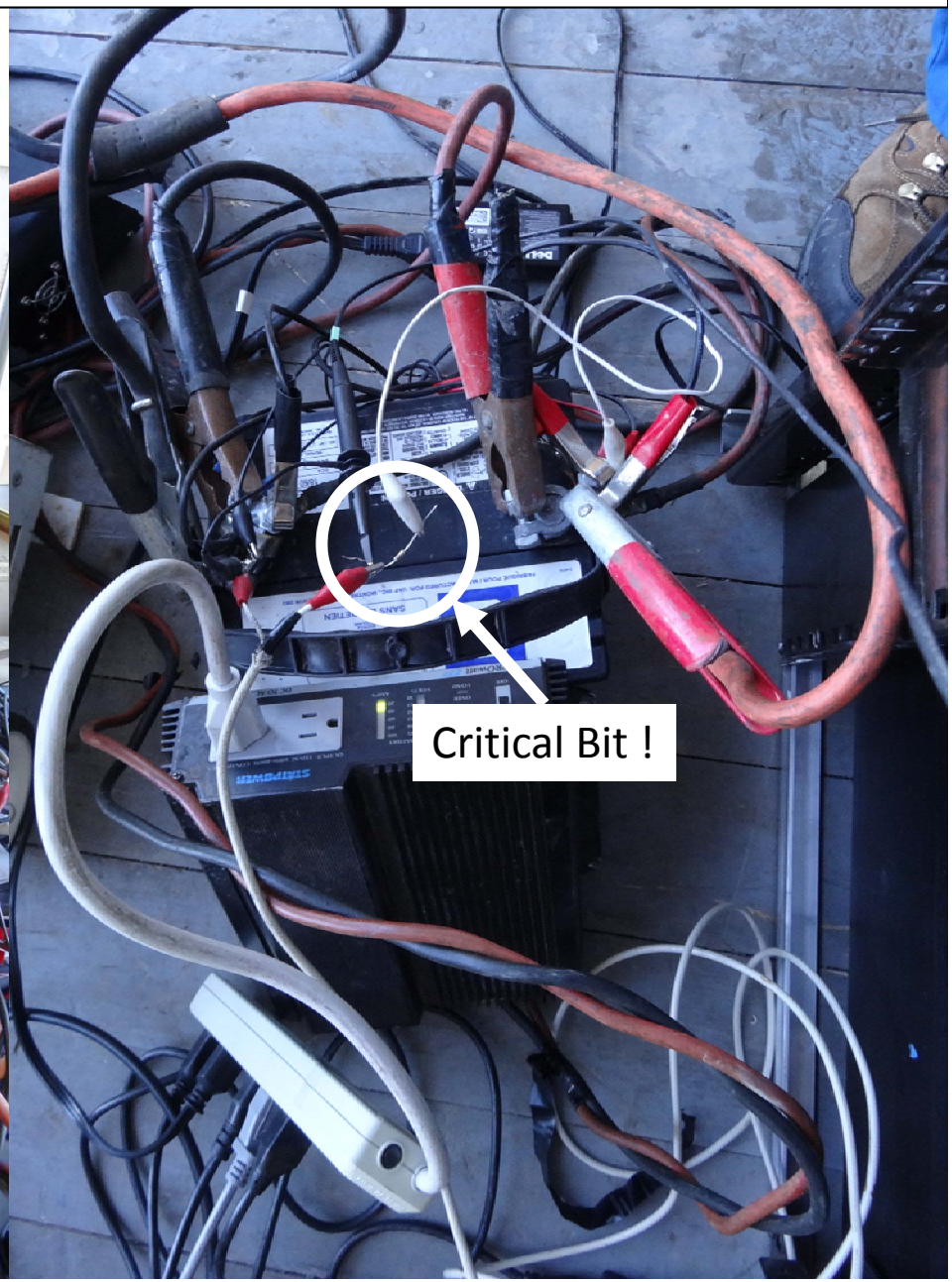


Recorders

Recorders

Recorders

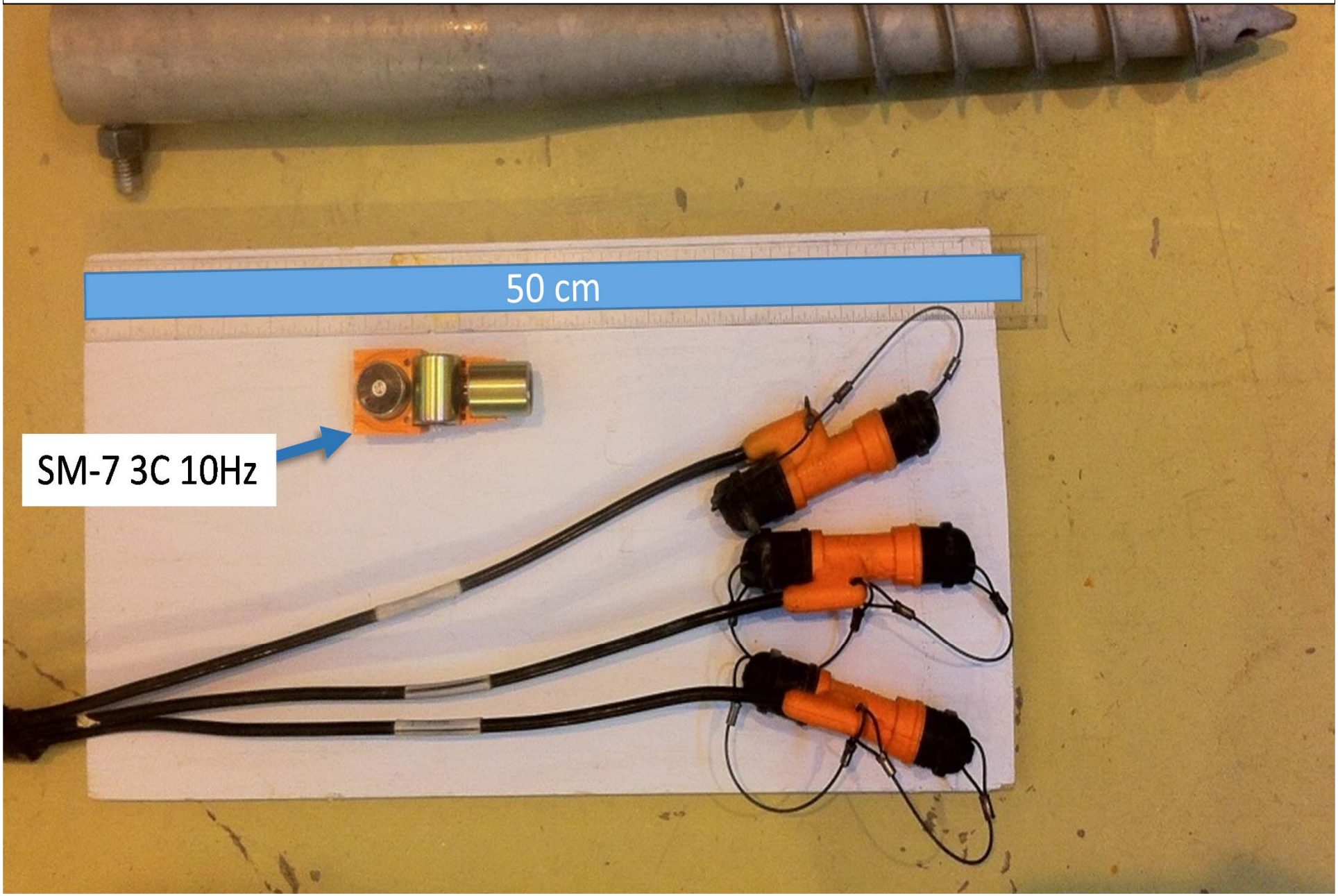




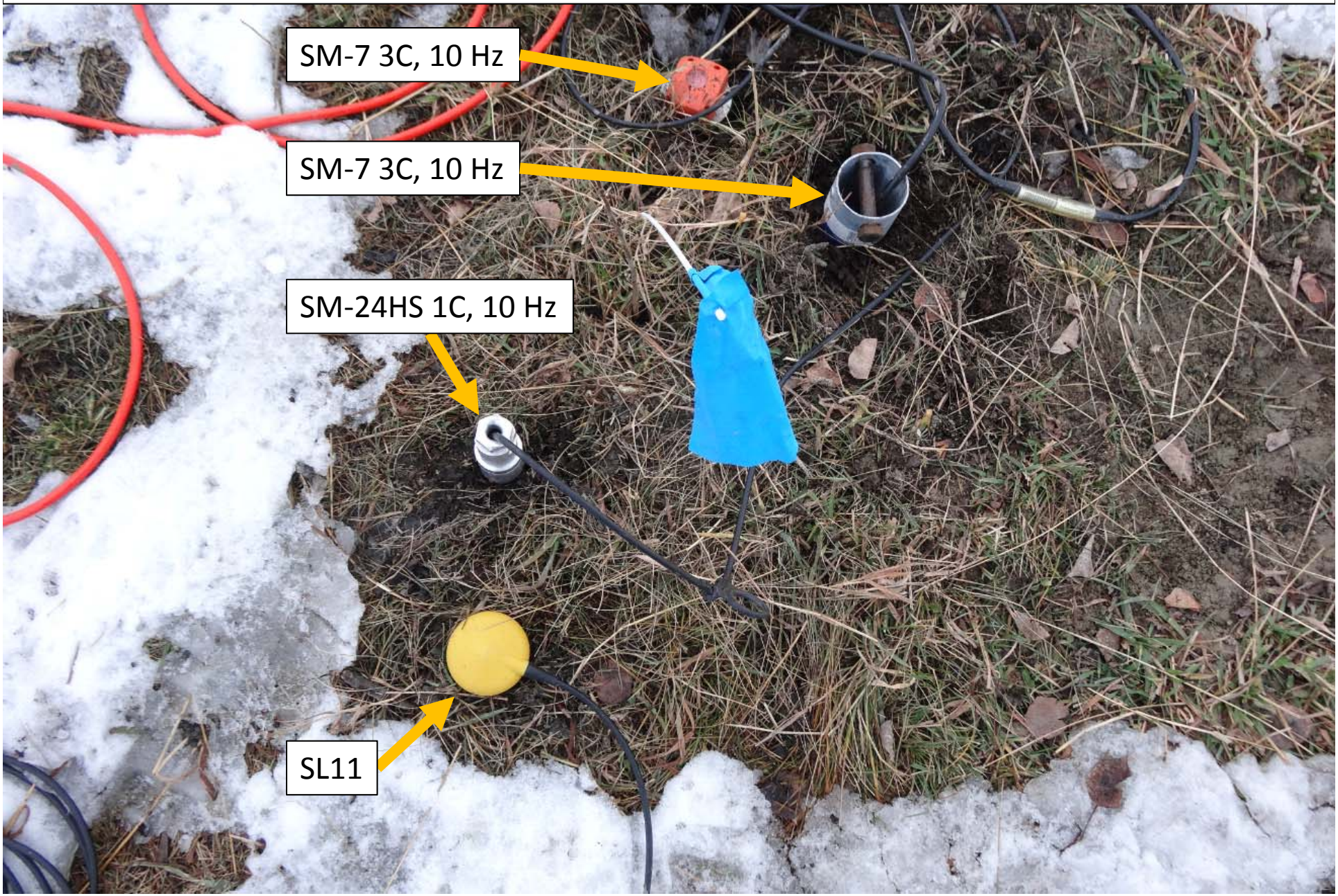
Sources, Dynamite

Sources, Inova Univib

Receivers, SM-7 within ground screw



Receivers, on surface



Receivers, Testhole 2

Receivers, Testhole 1

Receivers, Testhole 1

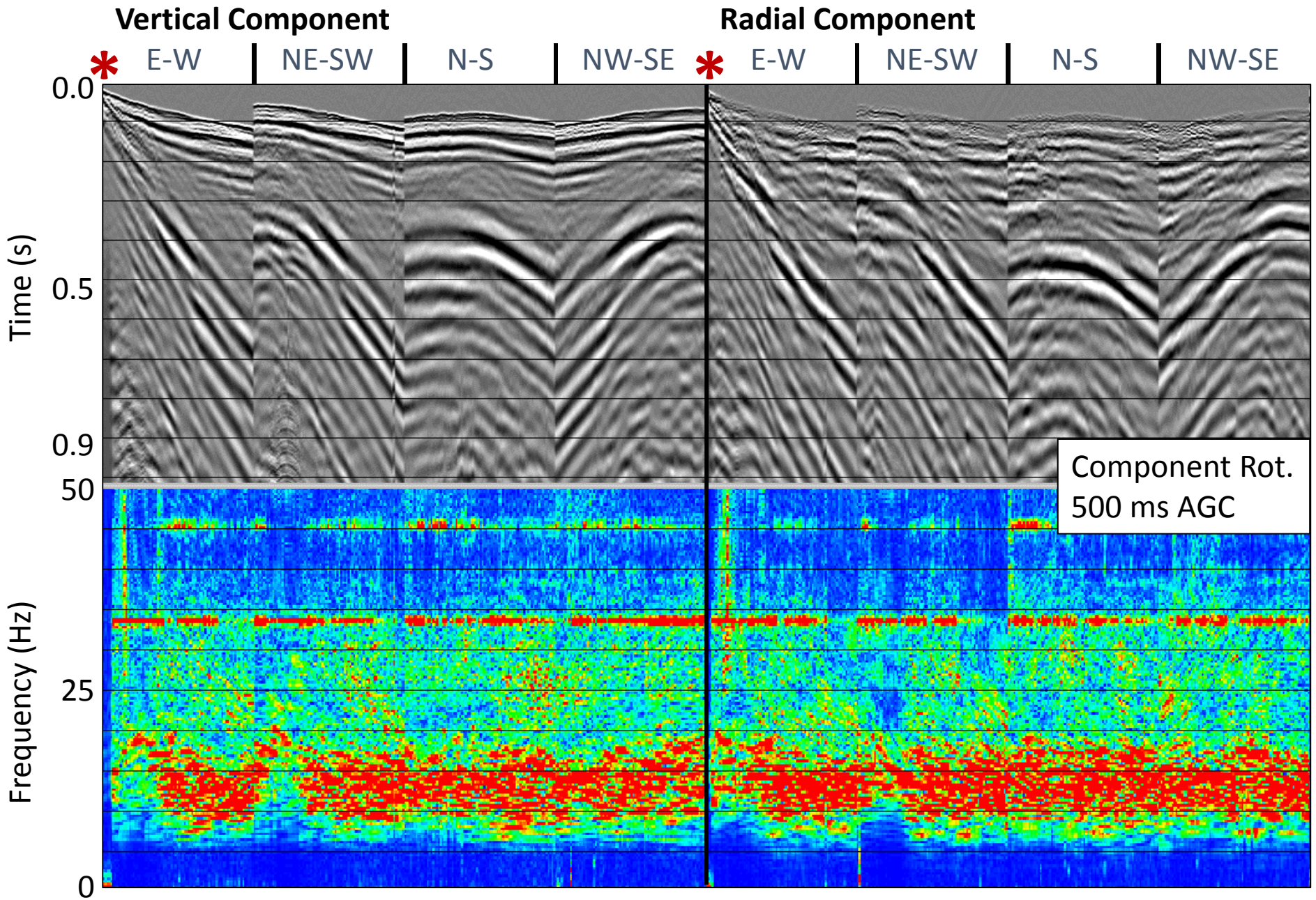
Receivers, Testhole 1

Dynamite, Inova SM7 10 Hz

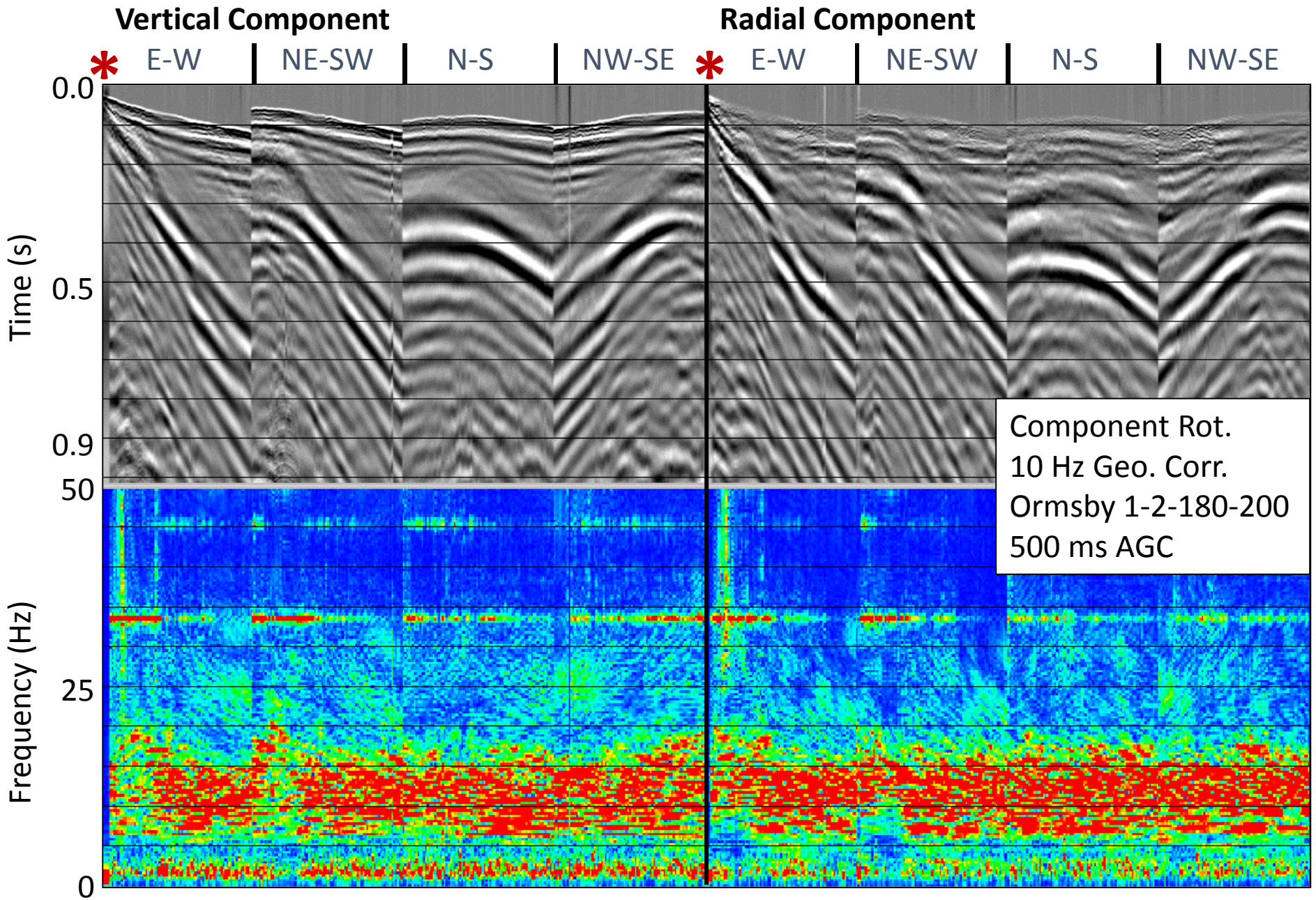
- Lines TH6 (E-W), TH1-02 (NE-SW), TH1-01 (N-S), TH1-04 (NW-SE)
- Inova Aries SPML recorder
- 320x3C 10 Hz geophones at 3 m spacing
- 1/8 kg dynamite@5 m depth, 6 m spacing

- 1 ms sample rate, 3 s records
- SP 2101 shown

SP 2101, 0.125 kg Dynamite @ 5m, SM7



SP 2101, 0.125 kg Dynamite @ 5m, SM7

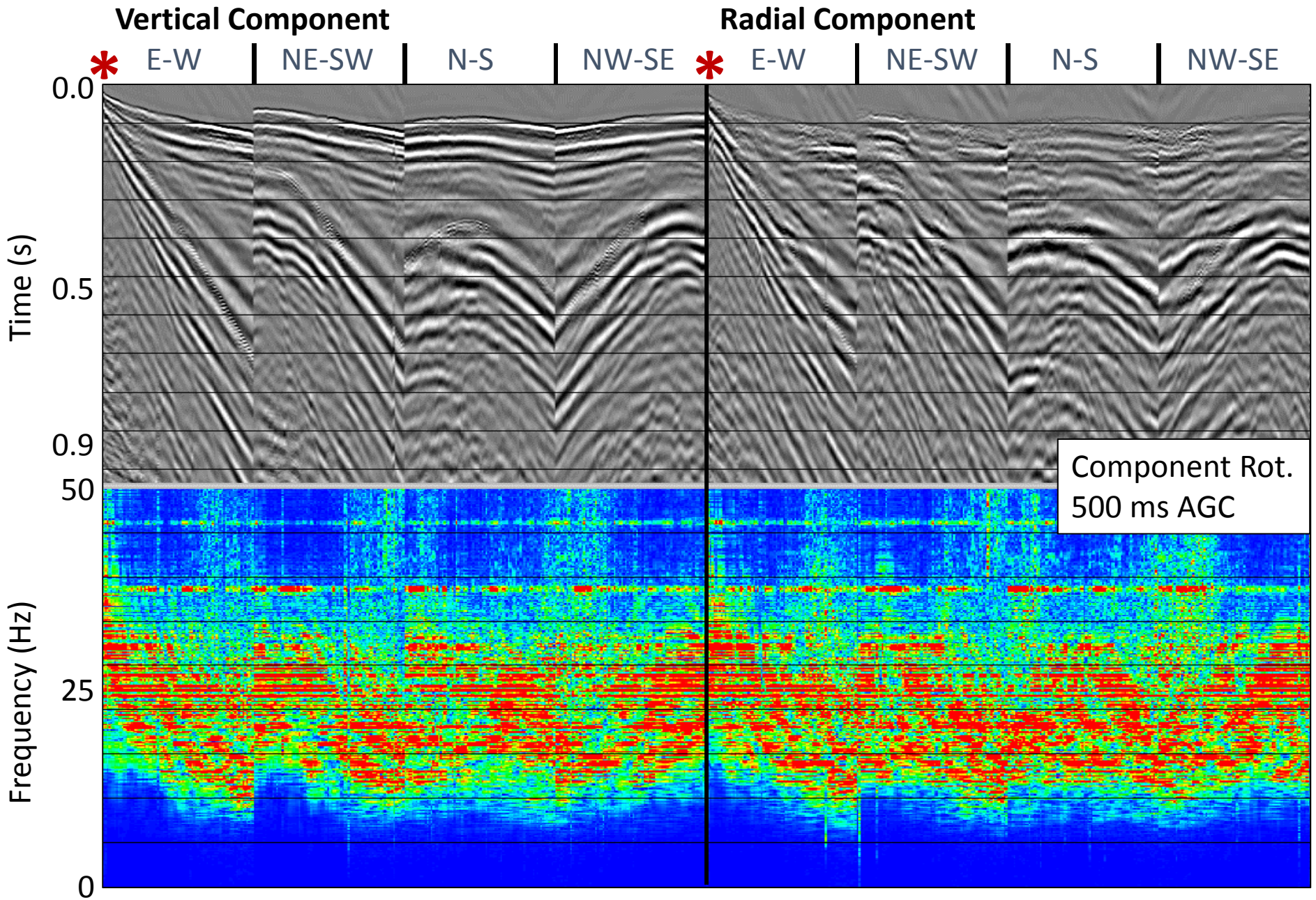


Inova UNIVIB, Inova SM7 10 Hz

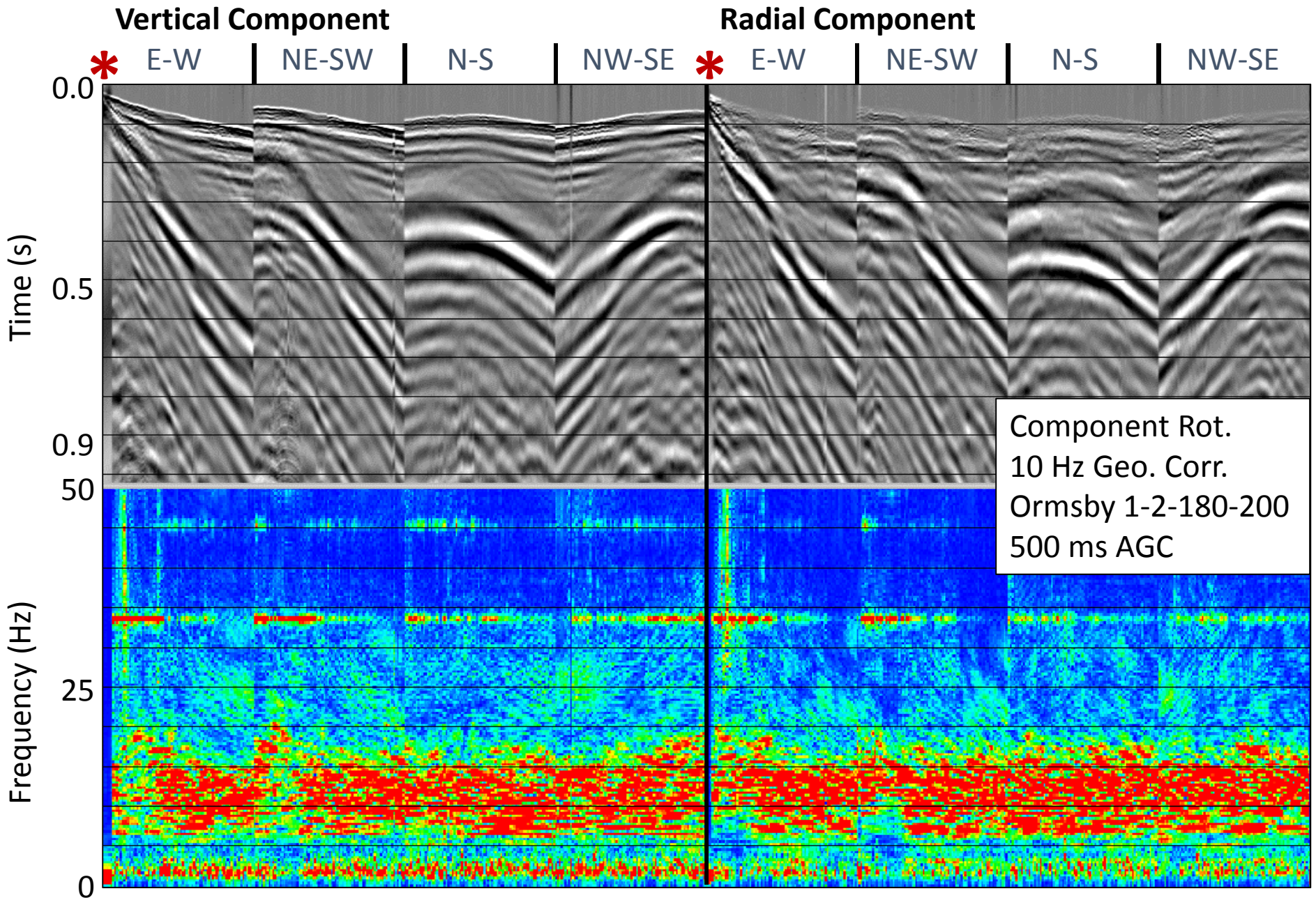
- Lines TH6 (E-W), TH1-02 (NE-SW), TH1-01 (N-S), TH1-04 (NW-SE)
- Inova Aries SPML recorder
- 320x3C 10 Hz geophones at 3 m spacing
- 16 s, 1.5-180.0 Hz linear sweep
- 2 sweeps/VP at 6 m spacing

- 1 ms sample rate, 6 s records
- Source gathers for VP 2101 shown

VP 2101, Linear 1.5-180 Hz sweep, SM7



VP 2101, Linear 1.5-180 Hz sweep, SM7

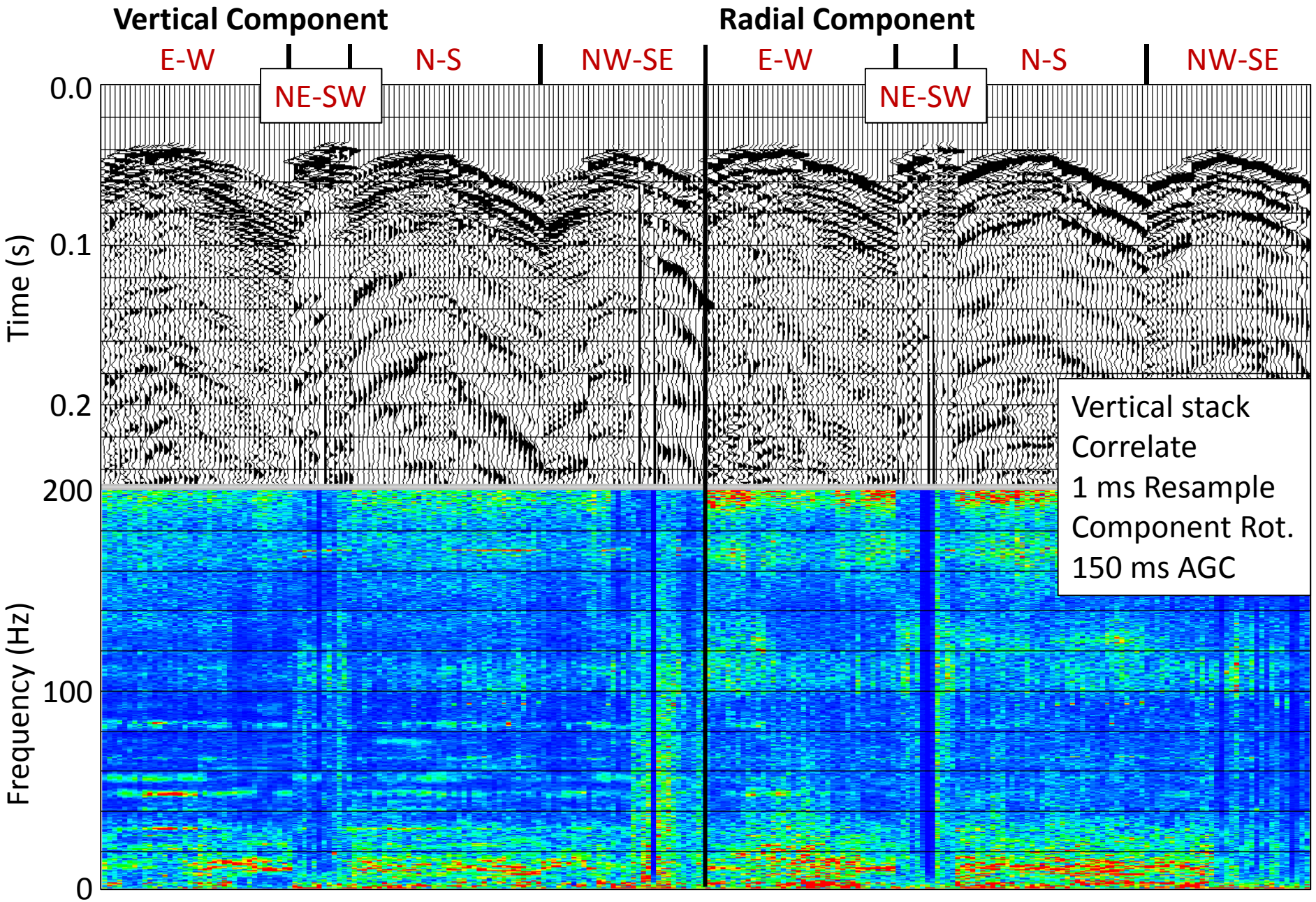


Dynamite, USSI Optiphone

- Testhole 2
- USSI recorder
- 6x3C optiphones (accelerometers) at 20 m spacing
- 1/8 kg dynamite@5 m depth, 6 m spacing

- 0.25 ms sample rate, 3 s records
- Receiver gathers at 75 m depth shown

Testhole 2, 0.125 kg Dynamite@5m, Optiphone

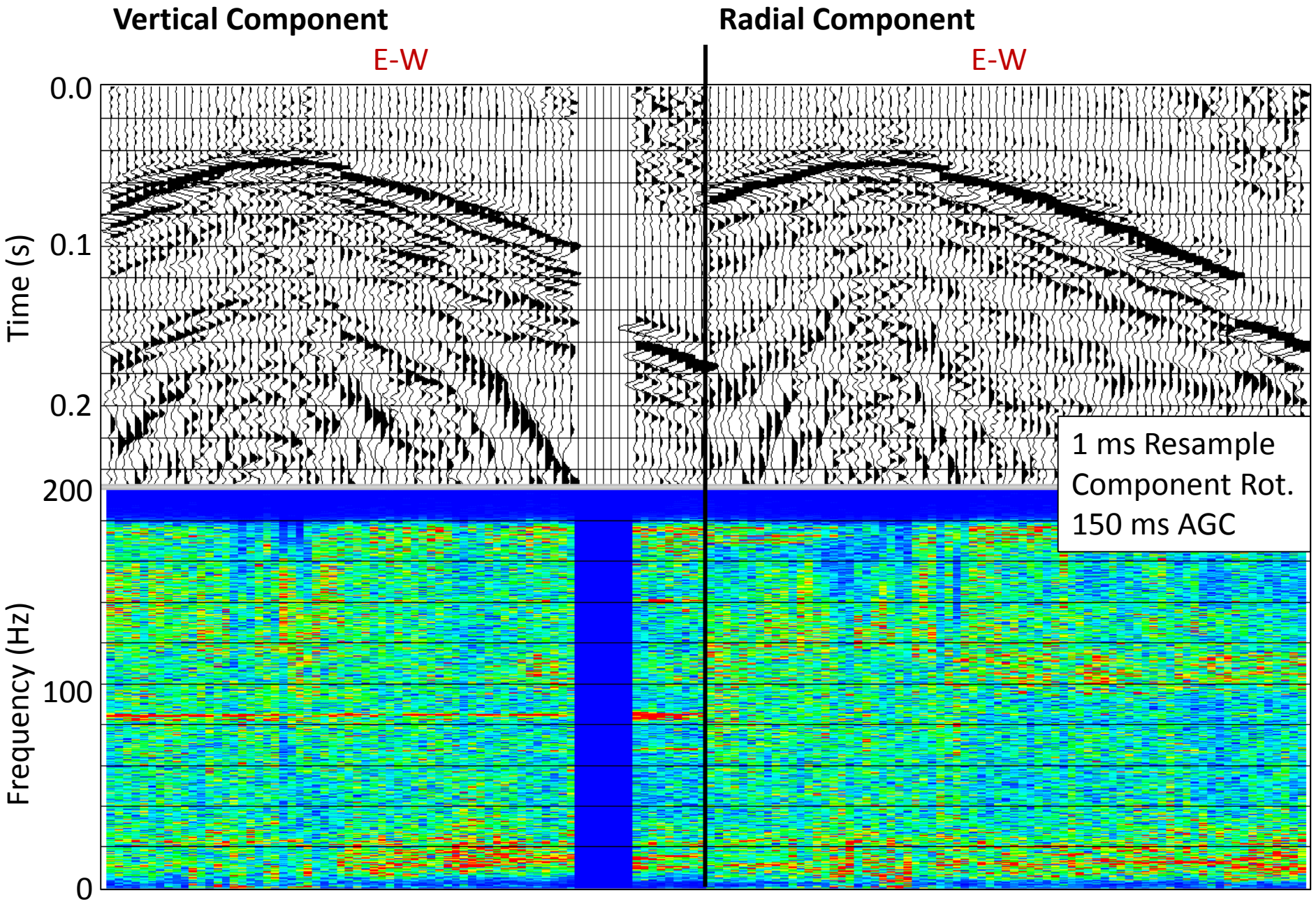


Inova UNIVIB, USSI Optiphone

- Testhole 2
- USSI recorder
- 6x3C optiphones (accelerometers) at 20 m spacing
- 16 s, 1.5-180.0 Hz linear sweep
- 2 sweeps/VP at 6 m spacing

- 0.25 ms sample rate, 6 s records
- Receiver gathers at 75 m depth shown

Testhole 2, Linear 1.5-180 Hz sweep, Optiphone

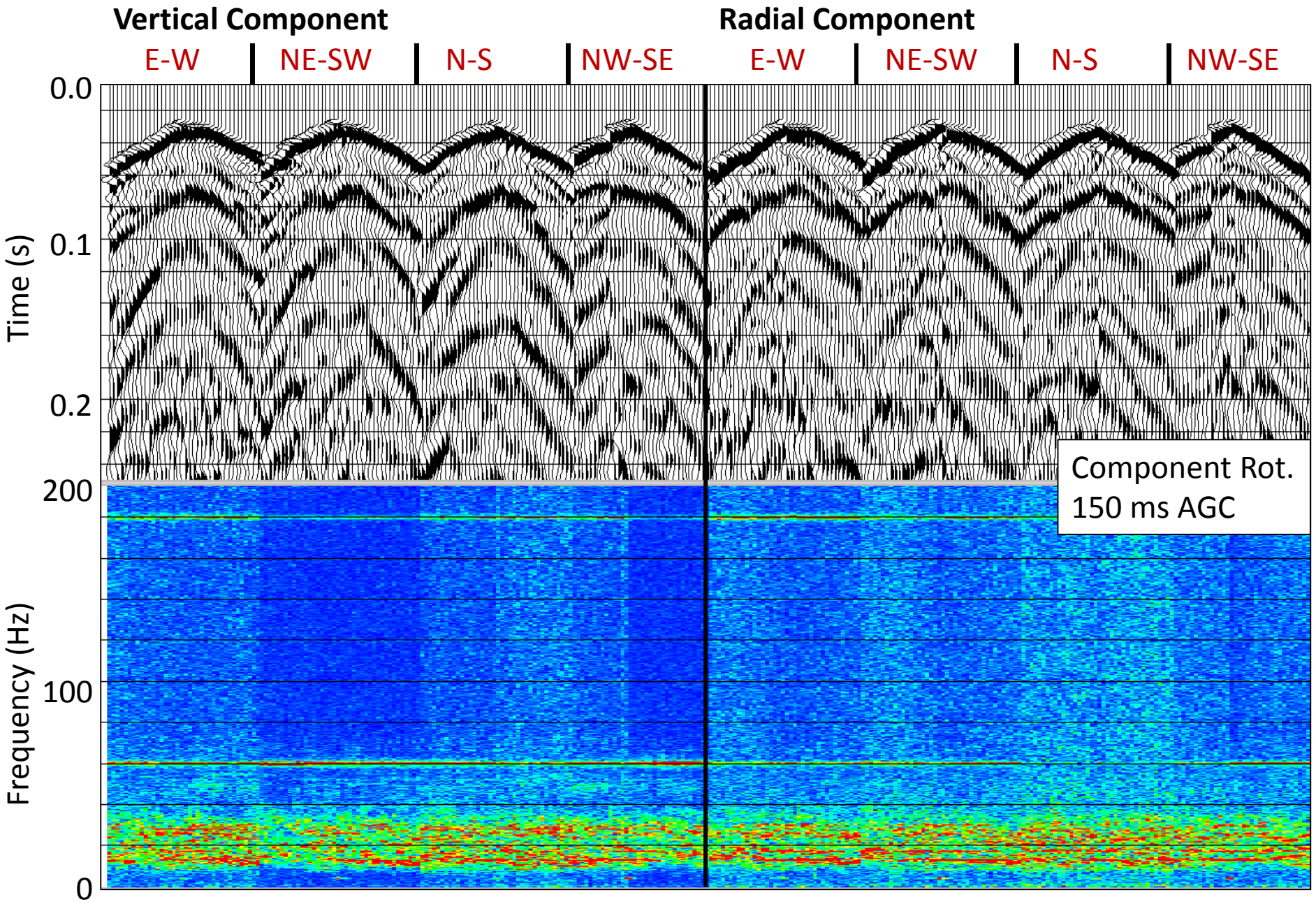


Dynamite, Geospace GS-14-L9 28 Hz

- Testhole 1
- Inova Aries SPML recorder
- 45x3C geophones at 3.06 m spacing
- 1/8 kg dynamite@5 m depth, 6 m spacing

- 1 ms sample rate, 3 s records
- Receiver gathers at 74 m depth shown

Testhole 1, 0.125 kg Dynamite @ 5m, GS-14-L9

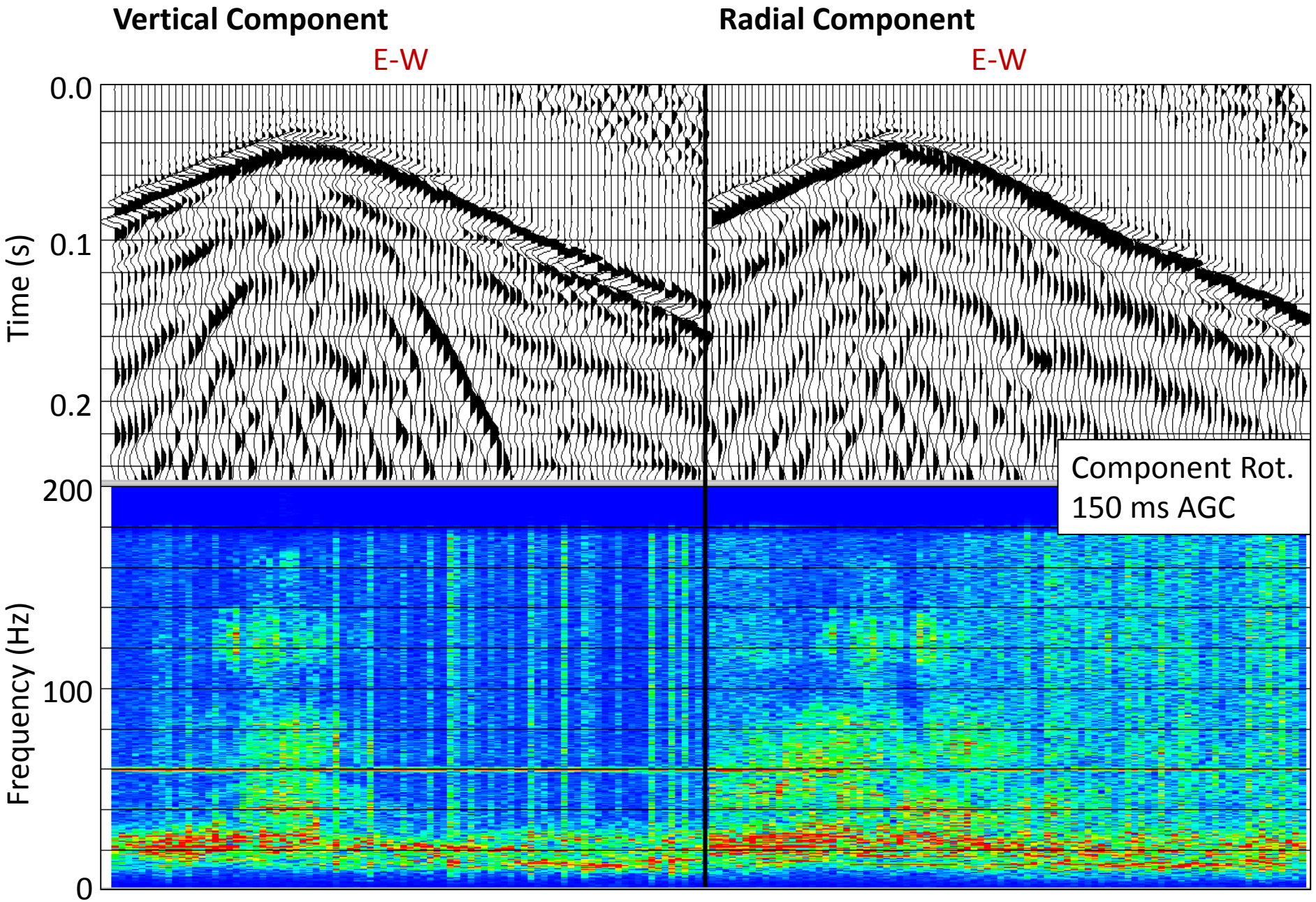


Inova UNIVIB, Geospace GS-14-L9

- Testhole 1
- Inova Aries SPML recorder
- 45x3C sensors at 3.06 m spacing
- 16 s, 1.5-180.0 Hz linear sweep
- 2 sweeps/VP at 6 m spacing

- 1 ms sample rate, 6 s records
- Receiver gathers at 74 m depth shown

Testhole 1, Linear 1.5-180 Hz sweep, GS-14-L9



Acknowledgements

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