

Survey type: VSP Checkshot
Company: International Ocean Discovery Program
Well: Expedition 396, Site U1566A
Field: Mid-Norwegian Cont. Margin
Magmatism
Country: Iceland
Run: 2
Date: 20-Aug-2021

Recorded by: C. Furman

Witnessed by: S. Midgley

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Introduction

This survey was conducted as the second run of a four-run logging suite in IODP Expedition 396, Hole U1566A and was recorded on 20 AUG 2021. The source for this survey was a pair of 150 cu. in. air guns suspended from the #3 crane (port side, aft) of the JOIDES Resolution drillship. High quality 3D seismic data for the field was already available, so the principle purpose of this survey was to confirm the time-to-depth conversion by means of checkshots.

Survey Results: Checkshot Survey

The original plan for this survey was to record stations every 10m from the bottom of the drilled interval up to the sea floor. The drilled TD was 2292mbrf, but owing to hole obstruction, the tool was unable to pass below 2255mbrf. Accordingly, stations were planned from 2250mbrf up to sea bed (2110.3mbrf) in 10m intervals. For this project, the drill pipe is left partially submerged in the formation to serve as a conduit for the wireline tools, as there is no conventional riser. The tip of the pipe was placed at 2160.7m, and the toolstring was just under 14m long, so the stations at 2170m and 2160m could not be attempted due to mechanical constraints. Stations from 2150m and higher were attempted with the tool inside drill pipe, but unfortunately, there was poor (non-existent) coupling between the outside of the pipe and the formation around it, so no useful signal was obtained in pipe. As is typical of shallow seismic, there was a lot of extraneous noise during the survey, but at least one useable checkshot was obtained at each of the other planned open-hole stations.

Recommendations and Conclusion

Well Information

Company	International Ocean Discovery Program
Well	Expedition 396, Site U1566A
Field	Mid-Norwegian Cont. Margin Magmatism
Country	Iceland
State	Atlantic
Logging Date	20-Aug-2021
Run Number	2
Service Order	
Well Head (Latitude)	N 64.9648
Well Head (Longitude)	E 2.72922
Well Head (X Coordinate)	0.0 UTM
Well Head (Y Coordinate)	0.0 UTM
Total Depth - Driller	2292.0 m
Total Depth - Logger	2255.0 m
Maximum Hole Deviation	5.0 deg
Azimuth of Maximum Deviation	
Program Version	19C0-187
Bit Size	9.875 in
Recorded by	C. Furman
Witnessed by	S. Midgley

Elevation Information

Permanent Datum	Sea Floor
Elevation Permanent Datum	-2110.3 m
Above Permanent Datum	2148.0 m
Drilling Measured From	Rig Floor
Derrick Floor	0.0 m
Ground Level	-2110.3 m
Kelly Bush	0.0 m
Log Measured From	Rig Floor
Elevation Log Zero	0.0 m

Depth Corrected Information

Water Velocity	1500.0 m/s
Seismic Reference Datum	0.0 m

Remarks

Hole drilled with RCB bottom hole assembly (BHA) at 9.875" BS
Drill pipe set at 2228 mbrf.
Fluid type was seawater displaced in the hole prior to logging.
Depth recorded from drill floor; logs presented as-logged without depth corrections or shifts, as per client instructions.
All logs presented in wireline measured depth below rig floor (MDBRF).
Caliper opened during upward passes; closed inside pipe and while logging down.
Hole size corrections made using caliper measurements for upward passes bit size used for downlog corrections.
AHC used from TD then switched off to facilitate pipe entry.
Survey Depths taken as per client instruction.
Downlog flipped and note the caliper closed logging down.

Well Information

Well Type	Vertical
Rig / Platform Type	Drill Ship
Well Reference Azimuth (Magnetic, True, or Grid North)	Magnetic North

Elevation Information

Water Depth	2110.3mbrf
Water Temperature	4 degc
Water Salinity	
Weathered Zone Depth	
Elevation Depth	

Sea Condition

Sea Condition	Light to moderate
Wave Height	3m
High Tide Level	
High Tide Time	
Low Tide Level	
Low Tide Time	

Velocity Information

Weathered Velocity	
Elevation Velocity	

Downhole Equipment Information

Tool Type	VSI
Surface Equipment	WSAM
Combined Tool	HNGS
Number of Shuttles	1
Nominal Receiver Spacing	N/A
Gimbaled (Y/N)	Y
Downhole Geophone Type	GAC-D
Sensitivity	
Natural Frequency	
Damping Factor	
DC Resistance	
Receiver #1	
Receiver #2	
Receiver #3	
Receiver #4	
Receiver #5	
Receiver #6	
Receiver #7	
Receiver #8	

Operational Time Breakdown

DATE	Time Start	Time Taken Hr : min	OPERATION
20-Aug-21	9:05	0:30	Tool Rig-up
20-Aug-21	9:35	1:20	Run in hole to sea floor
20-Aug-21	10:55	0:10	Downlog
20-Aug-21	11:05	0:15	Correlation / Tie-in pass, depth correlated to Run #1 DL
20-Aug-21	11:35	2:05	Main Survey w/ depth verification GR log
20-Aug-21	13:40	1:40	Pull out of hole
20-Aug-21	15:20	0:25	Rig Down VSI tool
		7:25	HRS -TOTAL OPERATING TIME

VSP - Checkshots

General Information

Survey Type	Zero Offset VSP
Surface Recording Length	500.0 ms
Surface Sampling Rate	1.0 ms
Downhole Recording Length	5000.0 ms
Downhole Sampling Rate	1.0 ms
Top of Survey	2130.0 m
Bottom of Survey	2250.0 m
Number of Shots	121
Number of Downhole Traces	121
Number of Downhole Traces used for Processing	14

Stack Summary Listing (1/1) from VSI_001_DualGunCluster_geo_wavefield_z.ldf

Stack Number	Measured Depth [m]	True Vertical Depth [m]	Measured Time [s]	One-way Vertical Time [s]	Two-way Vertical Time [s]	Interval Velocity [m/s]	Average Velocity [m/s]	RMS Velocity [m/s]
	0	0	0	0	0			
						69350.1		
11	2130.0	2130.0	0.0234	0.0307	0.0614		69350.1	69350.1
						92.1		
10	2140.0	2140.0	0.1319	0.1393	0.2785		15367.3	32569.1
						-78.6		
9	2150.0	2150.0	0.0048	0.0122	0.0243		176830.3	110223.4
						20.7		
8	2180.0	2180.0	1.4555	1.4626	2.9252		1490.5	10049.6
						3412.8		
7	2190.0	2190.0	1.4584	1.4655	2.9311		1494.3	10040.7
						2261.6		
6	2200.0	2200.0	1.4628	1.4700	2.9399		1496.6	10026.3
						2323.2		
5	2210.0	2210.0	1.4671	1.4743	2.9485		1499.0	10012.5
						981.6		
4	2220.0	2220.0	1.4773	1.4845	2.9689		1495.5	9978.4
						1824.6		
3	2230.0	2230.0	1.4828	1.4899	2.9798		1496.7	9960.7
						3812.8		
2	2240.0	2240.0	1.4854	1.4925	2.9851		1500.8	9953.2
						3303.3		
1	2250.0	2250.0	1.4884	1.4956	2.9912		1504.4	9944.2

Shot Summary Listing (1/1)

Measured Depth [m]	Tool Number	Stack Number	Relative Bearing [deg]	Caliper [in]	Anchoring force [kg]	Shot number
2130.0	1	11	-23.2	4.7	790.1	128
2140.0	1	10	-1.5	4.7	780.7	120
2150.0	1	9	-26.2	4.8	794.9	115
2180.0	1	8	36.1	10.9	731.8	109, 111
2190.0	1	7	8.3	10.8	751.9	92
2200.0	1	6	2.2	11.1	888.4	79, 86
2210.0	1	5	23.0	11.1	878.0	73
2220.0	1	4	-4.3	10.9	833.9	59
2230.0	1	3	8.1	13.4	736.4	36
2240.0	1	2	2.4	10.9	795.3	20, 21
2250.0	1	1	20.9	10.8	750.3	10

Observer's Note (1/3)

Well depth [m]	Time	Shot Type	Shot#	Stack#	Source	Remarks
2250.0	11:44:55	SHOT	1	1	DualGunCluster	
2250.0	11:46:23	SHOT	2	1	DualGunCluster	Good
2250.0	11:46:43	SHOT	3	1	DualGunCluster	
2250.0	11:47:01	SHOT	4	1	DualGunCluster	Good
2250.0	11:47:22	SHOT	5	1	DualGunCluster	
2250.0	11:48:34	SHOT	6	1	DualGunCluster	Good
2250.0	11:48:53	SHOT	7	1	DualGunCluster	
2250.0	11:49:11	SHOT	8	1	DualGunCluster	
2250.0	11:49:29	SHOT	9	1	DualGunCluster	OK
2250.0	11:49:48	SHOT	10	1	DualGunCluster	Good
2240.0	11:54:00	SHAK	11			
2240.0	11:54:23	SHOT	12	2	DualGunCluster	
2240.0	11:54:41	SHOT	13	2	DualGunCluster	
2240.0	11:55:03	SHOT	14	2	DualGunCluster	
2240.0	11:55:25	SHOT	15	2	DualGunCluster	
2240.0	11:55:49	SHOT	16	2	DualGunCluster	
2240.0	11:56:14	SHOT	17	2	DualGunCluster	
2240.0	11:56:36	SHOT	18	2	DualGunCluster	
2240.0	11:57:14	SHOT	19	2	DualGunCluster	
2240.0	11:58:19	SHOT	20	2	DualGunCluster	OK
2240.0	11:58:37	SHOT	21	2	DualGunCluster	OK
2240.0	11:59:00	SHOT	22	2	DualGunCluster	
2240.0	11:59:21	SHOT	23	2	DualGunCluster	
2240.0	11:59:43	SHOT	24	2	DualGunCluster	
2240.0	12:00:24	SHOT	25	2	DualGunCluster	
2240.0	12:00:58	SHOT	26	2	DualGunCluster	
2240.0	12:01:34	SHOT	27	2	DualGunCluster	
2240.0	12:01:52	SHOT	28	2	DualGunCluster	
2230.0	12:06:25	SHOT	29	3	DualGunCluster	
2230.0	12:06:51	SHOT	30	3	DualGunCluster	
2230.0	12:07:39	SHOT	31	3	DualGunCluster	
2230.0	12:07:57	SHOT	32	3	DualGunCluster	
2230.0	12:08:15	SHOT	33	3	DualGunCluster	
2230.0	12:09:11	SHAK	34			
2230.0	12:09:31	BKGD	35			
2230.0	12:09:40	SHOT	36	3	DualGunCluster	ok
2230.0	12:10:08	SHOT	37	3	DualGunCluster	ok
2230.0	12:10:45	SHOT	38	3	DualGunCluster	
2230.0	12:11:12	SHOT	39	3	DualGunCluster	
2230.0	12:11:35	SHOT	40	3	DualGunCluster	
2230.0	12:11:53	SHOT	41	3	DualGunCluster	
2230.0	12:12:11	SHOT	42	3	DualGunCluster	
2230.0	12:12:29	SHOT	43	3	DualGunCluster	
2230.0	12:12:47	SHOT	44	3	DualGunCluster	
2230.0	12:13:05	SHOT	45	3	DualGunCluster	
2230.0	12:13:42	SHOT	46	3	DualGunCluster	
2230.0	12:14:54	SHOT	47	3	DualGunCluster	
2220.0	12:19:16	SHOT	48	4	DualGunCluster	
2220.0	12:19:34	SHOT	49	4	DualGunCluster	Good
2220.0	12:19:53	SHOT	50	4	DualGunCluster	
2220.0	12:20:11	SHOT	51	4	DualGunCluster	
2220.0	12:20:29	SHOT	52	4	DualGunCluster	
2220.0	12:21:30	SHAK	53			
2220.0	12:21:56	SHOT	54	4	DualGunCluster	
2220.0	12:22:22	SHOT	55	4	DualGunCluster	
2220.0	12:22:40	SHOT	56	4	DualGunCluster	
2220.0	12:22:58	SHOT	57	4	DualGunCluster	
2220.0	12:23:16	SHOT	58	4	DualGunCluster	
2220.0	12:23:34	SHOT	59	4	DualGunCluster	OK

Observer's Note (2/3)

Well depth [m]	Time	Shot Type	Shot#	Stack#	Source	Remarks
2220.0	12:24:55	SHOT	60	4	DualGunCluster	
2220.0	12:26:55	SHOT	61	4	DualGunCluster	
2220.0	12:27:26	SHOT	62	4	DualGunCluster	
2210.0	12:33:36	SHOT	63	5	DualGunCluster	
2210.0	12:33:54	SHOT	64	5	DualGunCluster	Maybe
2210.0	12:34:24	SHOT	65	5	DualGunCluster	
2210.0	12:34:58	SHOT	66	5	DualGunCluster	
2210.0	12:35:16	SHOT	67	5	DualGunCluster	
2210.0	12:35:34	SHOT	68	5	DualGunCluster	
2210.0	12:35:55	SHOT	69	5	DualGunCluster	
2210.0	12:36:38	SHOT	70	5	DualGunCluster	
2210.0	12:36:56	SHOT	71	5	DualGunCluster	
2210.0	12:37:14	SHOT	72	5	DualGunCluster	
2210.0	12:37:37	SHOT	73	5	DualGunCluster	Good
2210.0	12:38:18	SHOT	74	5	DualGunCluster	
2210.0	12:38:36	SHOT	75	5	DualGunCluster	
2210.0	12:38:56	SHOT	76	5	DualGunCluster	
2210.0	12:39:14	SHOT	77	5	DualGunCluster	
2200.0	12:45:06	SHOT	78	6	DualGunCluster	Good
2200.0	12:45:25	SHOT	79	6	DualGunCluster	OK
2200.0	12:45:43	SHOT	80	6	DualGunCluster	
2200.0	12:46:01	SHOT	81	6	DualGunCluster	
2200.0	12:46:21	SHOT	82	6	DualGunCluster	
2200.0	12:46:39	SHOT	83	6	DualGunCluster	
2200.0	12:46:57	SHOT	84	6	DualGunCluster	
2200.0	12:47:15	SHOT	85	6	DualGunCluster	
2200.0	12:47:33	SHOT	86	6	DualGunCluster	Good
2190.0	12:52:47	SHOT	87	7	DualGunCluster	
2190.0	12:53:05	SHOT	88	7	DualGunCluster	
2190.0	12:53:23	SHOT	89	7	DualGunCluster	
2190.0	12:53:41	SHOT	90	7	DualGunCluster	
2190.0	12:53:59	SHOT	91	7	DualGunCluster	Good
2190.0	12:54:56	SHOT	92	7	DualGunCluster	Good
2190.0	12:55:16	SHOT	93	7	DualGunCluster	Good
2190.0	12:55:34	SHOT	94	7	DualGunCluster	Good
2190.0	12:55:52	SHOT	95	7	DualGunCluster	
2190.0	12:56:10	SHOT	96	7	DualGunCluster	
2180.0	13:02:00	SHOT	97	8	DualGunCluster	
2180.0	13:02:46	SHOT	98	8	DualGunCluster	
2180.0	13:03:05	SHOT	99	8	DualGunCluster	
2180.0	13:04:10	SHOT	100	8	DualGunCluster	
2180.0	13:04:28	SHOT	101	8	DualGunCluster	
2180.0	13:04:46	SHOT	102	8	DualGunCluster	
2180.0	13:05:09	SHOT	103	8	DualGunCluster	
2180.0	13:05:29	SHOT	104	8	DualGunCluster	Good
2180.0	13:06:32	SHAK	105			
2180.0	13:06:54	SHOT	106	8	DualGunCluster	
2180.0	13:07:59	SHOT	107	8	DualGunCluster	
2180.0	13:10:01	SHOT	108	8	DualGunCluster	
2180.0	13:10:46	SHOT	109	8	DualGunCluster	Good
2180.0	13:11:45	SHOT	110	8	DualGunCluster	
2180.0	13:12:04	SHOT	111	8	DualGunCluster	Good
2150.0	13:24:50	SHOT	112	9	DualGunCluster	
2150.0	13:25:08	SHOT	113	9	DualGunCluster	
2150.0	13:25:45	SHOT	114	9	DualGunCluster	
2150.0	13:26:03	SHOT	115	9	DualGunCluster	
2150.0	13:26:21	SHOT	116	9	DualGunCluster	
2140.0	13:30:30	SHOT	117	10	DualGunCluster	
2140.0	13:30:48	SHOT	118	10	DualGunCluster	

Observer's Note (3/3)

Well depth [m]	Time	Shot Type	Shot#	Stack#	Source	Remarks
2140.0	13:31:06	SHOT	119	10	DualGunCluster	
2140.0	13:31:34	SHOT	120	10	DualGunCluster	
2140.0	13:31:52	SHOT	121	10	DualGunCluster	
2130.0	13:35:57	SHAK	122			
2130.0	13:36:16	BKGD	123			
2130.0	13:36:26	SHOT	124	11	DualGunCluster	
2130.0	13:36:44	SHOT	125	11	DualGunCluster	
2130.0	13:37:02	SHOT	126	11	DualGunCluster	
2130.0	13:37:20	SHOT	127	11	DualGunCluster	
2130.0	13:37:40	SHOT	128	11	DualGunCluster	

Source Configuration (Air Gun)

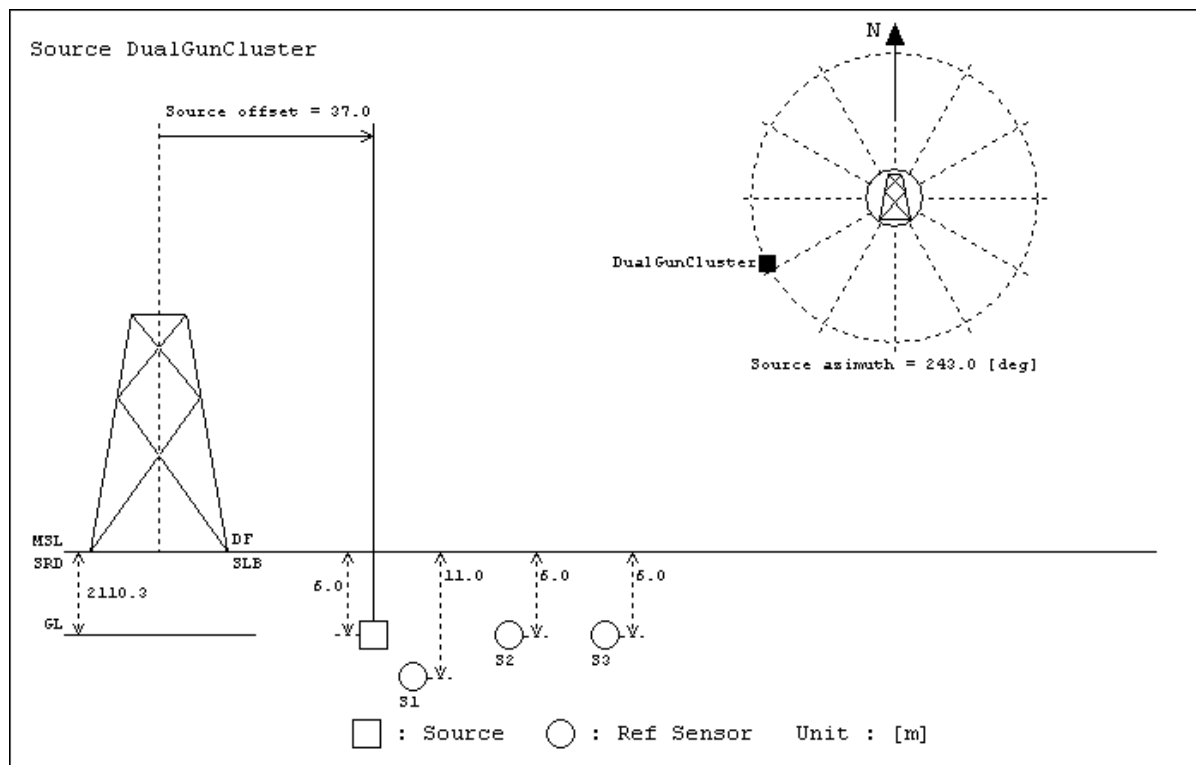
Source Location (Rig, Boat, Pit, Borehole)	Rig, Crane #3
Source Group ID (A, B, C, ...)	DualGunCluster
Source Offset (for fixed offset)	37m
Source Azimuth (for fixed offset)	243deg
Source Depth from Surface	6
Source Depth from Logging Zero	17.1

Gun Controller Type	WSAM
Gun Controller Model Name	
Gun Controller Serial Number	808
Gun Type	Sodera G-Gun
Gun Serial Number(s)	
Gun Configuration (3 Gun Cluster, Gun Array, etc.)	2-gun horizontal array
Gun Chamber Volumes	150 cu. in. ach
Gun Pit/Borehole Information	
Compressor Type	Rig HP air supply
Compressor Flow Rate	
Air Regulator Pressure	1800 PSI

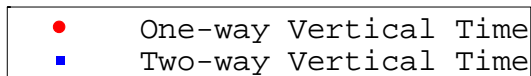
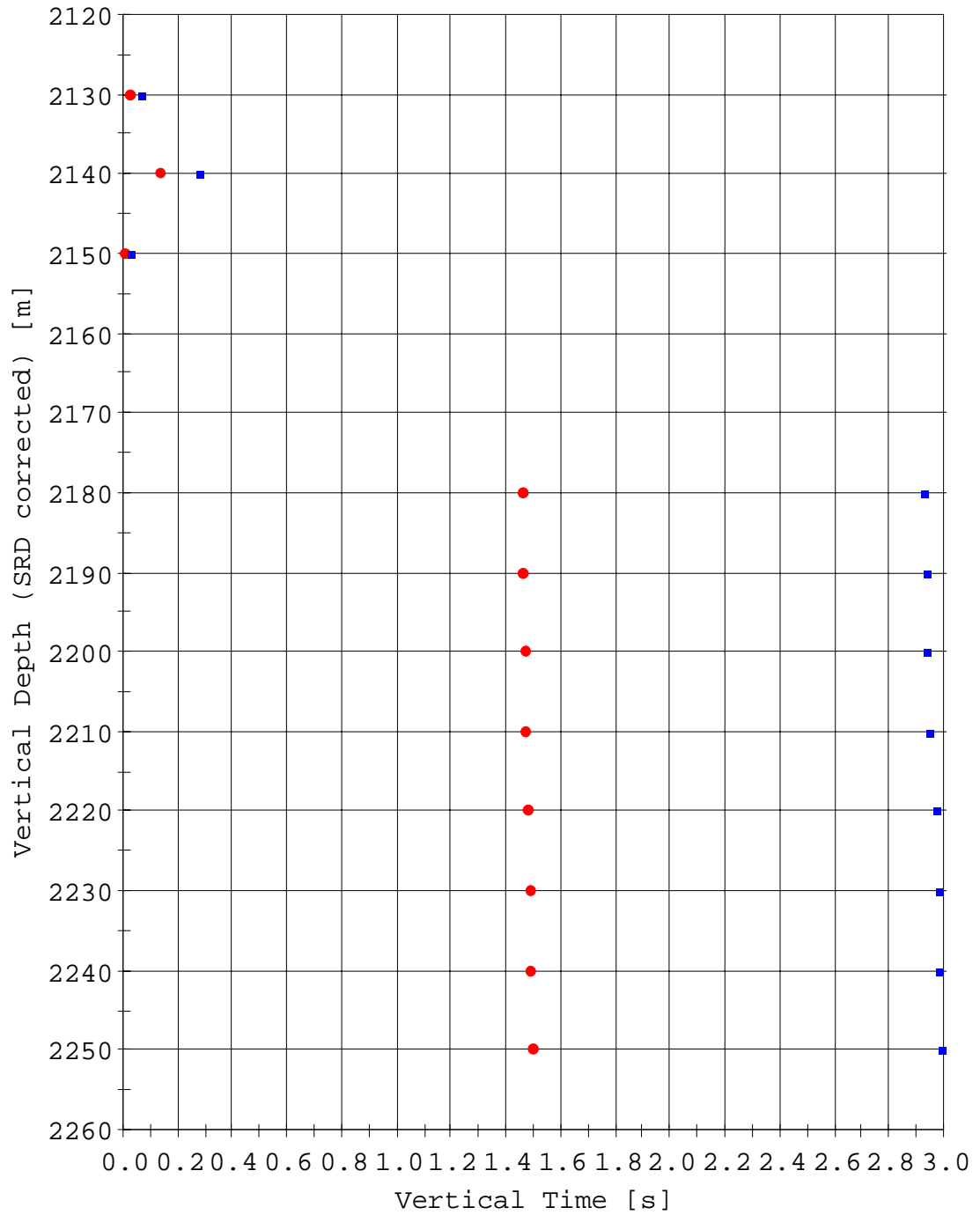
Surface Sensor Configuration

Number of Surface Reference Sensors	1
Surface Recording Length	500ms
Surface Sampling Rate	1ms
Sensor Type (S1)	MP2 Hydrophone
Sensor Type (S2)	
Sensor Type (S3)	
Sensor Depth from Surface (S1)	11m
Sensor Depth from Surface (S2)	
Sensor Depth from Surface (S3)	
Sensor Depth from Logging Zero (S1)	22.1
Sensor Depth from Logging Zero (S2)	
Sensor Depth from Logging Zero (S2)	
Sensor Offset from Source (S1)	0m (suspended below array)
Sensor Offset from Source (S2)	
Sensor Offset from Source (S3)	

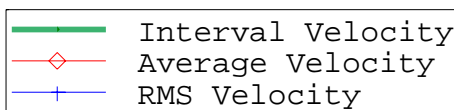
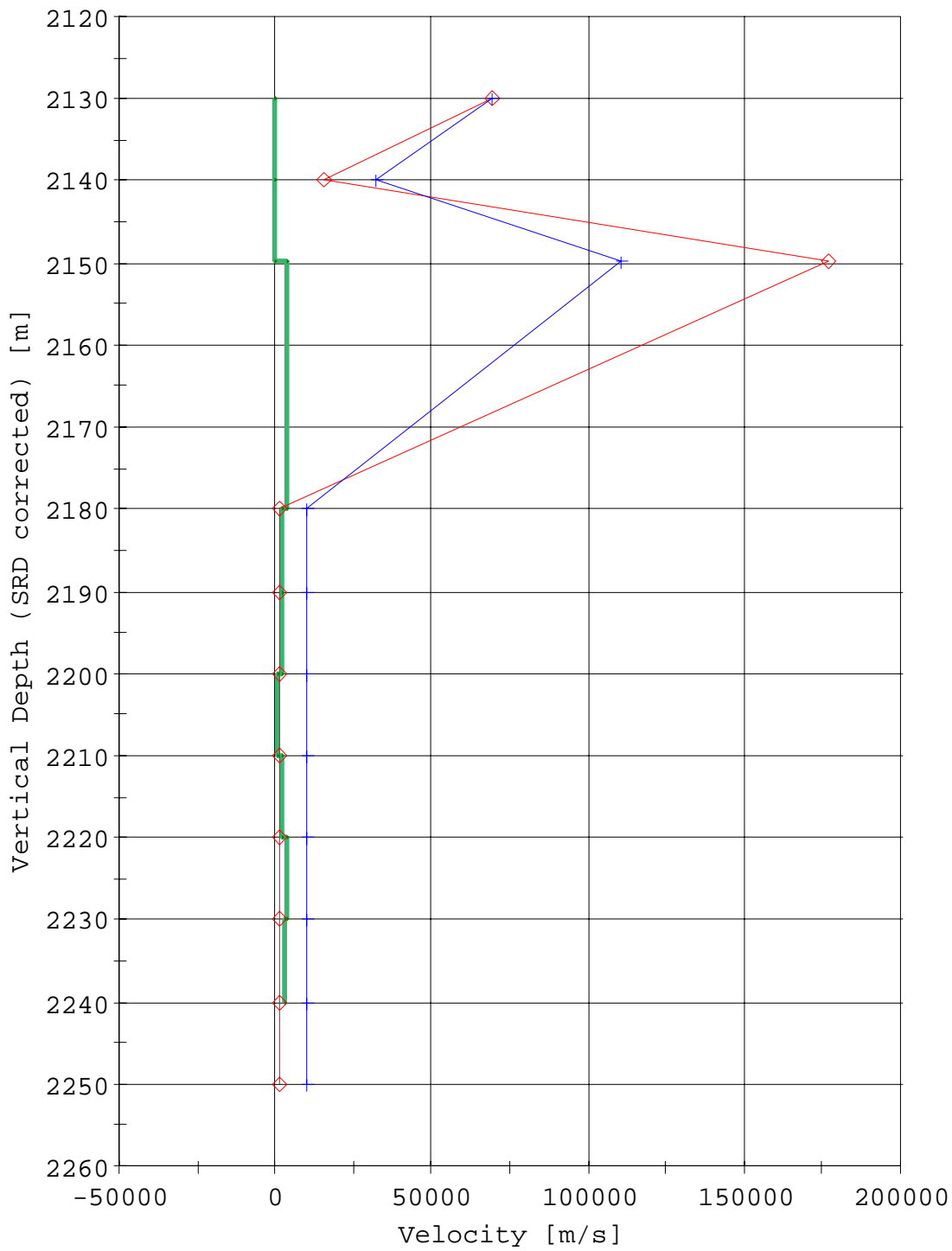
Source Geometry Sketch



Time Depth Plot



Velocity Plot



Process Flow	Parameter
<pre> graph TD LoadLdf[LoadLdf] -- Output_1 --> Shft[Shft] Shft -- Output_1 --> TraceRange[TraceRange] TraceRange -- Output_1 --> Frequency[Frequency] TraceRange -- Output_1 --> BPFiliter[BPFiliter] Frequency --> Frequency2[Frequency2] BPFiliter -- Output_1 --> GenVelfil[GenVelfil] GenVelfil -- Enhanced --> WaveDecon[WaveDecon] GenVelfil -- Residual --> WaveDecon WaveDecon -- Up_Output --> Frequency1[Frequency1] WaveDecon -- Up_Output --> BPFiliter1[BPFiliter1] BPFiliter1 -- Output_1 --> TVG_TAR[TVG(TAR)] TVG_TAR -- Output_1 --> GenVelfil1[GenVelfil1] </pre>	<p>[LoadLdf] Input 1: VSI_001_DualGunCluster_geo_wavelfield_z.ldr</p> <p>[Frequency2] Process all samples Apply FZ</p> <p>[BPFiliter] Phase: Zero Band Width: 5.0 - 90.0Hz</p> <p>[GenVelfil] Apply internal Normalization/Denormalization Median Filter 9 Traces</p> <p>[WaveDecon] Waveshape Deconvolution Design Filter trace Input start at TRANSIT_TIME wavelet: 8.0 - 85.0 Hz zero-phase Polarity: Positive</p> <p>[BPFiliter1] Phase: Zero Band Width: 8.0 - 85.0Hz</p> <p>[TVG(TAR)] Travel time exponent = 1.50</p> <p>[GenVelfil1] Median Filter 7 Traces</p> <p>[Corridor] Window Start: TRANSIT_TIME - 0.000 (s) Window End: TRANSIT_TIME - -0.200 (s) (Deepest 5 traces remain) Mean Stack BPF 5.0 - 90.0Hz</p> <p>[Frequency1] Process all samples Apply FK</p> <p>[Frequency] Process all samples Apply FK</p>

[LoadLdf]

FileLoadLdf Parameters

Input 1: VSI_001_DualGunCluster_geo_wavelfield_z.ldf

[Shft]

Shift Parameters

Shift: + TT_SRD to TT Difference - 0 s

Update selected headers

[TraceRange]

Trace Range Set Manual Parameters

Trace Range Set Parameters

Remove Bad Trace

[Frequency2]

Spectral Analyser Parameters

Process all samples

Depth/Offset header = CABLE_LENGTH

Output is Frequency Domain

Compute Amplitude spectrum in dB

[BPFfilter]

BPF Parameters

Butterworth Filter, Zero Phase

Charasteristic: 5.000 Hz to 90.000 Hz Order 3

[GenVelFil]

Mean/Median Generalized Velocity Filter Parameters

Align events using times of TRANSIT_TIME x 1.000

Compute both enhanced and residual output

Apply internal Normalization/Denormalization based on RMS of time window

From TRANSIT_TIME - 0.020 s

Windown length = 0.500 s

Median Stacking

Stacking window (traces): 9

Stacking window (samples): 1

Source and receiver coordinates Parameters

Source Offset: SOURCE_LINE_POSITION_RHO

Source Depth: SOURCE_LINE_POSITION_Z

Receiver Offset: RECEIVER_LINE_POSITION_RHO

Receiver Depth: RECEIVER_LINE_POSITION_Z

[WaveDecon]

Waveshaping deconvolution Parameters

Design Filter trace by trace

Filter input start at TRANSIT_TIME - 0.080 s

Filter input window: 1.000 s

Filter Length is filter input window

Desired wavelet created by filtered unit impulse from 8.000 Hz to 85.000 Hz , zero-phase

Positive wavelet polarity

Wavelet delay time = Filter Length / 2

White noise (%): 5.000

Waveshaping optimization Parameters

[BPFfilter1]

BPF Parameters

Butterworth Filter, Zero Phase

Charasteristic: 8.000 Hz to 85.000 Hz Order 3

[TVG(TAR)]

Time-Varying Gain Parameters

Window start at TRANSIT_TIME - 0.000000
Window length = 4.999000
Travel time exponent = 1.500000
Exponential Weighting = 0.000000

[GenVelfill]

Mean/Median Generalized Velocity Filter Parameters
Align events using times of TRANSIT_TIME x -1.000
Compute both enhanced and residual output
Median Stacking
Stacking window (traces): 7
Stacking window (samples): 1
Source and receiver coordinates Parameters
Source Offset: SOURCE_LINE_POSITION_RHO
Source Depth: SOURCE_LINE_POSITION_Z
Receiver Offset: RECEIVER_LINE_POSITION_RHO
Receiver Depth: RECEIVER_LINE_POSITION_Z

[Corridor]

Corridor stack Parameters
Mute before TRANSIT_TIME - 0 s
Mute after TRANSIT_TIME - -0.200 s
All traces except the deepest (traces): 5
Depth header: RECEIVER_POSITION_Z
Mean stack
Apply +TT with TRANSIT_TIME
Replicate corridor stack x 10
Apply BPF on resulting corridor stack
BPF Parameters
Butterworth Filter, Zero Phase
Characteristic: 5.000 Hz to 90.000 Hz Order 3

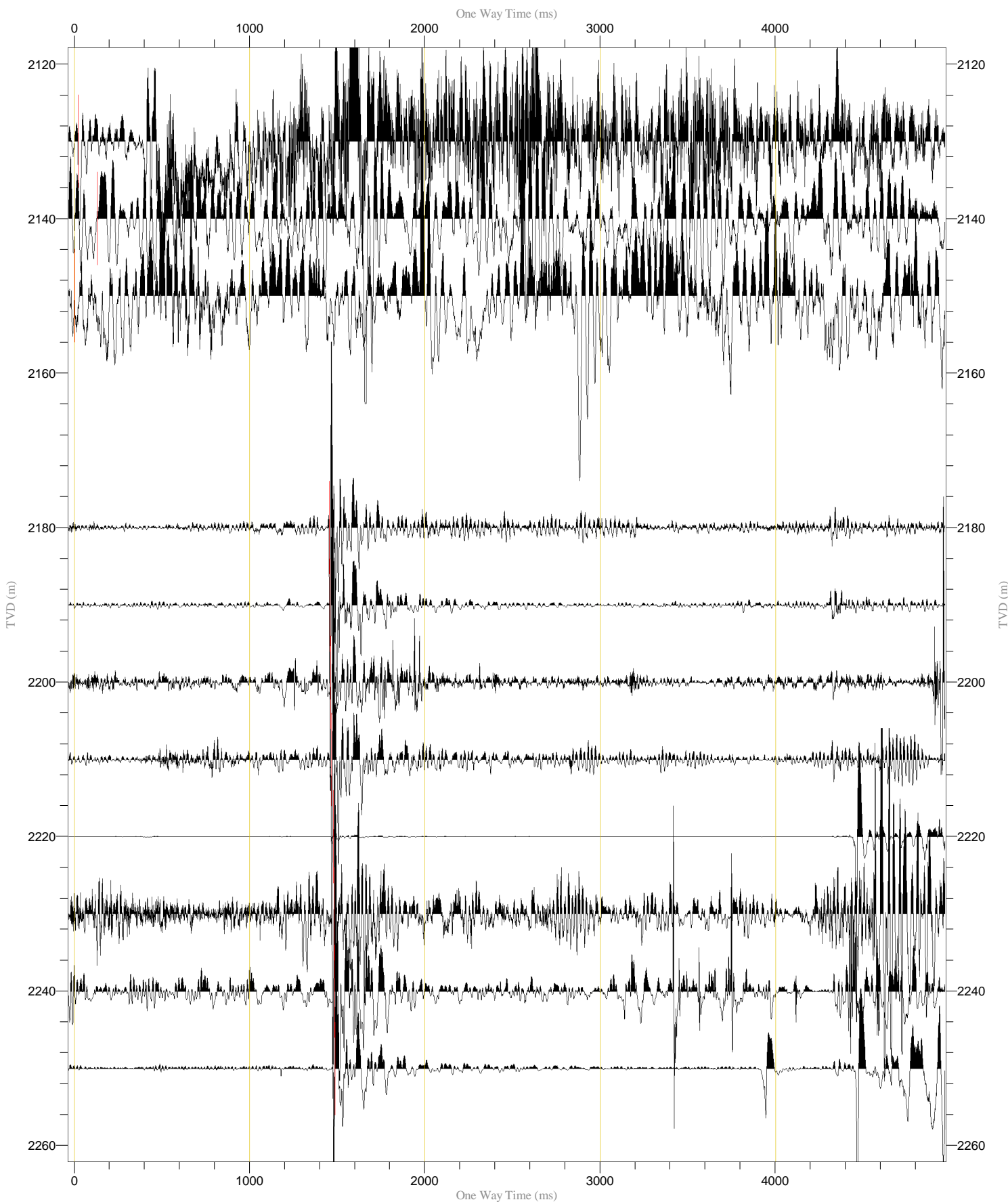
[Frequency1]


Spectral Analyser Parameters
Process all samples
Depth/Offset header = CABLE_LENGTH
Output is FK Domain
Compute Amplitude spectrum in dB

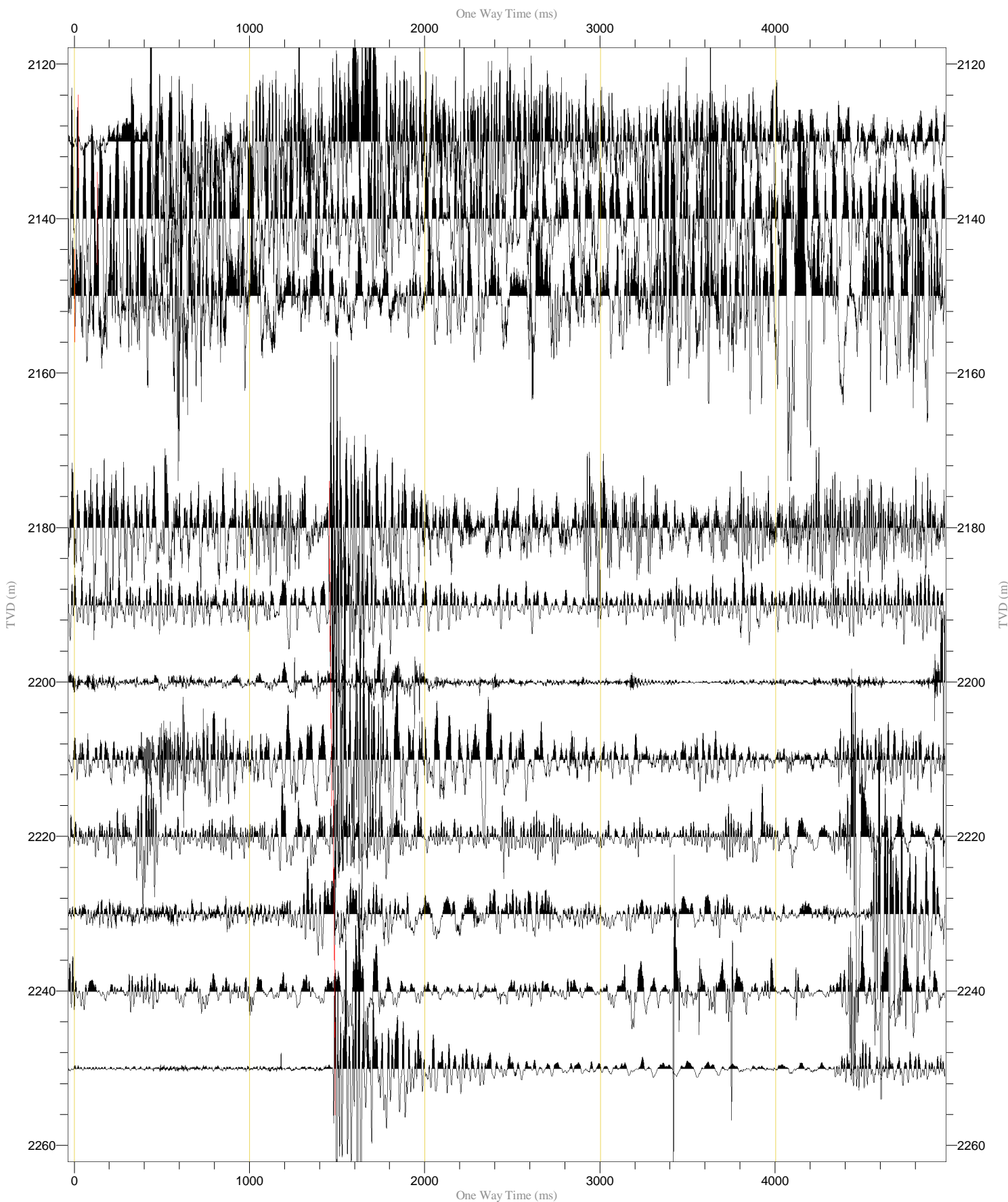
[Frequency]


Spectral Analyser Parameters
Process all samples
Depth/Offset header = CABLE_LENGTH
Output is FK Domain
Compute Amplitude spectrum in dB

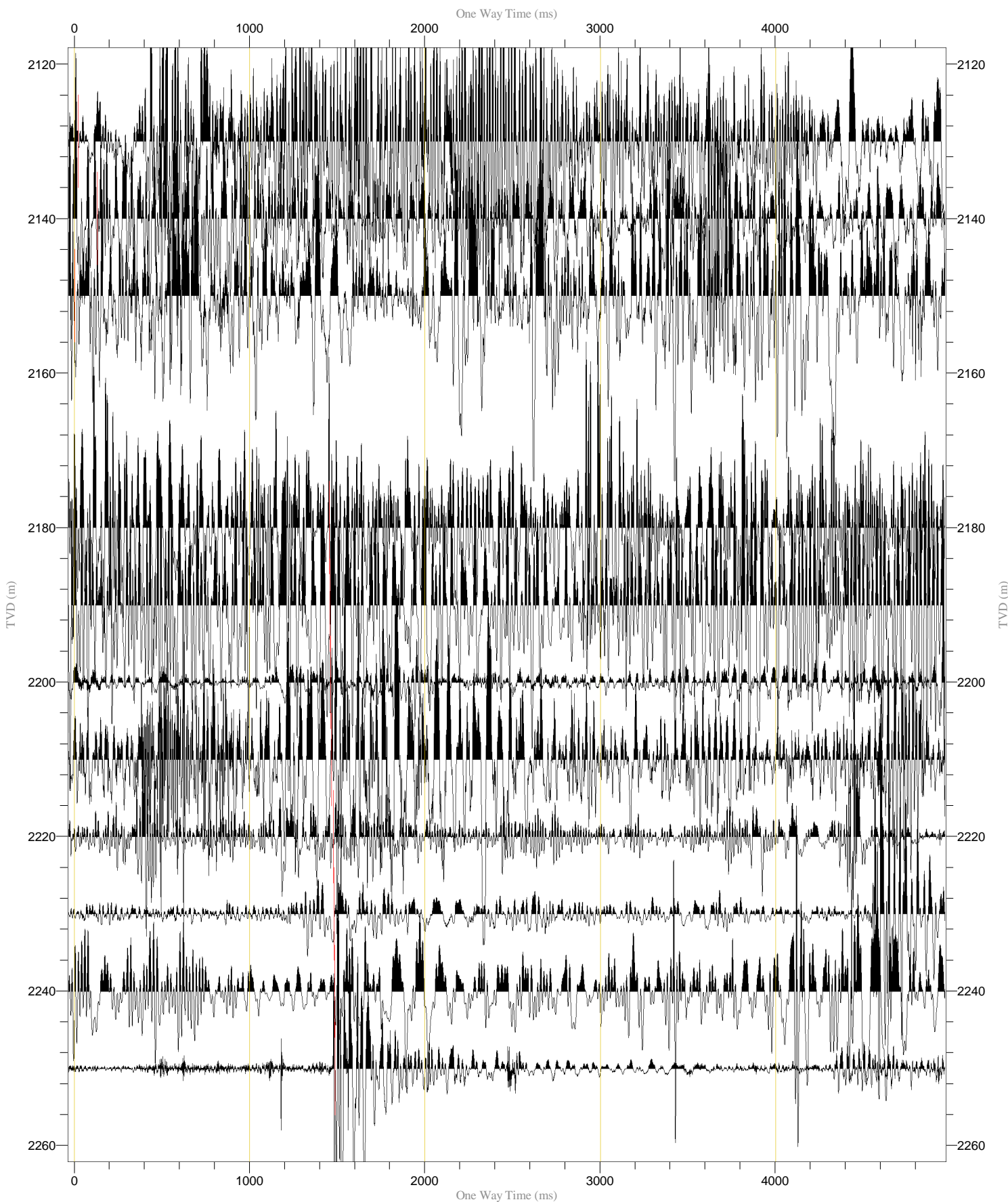
Raw Stack (Z) Normalization Trace by Trace (250%)
Polarity Normal
One Way Time (ms)
Scaling 3.4 cm/sec, 1/660



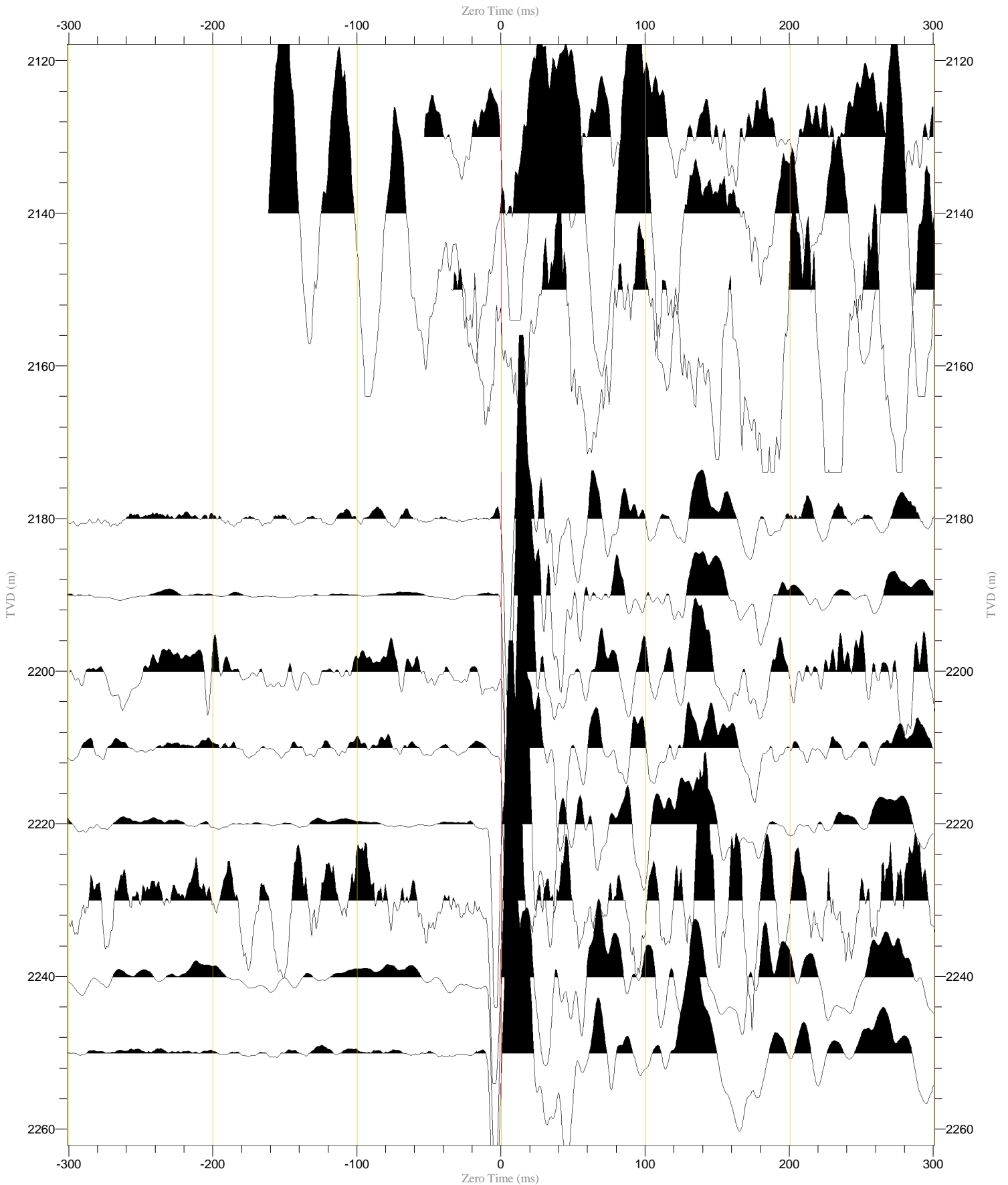
Raw Stack (X)	Normalization Trace by Trace (250%) Polarity Normal One Way Time (ms) Scaling 3.4 cm/sec, 1/660	
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Raw Stack (Y)	Normalization Trace by Trace (250%) Polarity Normal One Way Time (ms) Scaling 3.4 cm/sec, 1/660	
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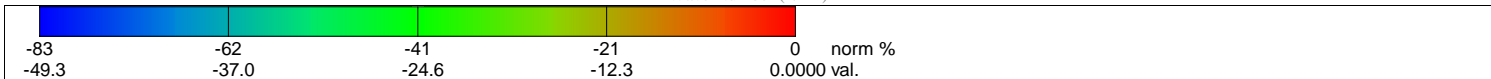
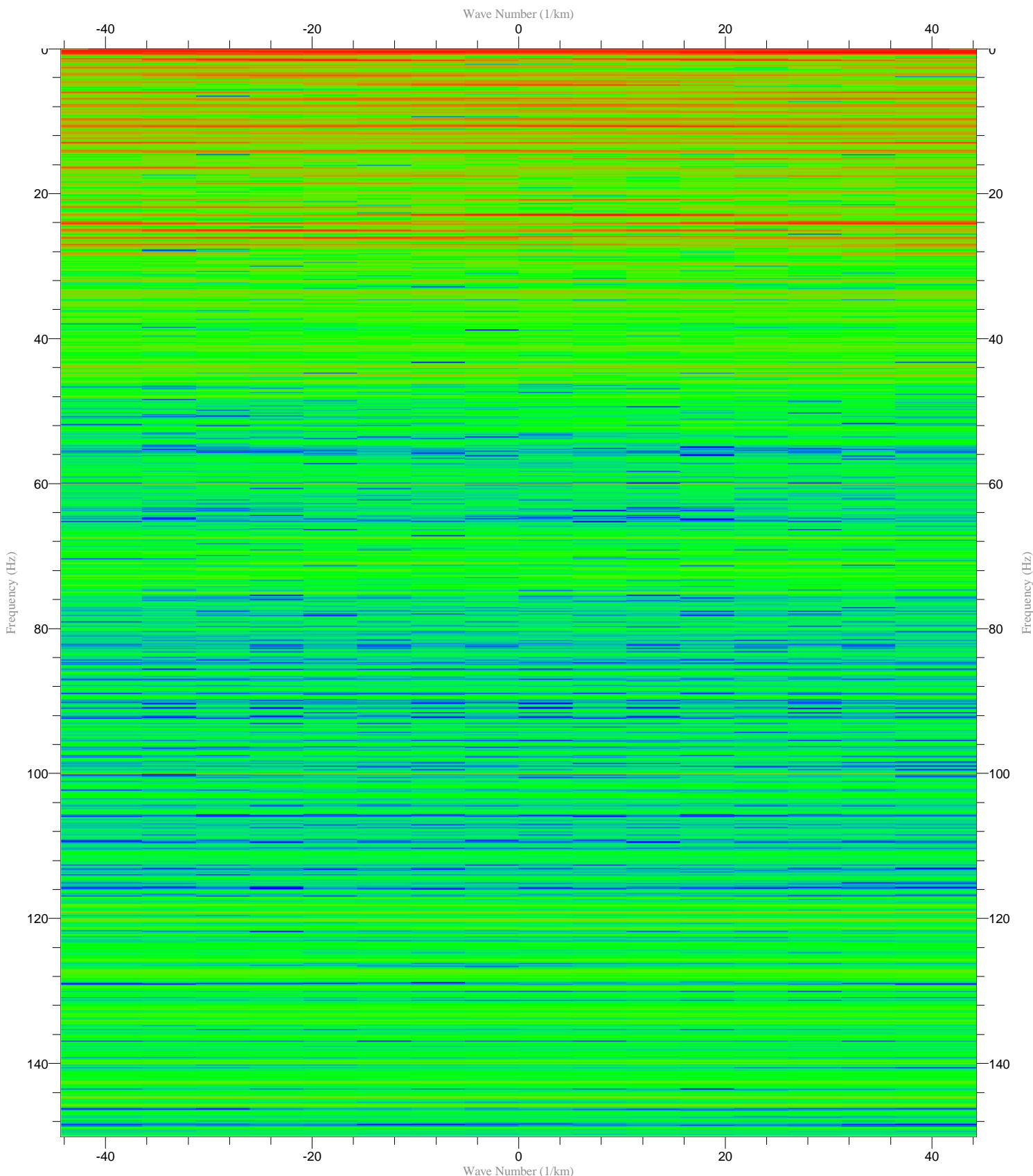


Raw Stack (Z) (Magnified) Normalization Trace by Trace (250%)
Polarity Normal
Zero Time (ms)
Scaling 28.5 cm/sec, 1/660



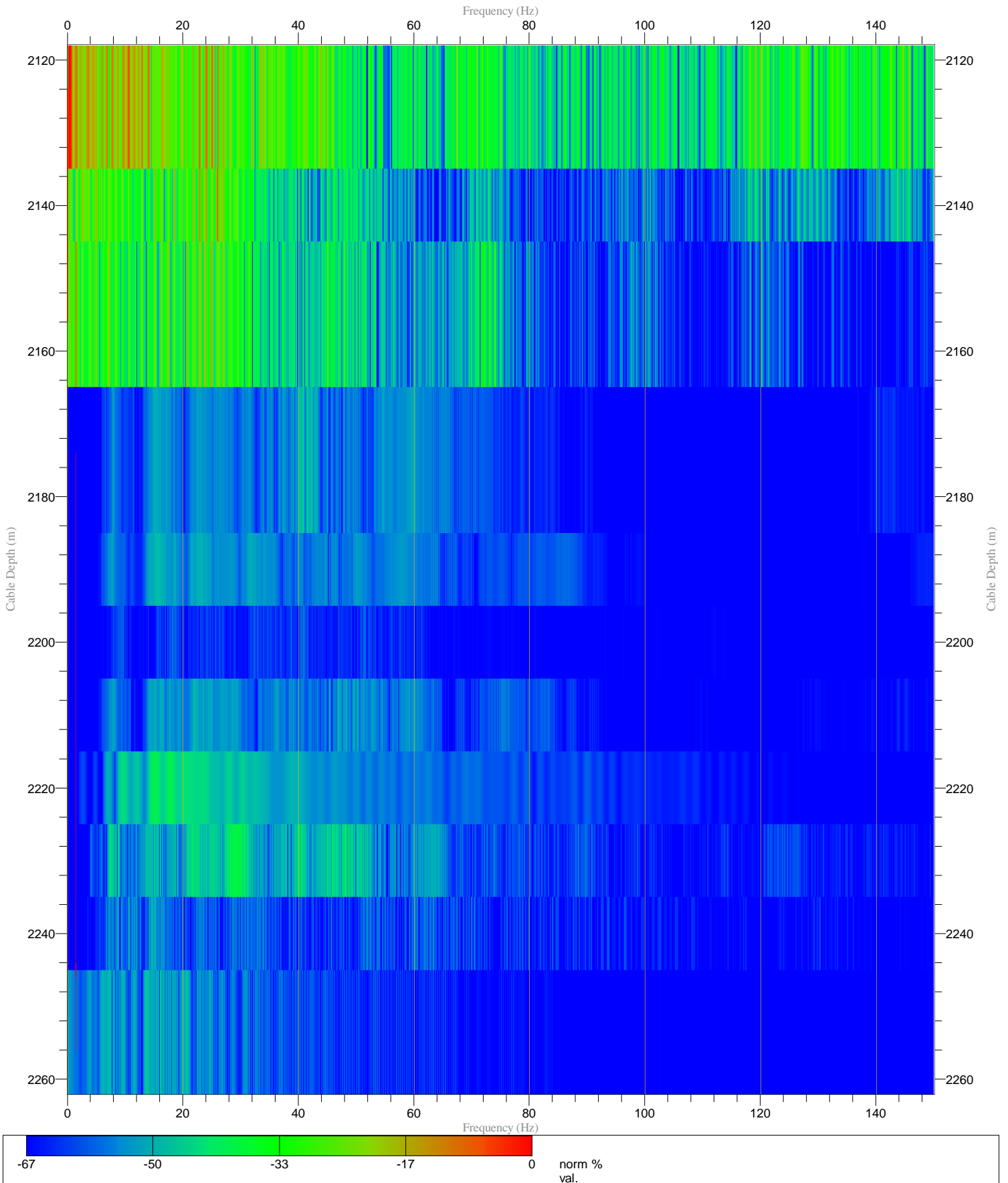
VSP Raw Stack (Z) FK
Apply FK

Normalization First Trace in Gather (100%)
Polarity Normal
Frequency (Hz)
Scaling 0.14 cm/Hz, 5.07(1/km)/cm



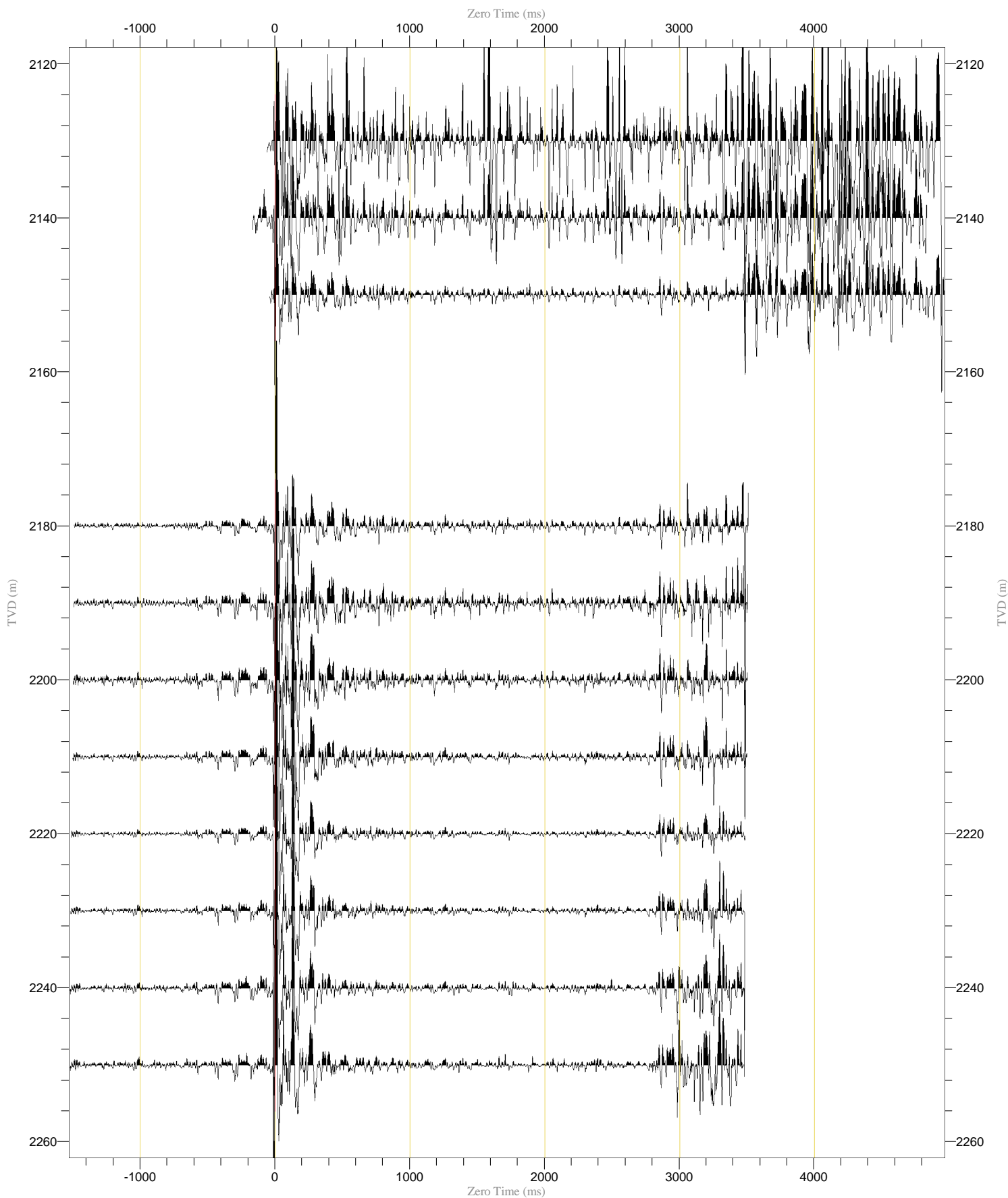
VSP Raw Stack (Z) FZ
Apply FZ

Normalization Trace by Trace (100%)
Polarity Normal
Frequency (Hz)
Scaling 0.1 cm/Hz, 1/660



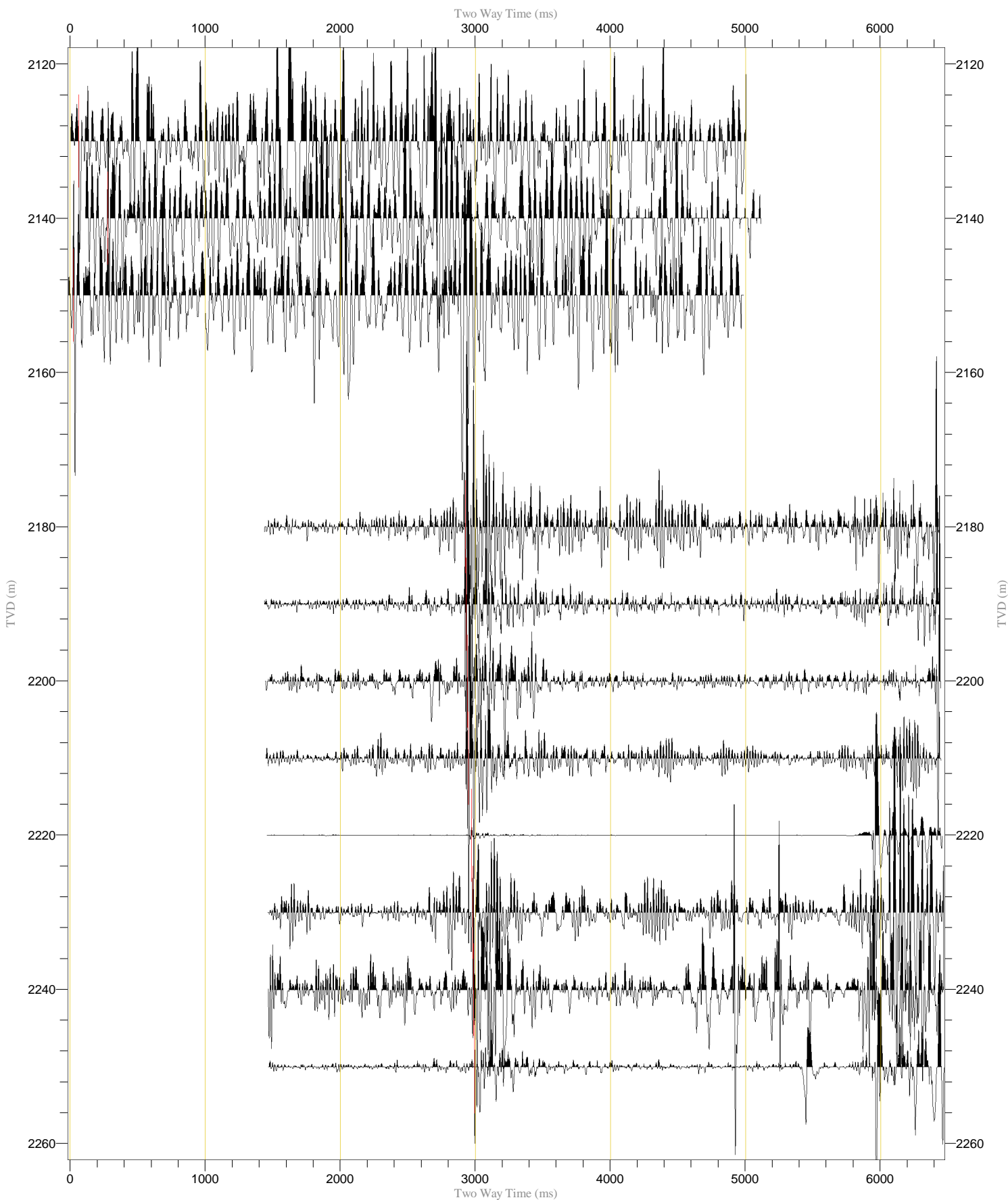
VSP Downgoing
BPF 5.0 - 90.0Hz
Median Filter 9 Traces

Normalization Trace by Trace (250%)
Polarity Normal
Zero Time (ms)
Scaling 2.6 cm/sec, 1/660



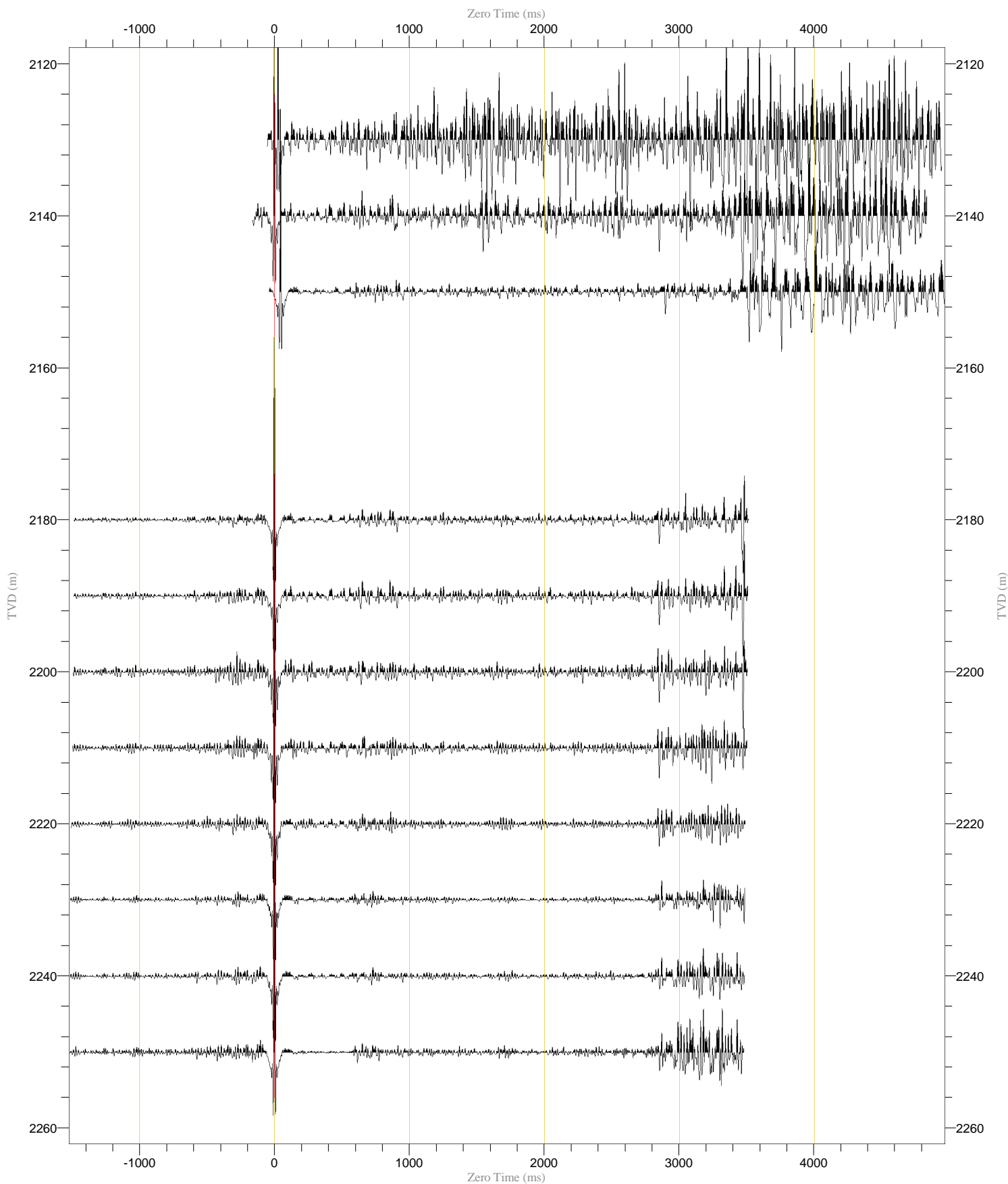
VSP Upgoing
BPF 5.0 - 90.0Hz
Median Filter 9 Traces

Normalization Trace by Trace (250%)
Polarity Normal
Two Way Time (ms)
Scaling 2.6 cm/sec, 1/660



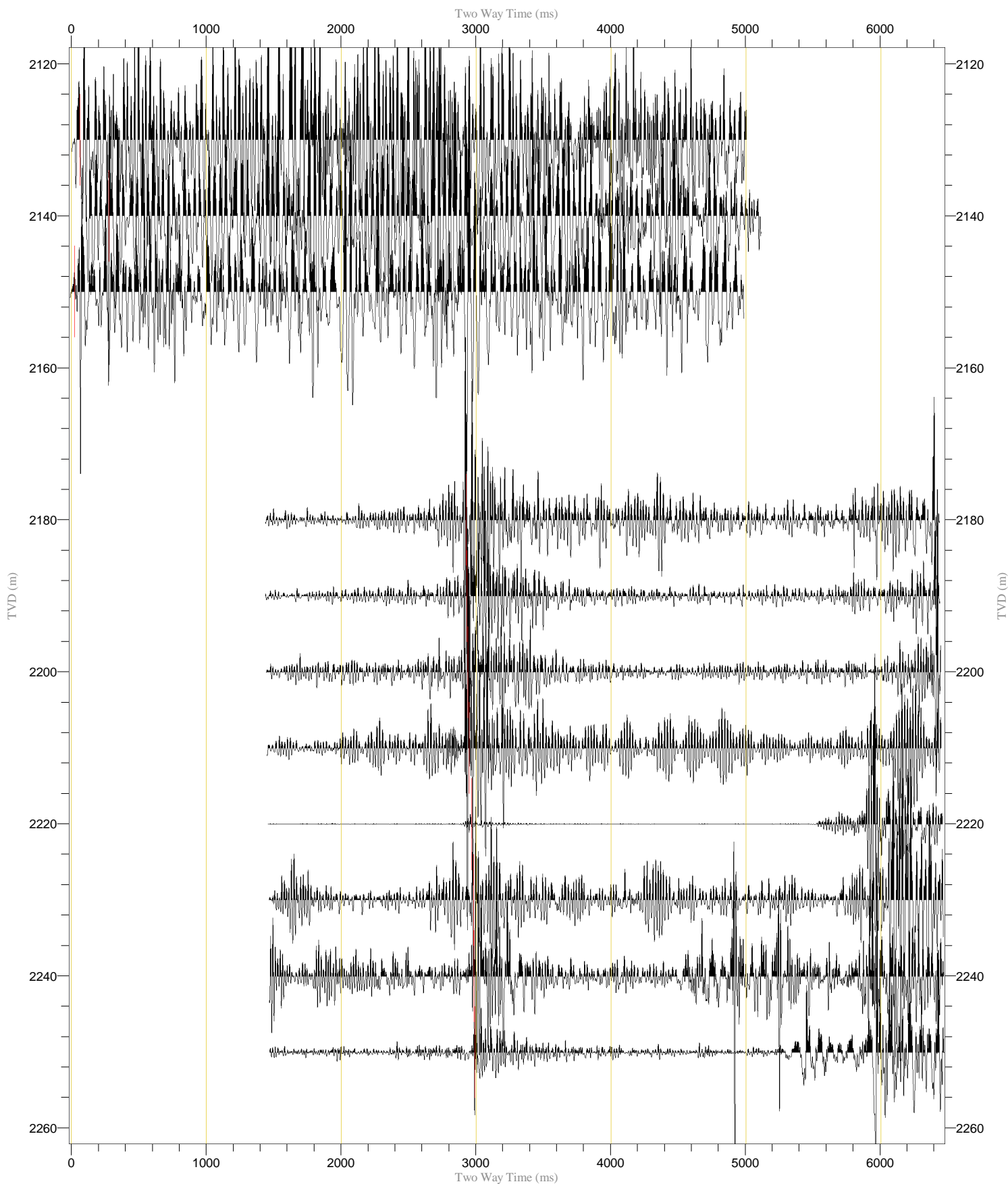
VSP Waveshape decon downgoing
BPF 5.0 - 90.0Hz
Median Filter 9 Traces
Waveshape Decon.(wavelet: 8.0 - 85.0 Hz zero-phase)

Normalization Trace by Trace (250%)
Polarity Normal
Zero Time (ms)
Scaling 2.6 cm/sec, 1/670



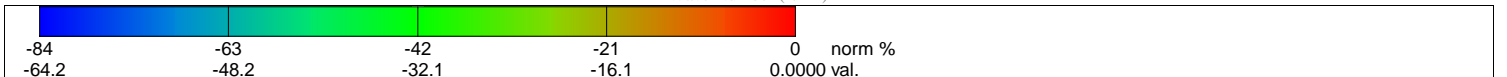
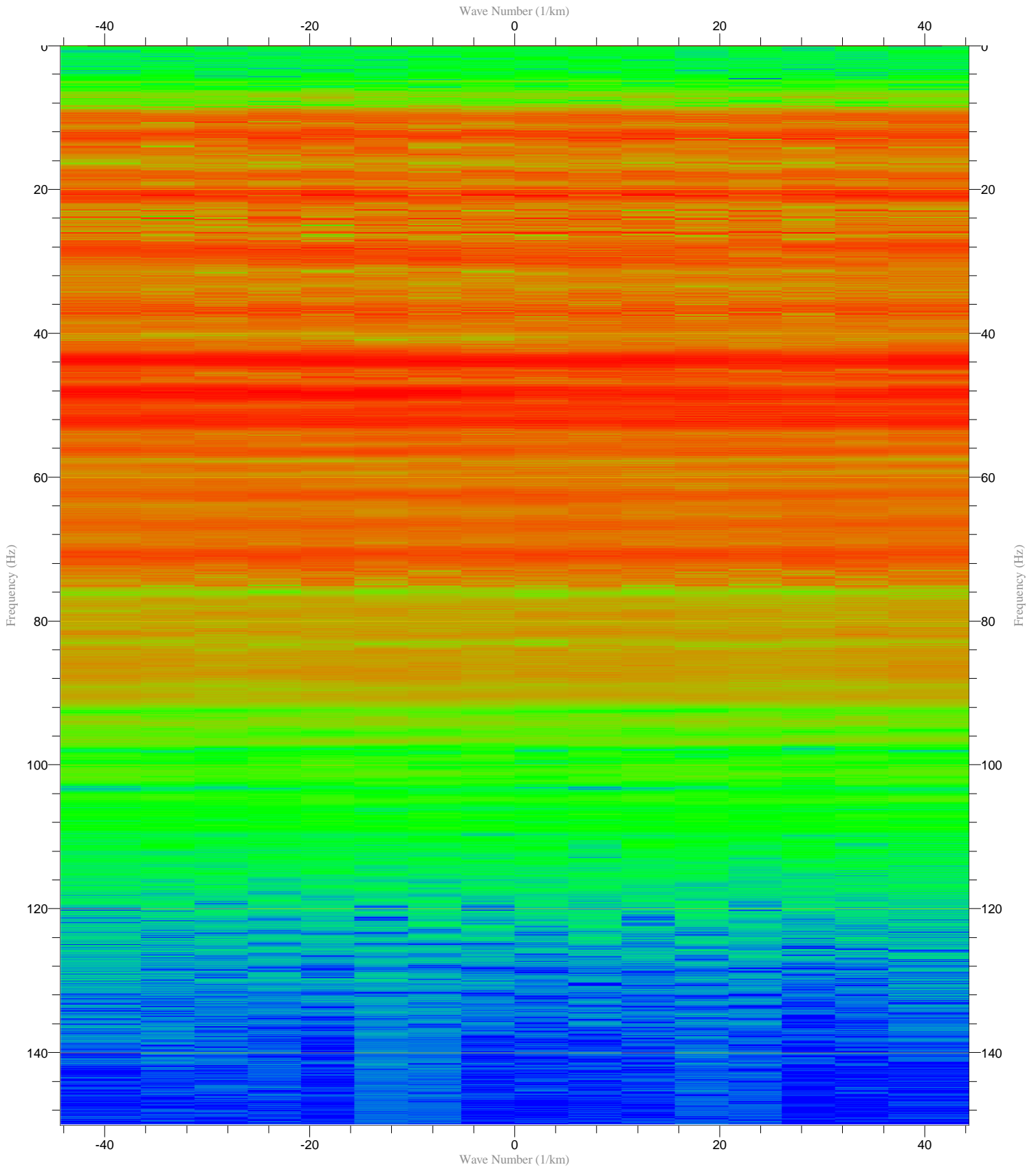
VSP Waveshape decon upgoing
BPF 5.0 - 90.0Hz
Median Filter 9 Traces
Waveshape Decon.(wavelet: 8.0 - 85.0 Hz zero-phase)


Normalization Trace by Trace (250%)
Polarity Normal
Two Way Time (ms)
Scaling 2.6 cm/sec, 1/670

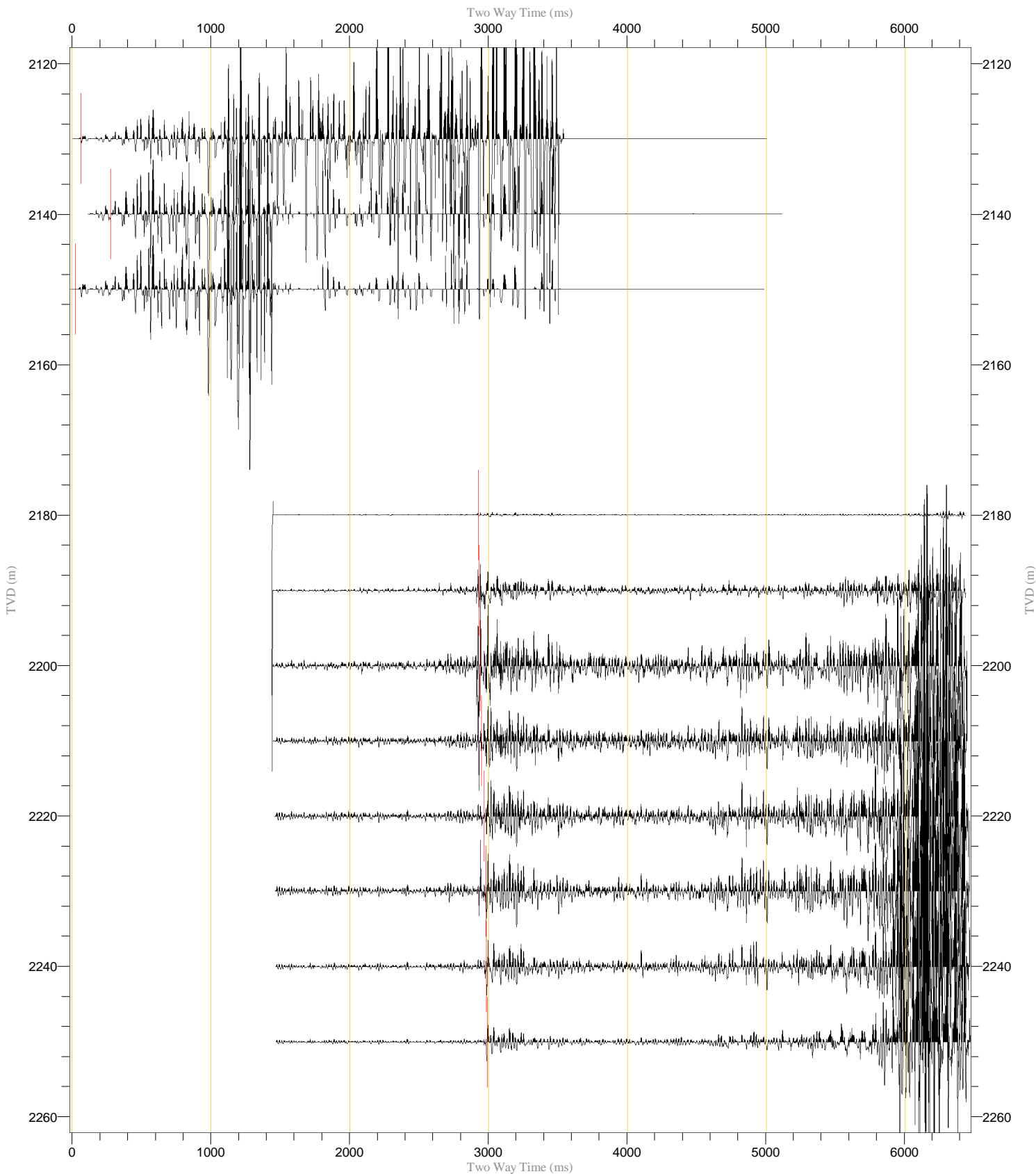



VSP Waveshape decon upgoing FK
Apply FK

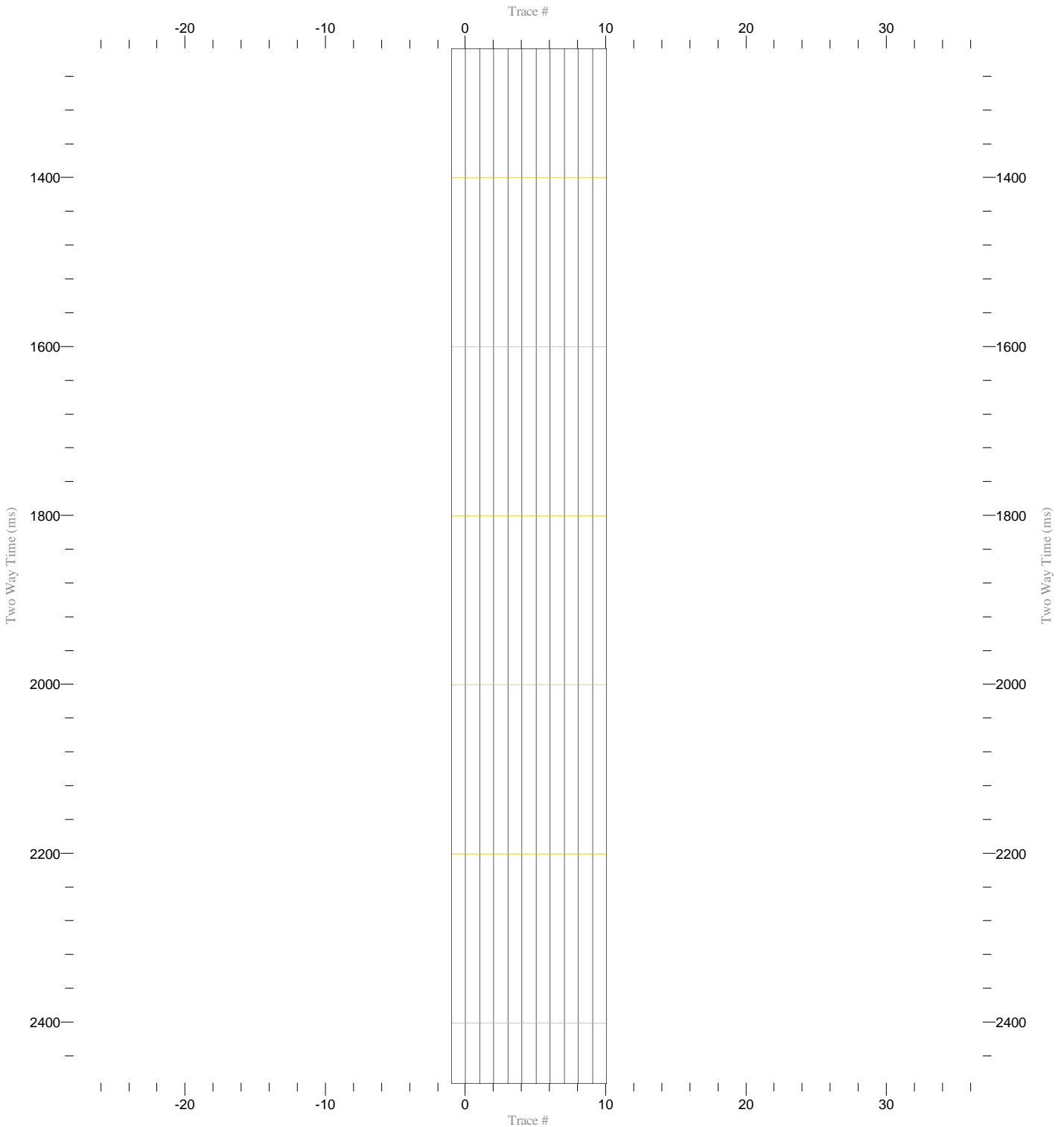
Normalization First Trace in Gather (100%)
Polarity Normal
Frequency (Hz)
Scaling 0.14 cm/Hz, 5.07(1/km)/cm



<p>VSP Corridor Stack (Input) BPF 5.0 - 90.0Hz Median Filter 9 Traces Waveshape Decon.(wavelet: 8.0 - 85.0 Hz zero-phase) BPF 8.0 - 85.0Hz Travel time exponent = 1.50 Median Filter 7 Traces</p>	<p>Normalization Trace by Trace (250%) Polarity Normal Two Way Time (ms) Scaling 2.6 cm/sec, 1/700</p>	
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<p>VSP Corridor Stack (output) BPF 5.0 - 90.0Hz Median Filter 9 Traces Waveshape Decon.(wavelet: 8.0 - 85.0 Hz zero-phase) BPF 8.0 - 85.0Hz Travel time exponent = 1.50 Median Filter 7 Traces Corridor Stack (Mean): BPF 5.0 - 90.0Hz</p>	<p>Normalization Trace by Trace (250%) Polarity Normal Two Way Time (ms) Scaling 15.00 cm/sec, 4.01/cm</p>	
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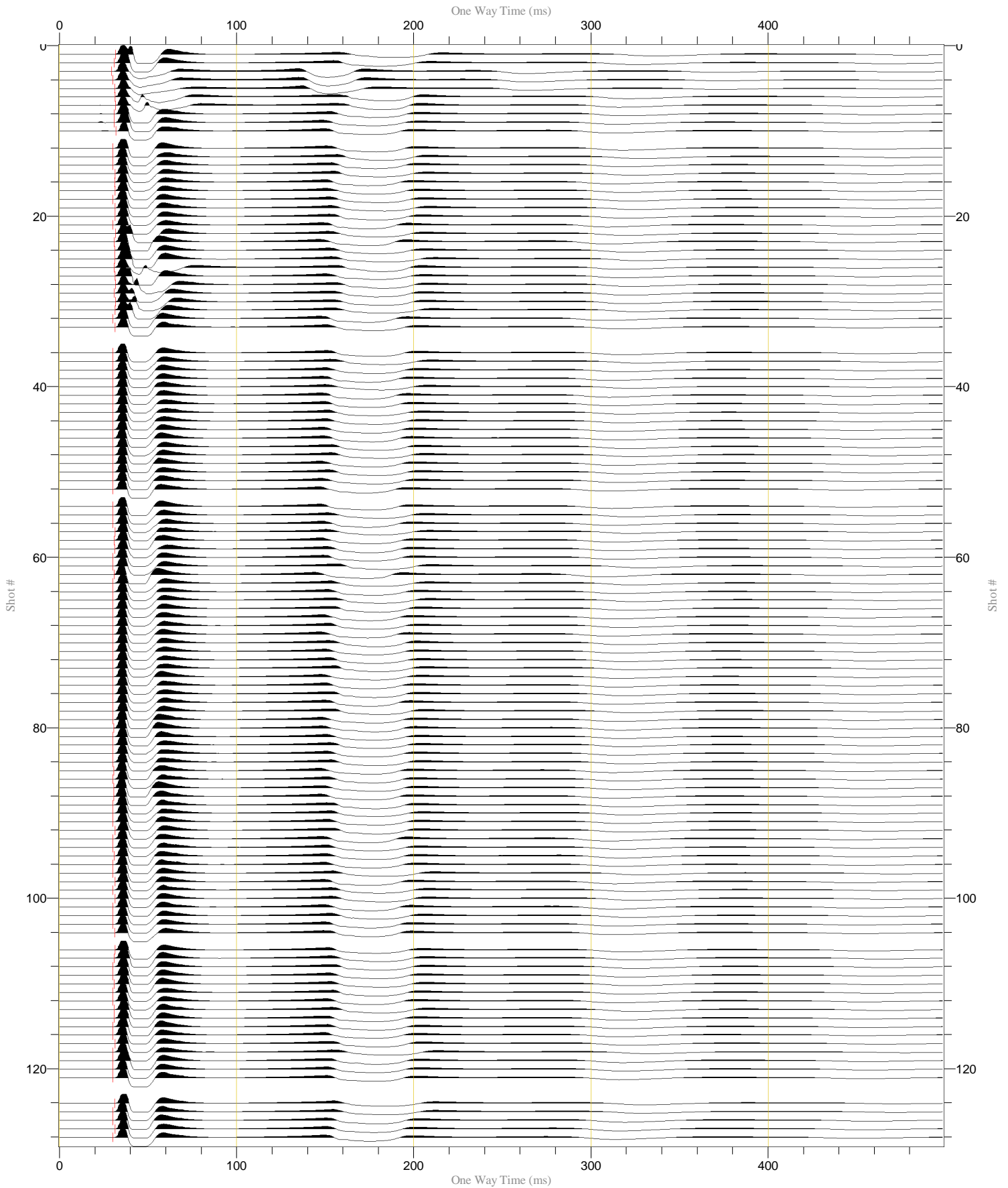
Source Sensor Signature

Normalization Trace by Trace (100%)

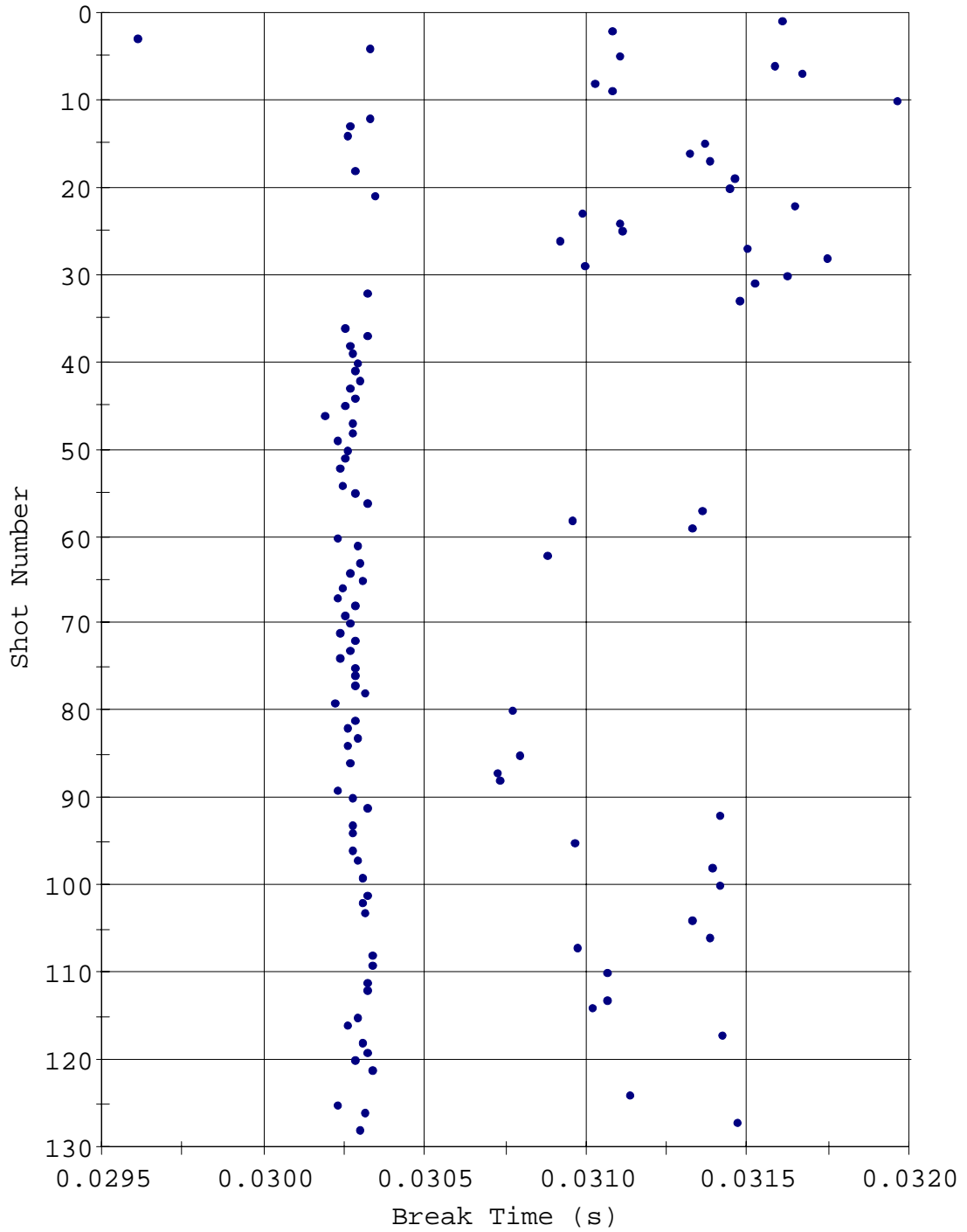
Polarity Normal

One Way Time (ms)

Scaling 34.99 cm/sec, 5.94/cm

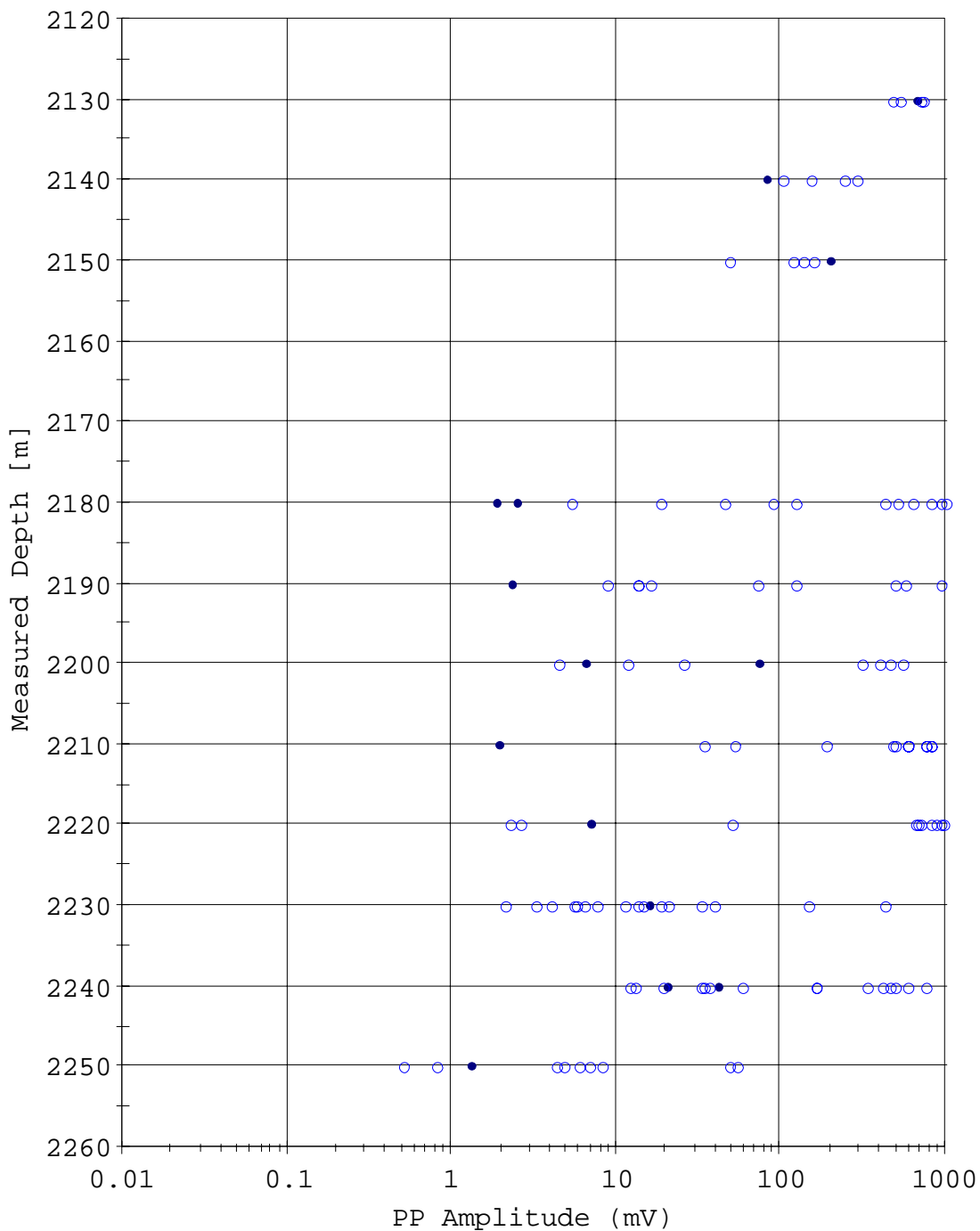


Surface Sensor QC Plot Page



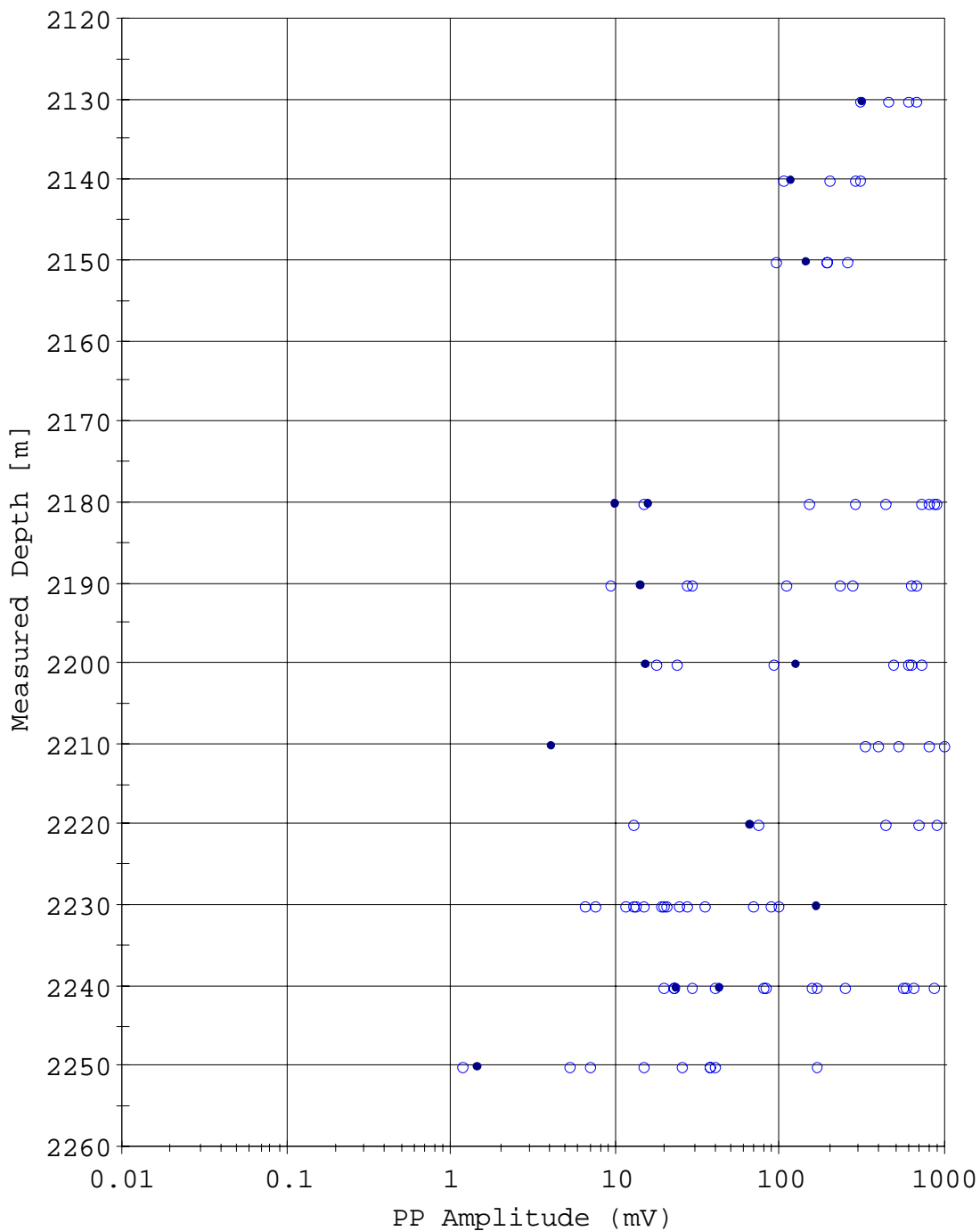
• Surface Sensor Break Time

Peak To Peak Plot (X)



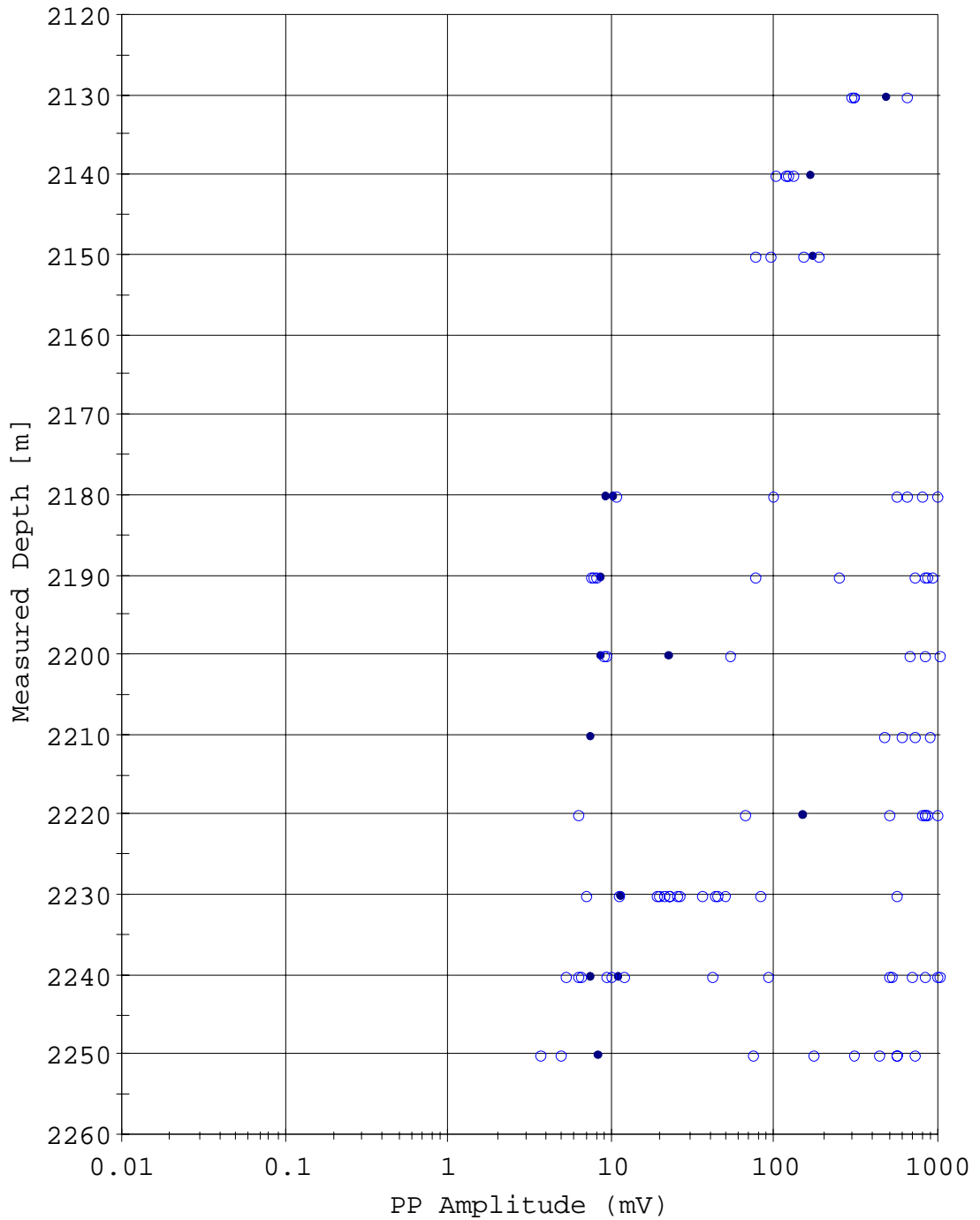
PP Amplitude (mV) accepted for stack
 PP Amplitude (mV) rejected

Peak To Peak Plot (Y)



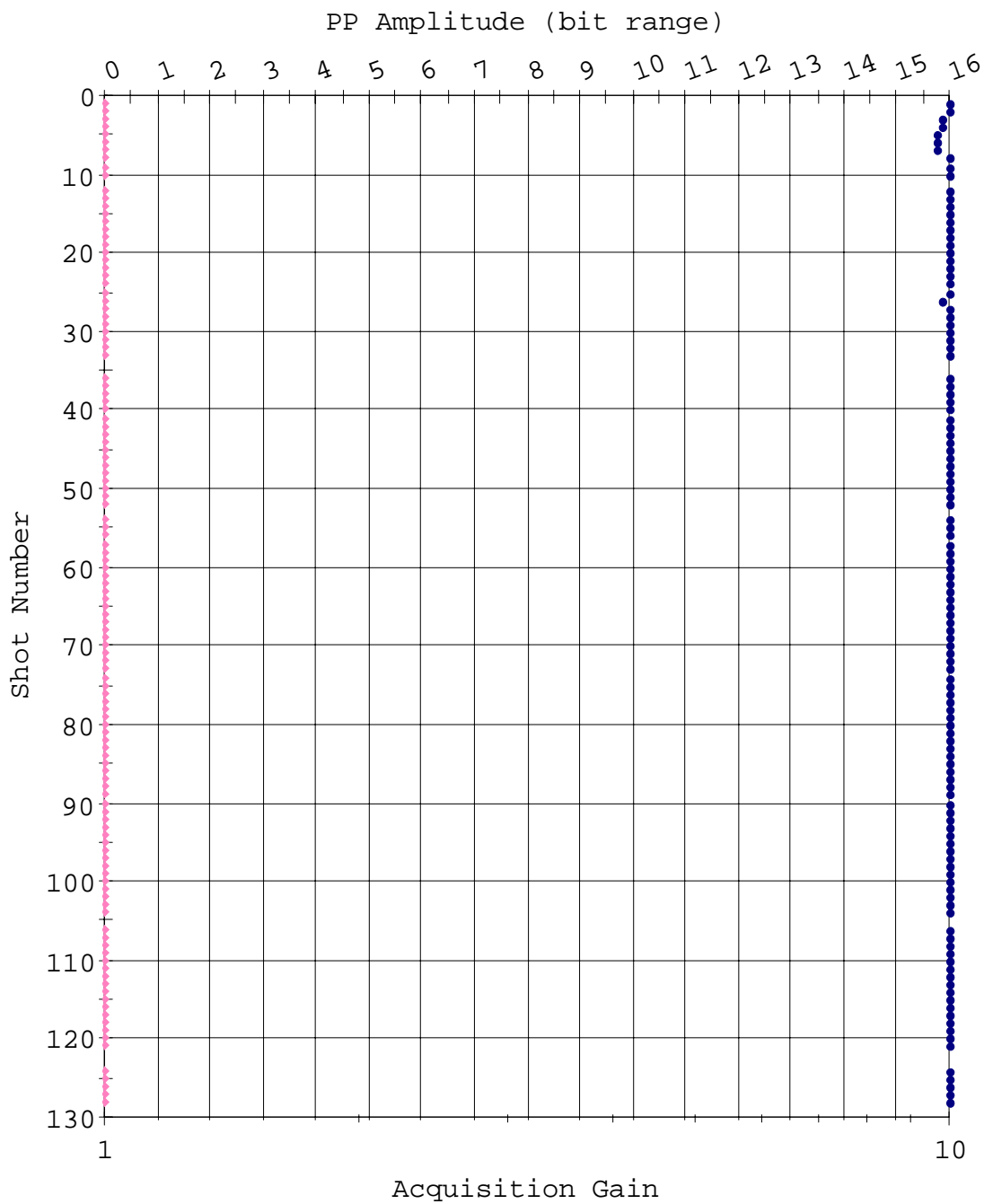
• PP Amplitude (mV) accepted for stack
 ○ PP Amplitude (mV) rejected

Peak To Peak Plot (Z)



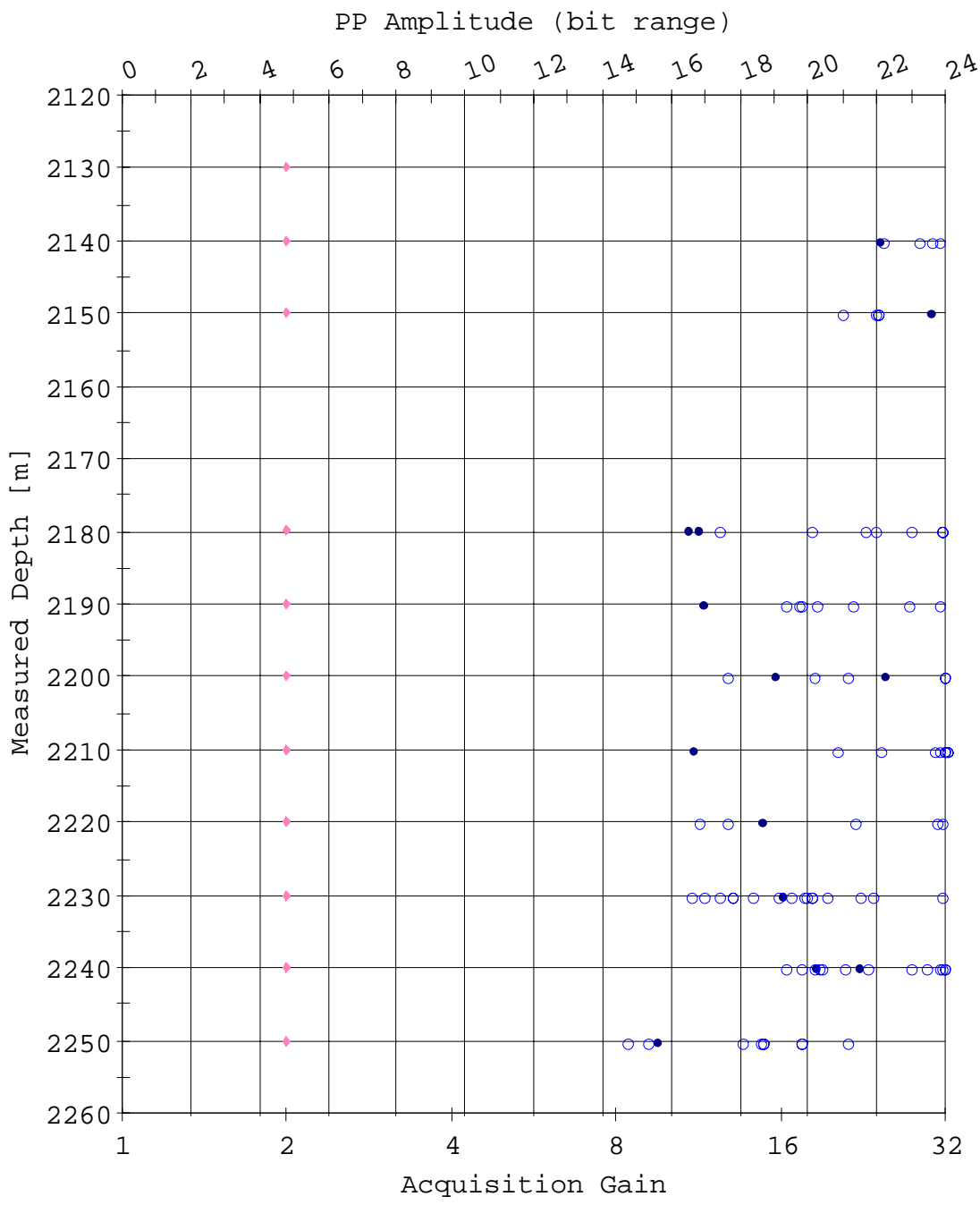
• PP Amplitude (mV) accepted for stack
 ○ PP Amplitude (mV) rejected

Amplitude QC Plot (Surface)



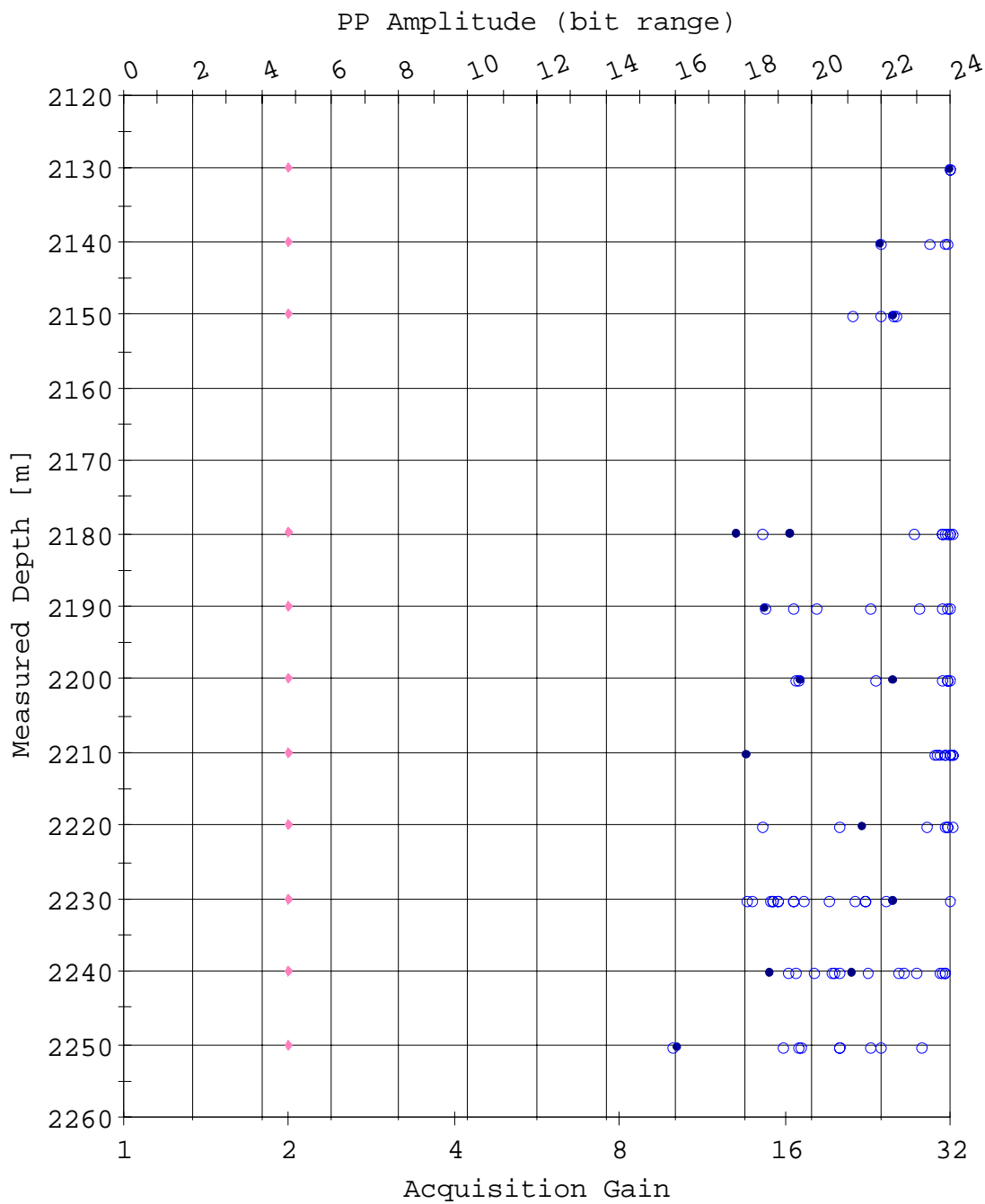
- PP Amplitude (bit range) accepted for stack
- PP Amplitude (bit range) rejected
- ◆ Acquisition Gain

Amplitude QC Plot (X)



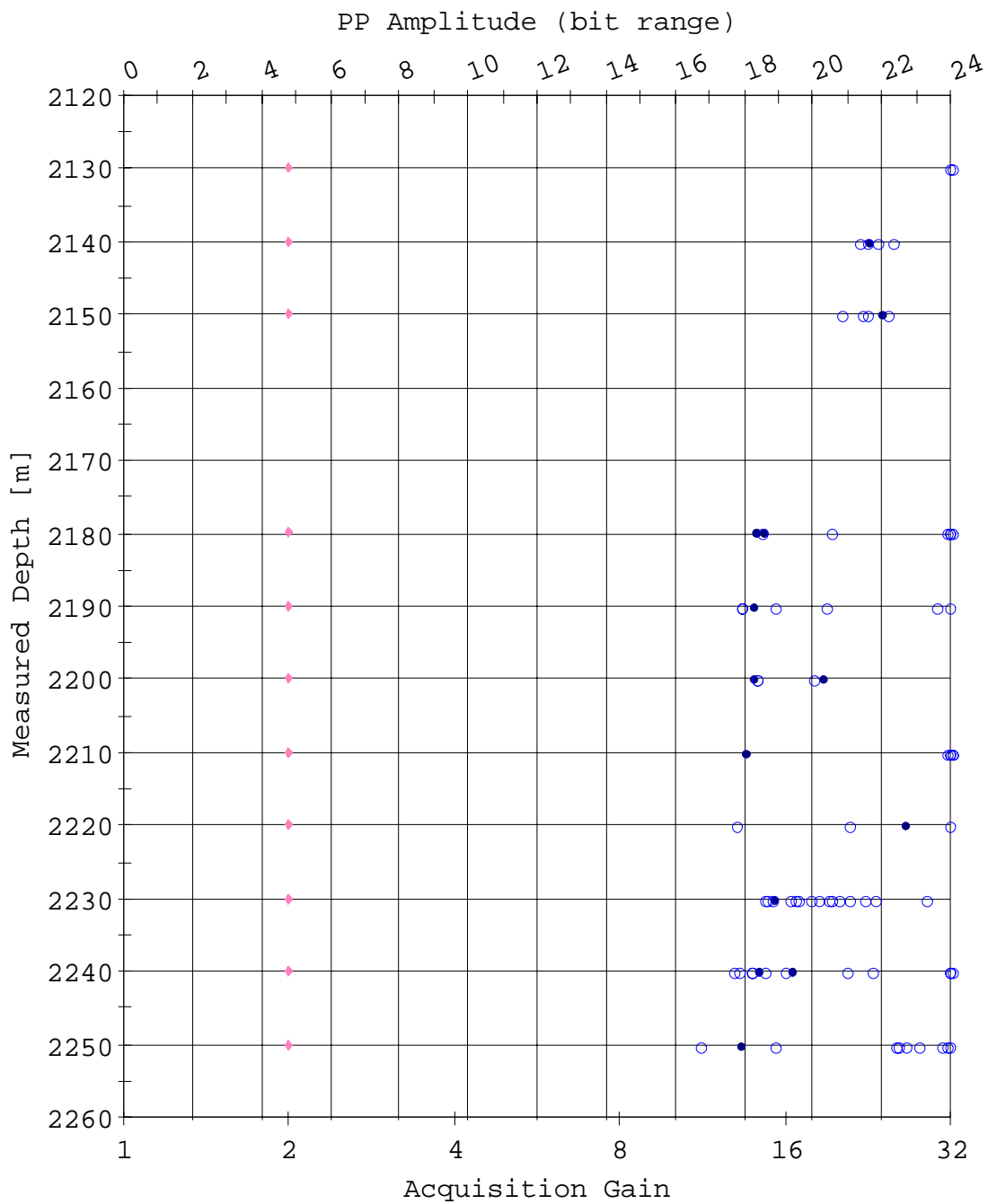
• PP Amplitude (bit range) accepted for stack
 ○ PP Amplitude (bit range) rejected
 ◆ Acquisition Gain

Amplitude QC Plot (Y)



- PP Amplitude (bit range) accepted for stack
- PP Amplitude (bit range) rejected
- ◆ Acquisition Gain

Amplitude QC Plot (Z)



• PP Amplitude (bit range) accepted for stack
 ○ PP Amplitude (bit range) rejected
 ◆ Acquisition Gain

Observer's Note (1/3)

Well depth [m]	Time	Shot Type	Shot#	Stack#	Source	Remarks
2250.0	11:44:55	SHOT	1	1	DualGunCluster	
2250.0	11:46:23	SHOT	2	1	DualGunCluster	Good
2250.0	11:46:43	SHOT	3	1	DualGunCluster	
2250.0	11:47:01	SHOT	4	1	DualGunCluster	Good
2250.0	11:47:22	SHOT	5	1	DualGunCluster	
2250.0	11:48:34	SHOT	6	1	DualGunCluster	Good
2250.0	11:48:53	SHOT	7	1	DualGunCluster	
2250.0	11:49:11	SHOT	8	1	DualGunCluster	
2250.0	11:49:29	SHOT	9	1	DualGunCluster	OK
2250.0	11:49:48	SHOT	10	1	DualGunCluster	Good
2240.0	11:54:00	SHAK	11			
2240.0	11:54:23	SHOT	12	2	DualGunCluster	
2240.0	11:54:41	SHOT	13	2	DualGunCluster	
2240.0	11:55:03	SHOT	14	2	DualGunCluster	
2240.0	11:55:25	SHOT	15	2	DualGunCluster	
2240.0	11:55:49	SHOT	16	2	DualGunCluster	
2240.0	11:56:14	SHOT	17	2	DualGunCluster	
2240.0	11:56:36	SHOT	18	2	DualGunCluster	
2240.0	11:57:14	SHOT	19	2	DualGunCluster	
2240.0	11:58:19	SHOT	20	2	DualGunCluster	OK
2240.0	11:58:37	SHOT	21	2	DualGunCluster	OK
2240.0	11:59:00	SHOT	22	2	DualGunCluster	
2240.0	11:59:21	SHOT	23	2	DualGunCluster	
2240.0	11:59:43	SHOT	24	2	DualGunCluster	
2240.0	12:00:24	SHOT	25	2	DualGunCluster	
2240.0	12:00:58	SHOT	26	2	DualGunCluster	
2240.0	12:01:34	SHOT	27	2	DualGunCluster	
2240.0	12:01:52	SHOT	28	2	DualGunCluster	
2230.0	12:06:25	SHOT	29	3	DualGunCluster	
2230.0	12:06:51	SHOT	30	3	DualGunCluster	
2230.0	12:07:39	SHOT	31	3	DualGunCluster	
2230.0	12:07:57	SHOT	32	3	DualGunCluster	
2230.0	12:08:15	SHOT	33	3	DualGunCluster	
2230.0	12:09:11	SHAK	34			
2230.0	12:09:31	BKGD	35			
2230.0	12:09:40	SHOT	36	3	DualGunCluster	ok
2230.0	12:10:08	SHOT	37	3	DualGunCluster	ok
2230.0	12:10:45	SHOT	38	3	DualGunCluster	
2230.0	12:11:12	SHOT	39	3	DualGunCluster	
2230.0	12:11:35	SHOT	40	3	DualGunCluster	
2230.0	12:11:53	SHOT	41	3	DualGunCluster	
2230.0	12:12:11	SHOT	42	3	DualGunCluster	
2230.0	12:12:29	SHOT	43	3	DualGunCluster	
2230.0	12:12:47	SHOT	44	3	DualGunCluster	
2230.0	12:13:05	SHOT	45	3	DualGunCluster	
2230.0	12:13:42	SHOT	46	3	DualGunCluster	
2230.0	12:14:54	SHOT	47	3	DualGunCluster	
2220.0	12:19:16	SHOT	48	4	DualGunCluster	
2220.0	12:19:34	SHOT	49	4	DualGunCluster	Good
2220.0	12:19:53	SHOT	50	4	DualGunCluster	
2220.0	12:20:11	SHOT	51	4	DualGunCluster	
2220.0	12:20:29	SHOT	52	4	DualGunCluster	
2220.0	12:21:30	SHAK	53			
2220.0	12:21:56	SHOT	54	4	DualGunCluster	
2220.0	12:22:22	SHOT	55	4	DualGunCluster	
2220.0	12:22:40	SHOT	56	4	DualGunCluster	
2220.0	12:22:58	SHOT	57	4	DualGunCluster	
2220.0	12:23:16	SHOT	58	4	DualGunCluster	
2220.0	12:23:34	SHOT	59	4	DualGunCluster	OK

Observer's Note (2/3)

Well depth [m]	Time	Shot Type	Shot#	Stack#	Source	Remarks
2220.0	12:24:55	SHOT	60	4	DualGunCluster	
2220.0	12:26:55	SHOT	61	4	DualGunCluster	
2220.0	12:27:26	SHOT	62	4	DualGunCluster	
2210.0	12:33:36	SHOT	63	5	DualGunCluster	
2210.0	12:33:54	SHOT	64	5	DualGunCluster	Maybe
2210.0	12:34:24	SHOT	65	5	DualGunCluster	
2210.0	12:34:58	SHOT	66	5	DualGunCluster	
2210.0	12:35:16	SHOT	67	5	DualGunCluster	
2210.0	12:35:34	SHOT	68	5	DualGunCluster	
2210.0	12:35:55	SHOT	69	5	DualGunCluster	
2210.0	12:36:38	SHOT	70	5	DualGunCluster	
2210.0	12:36:56	SHOT	71	5	DualGunCluster	
2210.0	12:37:14	SHOT	72	5	DualGunCluster	
2210.0	12:37:37	SHOT	73	5	DualGunCluster	Good
2210.0	12:38:18	SHOT	74	5	DualGunCluster	
2210.0	12:38:36	SHOT	75	5	DualGunCluster	
2210.0	12:38:56	SHOT	76	5	DualGunCluster	
2210.0	12:39:14	SHOT	77	5	DualGunCluster	
2200.0	12:45:06	SHOT	78	6	DualGunCluster	Good
2200.0	12:45:25	SHOT	79	6	DualGunCluster	OK
2200.0	12:45:43	SHOT	80	6	DualGunCluster	
2200.0	12:46:01	SHOT	81	6	DualGunCluster	
2200.0	12:46:21	SHOT	82	6	DualGunCluster	
2200.0	12:46:39	SHOT	83	6	DualGunCluster	
2200.0	12:46:57	SHOT	84	6	DualGunCluster	
2200.0	12:47:15	SHOT	85	6	DualGunCluster	
2200.0	12:47:33	SHOT	86	6	DualGunCluster	Good
2190.0	12:52:47	SHOT	87	7	DualGunCluster	
2190.0	12:53:05	SHOT	88	7	DualGunCluster	
2190.0	12:53:23	SHOT	89	7	DualGunCluster	
2190.0	12:53:41	SHOT	90	7	DualGunCluster	
2190.0	12:53:59	SHOT	91	7	DualGunCluster	Good
2190.0	12:54:56	SHOT	92	7	DualGunCluster	Good
2190.0	12:55:16	SHOT	93	7	DualGunCluster	Good
2190.0	12:55:34	SHOT	94	7	DualGunCluster	Good
2190.0	12:55:52	SHOT	95	7	DualGunCluster	
2190.0	12:56:10	SHOT	96	7	DualGunCluster	
2180.0	13:02:00	SHOT	97	8	DualGunCluster	
2180.0	13:02:46	SHOT	98	8	DualGunCluster	
2180.0	13:03:05	SHOT	99	8	DualGunCluster	
2180.0	13:04:10	SHOT	100	8	DualGunCluster	
2180.0	13:04:28	SHOT	101	8	DualGunCluster	
2180.0	13:04:46	SHOT	102	8	DualGunCluster	
2180.0	13:05:09	SHOT	103	8	DualGunCluster	
2180.0	13:05:29	SHOT	104	8	DualGunCluster	Good
2180.0	13:06:32	SHAK	105			
2180.0	13:06:54	SHOT	106	8	DualGunCluster	
2180.0	13:07:59	SHOT	107	8	DualGunCluster	
2180.0	13:10:01	SHOT	108	8	DualGunCluster	
2180.0	13:10:46	SHOT	109	8	DualGunCluster	Good
2180.0	13:11:45	SHOT	110	8	DualGunCluster	
2180.0	13:12:04	SHOT	111	8	DualGunCluster	Good
2150.0	13:24:50	SHOT	112	9	DualGunCluster	
2150.0	13:25:08	SHOT	113	9	DualGunCluster	
2150.0	13:25:45	SHOT	114	9	DualGunCluster	
2150.0	13:26:03	SHOT	115	9	DualGunCluster	
2150.0	13:26:21	SHOT	116	9	DualGunCluster	
2140.0	13:30:30	SHOT	117	10	DualGunCluster	
2140.0	13:30:48	SHOT	118	10	DualGunCluster	

Observer's Note (3/3)

Well depth [m]	Time	Shot Type	Shot#	Stack#	Source	Remarks
2140.0	13:31:06	SHOT	119	10	DualGunCluster	
2140.0	13:31:34	SHOT	120	10	DualGunCluster	
2140.0	13:31:52	SHOT	121	10	DualGunCluster	
2130.0	13:35:57	SHAK	122			
2130.0	13:36:16	BKGD	123			
2130.0	13:36:26	SHOT	124	11	DualGunCluster	
2130.0	13:36:44	SHOT	125	11	DualGunCluster	
2130.0	13:37:02	SHOT	126	11	DualGunCluster	
2130.0	13:37:20	SHOT	127	11	DualGunCluster	
2130.0	13:37:40	SHOT	128	11	DualGunCluster	