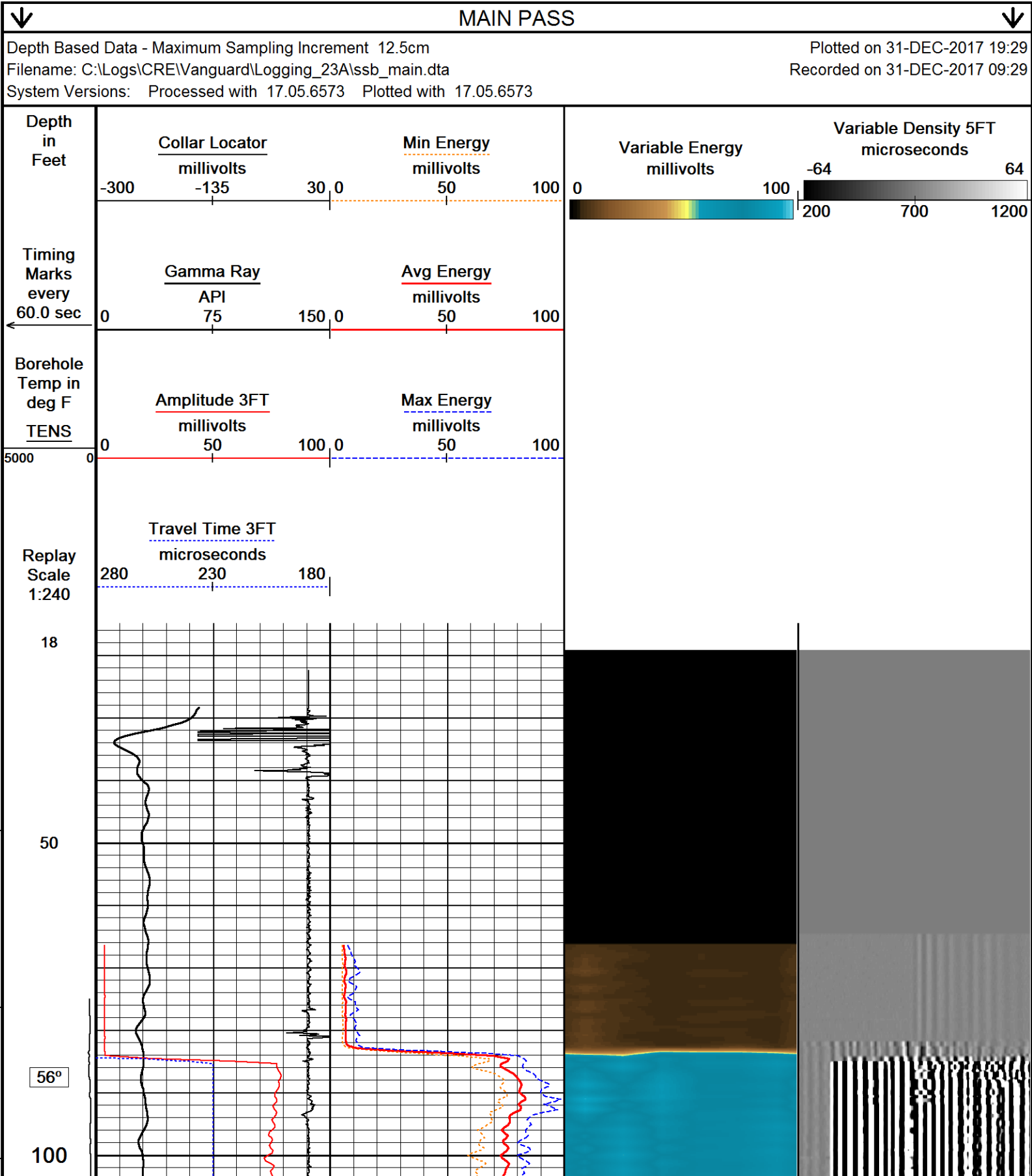
 Weatherford®			SECTOR BOND LOG		
COMPANY WELL FIELD PROVINCE/COUNTY COUNTRY/STATE LOCATION			VANGUARD OPERATING LLC. FEDERAL GGU 23A-28-691 MAMM CREEK GARFIELD U.S.A./COLORADO		
SEC 28	TWP 6S	RGE 91W	Other Services		
Latitude			RAPTOR		
Longitude			PRESSURE		
API Number	05-045-23534		TEMPERATURE		
Permanent Datum :Ground Level, Elevation 6130.6 feet			Elevations:		
Log Measured From KB, 17.00 feet above Permanent Datum			KB 6147.60		
Drilling Measured From KB			DF 6130.60		
			GL 6130.60		
Date	31-DEC-2017		PERFORATION RECORD		
Run Number	ONE		Shot	Number	Depth From
Service Order	5839-201849832		Density	of Shots	Depth To
Type Log	CRE				
Depth Driller	7665.00				
Depth Logger	7616.00				
Top Log Interval	0.00				
Bottom Log Interval	7605.08				
Hole Fluid Type	WATER				
Hole Fluid Level	83.70				
Restriction ID	4.000				
Max Recorded Temp	211.00		Gun Type		
Well Head Pressure	0.00		Gun Size		
Well Head Equipment	PackOff		CASING / TUBING RECORD		
Time Well Ready	0700		Size	Weight	Depth From
Time Logger Bottom	0800		inches	pounds/ft	Depth To
Unit	14115/15108		8.625	32.00	0.00
Equipment Name	CRE-SSB		4.500	11.60	0.00
Base	CASPER, WY				
Recorded By	A. TAYLOR				
Witnessed By	R. SNOW				

CASING / TUBING RECORD						
Type	Grade	TypeJoint	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
			8.625	0.00	827.00	32.00
	HCP-110		4.500	0.00	7665.00	11.60

REMARKS
<p>Logged with WLS v 17.05.6573 via WSS-E</p> <p>Intervals logged and presented at clients request.</p> <p>Low logging speed adversely affect CCL downhole. Low logging speed required for CRE/Raptor logging in NVision mode.</p> <p>Bond log logged in combination with CRE/Raptor from TD to 3700'. Bond log logged without CRE/Raptor from 3700' to end of interval without CRE/Raptor energized.</p> <p>Depth correlated to marker joint at 7488.4' from log supplied on location (RMWS Temperature/GR/CCL Log; 12-07-2017)</p> <p>Sector bond tool ran in combination with CRE/Raptor.</p> <p>Gamma Ray measurements and repeatability adversely affected by presence of operational pulsed neutron tool (CRE/Raptor). This is not indicative of a malfunctioning tool.</p>

In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and

interpretations, are opinions based on inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.



56°

150

56°

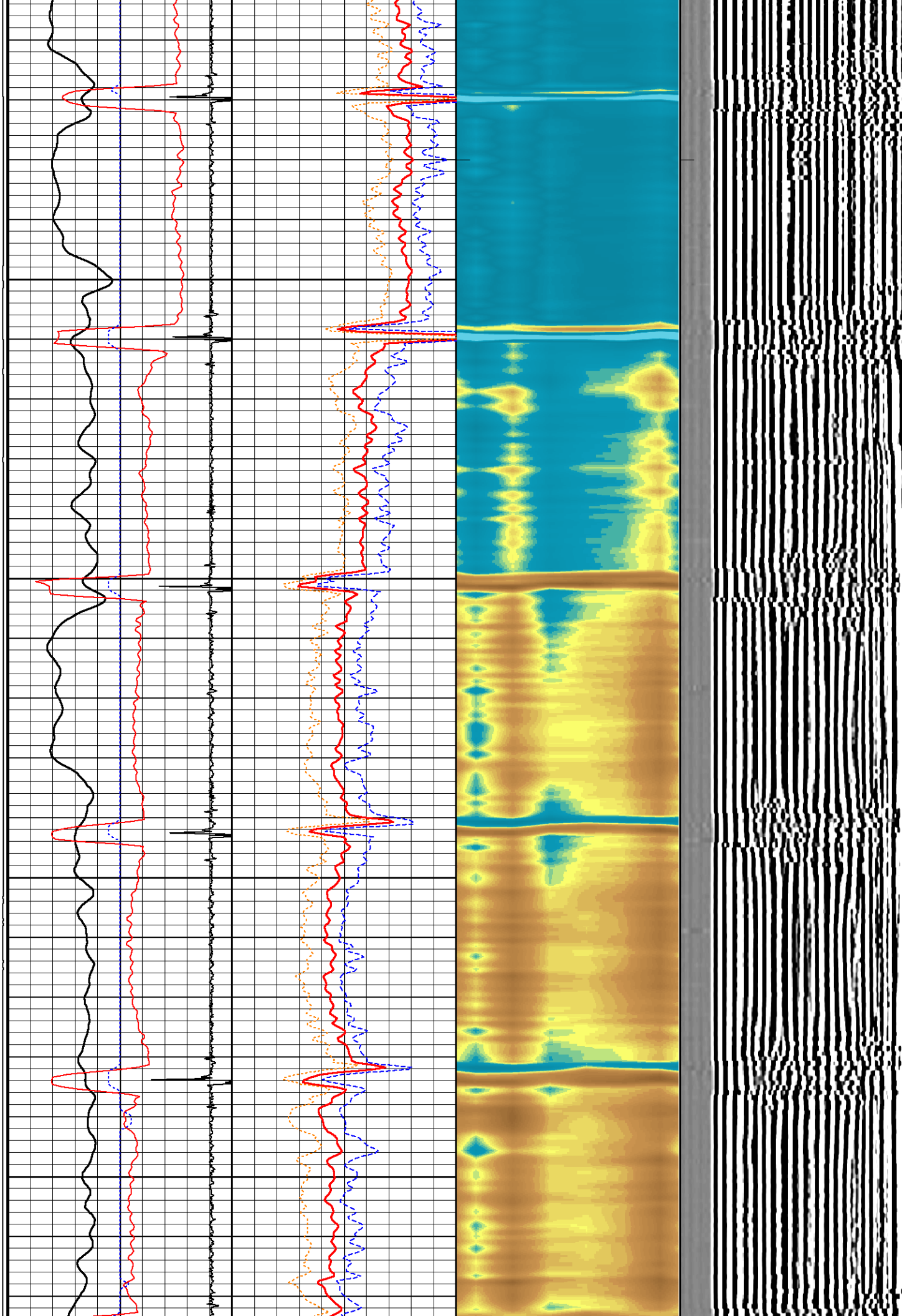
200

57°

250

58°

300



59°

350

60°

400

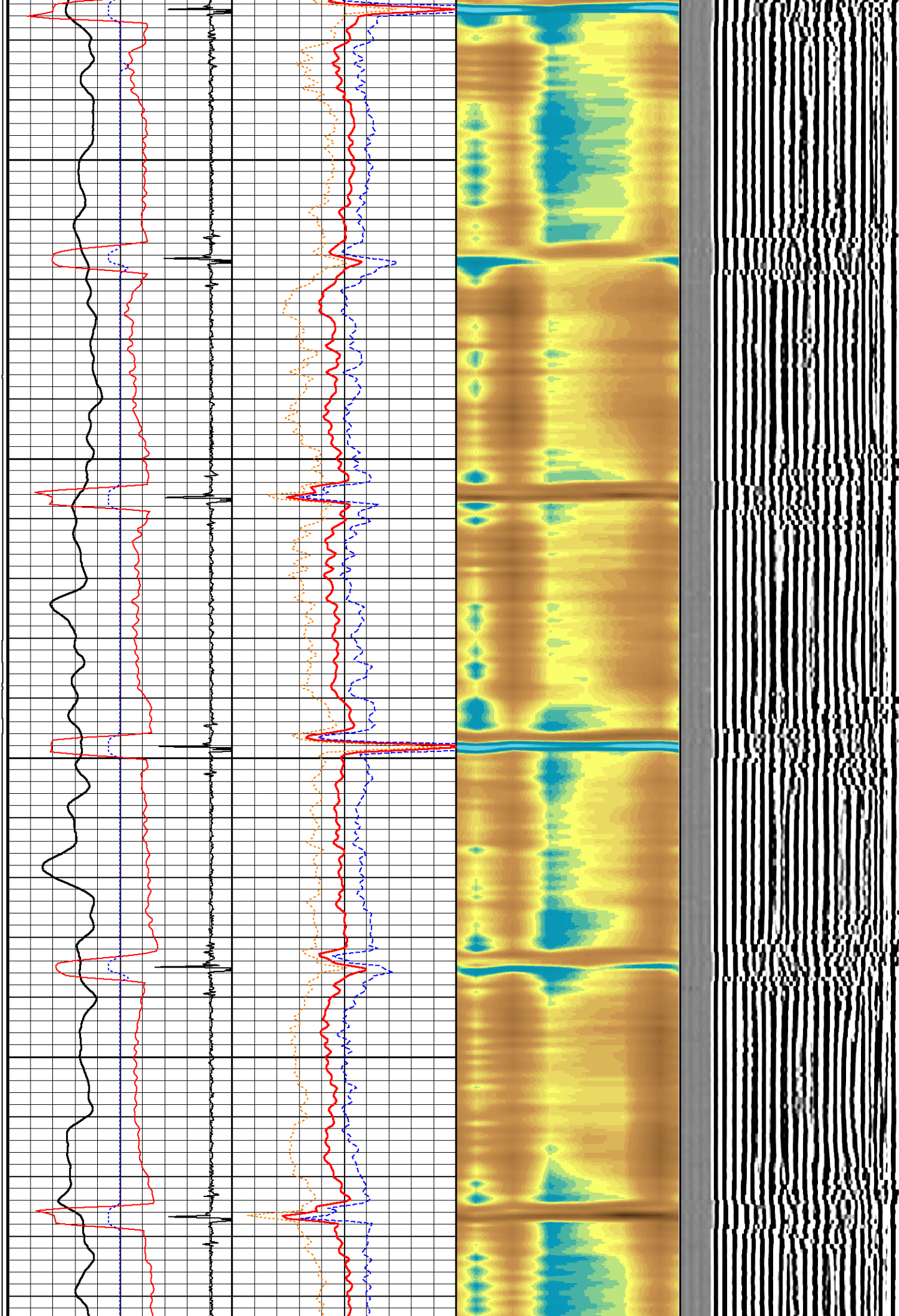
61°

450

62°

500

63°



550

63°

600

64°

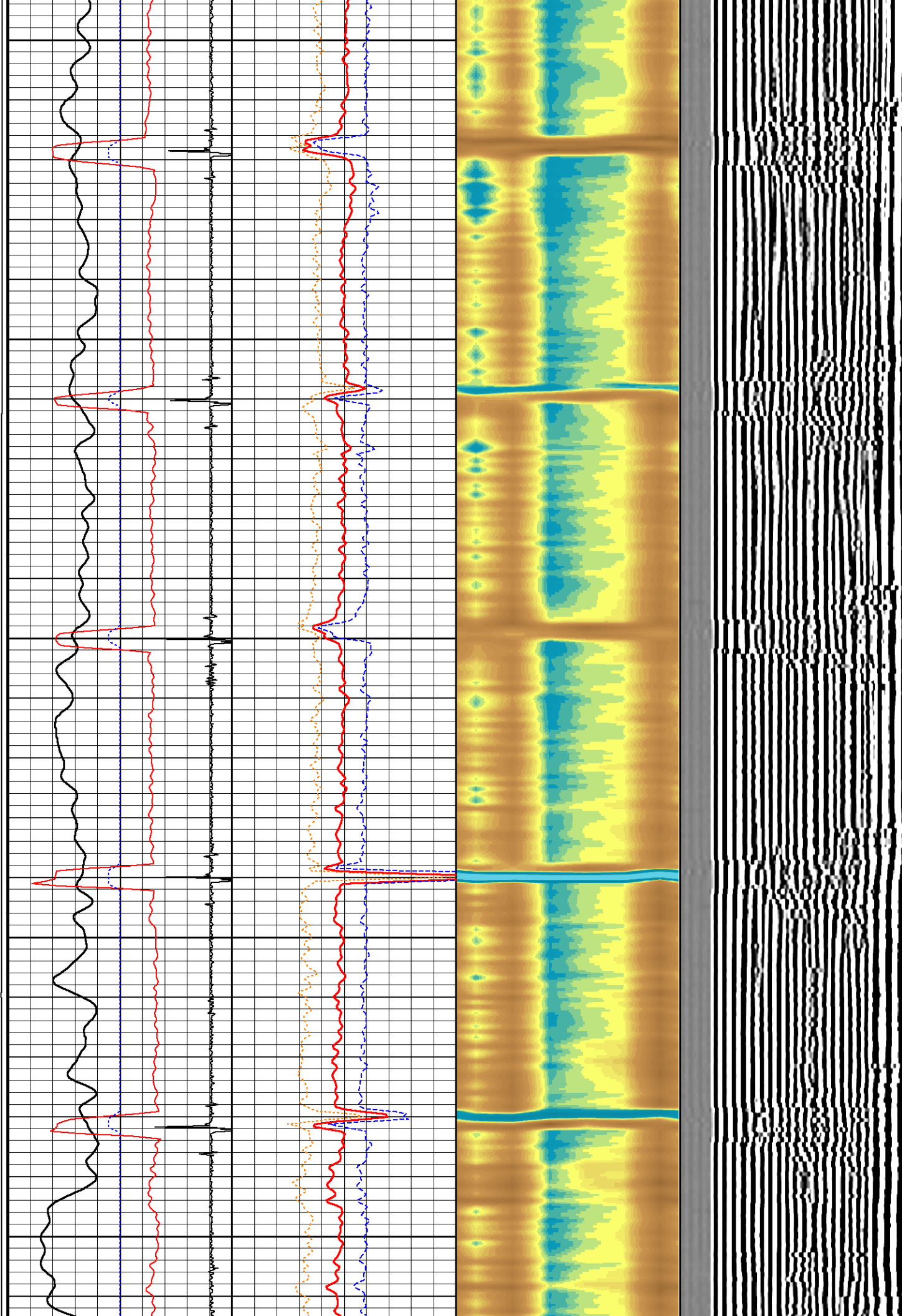
650

65°

700

66°

750



67°

800

68°

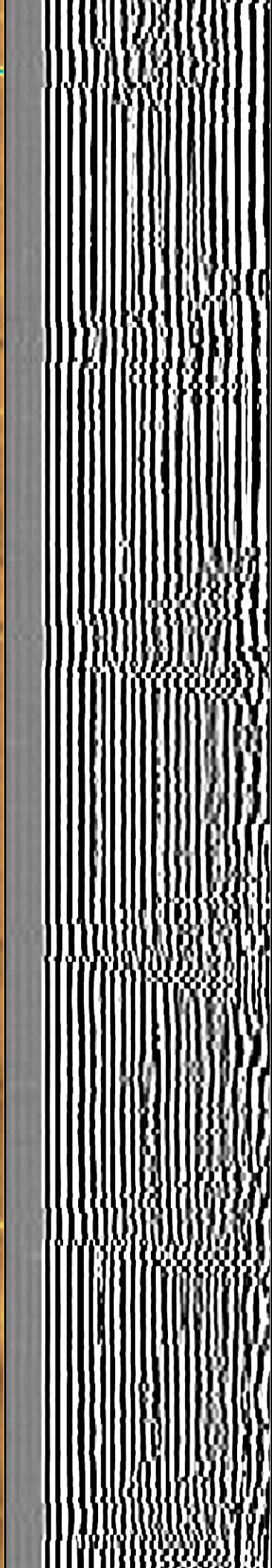
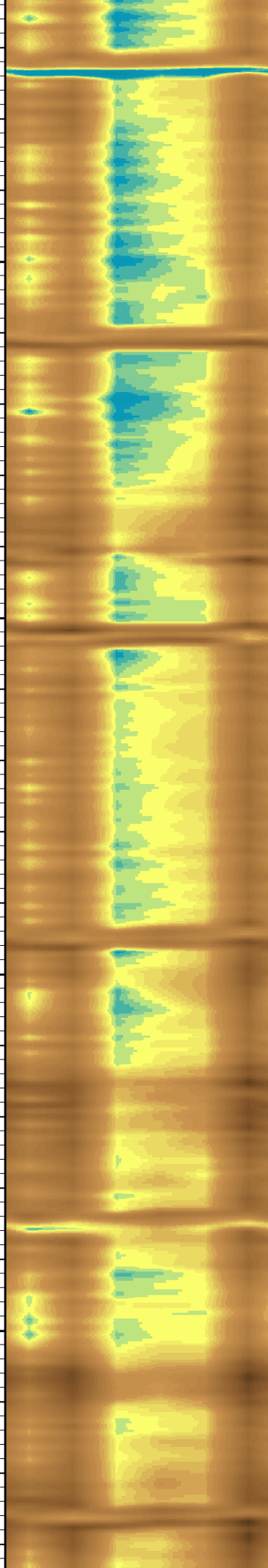
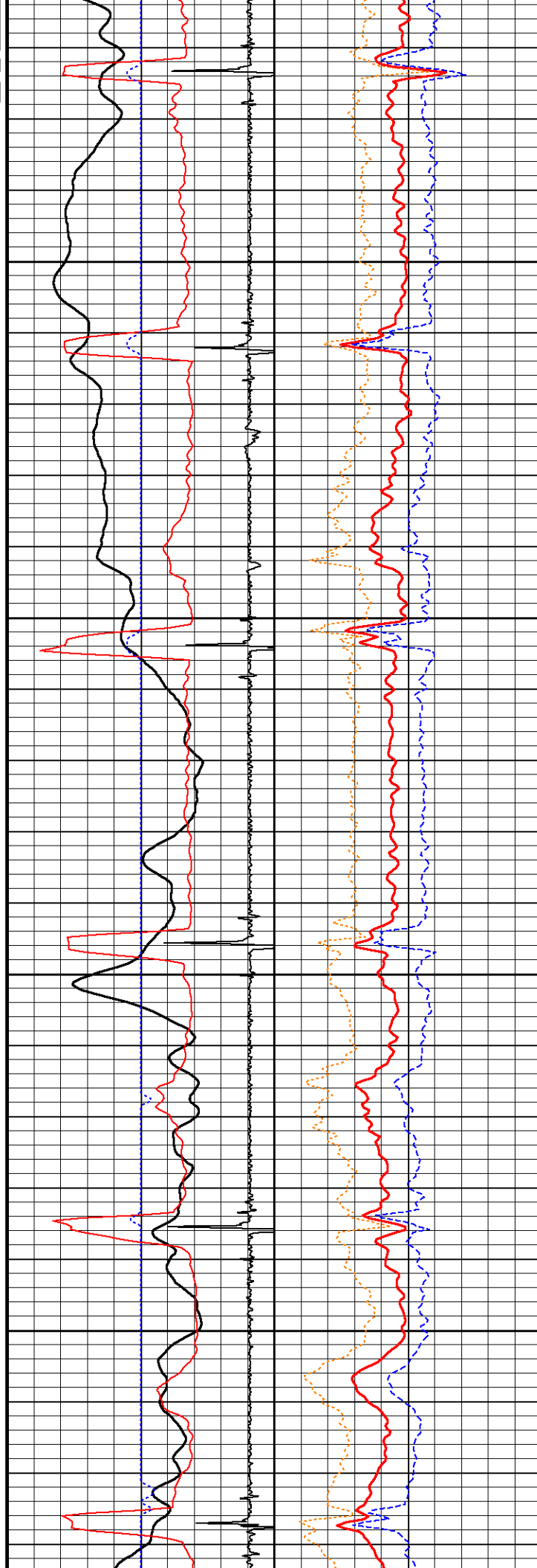
850

69°

900

70°

950



71°

1000

72°

1050

73°

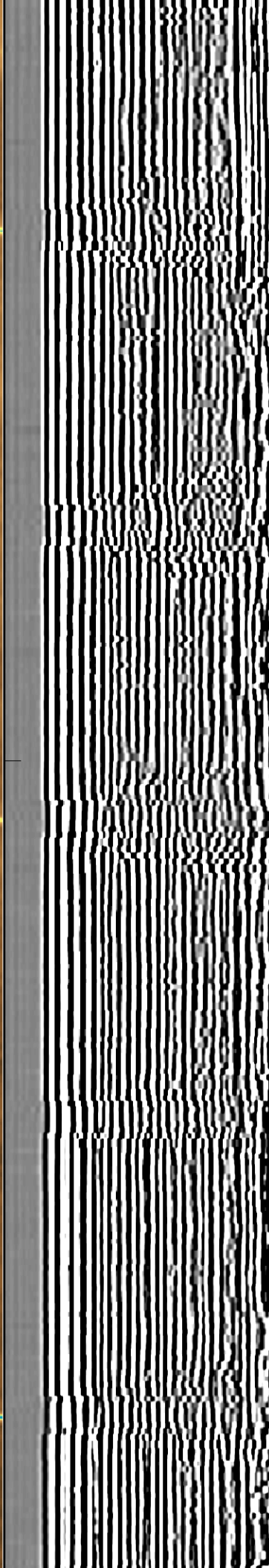
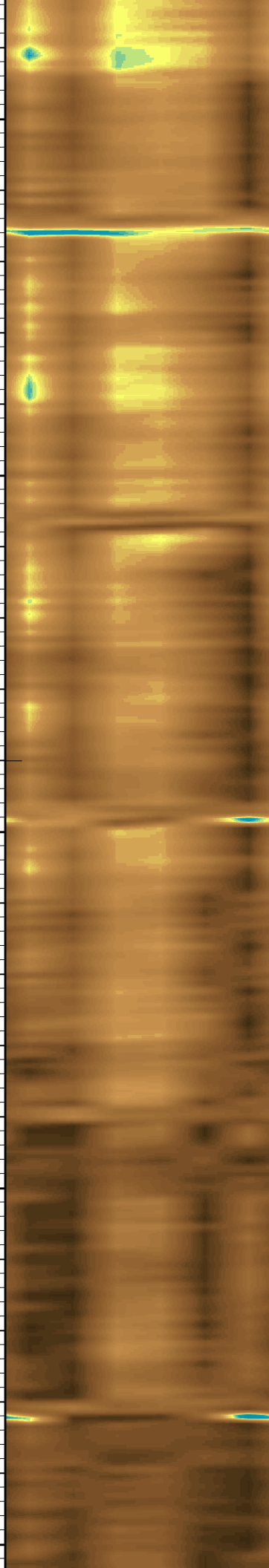
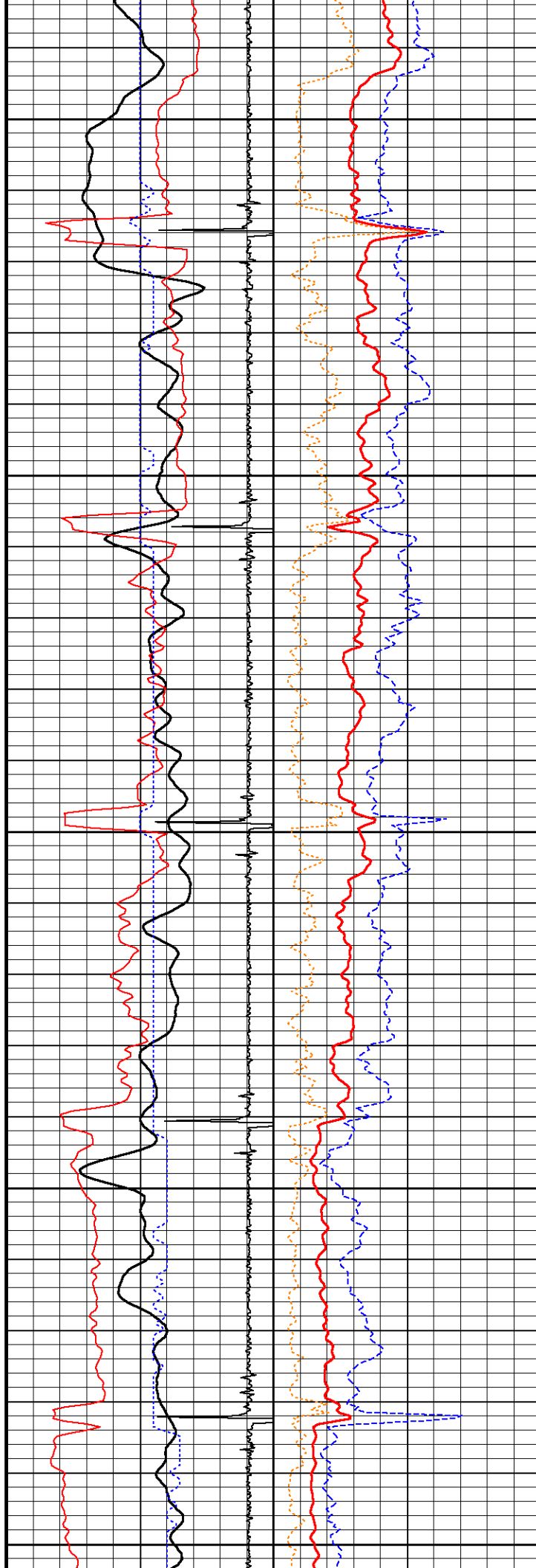
1100

74°

1150

75°

1200



75°

1250

76°

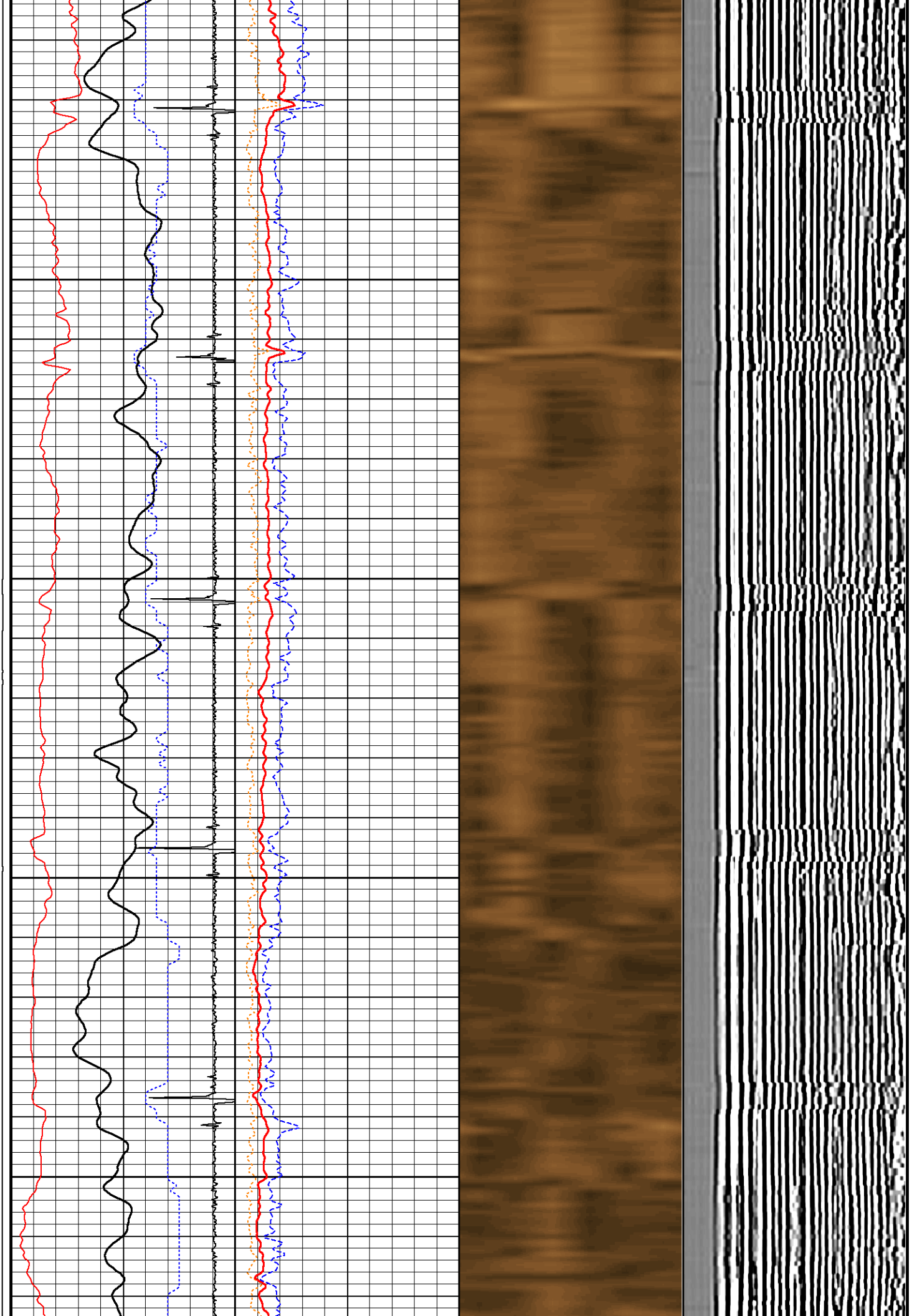
1300

77°

1350

78°

1400



79°

1450

79°

1500

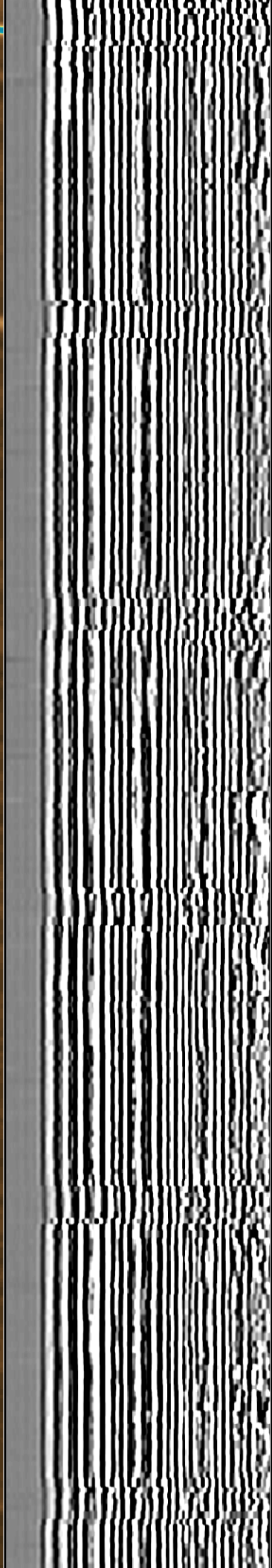
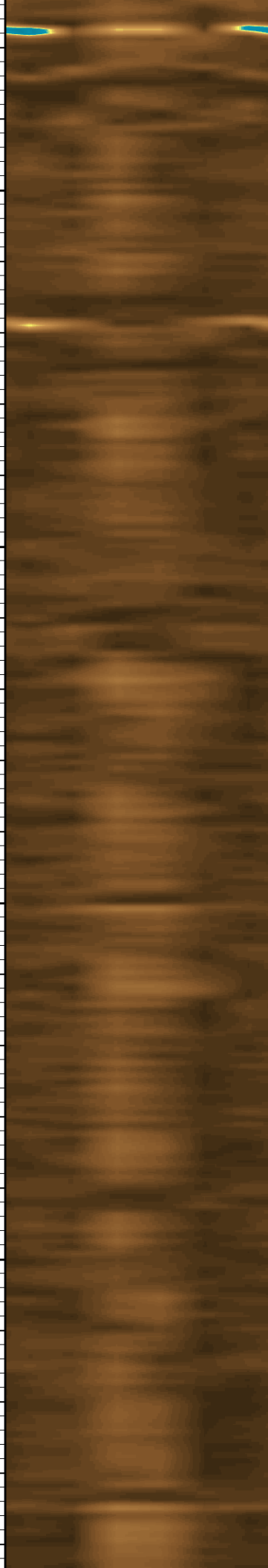
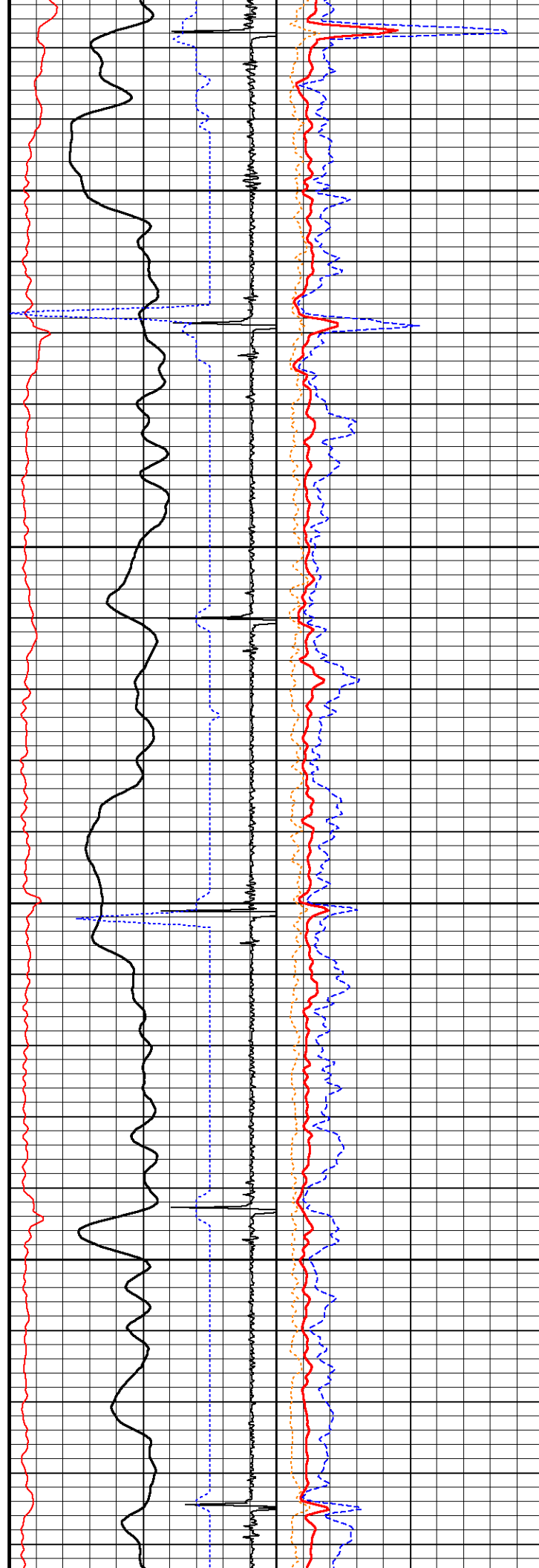
80°

1550

81°

1600

82°



1650

83°

1700

83°

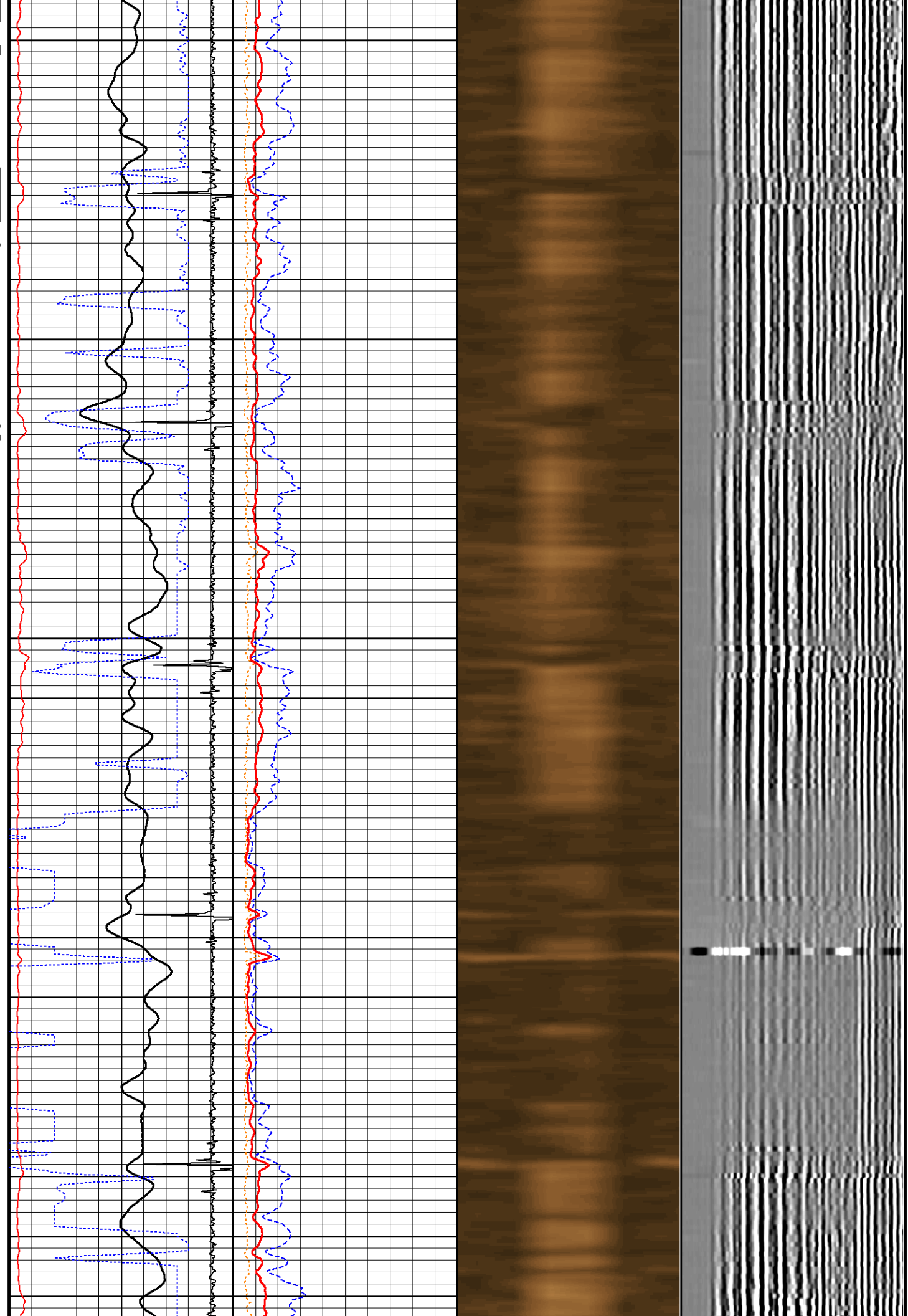
1750

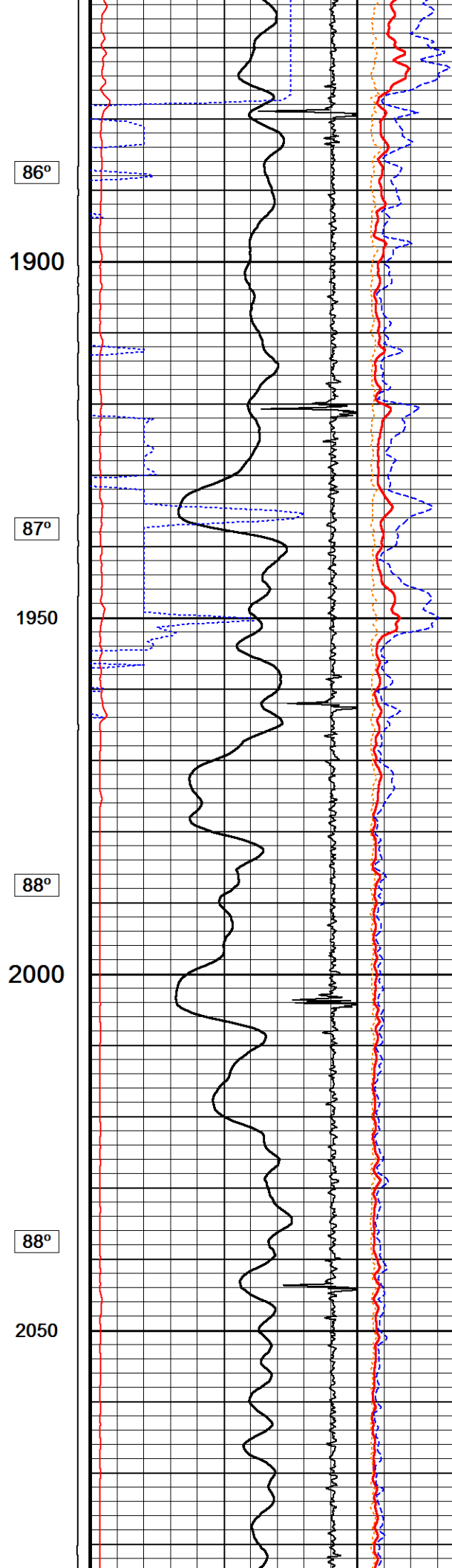
84°

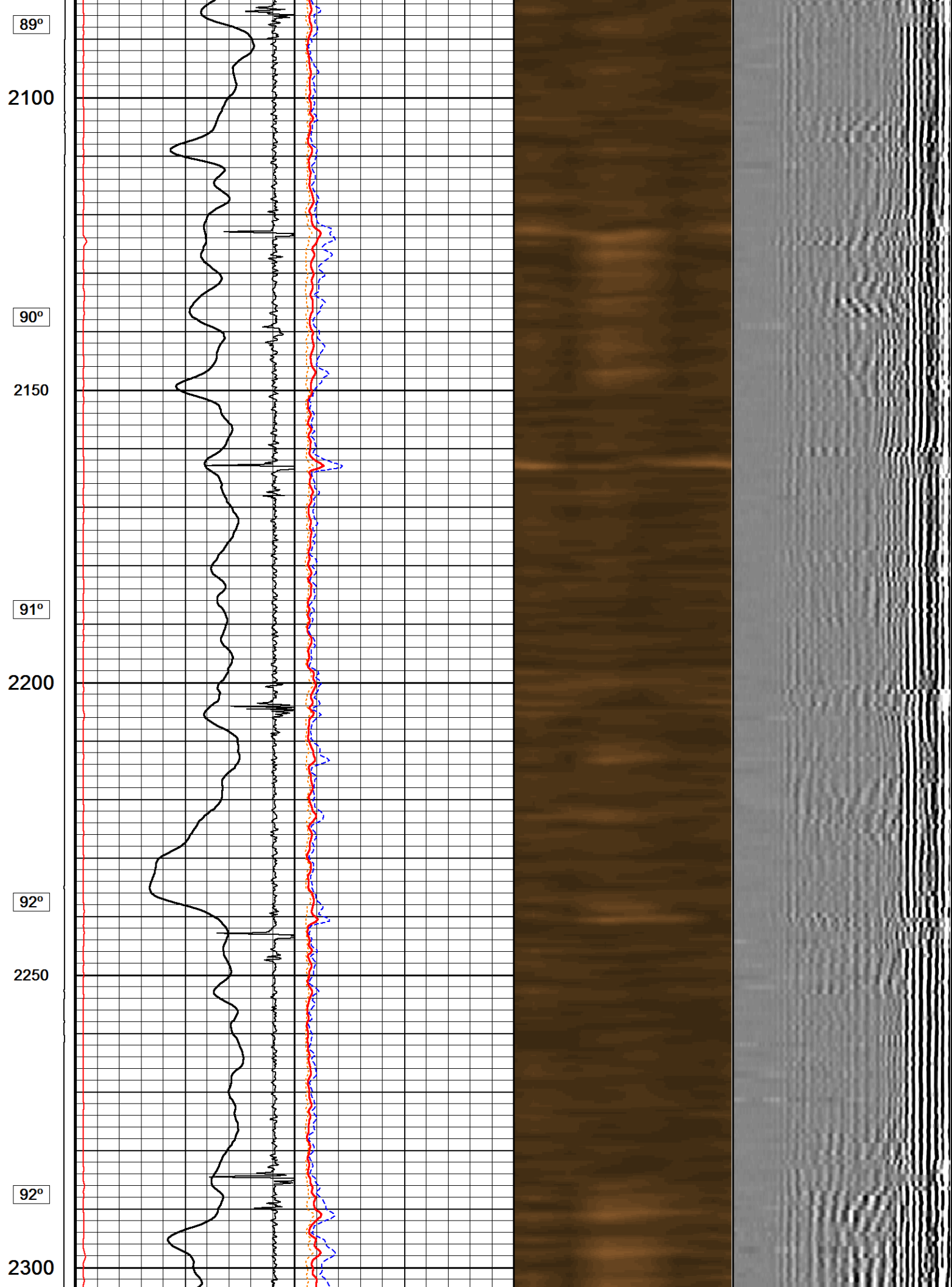
1800

85°

1850







93°

2350

94°

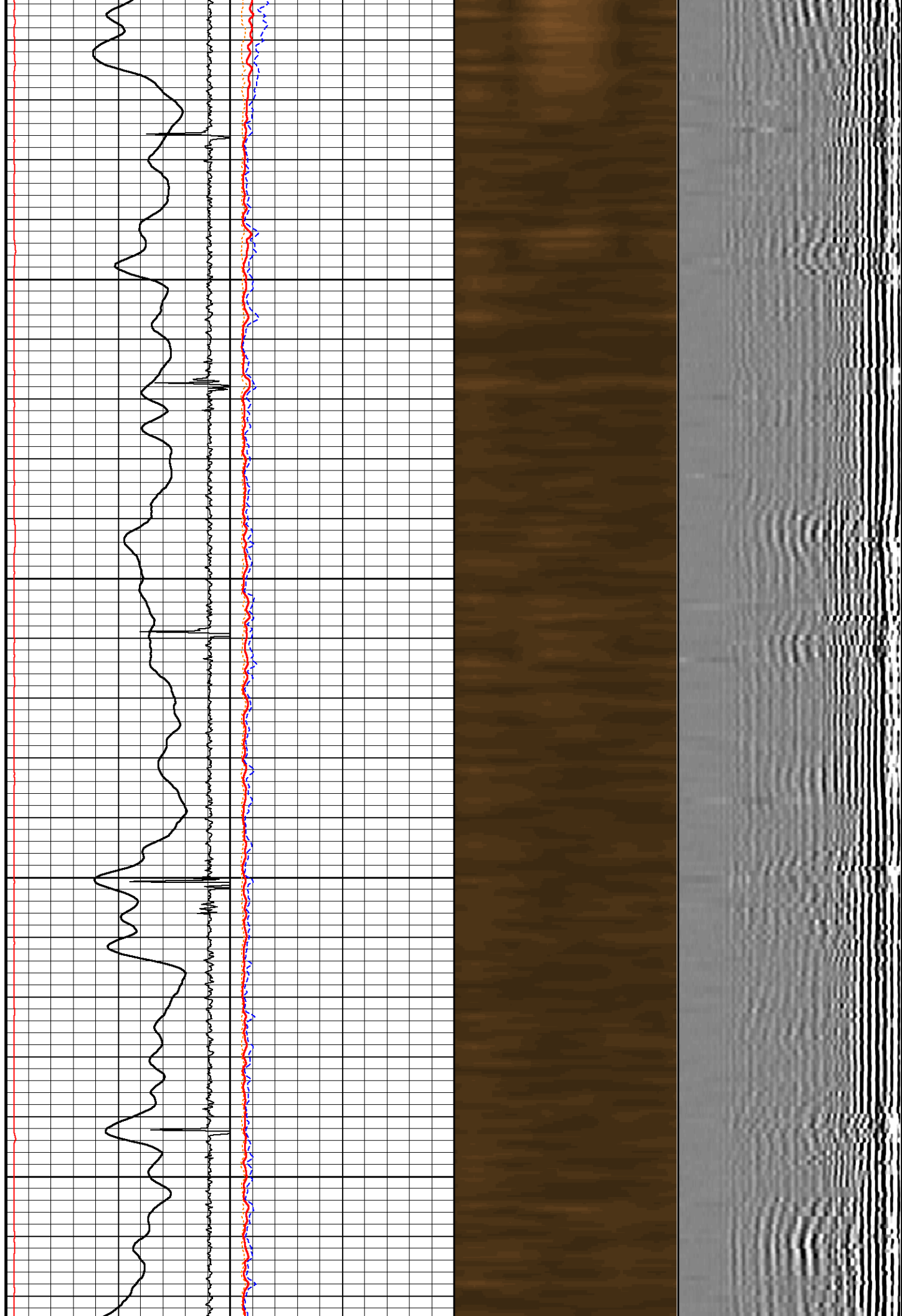
2400

95°

2450

96°

2500



96°

2550

97°

2600

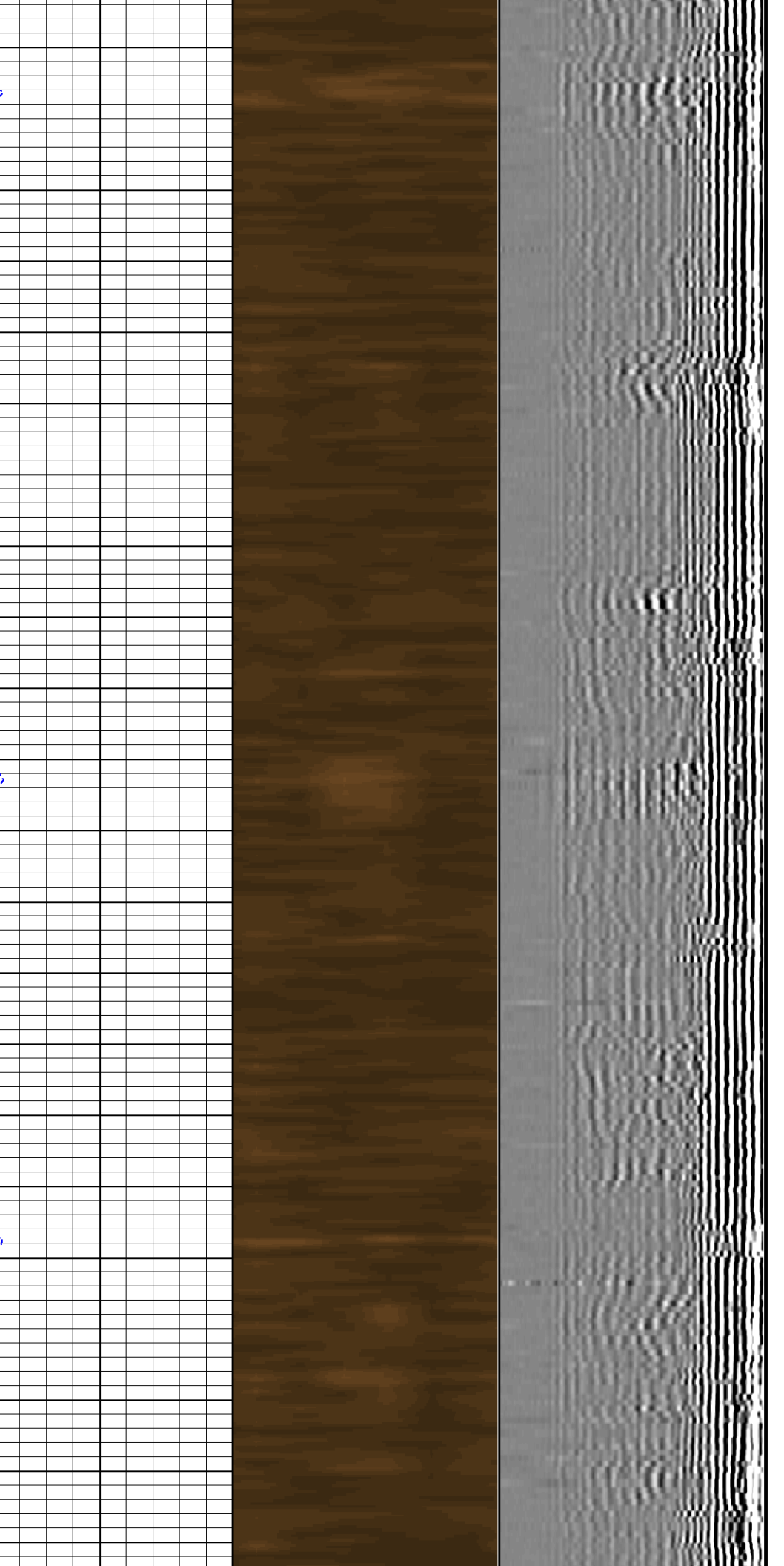
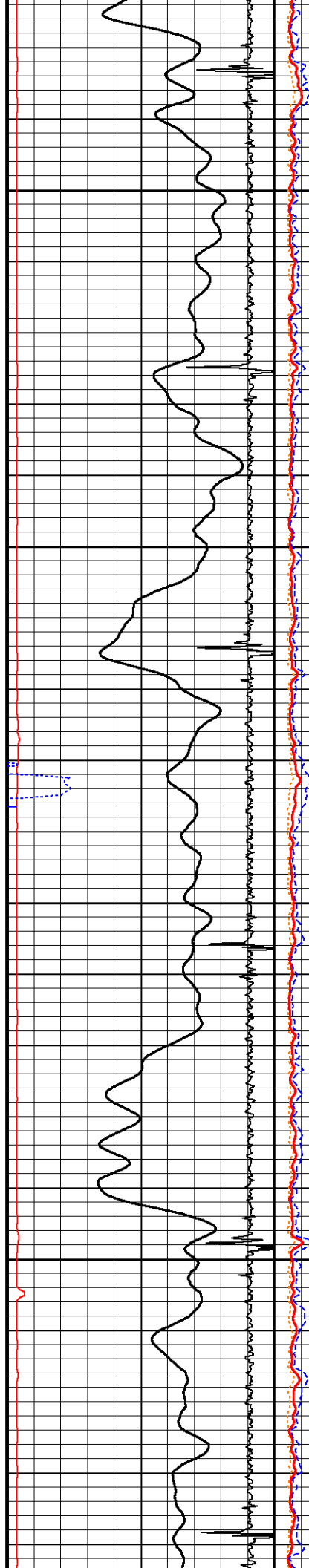
98°

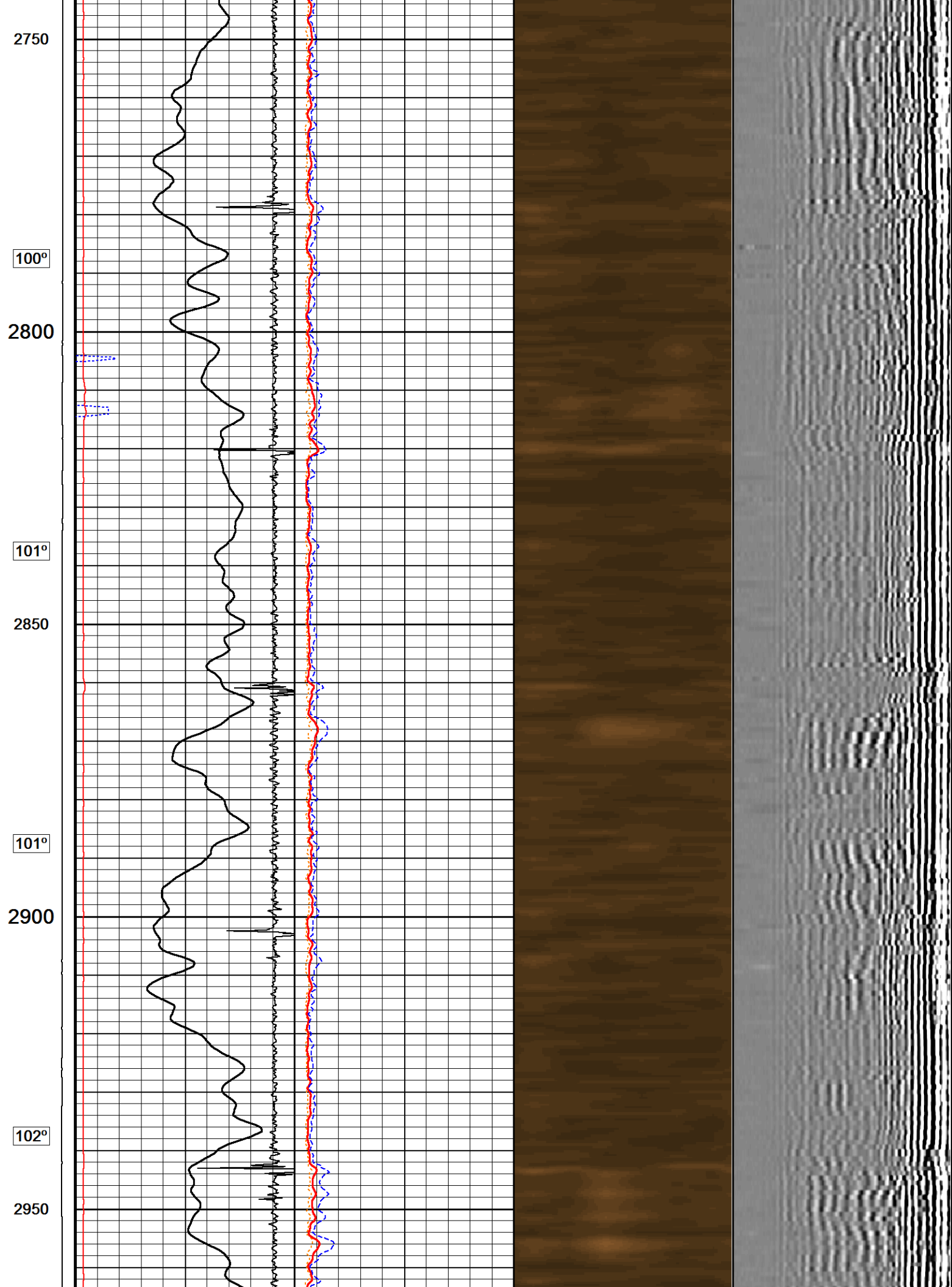
2650

98°

2700

99°





103°

3000

104°

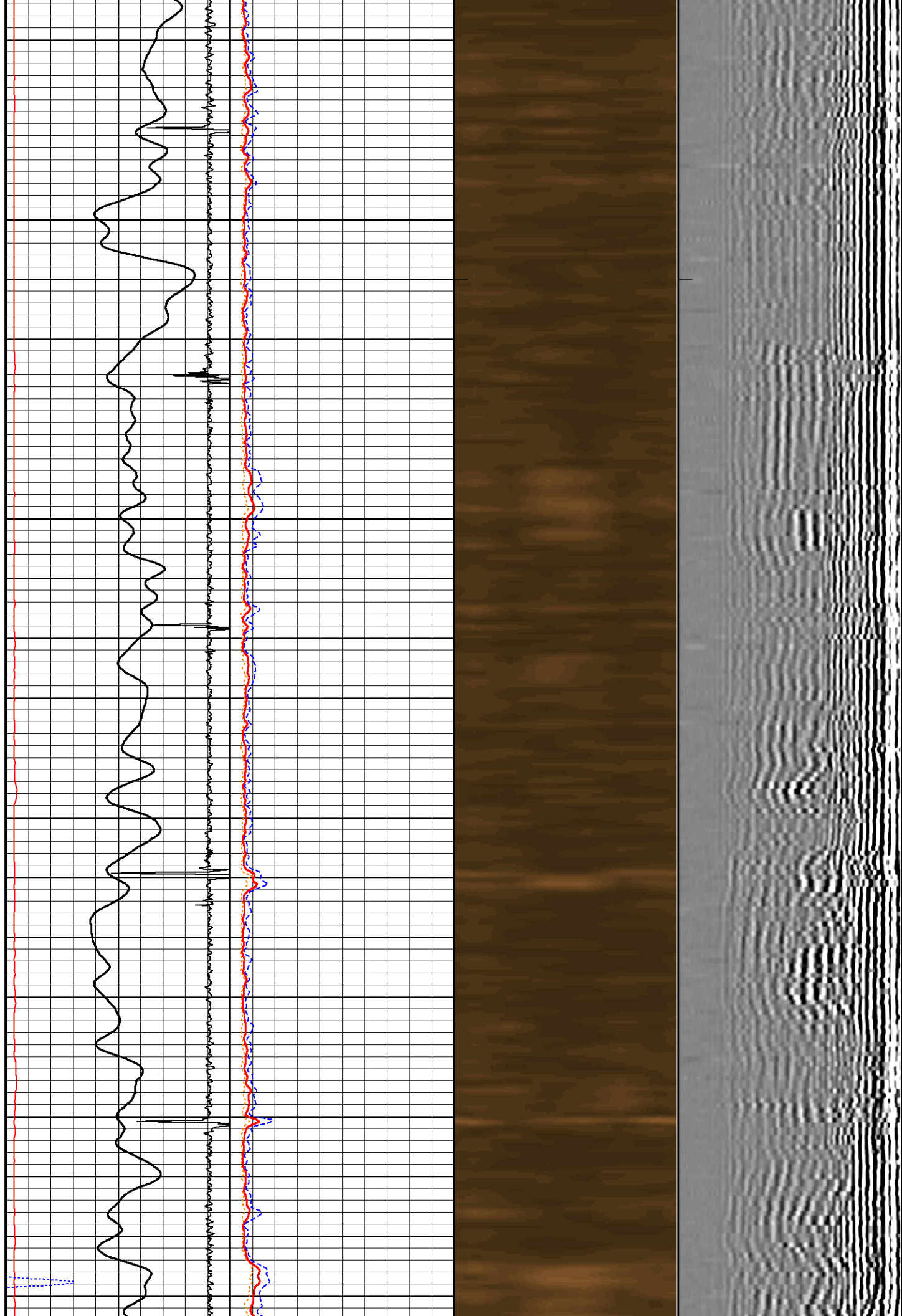
3050

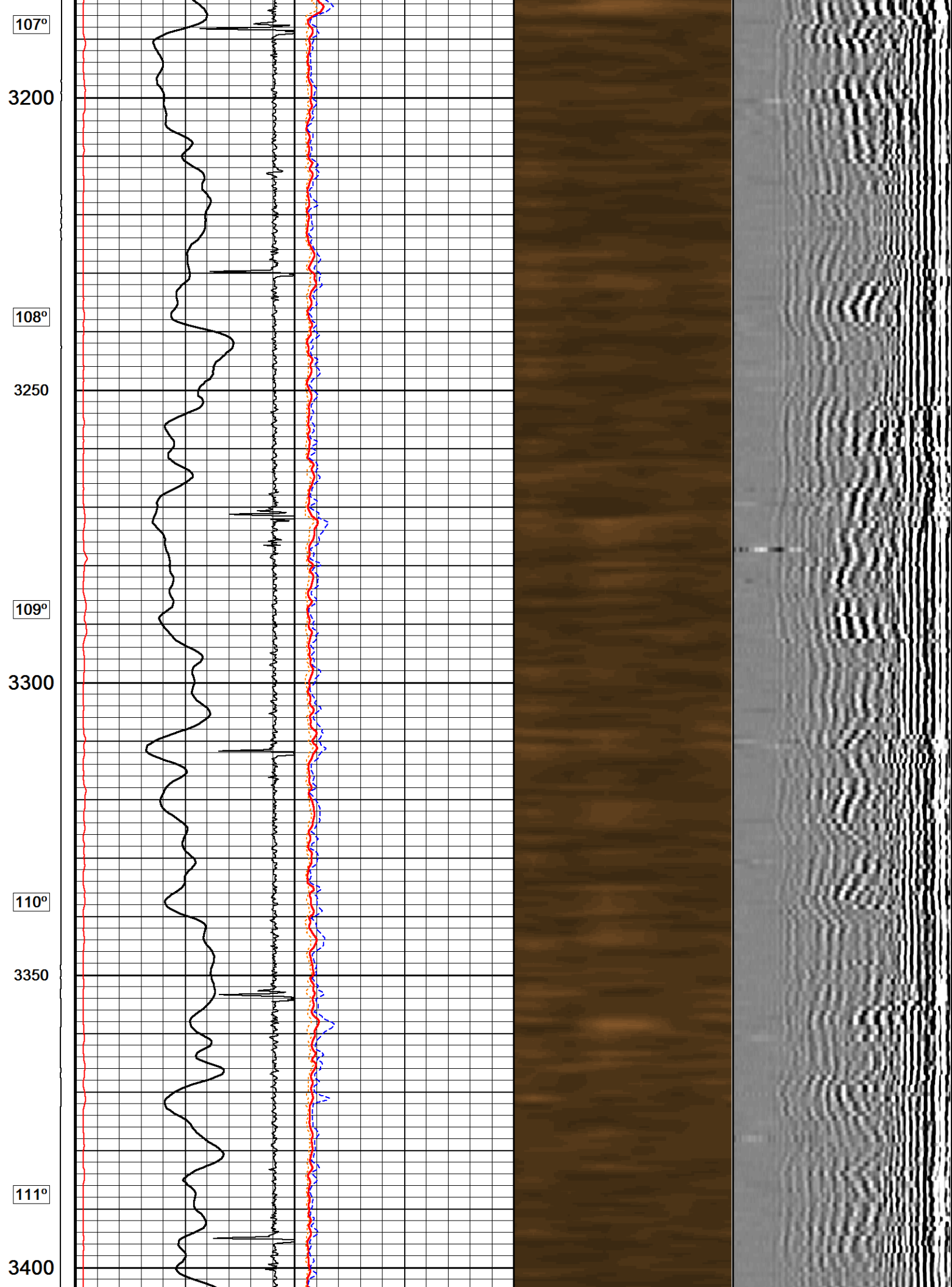
105°

3100

106°

3150





112°

3450

113°

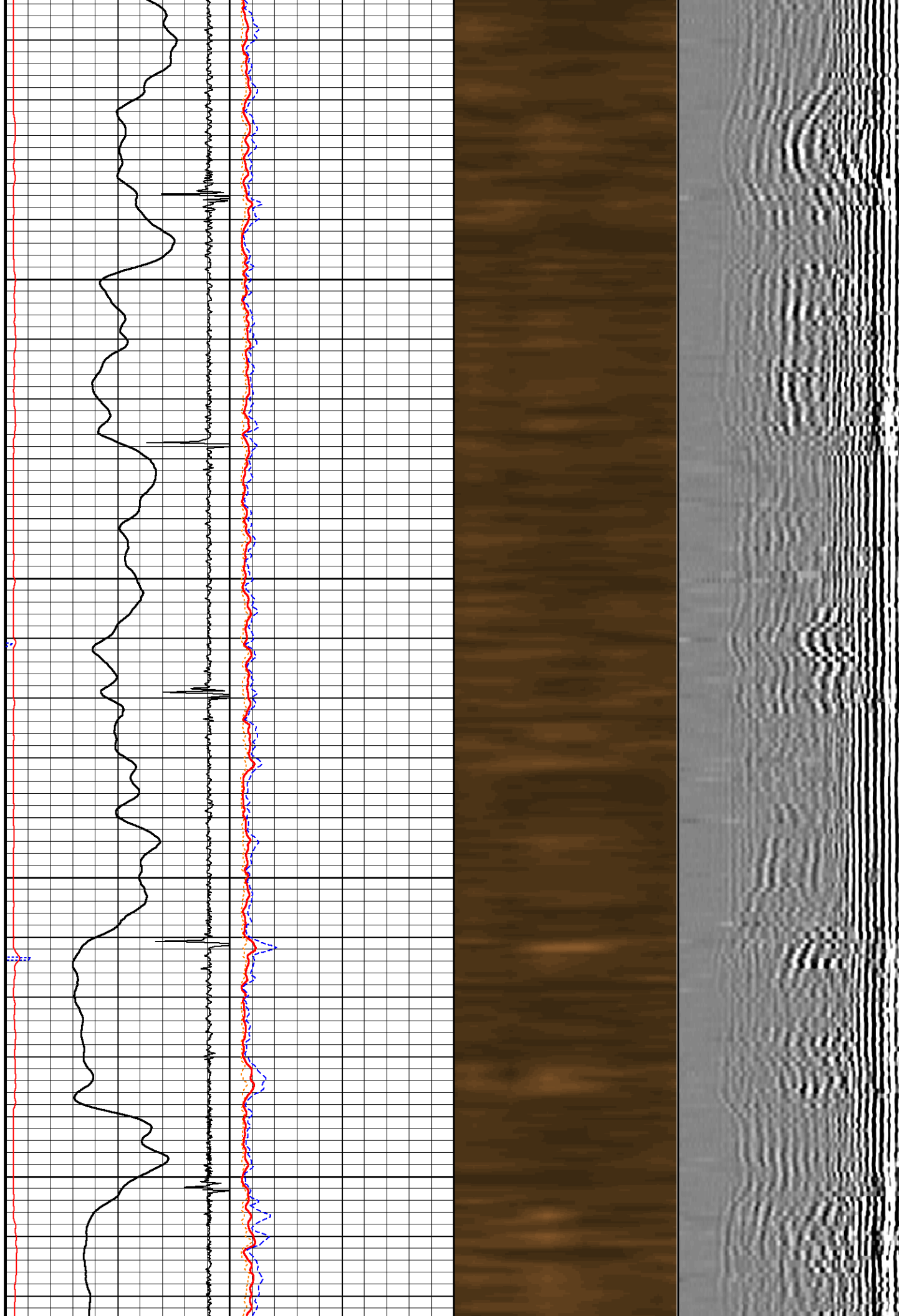
3500

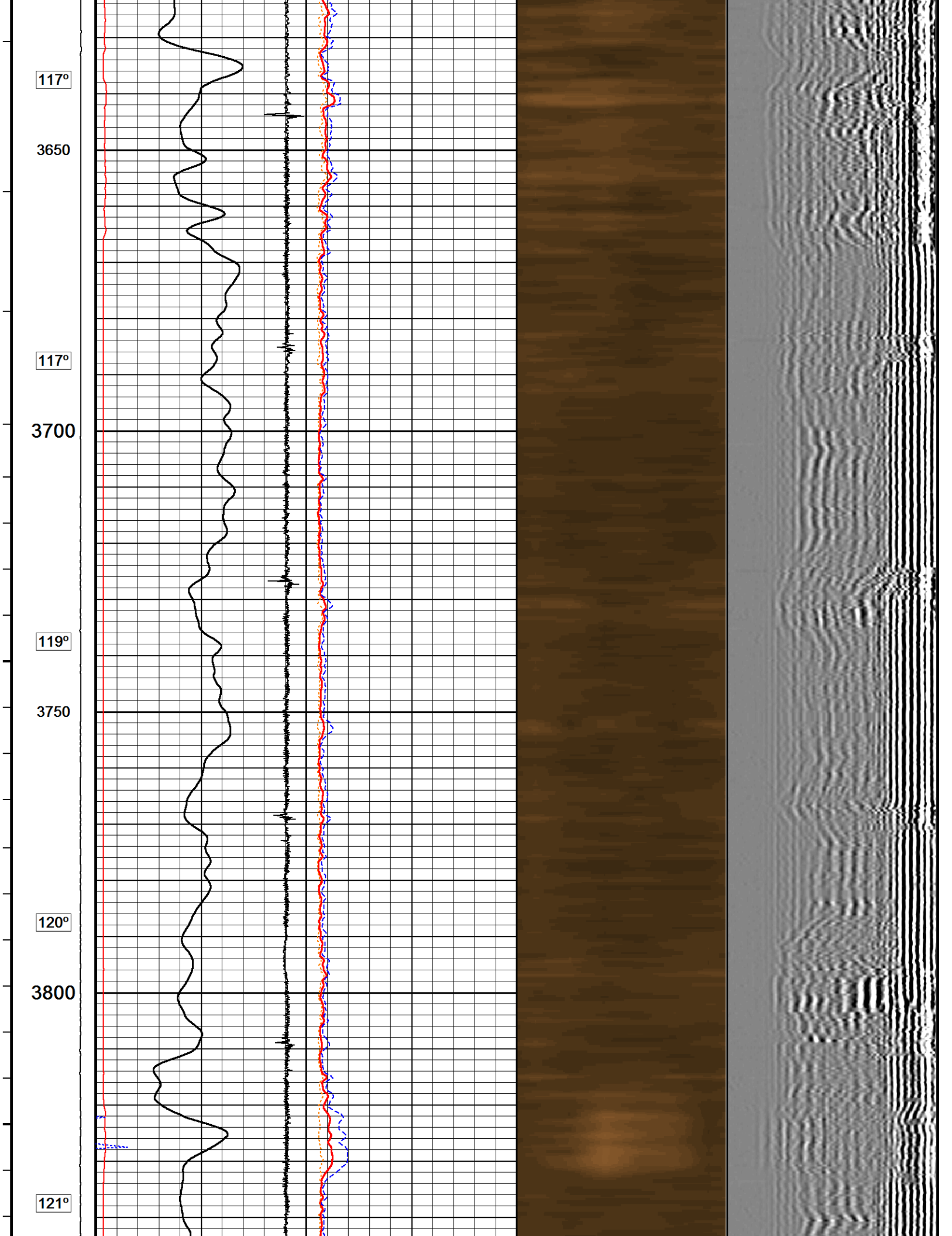
114°

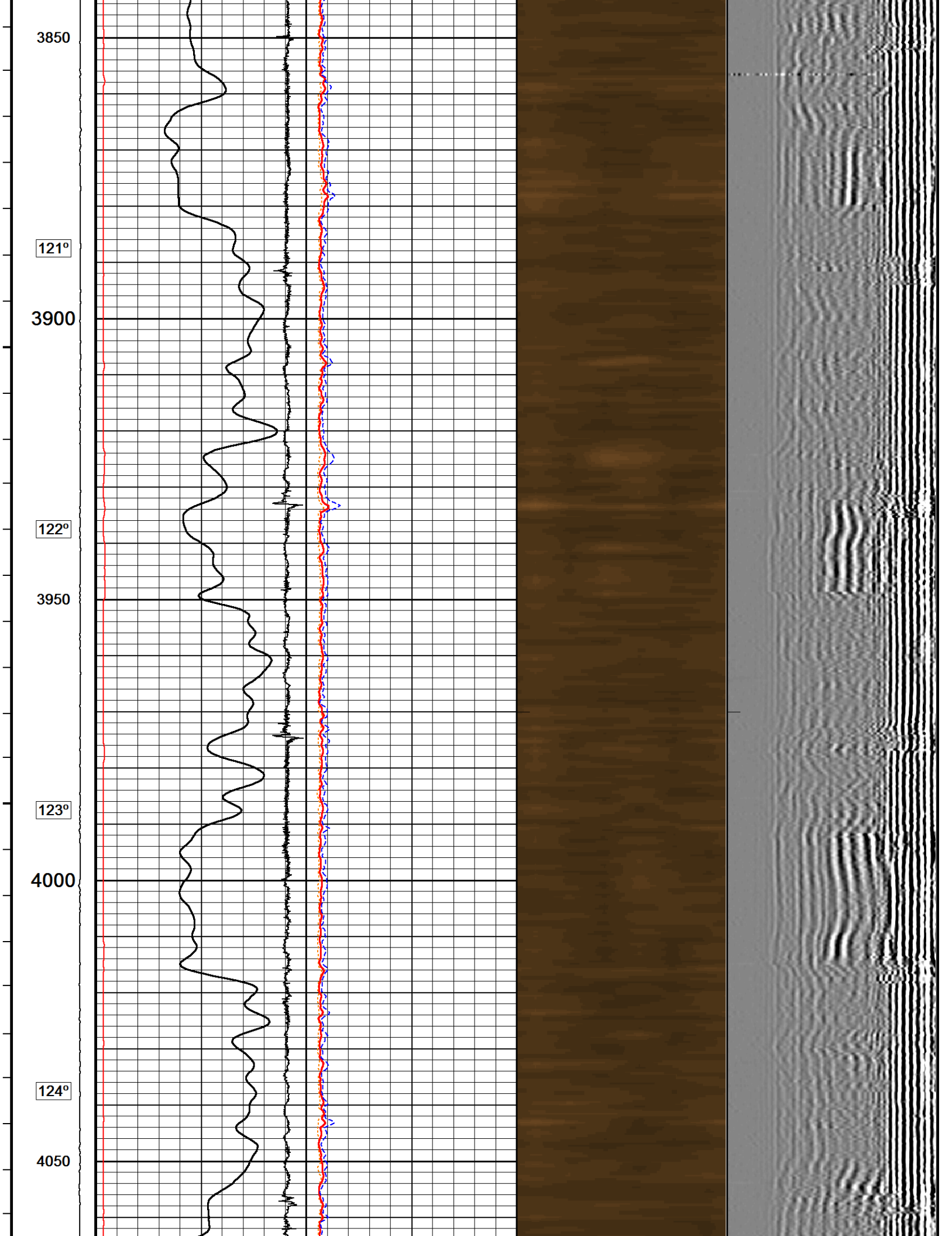
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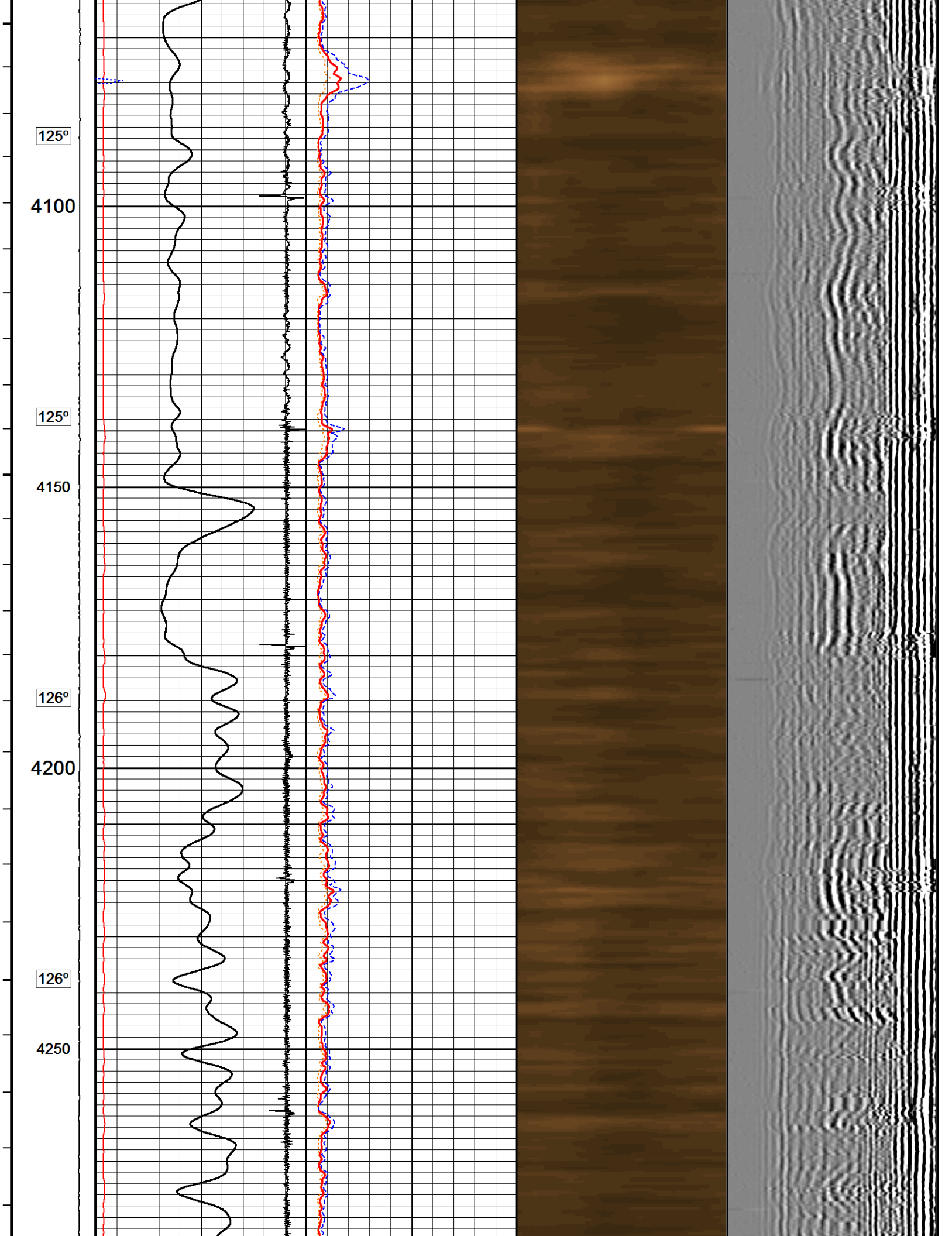
115°

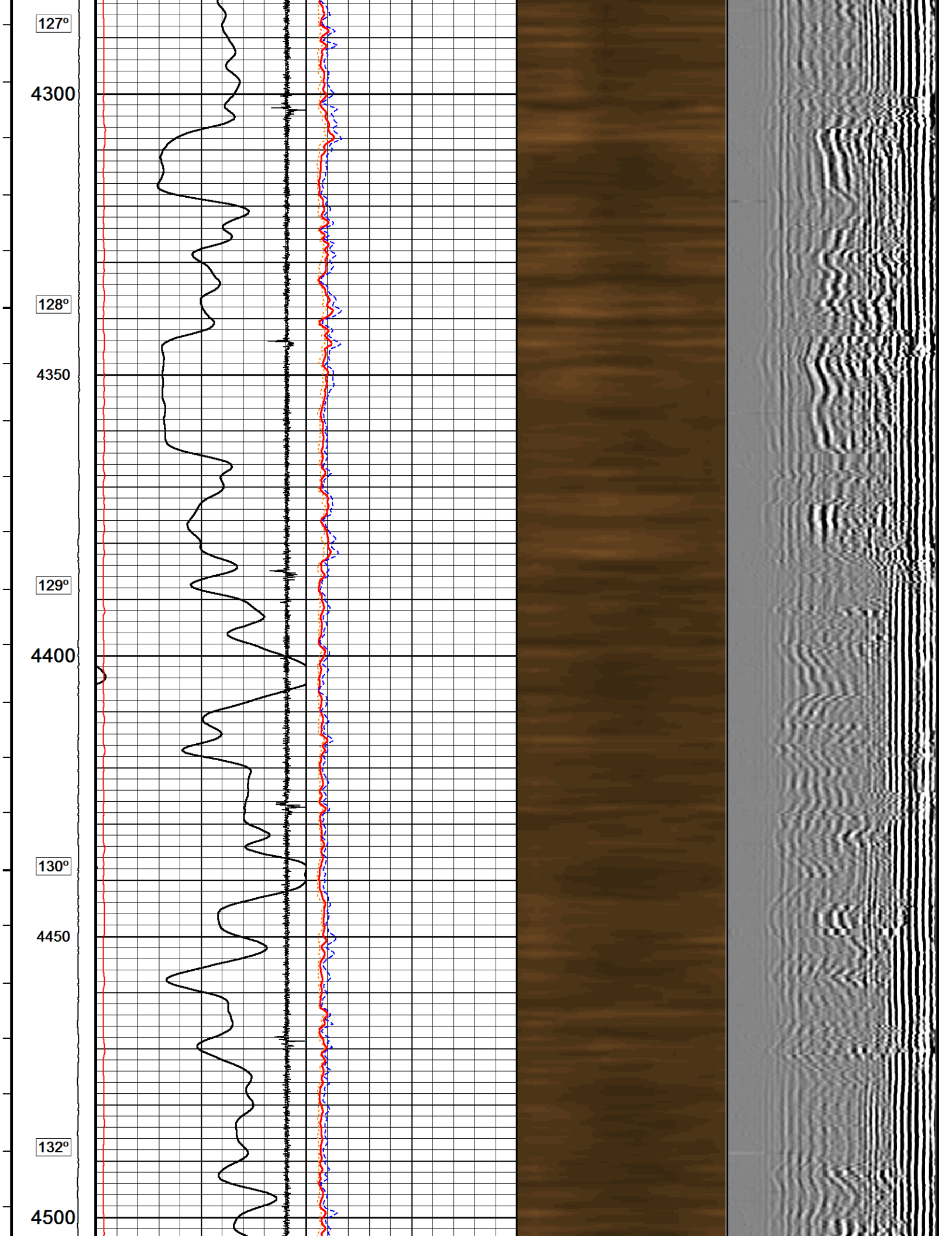
3600

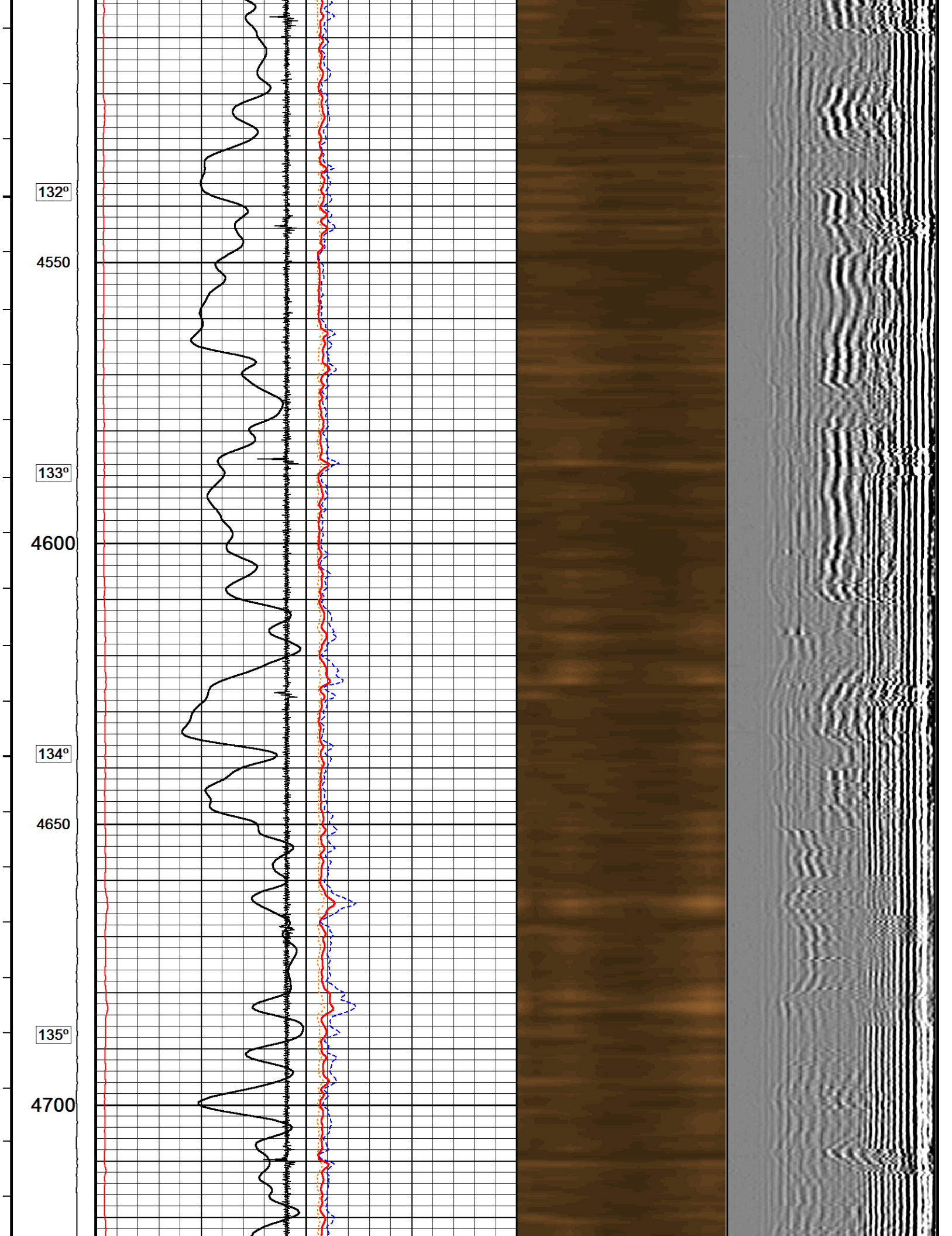


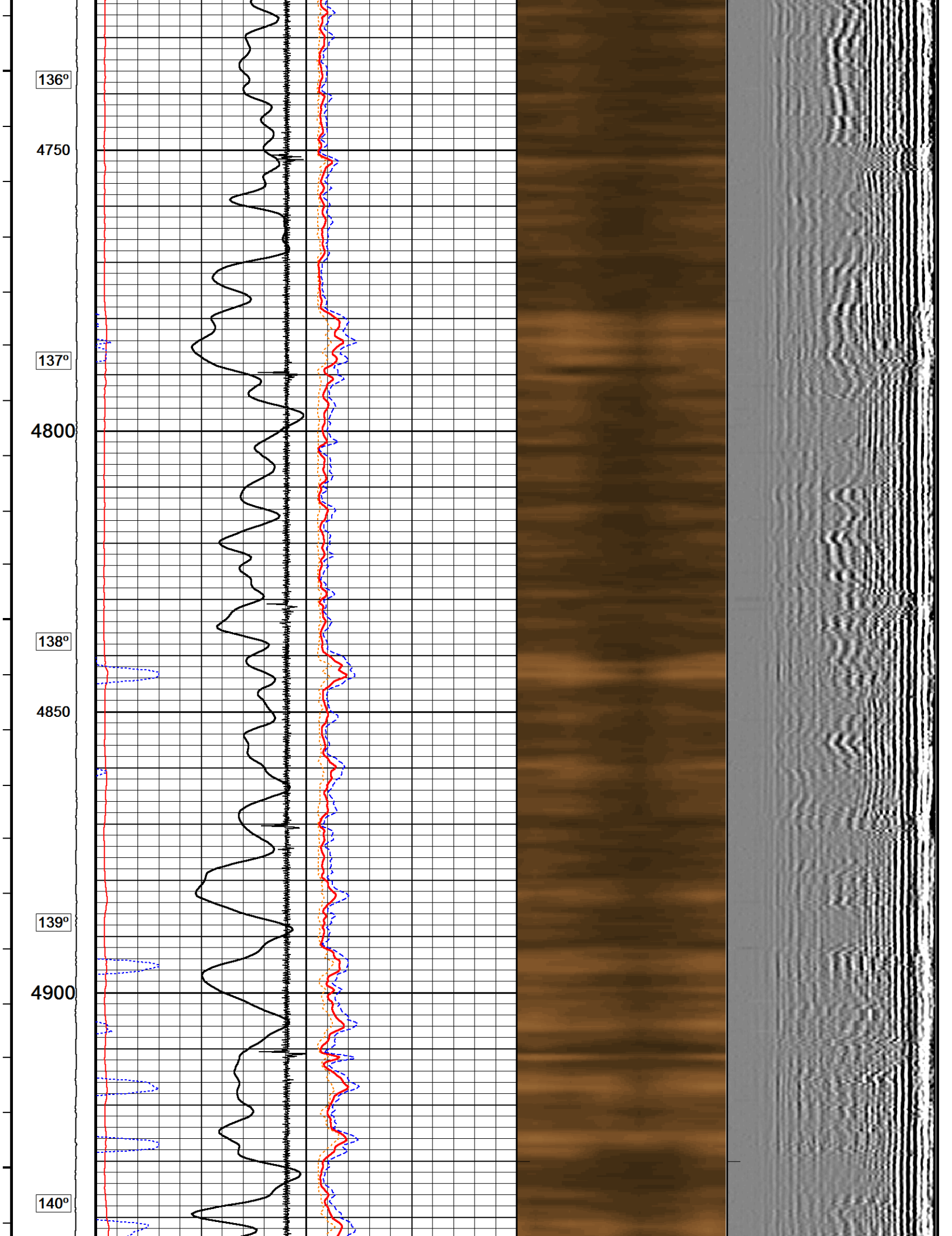


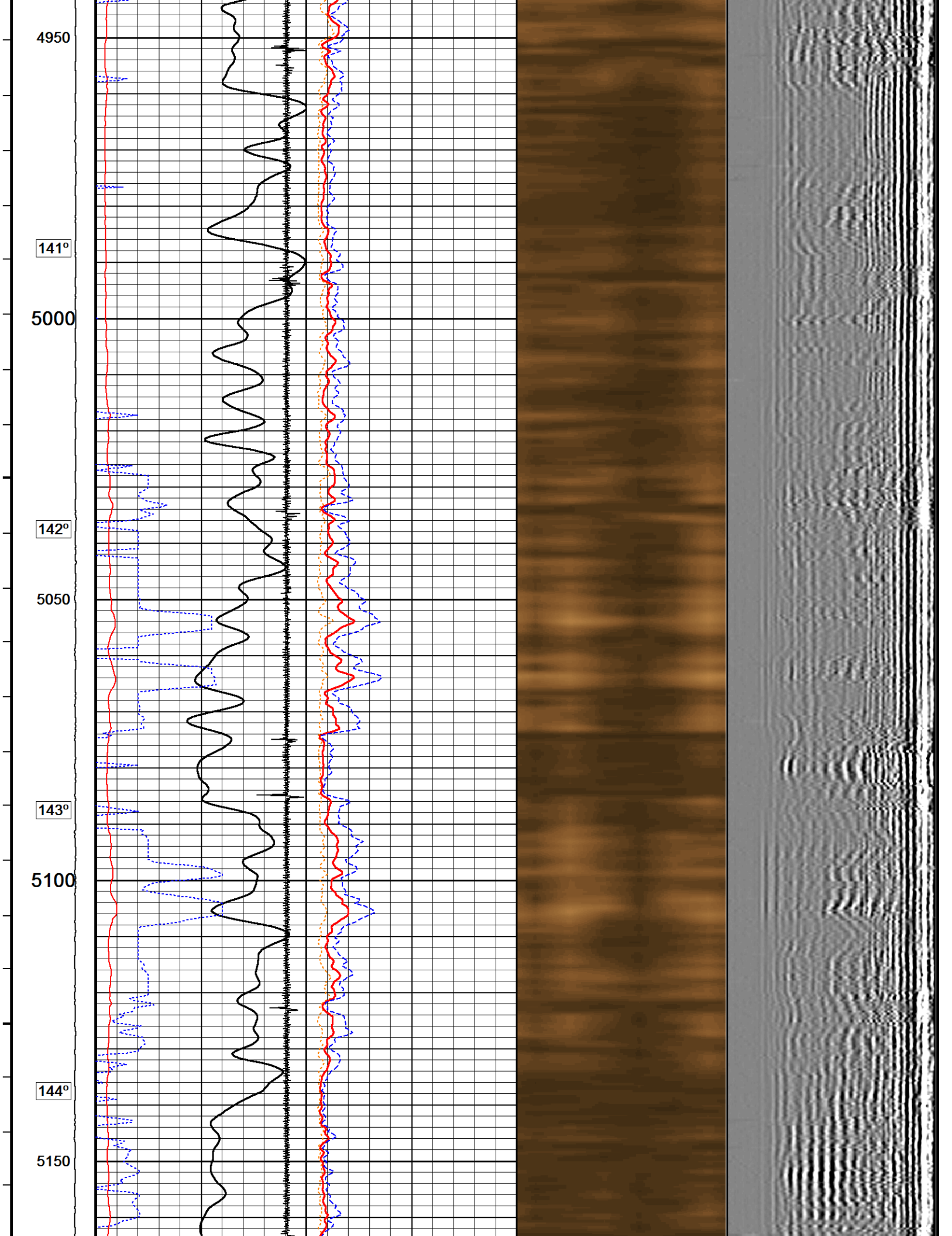


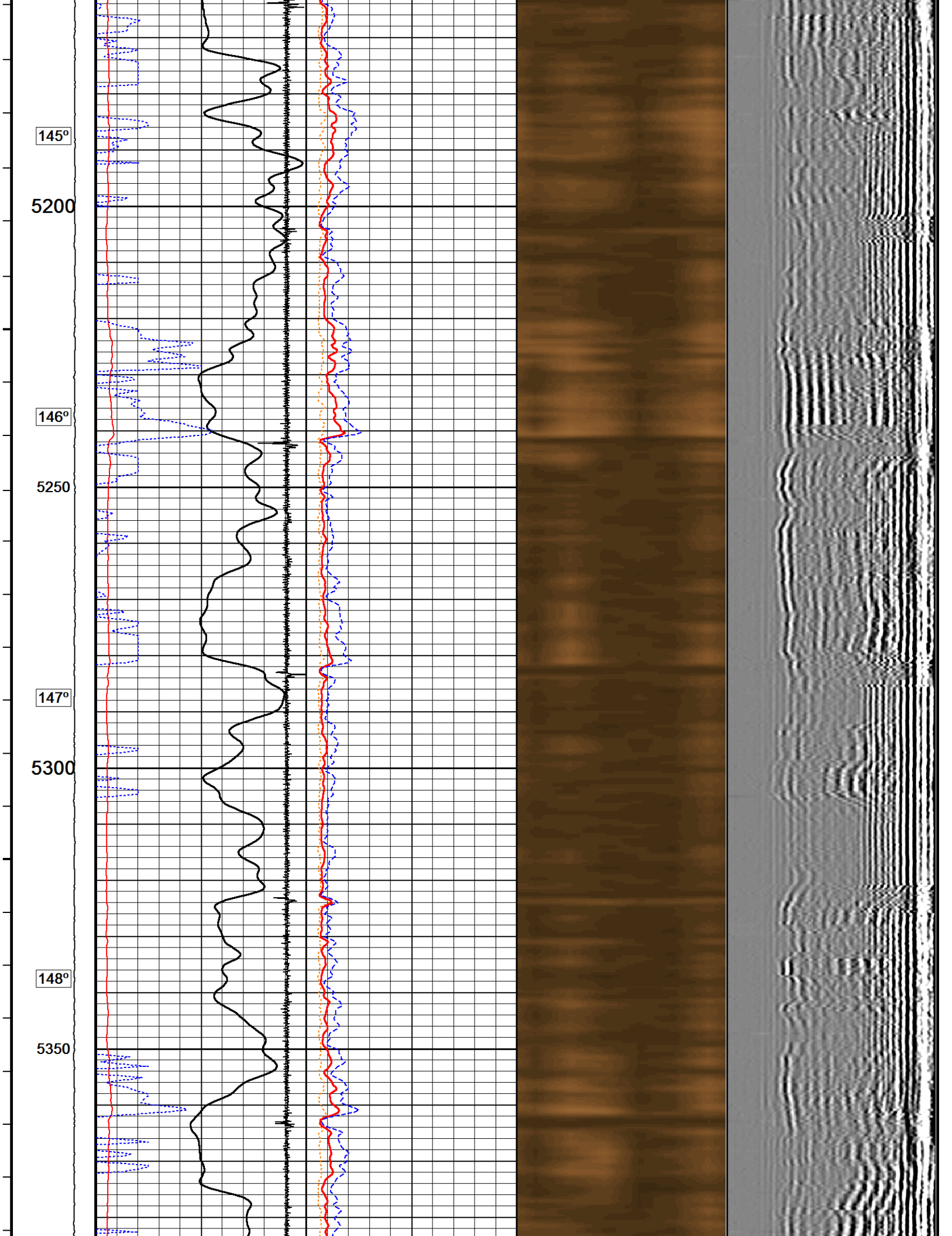


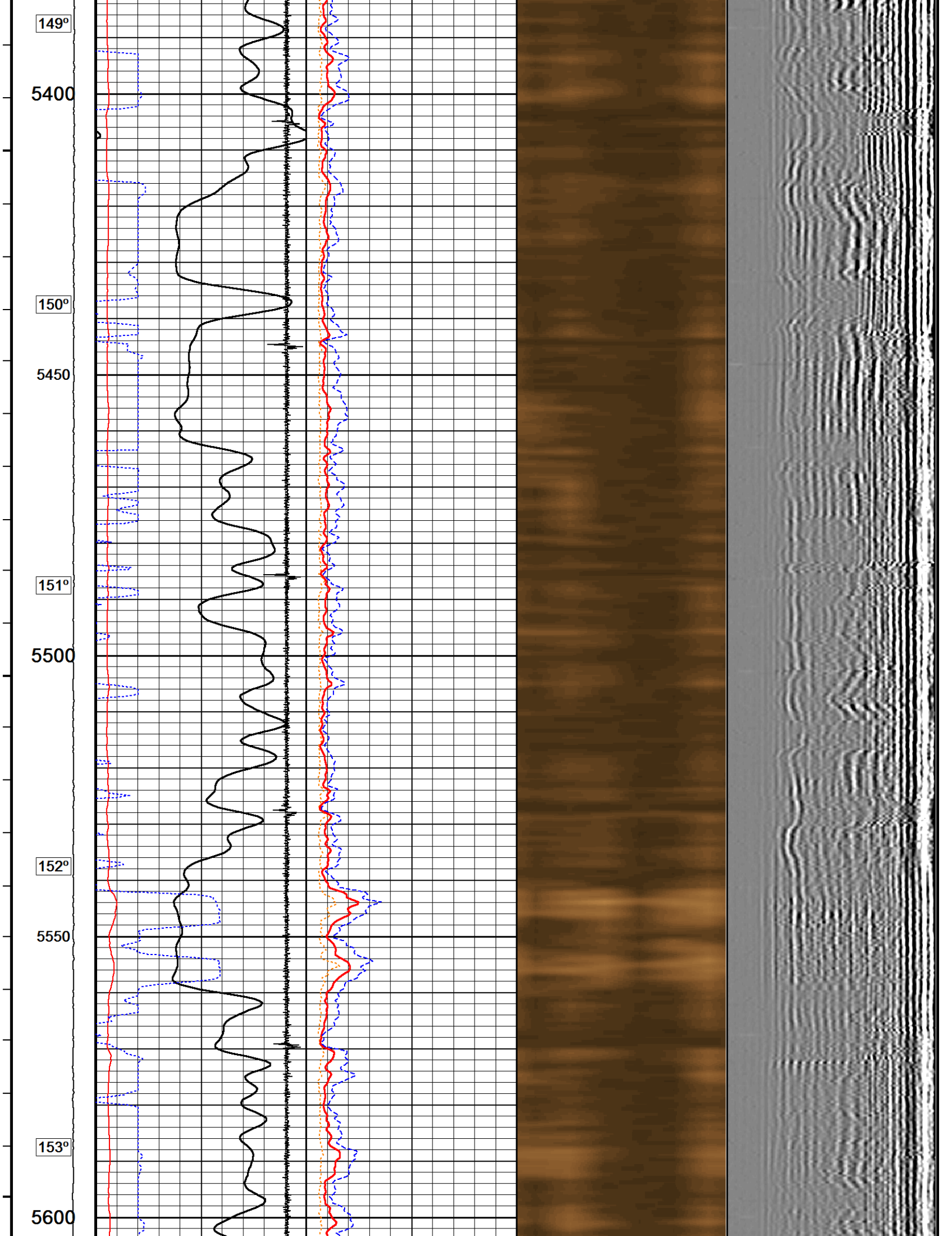


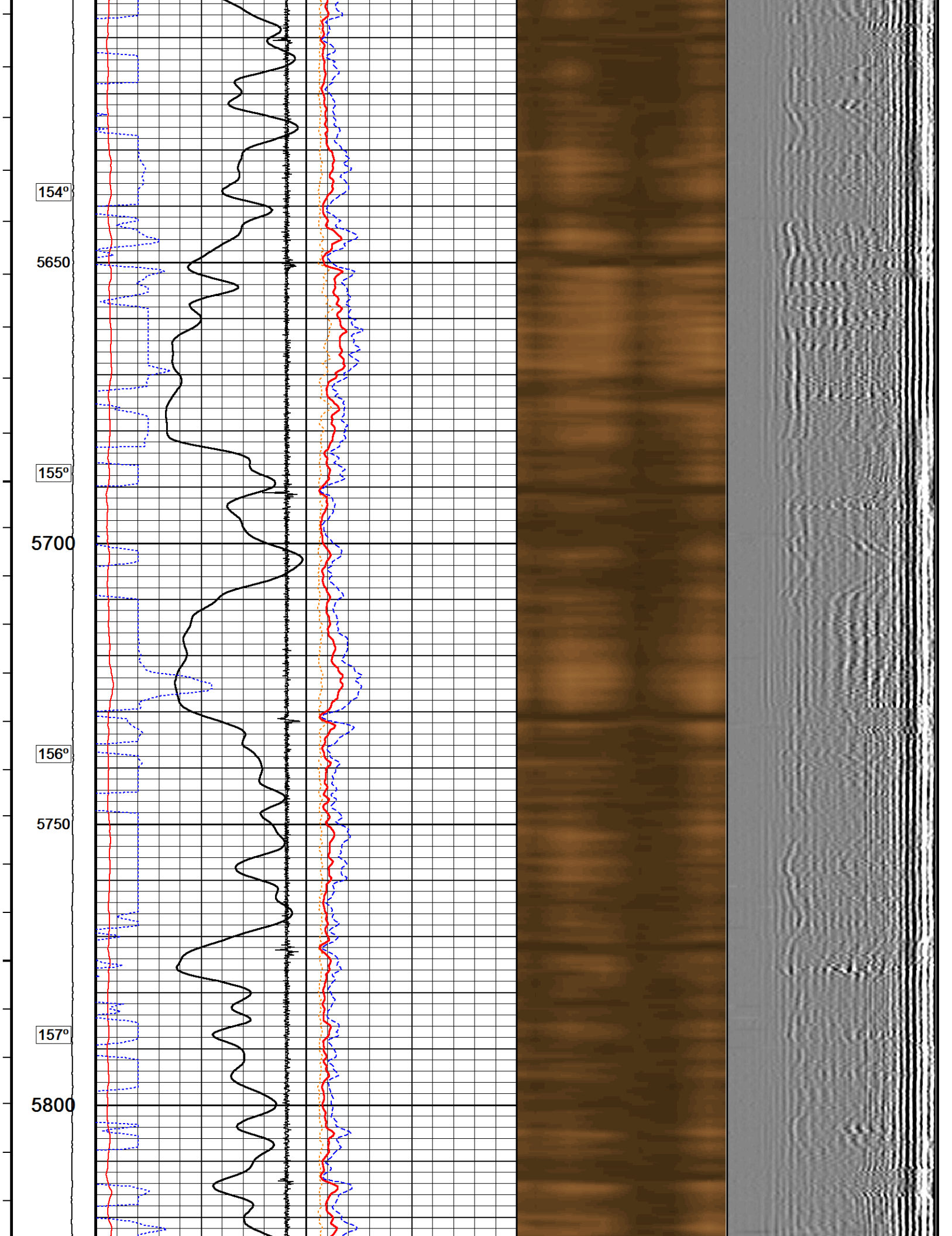


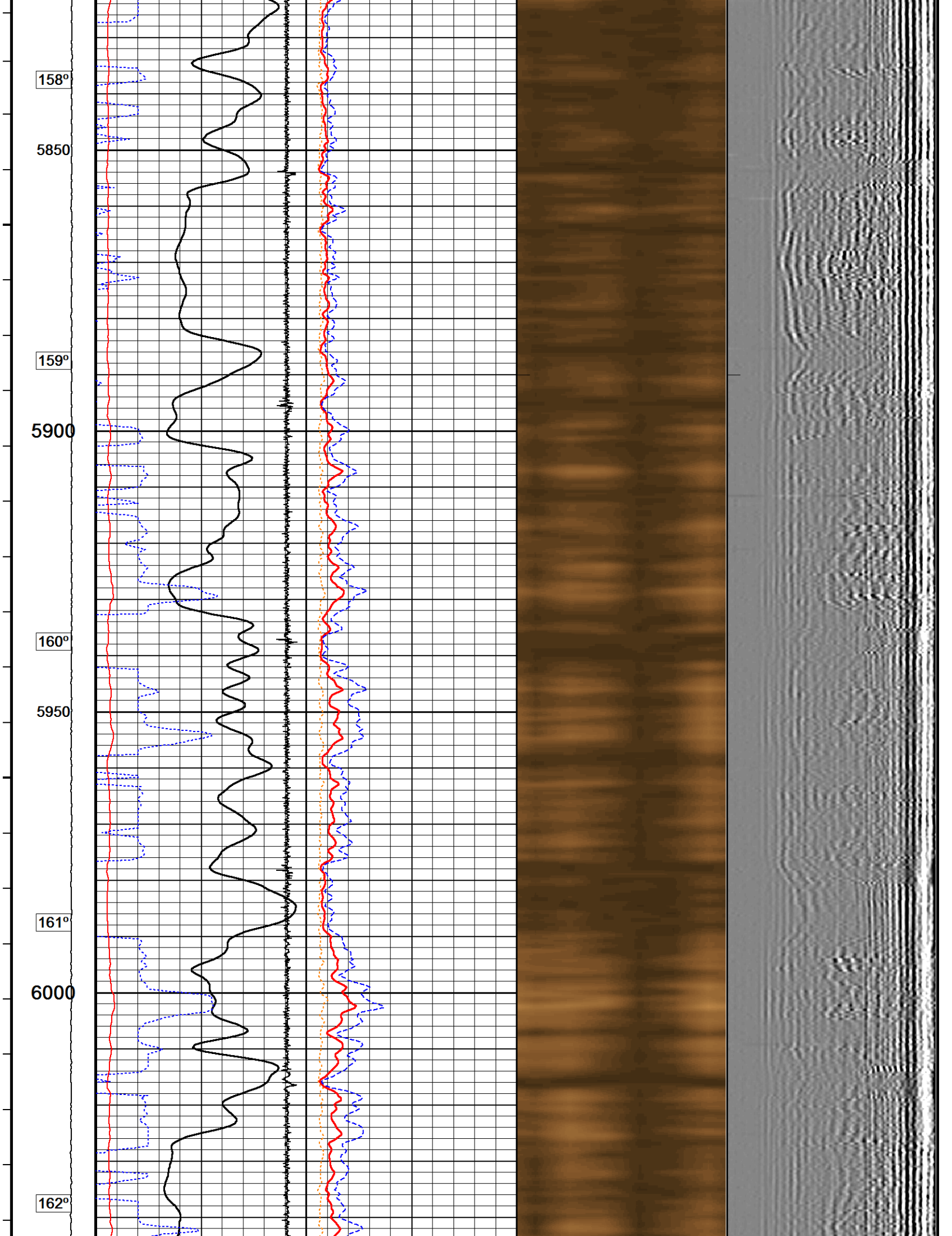


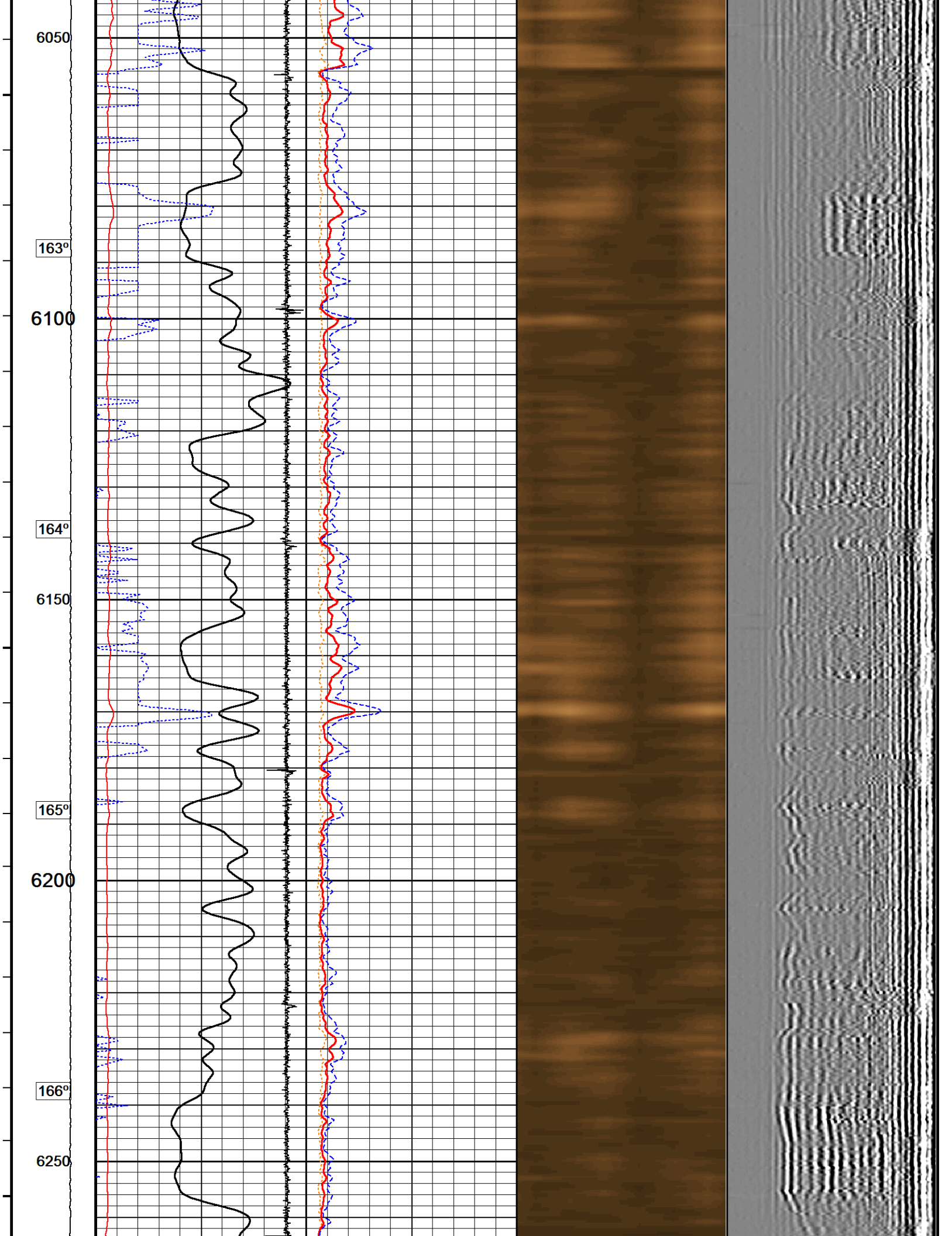


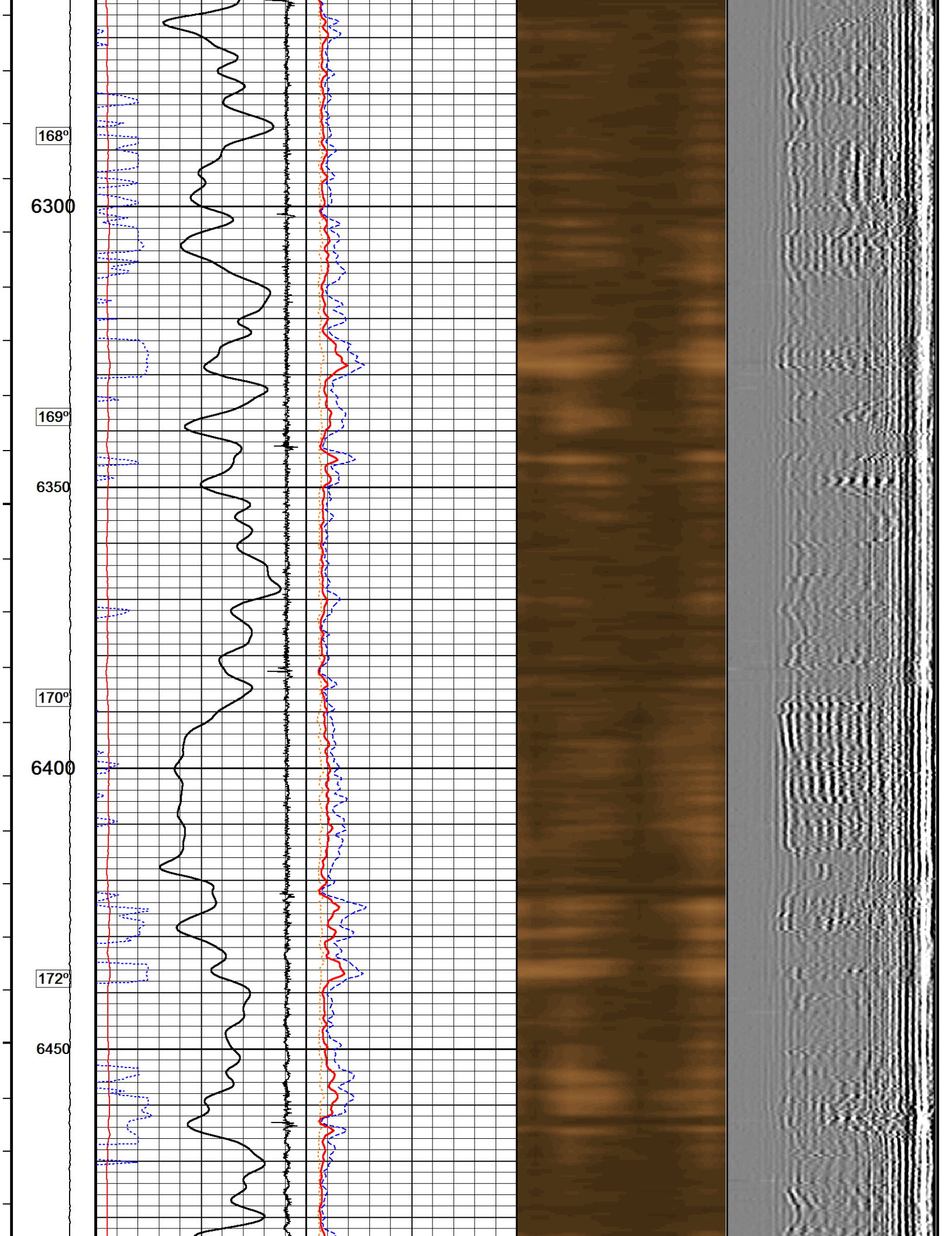


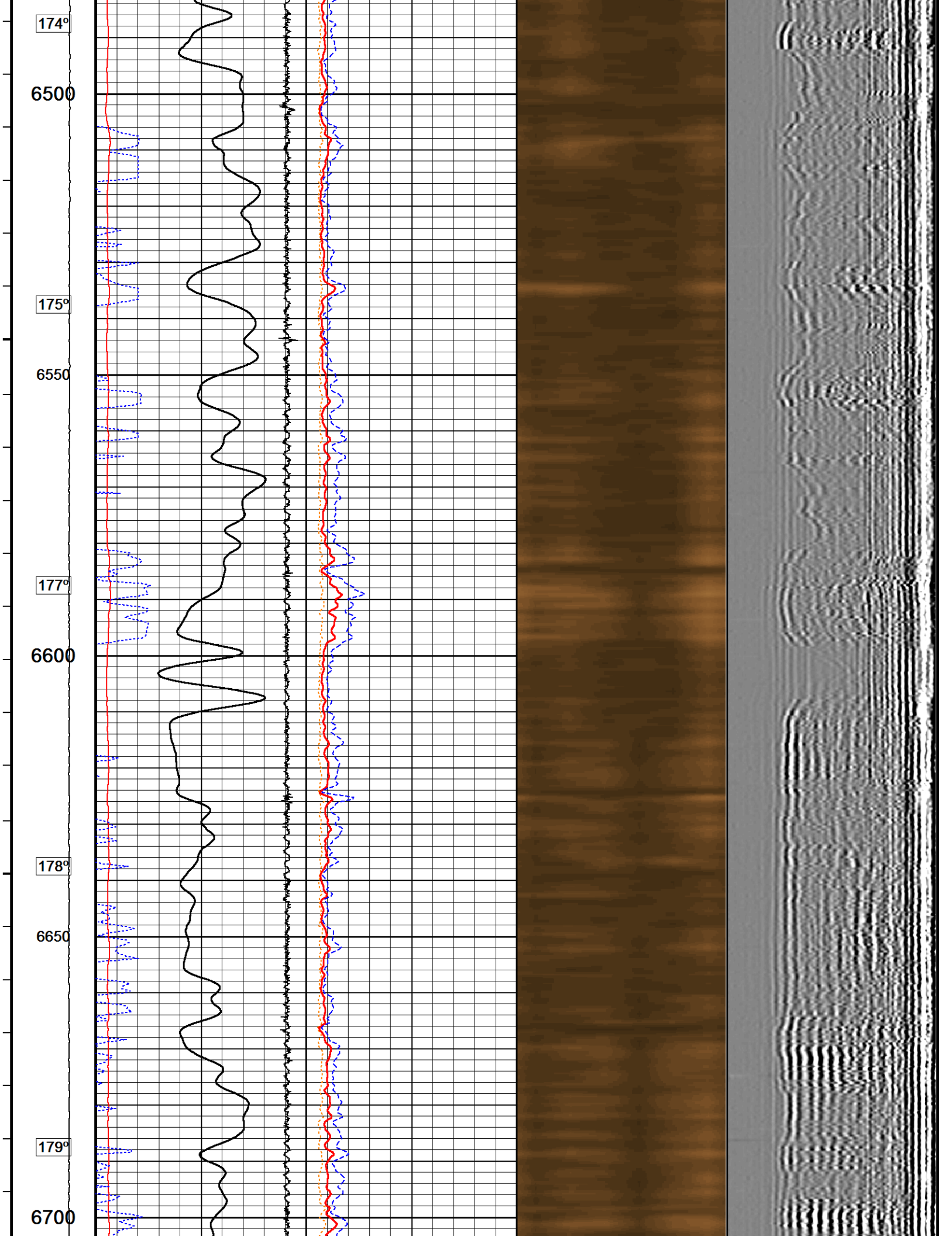


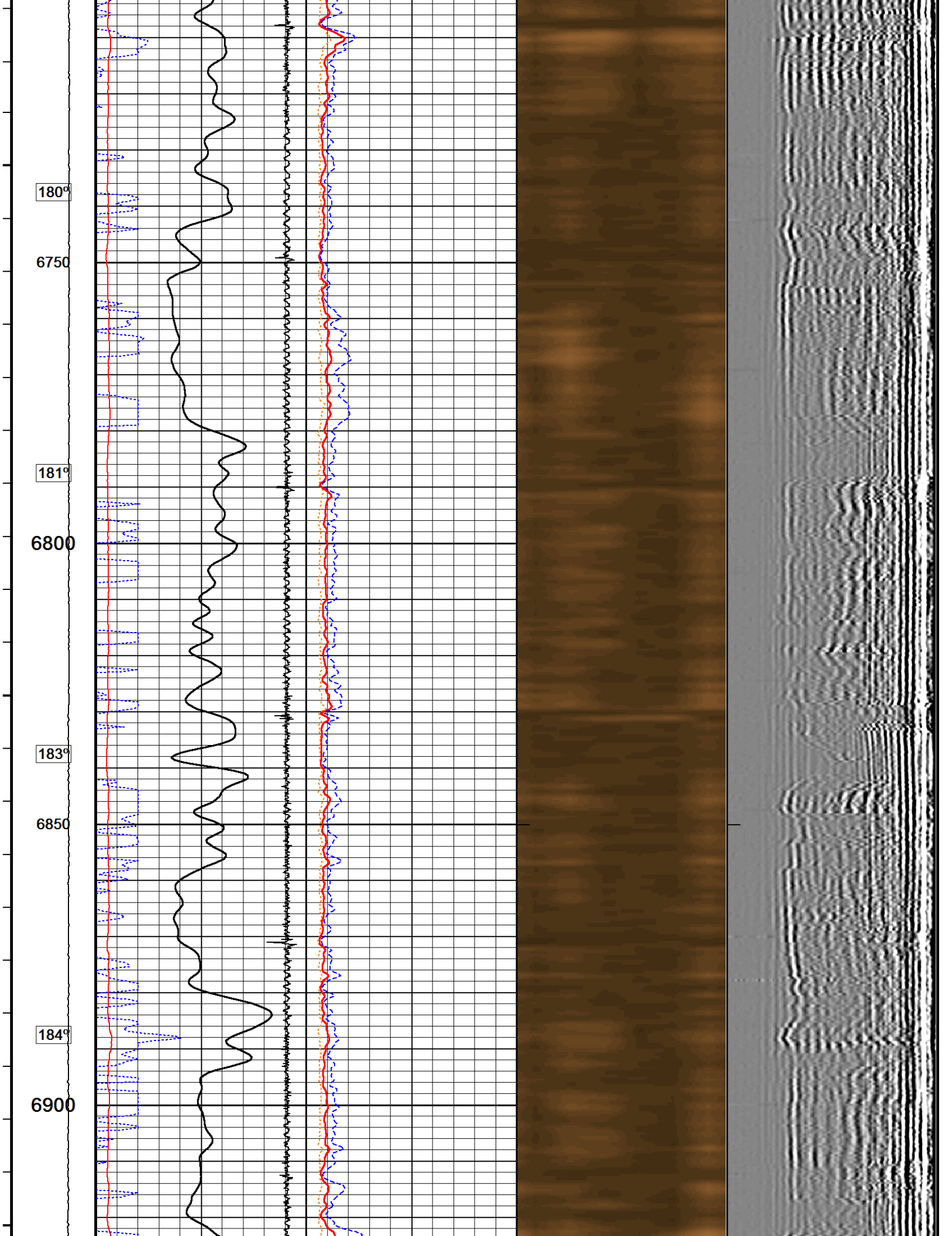


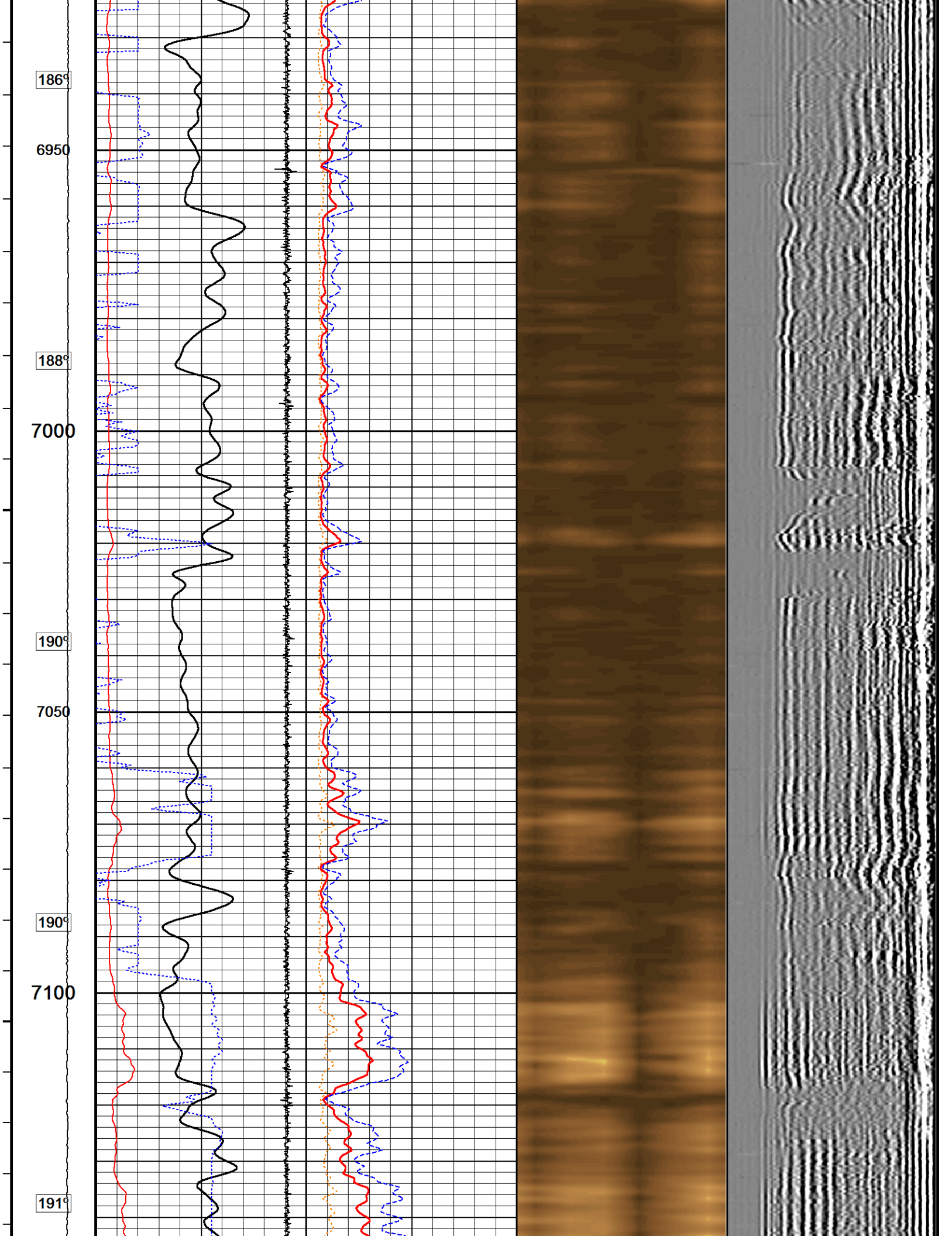


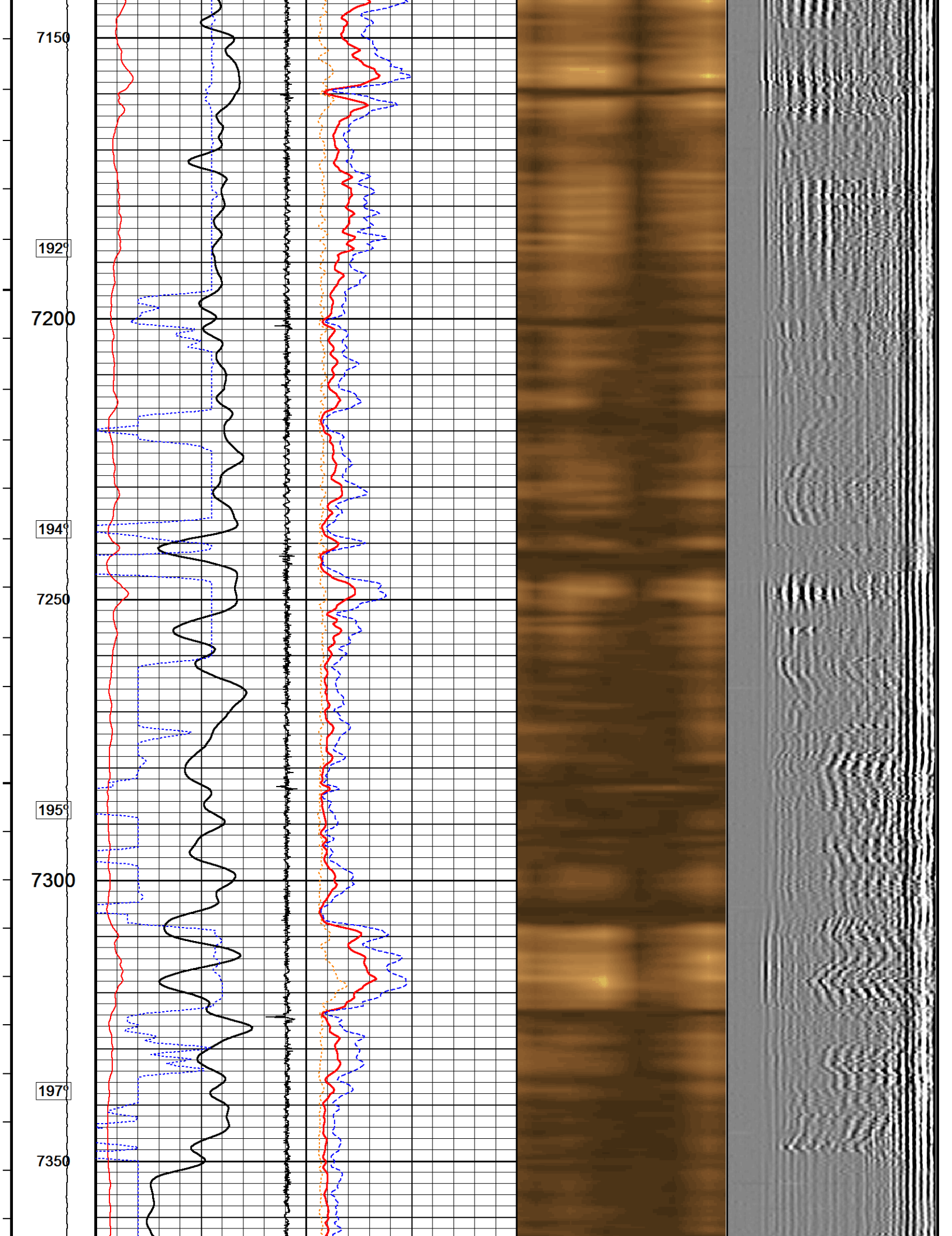


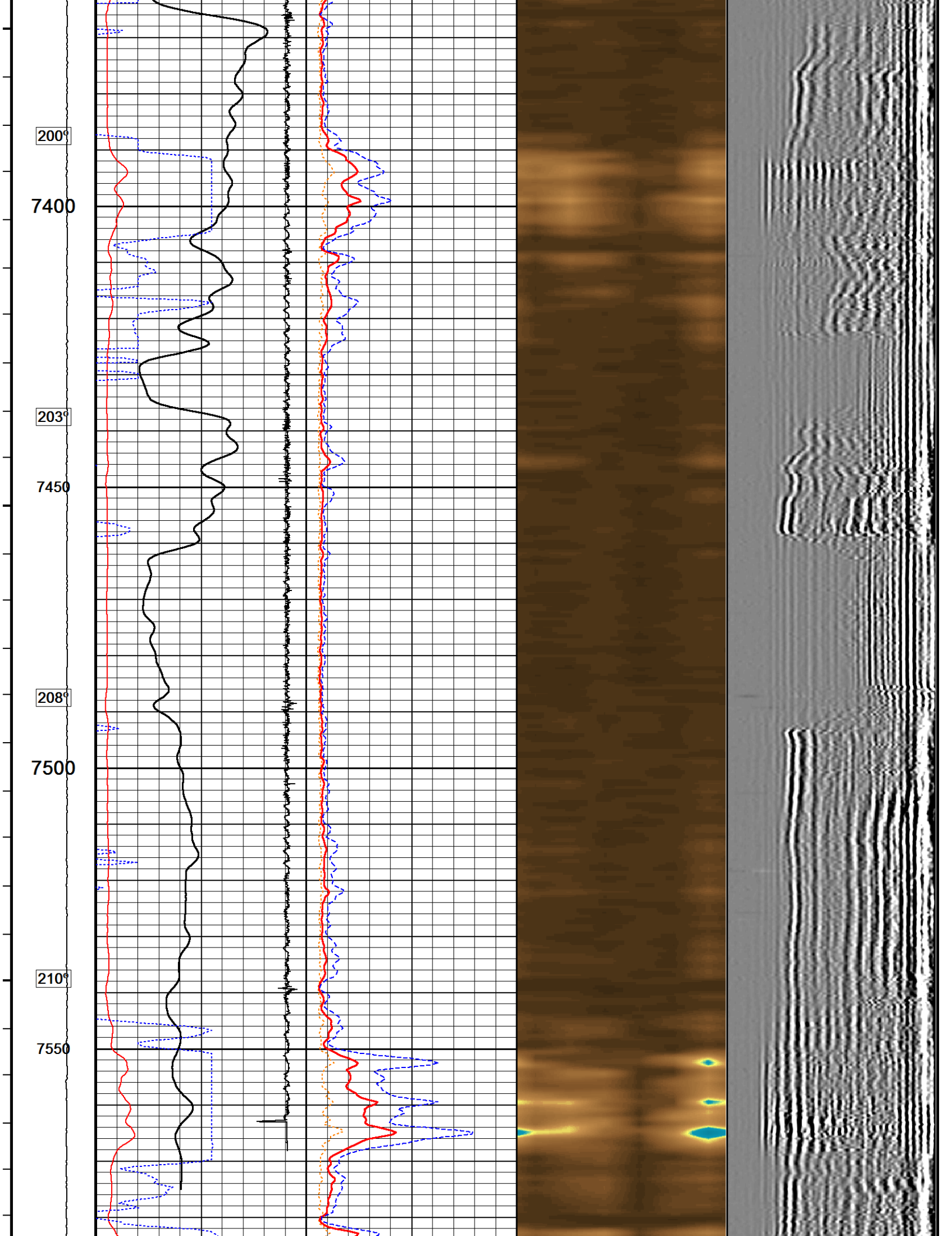


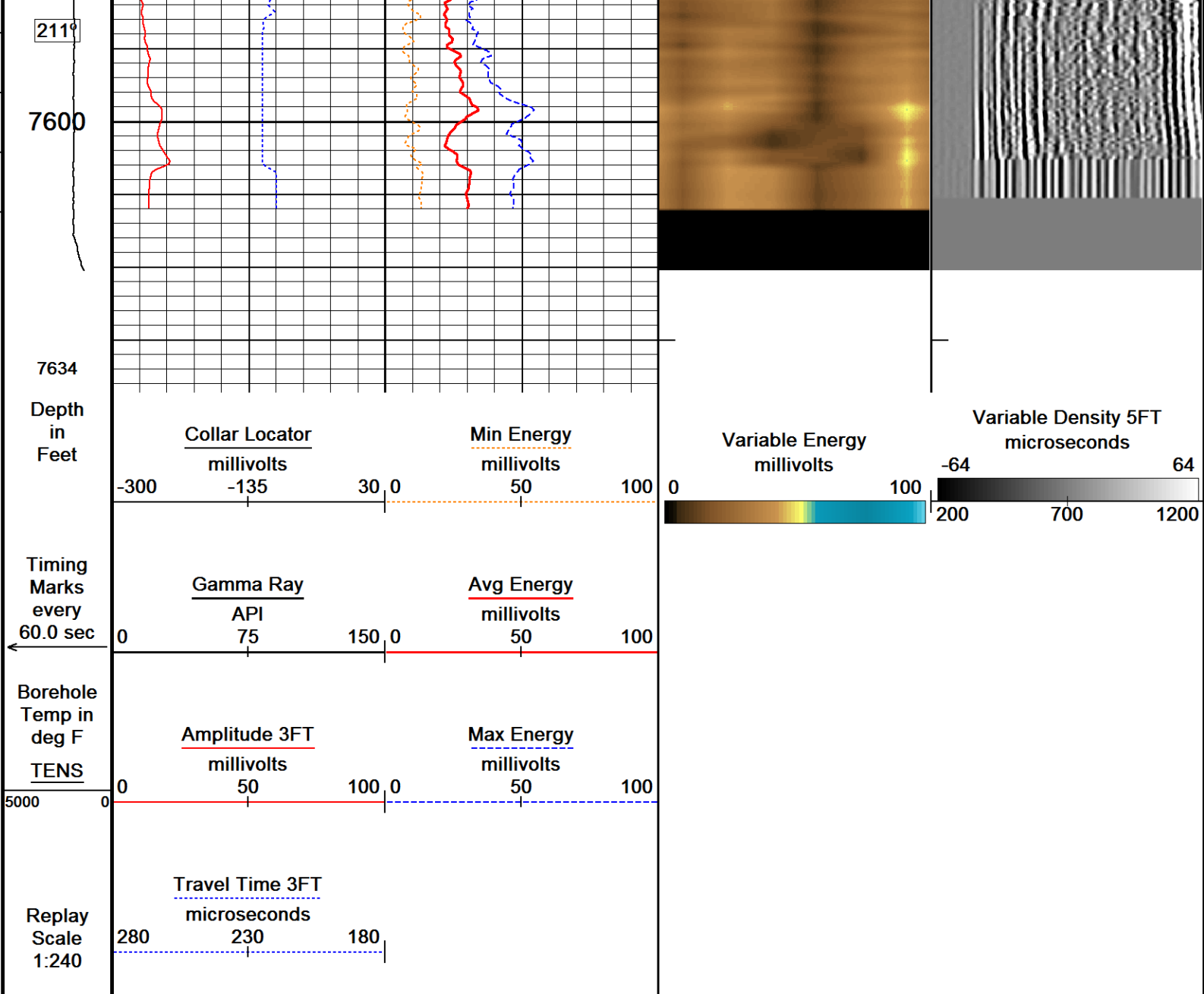












Depth Based Data - Maximum Sampling Increment 12.5cm

Filename: C:\Logs\CRE\Vanguard\Logging_23A\ssb_main.dta

System Versions: Processed with 17.05.6573 Plotted with 17.05.6573

Plotted on 31-DEC-2017 19:29

Recorded on 31-DEC-2017 09:29

↑ MAIN PASS ↑

↓ REPEAT PASS MAIN PASS ↓

Depth Based Data - Maximum Sampling Increment 12.5cm

Filename: C:\Logs\CRE\Vanguard\Logging_23A\Van_GGU13-28_23A_mp_001.dta

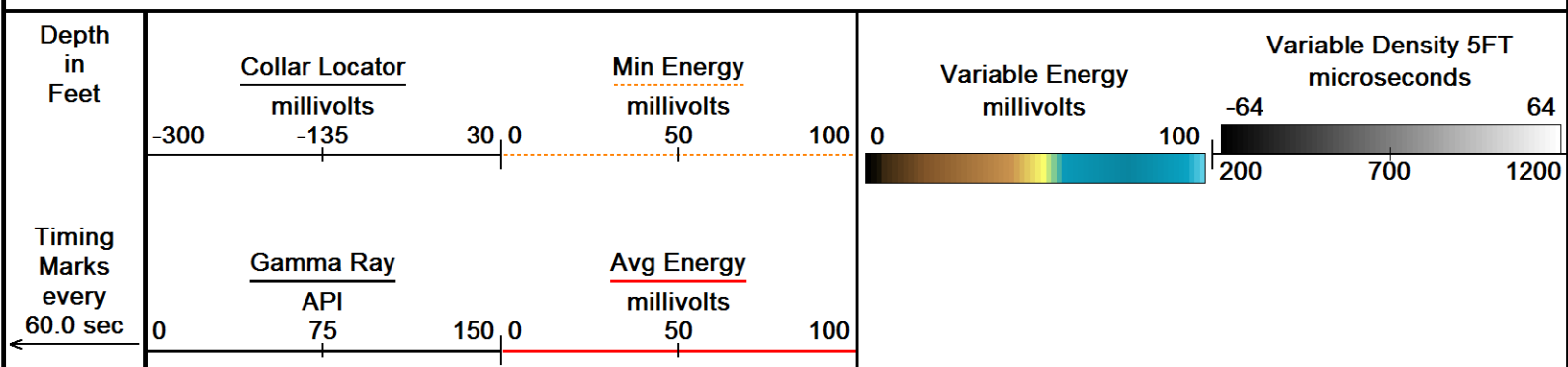
Filename: C:\Logs\CRE\Vanguard\Logging_23A\ssb_main.dta

System Versions: Logged with 17.05.6573 Plotted with 17.05.6573

Plotted on 31-DEC-2017 19:29

Recorded on 31-DEC-2017 16:41

Recorded on 31-DEC-2017 09:29



Borehole
Temp in
deg F
TENS

Amplitude 3FT

millivolts

Max Energy

millivolts

Travel Time 3FT

microseconds

Replay
Scale
1:240

280

230

180

3700

119°

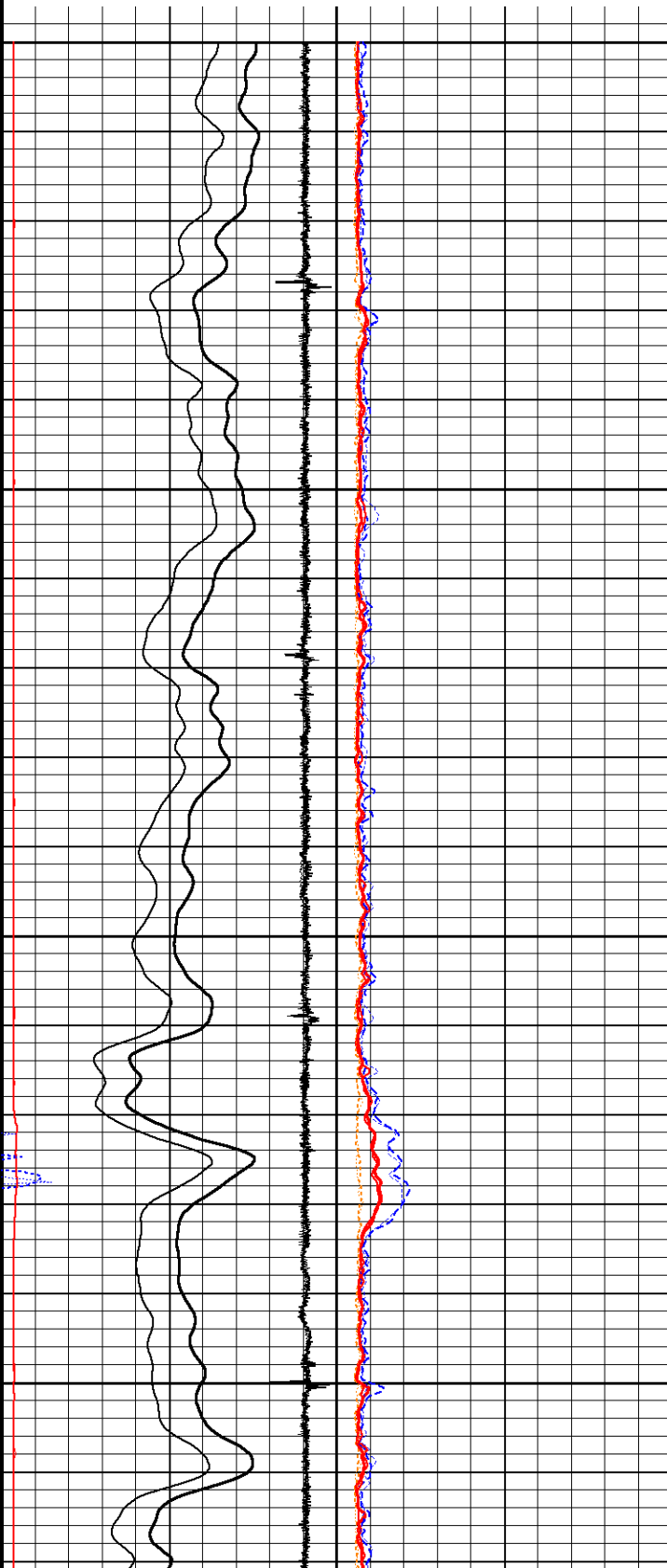
3750

120°

3800

121°

3850



122°

3900

122°

3950

123°

4000

4010

Depth
in
Feet

Collar Locator

millivolts

-300 -135 30 0

Min Energy

millivolts

50 100

Variable Energy

millivolts

0 100

Variable Density 5FT

microseconds

-64 64

200 700 1200

Timing
Marks
every
60.0 sec

Gamma Ray

API

0 75 150 0

Avg Energy

millivolts

50 100

Borehole
Temp in
deg F

TENS

Amplitude 3FT

millivolts

0 50 100 0

Max Energy

millivolts

50 100

Replay
Scale
1-240

Travel Time 3FT

microseconds

280 230 180

↑

REPEAT PASS

MAIN PASS

↑

SHOP AND FIELD CALIBRATIONS				
C:\Logs\CRE\Vanguard\Logging_23A\ssb_main.dta				
WCC Shop calibration WCC-CB 136				
Calibration on 00-JAN-1988 00:00				
Tension Compression Shop Calibration				
Tool Type: WCC-CB		Serial No: 136		
	Standard	+1G Measured	Standard	-1G Measured
X Acc	1.000 G	3664.0 mv	-1.000 G	1281.0 mv
Y Acc	1.000 G	3699.0 mv	-1.000 G	1315.0 mv
Z Acc	1.000 G	3705.0 mv	-1.000 G	1300.0 mv
UGK Before Survey Cal UGR-KA 109				
Field Calibration on 01-DEC-2017 14:55				
Gamma Ray Before Survey Calibration				
Tool Type: UGR-KA		Serial No: 109		
Calibrator No: 101				
	Background	Calibrator	Standard	Units
	65.1	860.4	470.2	API
Delta Counts Per Sec: 795.3		CPS/API = 1.691		
Temperature Tool Shop Survey Calibration TMP-NA 139				
Temperature Tool Shop Survey Calibration				
Tool Type: TMP-NA		Serial No: 139		
	Calibration			
	Standard	Measured		
	32 DEGF	36714 Hz		
	212 DEGF	50849 Hz		
UGK Before Survey Cal UGR-KA 144				

Gamma Ray Before Survey Calibration

Tool Type: UGR-KA
Calibrator No: 101

Serial No: 144

Background Calibrator Standard Units

55.1 833.1 470.2 API

Delta Counts Per Sec: 778.0 CPS/API = 1.655

SSBC Field Calibration SSS-CA 125

Field Calibration on 28-DEC-2017 09:48

Slim Sector Bond Field Calibration

Tool Type SSS-CA Serial No 125

Sensor	Description	Standard	Measured
AMP 3FT	100% Bond	3.50	0.30
	Free Pipe	81.00	2634.20
AMP 5FT	100% Bond	0.40	0.20
	Free Pipe	54.00	2092.60
1 SECTOR AMP	100% Bond	5.00	0.00
	Free Pipe	95.00	448.80
2 SECTOR AMP	100% Bond	5.00	0.00
	Free Pipe	95.00	527.80
3 SECTOR AMP	100% Bond	5.00	0.00
	Free Pipe	95.00	518.90
4 SECTOR AMP	100% Bond	5.00	0.10
	Free Pipe	95.00	533.90
5 SECTOR AMP	100% Bond	5.00	0.20
	Free Pipe	95.00	593.90
6 SECTOR AMP	100% Bond	5.00	0.00
	Free Pipe	95.00	518.30

SSBC Constants SSS-CA 125

Last Edited on 00-JAN-1988 00:00

Min Ampl 100% Bond	3.51 MV
Max Ampl 0% Bond	81.03 MV
Casing Size	4.50 IN
Casing Weight	11.6 LB/F
3' TT Correction	0.0 US
DT Fluid	204.0 US/F
Fast Formation TT	38.5 US/F
Cement Cmpr Strength	600 PSI
Casing Velocity	57.00 US/F
Maximum Attenuation	12.00 DB/F

Cement weight

0.00 LB/G

DOWNHOLE EQUIPMENT

C:\Logs\CRE\Vanguard\Logging_23A\ssb_main.dta

Mono-Cablehead

MCH-AA 0 LG: 1.03 ft WT: 2.2 lb OD: 1.457 in

Comm Sub

WCC-CB 136 LG: 5.97 ft WT: 24.3 lb OD: 1.693 in

Centroller, 43mm, ITB, 3-arm Bi-Direct

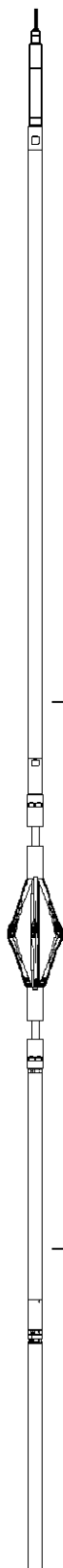
CR3-BA 137 LG: 2.51 ft WT: 8.8 lb OD: 1.693 in

Gamma Ray K

UGR-KA 109 LG: 2.34 ft WT: 17.6 lb OD: 1.693 in

CRE series II processor section

CRP-BA 129 LG: 3.31 ft WT: 15.4 lb OD: 1.654 in



52.34 ft CCL - Collar Locator

47.39 ft GR - Gamma Ray

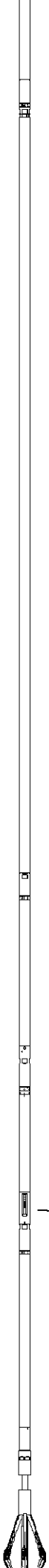
Casing Reservoir Evaluation Tool Sonde
CRM-BA 129 LG: 9.19 ft WT: 46.3 lb OD: 1.693 in

Quartz Press, Dual ITB, 43mm
QPG-EA 141 LG: 2.23 ft WT: 8.8 lb OD: 1.693 in

Tool Temperature, 43mm, 177C, 10-pin ITB
TMP-NA 139 LG: 1.93 ft WT: 8.8 lb OD: 1.693 in

Gamma Ray K
UGR-KA 144 LG: 2.34 ft WT: 17.6 lb OD: 1.693 in

Centroller, 43mm, ITB, 3-arm Bi-Direct
CR3-BA 107 LG: 2.51 ft WT: 8.8 lb OD: 1.693 in

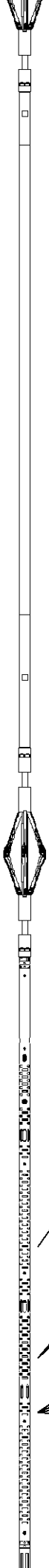


30.49 ft TMPN - Temperature

SSB Upper Electronics, ITB
SUE-CA 105 LG: 7.64 ft WT: 26.5 lb OD: 1.654 in

Centroller, 43mm, SSB, 3-arm Bi-Direct
CR3-DA 110 LG: 2.83 ft WT: 6.6 lb OD: 1.693 in

SSB Receiver Sonde
SSS-CA 125 LG: 8.97 ft WT: 37.5 lb OD: 1.690 in



10.05 ft VDL5 - Variable Density 5FT

9.05 ft TT3F - Travel Time 3FT

9.05 ft AM3F - Amplitude 3FT

8.55 ft AAVG - Avg Energy

8.55 ft AMIN - Min Energy

8.55 ft AMAX - Max Energy

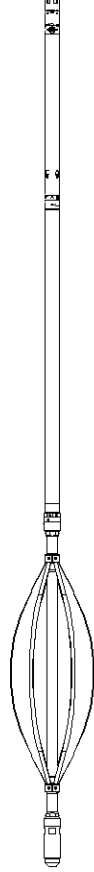
8.55 ft VAMP - Variable Energy

SSB Transmitter Section
STE-BA 139 LG: 2.64 ft WT: 17.6 lb OD: 1.654 in

Centralizer, 43mm, ITB, bi-directional
CEN-PA 399 LG: 3.00 ft WT: 8.8 lb OD: 1.690 in

Bull Plug, 10-pin ITB, 43mm, NO TERM
BUL-HA 0 LG: 0.08 ft WT: 0.0 lb OD: 1.693 in

Total Length: 58.50 ft Weight: 255.7 lb



0.00 ft TENS - Tension
Tool Zero (0.00ft from bottom)

All measurements relative to tool zero.

COMPANY	VANGUARD OPERATING LLC.
WELL	FEDERAL GGU 23A-28-691
FIELD	MAMM CREEK
PROVINCE/COUNTY	GARFIELD
COUNTRY/STATE	U.S.A./COLORADO

Elevation Kelly Bushing	6147.6	feet	Bottom Log Interval	7605.08	feet
Elevation Drill Floor		feet	Depth Driller	7665.00	feet
Elevation Ground Level	6130.6	feet	Depth Logger	7616.00	feet



SECTOR
BOND
LOG

Weatherford®