

Company: Noble Energy Inc

Well: Wells Ranch AA35-68-1AHNA

Field: Wattenberg

County: Weld State: Colorado

Ultrasonic Imaging Tool
Casing Evaluation

County: Weld

Field: Wattenberg

Location: Sec. 36, T6N, R63W

Well: Wells Ranch AA35-68-1AHNA

Company: Noble Energy Inc

LOCATION

Sec. 36, T6N, R63W

SHL: NW/4NW 680 FNL X 164 FWL

Lat/Long: 40.44828000/-104.39409000

Elev.: K.B. 4838.00 ft

G.L. 4808.00 ft

D.F. 4837.00 ft

Permanent Datum: _____

Ground Level _____

Elev.: 4808.00 ft

Log Measured From: _____

Kelly Bushing _____

30.00 ft above Perm. Datum

Drilling Measured From: _____

Kelly Bushing _____

API Serial No.

05-123-38664-000C

Section 36

Township 6N

Range 63W

Logging Date	27-Mar-2014								
Run Number	1								
Depth Driller	11169 ft								
Schlumberger Depth	9541 ft								
Bottom Log Interval	9541 ft								
Top Log Interval	0 ft								
Casing Fluid Type	Brine								
Salinity									
Density	8.4 lbm/gal								
Fluid Level	0 ft								
BIT/CASING/TUBING STRING									
Bit Size	8.750 in								
From	635 ft								
To	6931 ft								
Casing/Tubing Size	7.000 in								
Weight	26 lbm/ft								
Grade	P-110								
From	635 ft								
To	6931 ft								
Maximum Recorded Temperatures									
Logger On Bottom	27-Mar-2014		Time			10:20			
Unit Number	3030		Location	Casper, WY					
Recorded By	Allison Johnston								
Witnessed By	Kelli Hale								

Oil Density		Run 1	Run 2	Run 3
Water Salinity				
Gas Gravity				
Bo				
Bw				
1/Bg				
Bubble Point Pressure				
Bubble Point Temperature				
Solution GOR				
Maximum Deviation				
CEMENTING DATA				
Primary/Squeeze		Primary		
Casing String No				
Lead Cement Type				
Volume				
Density				
Water Loss				
Additives				
Tail Cement Type				
Volume				
Density				
Water Loss				
Additives				
Expected Cement Top				
Logging Date				
Run Number				
Depth Driller				
Schlumberger Depth				
Bottom Log Interval				
Top Log Interval				
Casing Fluid Type				
Salinity				
Density				
Fluid Level				
BIT/CASING/TUBING STRING				
Bit Size				
From				
To				
Casing/Tubing Size				
Weight				
Grade				
From				
To				
Maximum Recorded Temperatures				
Logger On Bottom	Time			
Unit Number	Location			
Recorded By				
Witnessed By				

DEPTH SUMMARY LISTING

Date Created: 27-MAR-2014 11:52:34

Depth System Equipment

Depth Measuring Device		Tension Device		Logging Cable	
Type:	IDW-B	Type:	CMTD-B/A	Type:	7-39P-LXS
Serial Number:	6404	Serial Number:	2858	Serial Number:	
Calibration Date:	30-Oct-2013	Calibration Date:	27-Feb-2014	Length:	18240 FT
Calibrator Serial Number:	6404	Calibrator Serial Number:	44135	Conveyance Method:	Wireline
Calibration Cable Type:	7-39P-LXS	Number of Calibration Points:	10	Rig Type:	LAND
Wheel Correction 1:	-4	Calibration RMS:	13		
Wheel Correction 2:	-4	Calibration Peak Error:	24		

Depth Control Parameters

Log Sequence:	First Log In the Well
Rig Up Length At Surface:	0.00 FT
Rig Up Length At Bottom:	0.00 FT
Rig Up Length Correction:	0.00 FT
Stretch Correction:	3.00 FT
Tool Zero Check At Surface:	

Depth Control Remarks

1. All Schlumberger depth procedures followed.
2. IDW used as primary depth control, z-chart used as secondary depth control.
- 3.
- 4.
- 5.
- 6.

DISCLAIMER




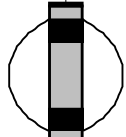


THE USE OF AND RELIANCE UPON THIS RECORDED-DATA BY THE HEREIN NAMED COMPANY (AND ANY OF ITS AFFILIATES, PARTNERS, REPRESENTATIVES, AGENTS, CONSULTANTS AND EMPLOYEES) IS SUBJECT TO THE TERMS AND CONDITIONS AGREED UPON BETWEEN SCHLUMBERGER AND THE COMPANY, INCLUDING: (a) RESTRICTIONS ON USE OF THE RECORDED-DATA; (b) DISCLAIMERS AND WAIVERS OF WARRANTIES AND REPRESENTATIONS REGARDING COMPANY'S USE OF AND RELIANCE UPON THE RECORDED-DATA; AND (c) CUSTOMER'S FULL AND SOLE RESPONSIBILITY FOR ANY INFERENCE DRAWN OR DECISION MADE IN CONNECTION WITH THE USE OF THIS RECORDED-DATA.

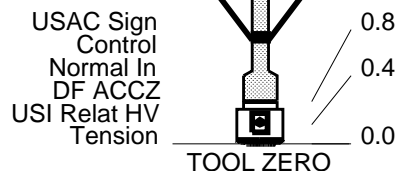
OTHER SERVICES1	OTHER SERVICES2
OS1:	OS1:
OS2:	OS2:
OS3:	OS3:
OS4:	OS4:
OS5:	OS5:
REMARKS: RUN NUMBER 1	REMARKS: RUN NUMBER 2
1) Toolstring run as per tool sketch.	
2) Logging Objective: cement evaluation	
3) Well cemented by Haliburton on 10-Mar-2014.	
4) Well cemented with 13.8 ppg Expandacem tail and 12.5 ppg Varicem lead.	

11.5 ppg tuned spacer used.	
5) Station log run while pressuring up to 3000 psi.	
5) Main pass run under 3000 psi. Repeat pass run without pressure.	
6) Top of cement 1250'.	
7) Schlumberger Crew: Josh Strand and Aaron Weber	

RUN 1			RUN 2		
SERVICE ORDER #: PROGRAM VERSION: FLUID LEVEL:			SERVICE ORDER #: PROGRAM VERSION: FLUID LEVEL:		
C31T-00113 19C1-222 0 ft					
LOGGED INTERVAL	START	STOP	LOGGED INTERVAL	START	STOP

EQUIPMENT DESCRIPTION					
RUN 1			RUN 2		

SURFACE EQUIPMENT WITM (EDTS)-A					
DOWNHOLE EQUIPMENT					
LEH-QT LEH-QT		30.7			
EDTC-B EDTH-B EDTC-B EDTG-A/B		27.8			
MDSB_EDTC Mud Tempe		27.8			
CTEM		24.3			
Gamma Ray EFTB DIAG TelStatus EDTCB Ele		22.4			
		21.3			
AH-InLine AH-InLine		21.3			
AH-107 AH-107		17.5			
USIT-E ECH-MFA 1964 USAC-A 992 USIS-A 1804 USSC-B 745 USRS-B 779		15.5			



MAXIMUM STRING DIAMETER 7.50 IN
MEASUREMENTS RELATIVE TO TOOL ZERO
ALL LENGTHS IN FEET

Schlumberger

Casing Evaluation 5"=100'

MAXIS Field Log

Input DLIS Files

DEFAULT	USI_012LUP	FN:11	PRODUCER	27-Mar-2014 09:52	6541.5 FT	100.2 FT
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Output DLIS Files

DEFAULT	USI_020PUP	FN:19	PRODUCER	27-Mar-2014 12:13	6544.5 FT	103.5 FT
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OP System Version: 19C1-222

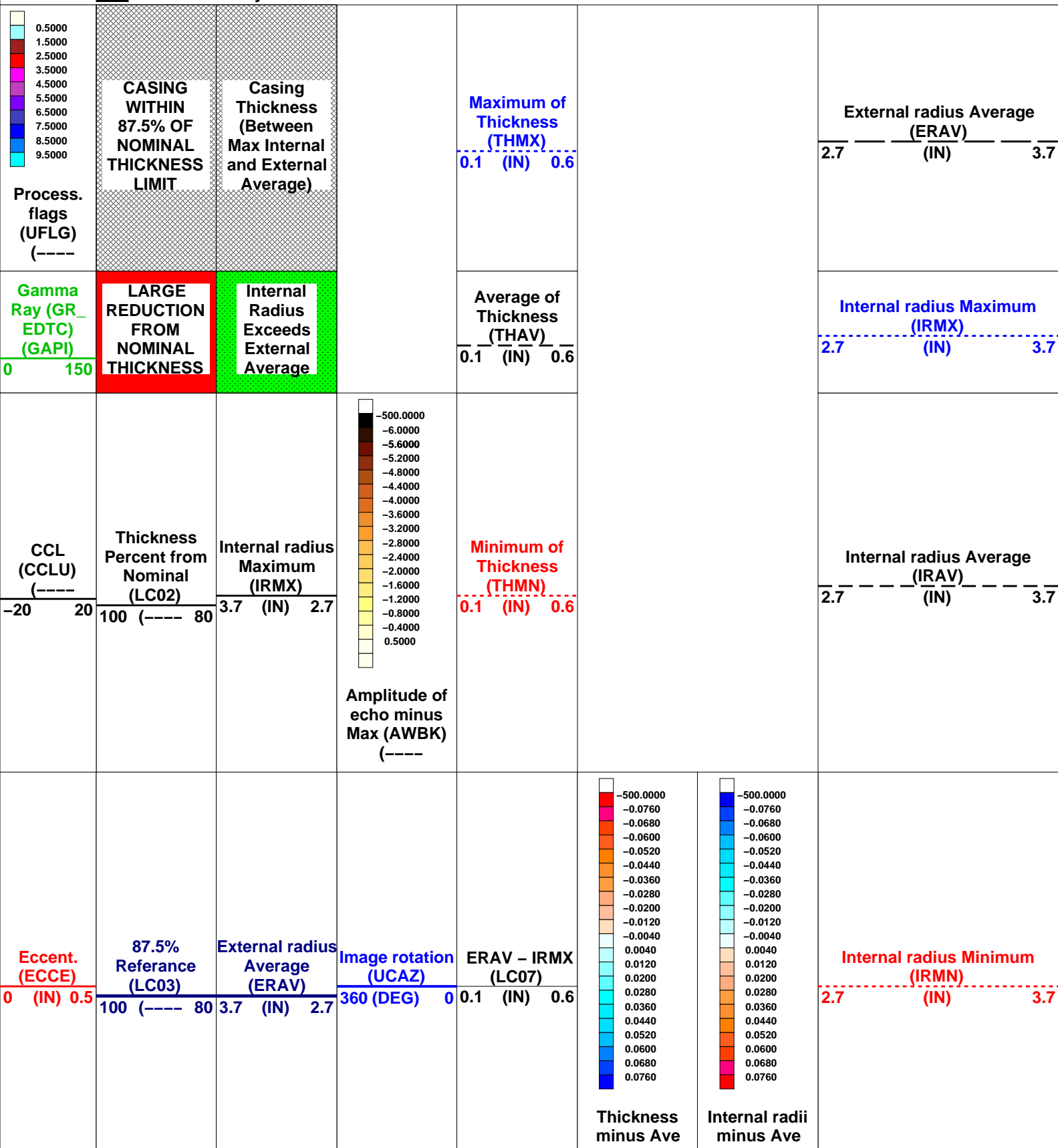
USIT-E	19C1-222	EDTC-B	19C1-222
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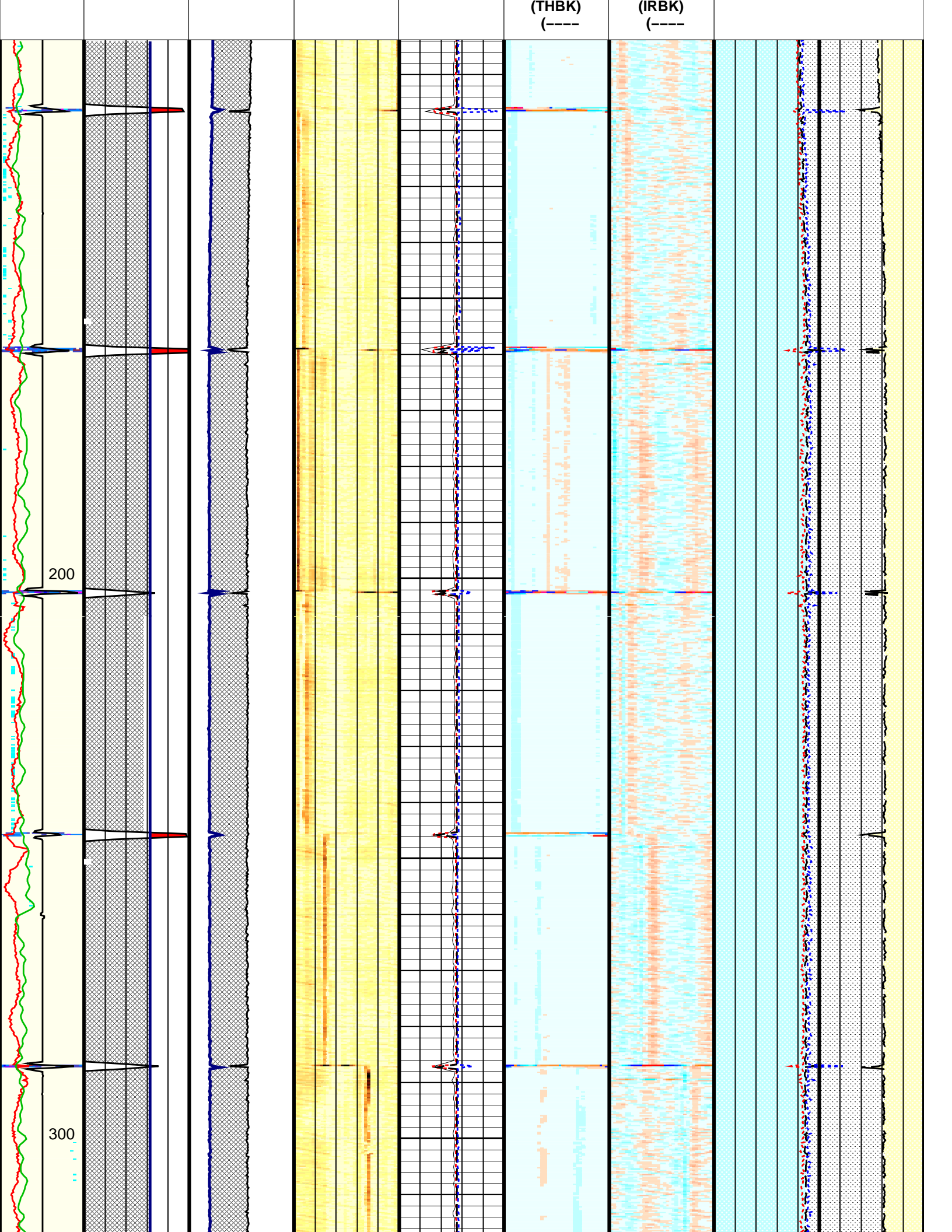
Changed Parameter Summary

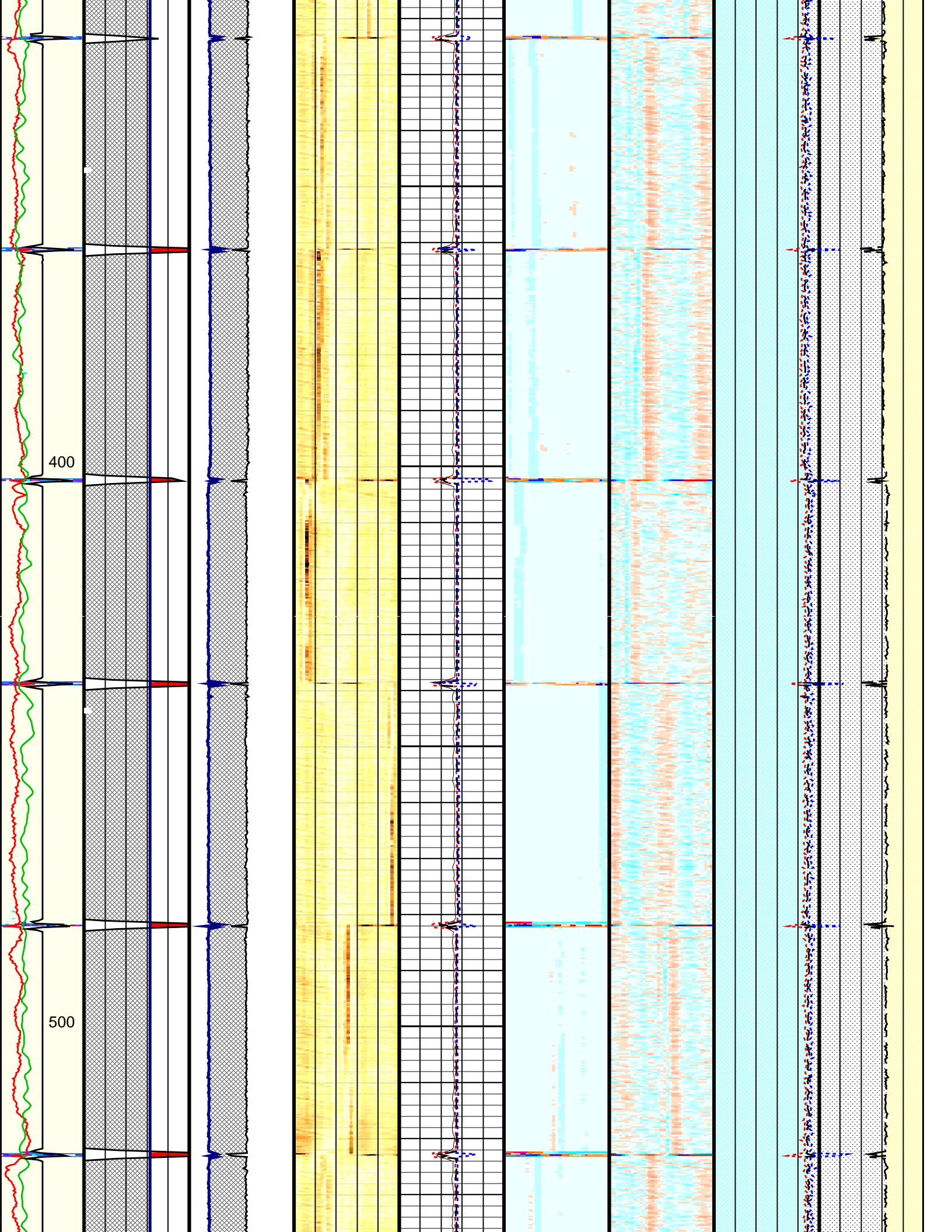
DLIS Name	New Value	Previous Value	Depth & Time
DFVL	186 US/F	197 US/F	6544.5 12:13:10
	187 US/F	186 US/F	5900.0 12:13:33
	187 US/F	187 US/F	5200.0 12:14:12
	189 US/F	187 US/F	4050.0 12:15:17
	191 US/F	189 US/F	2900.0 12:16:21
	192 US/F	191 US/F	2300.0 12:16:55
	193 US/F	192 US/F	1900.0 12:17:18
	193 US/F	193 US/F	1750.0 12:17:26
	195 US/F	193 US/F	1600.0 12:17:34
	195 US/F	195 US/F	1300.0 12:17:51
	197 US/F	195 US/F	900.0 12:18:14

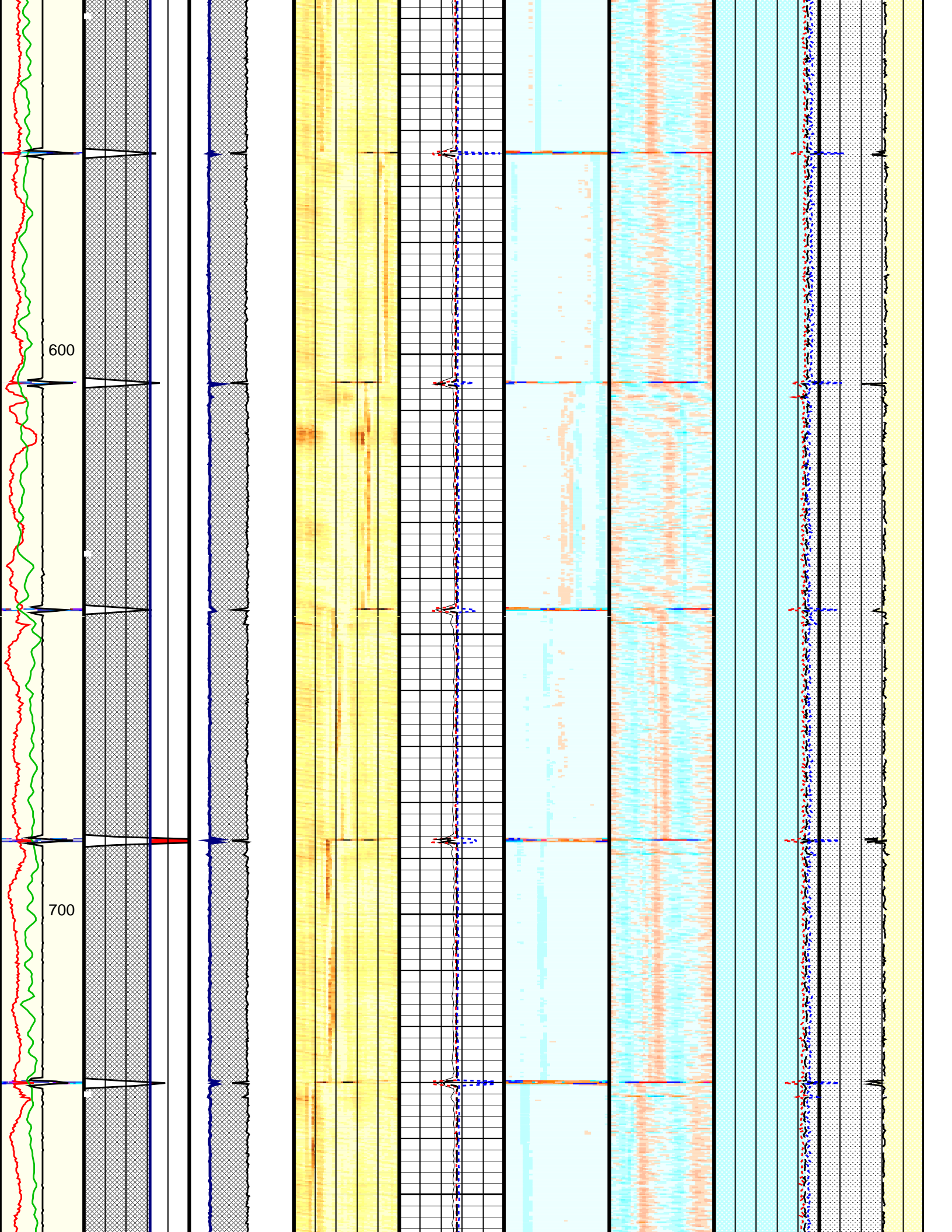
400.0 12:18:42
6544.5 12:13:10
5900.0 12:13:32
5200.0 12:14:12
4050.0 12:15:17
2900.0 12:16:21
2300.0 12:16:55
1900.0 12:17:18
1750.0 12:17:26
1600.0 12:17:34
1300.0 12:17:51
900.0 12:18:14
400.0 12:18:42

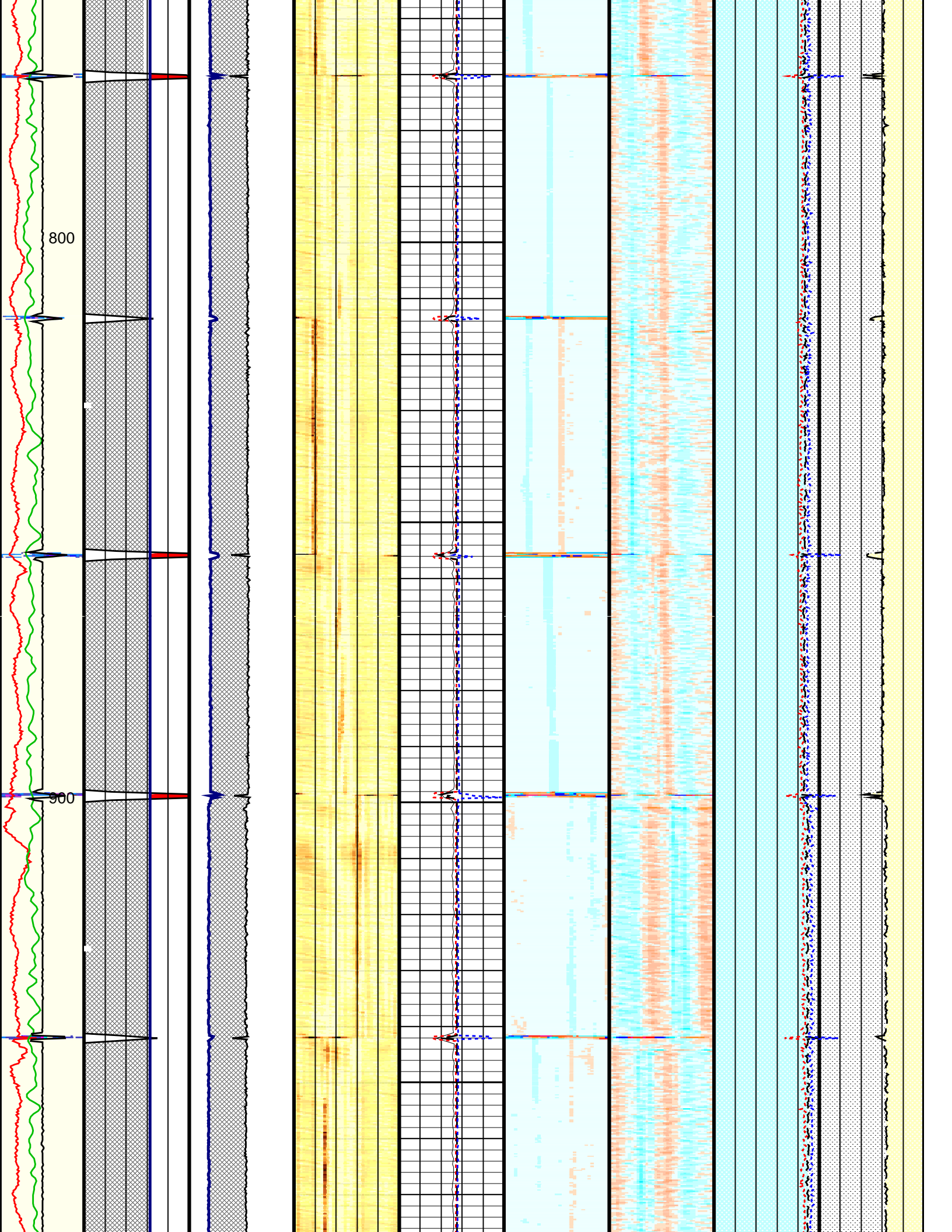
Time Mark Every 60 S

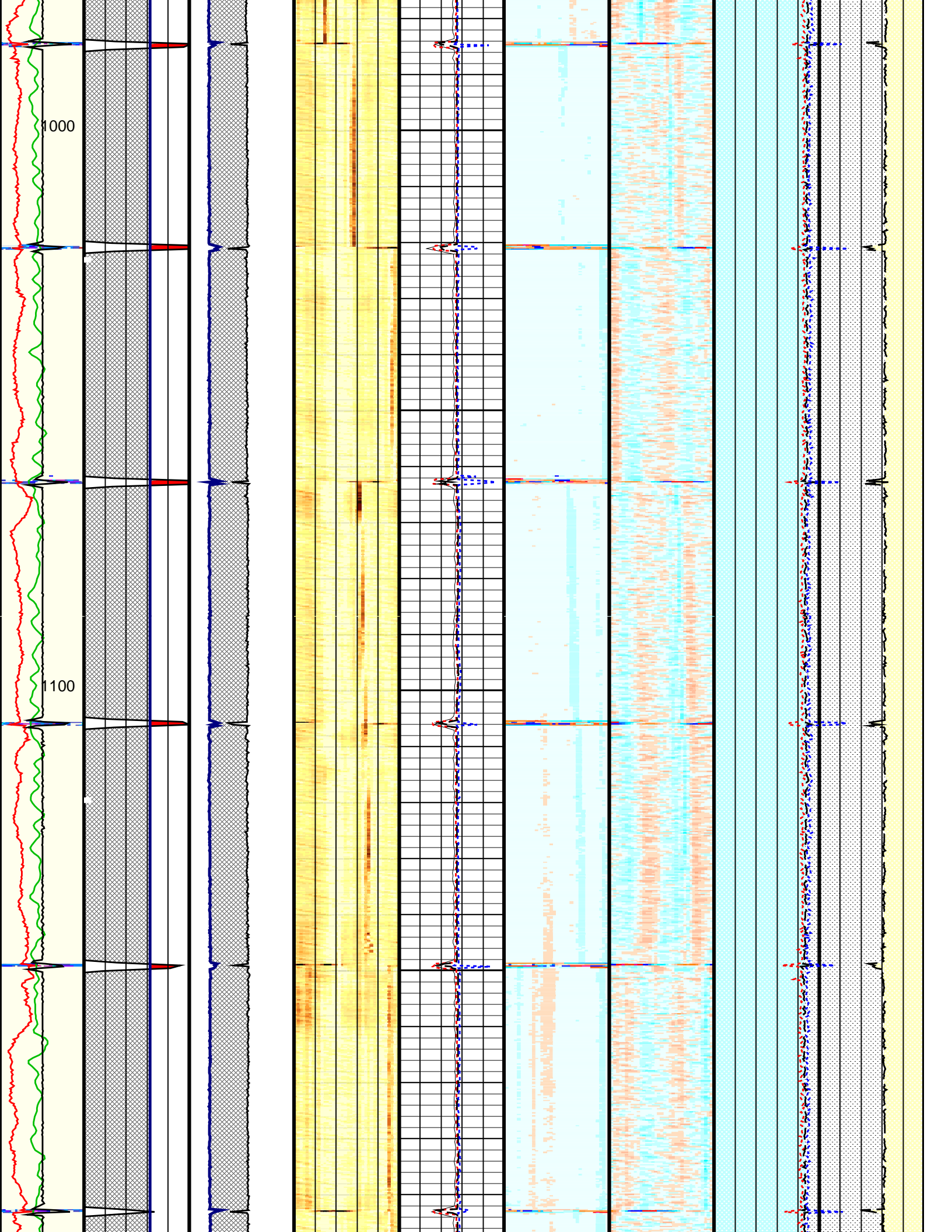


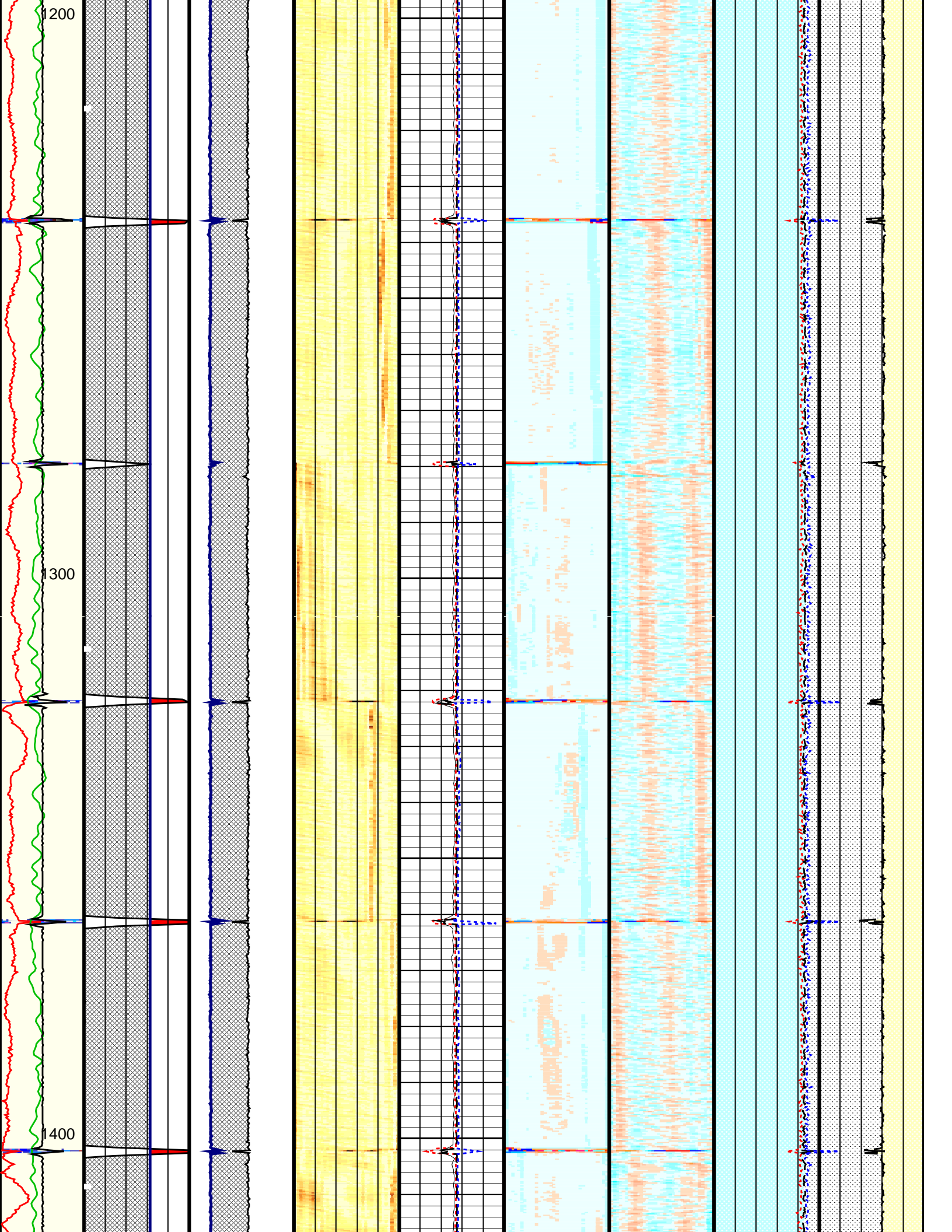


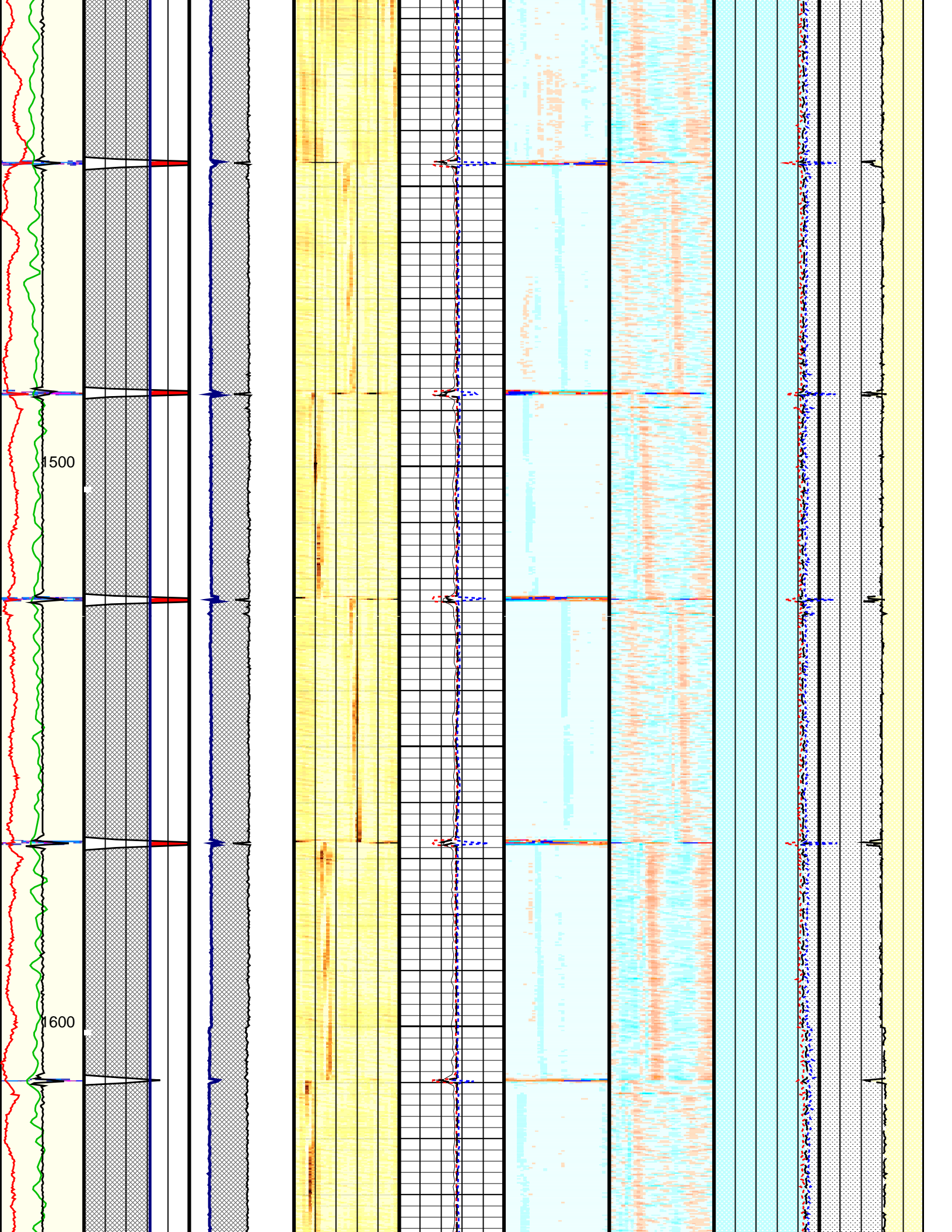


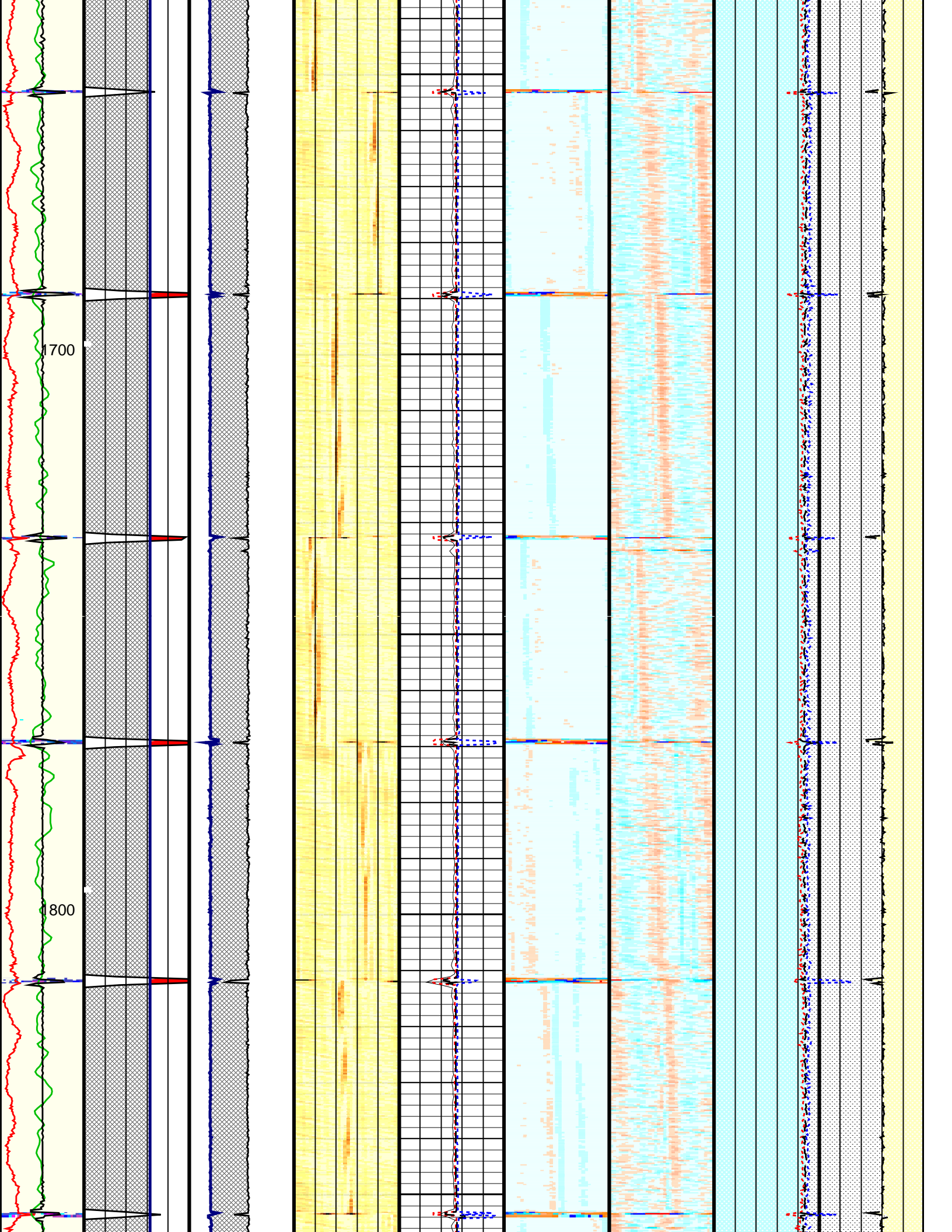


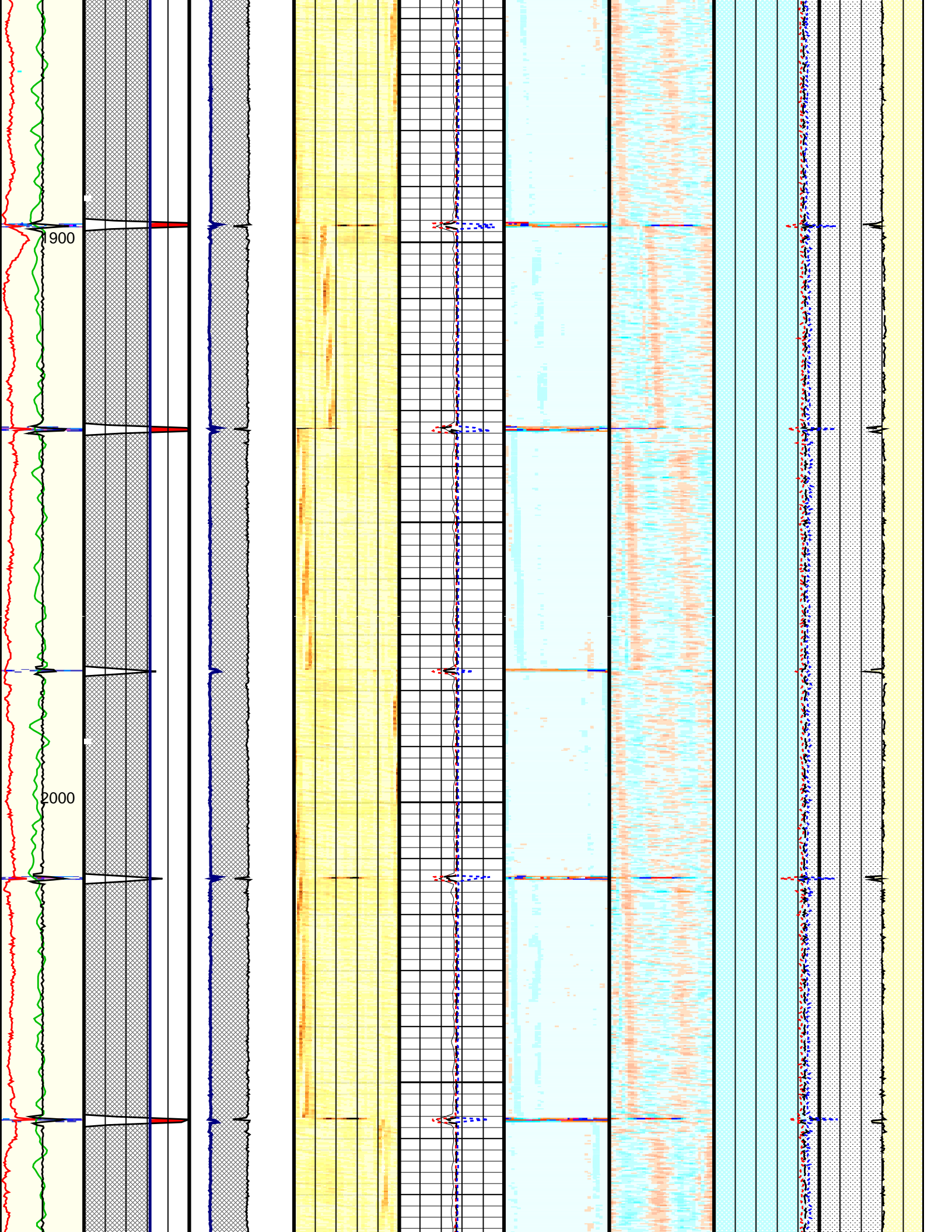


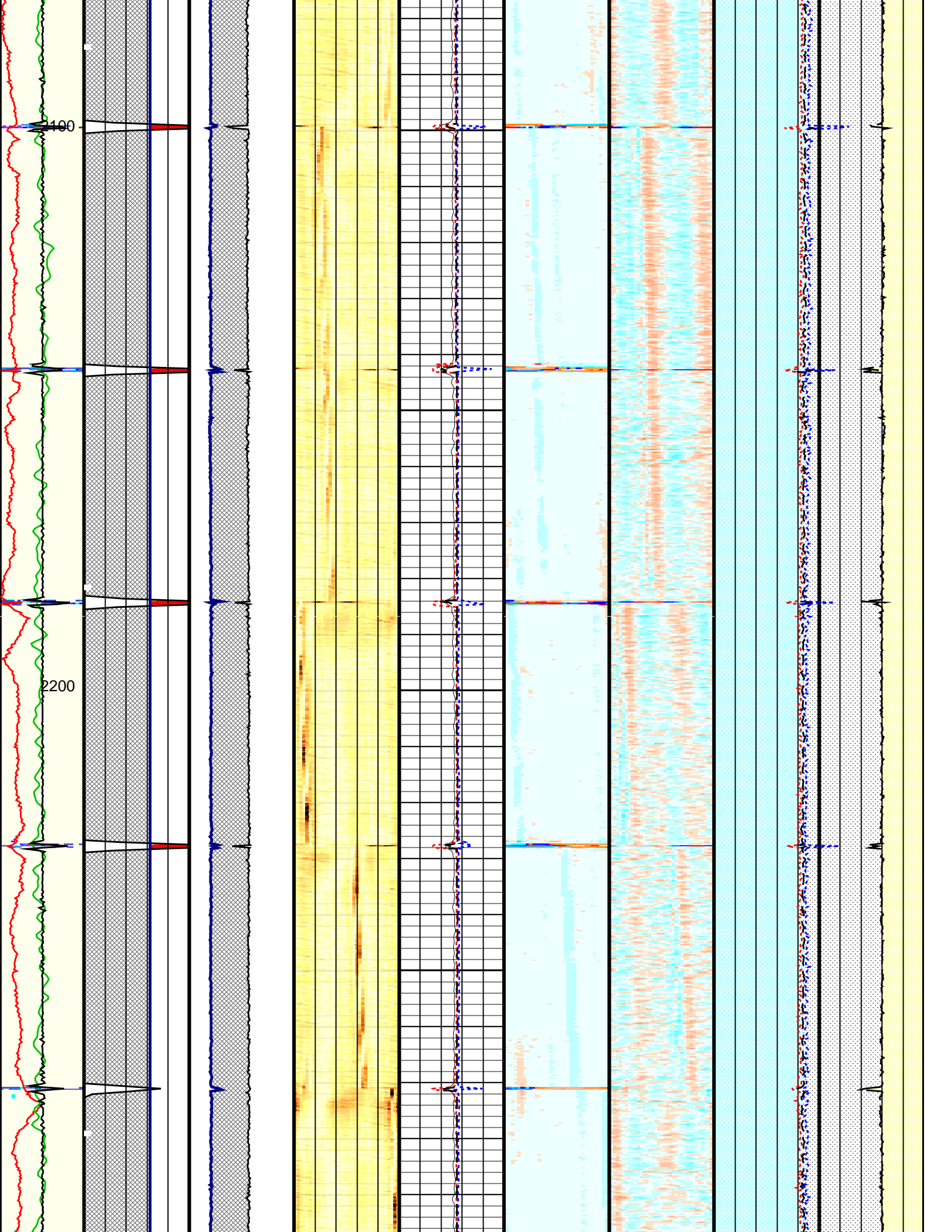


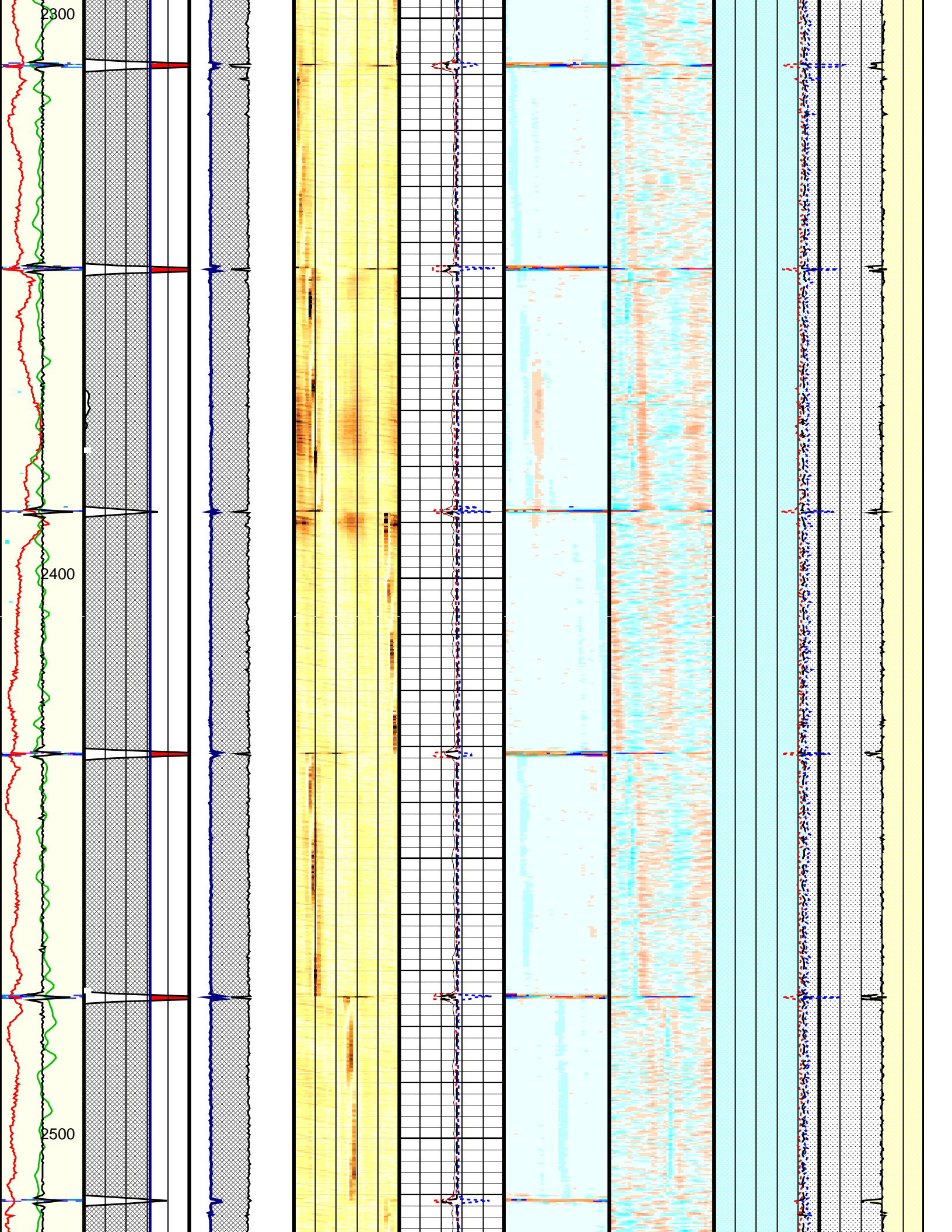


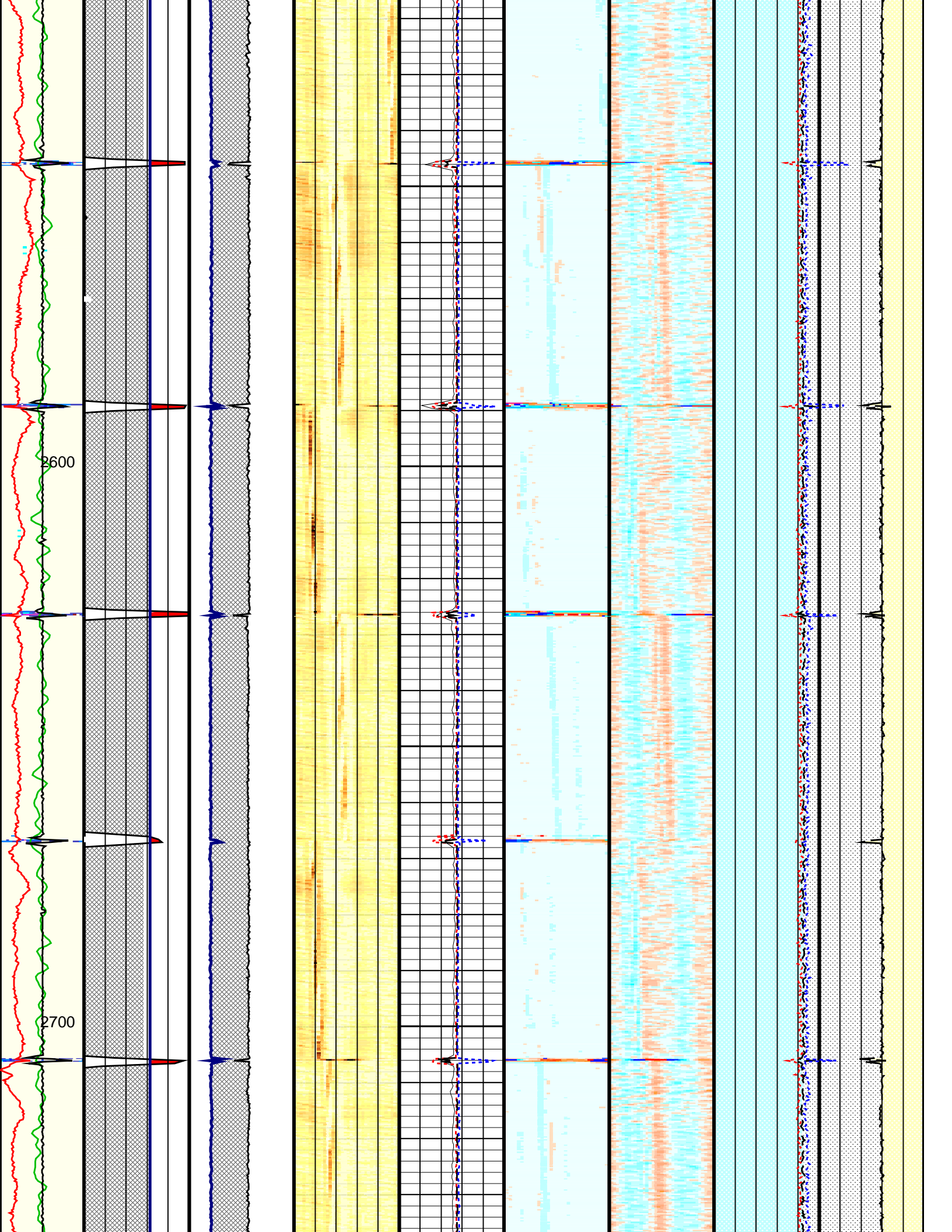


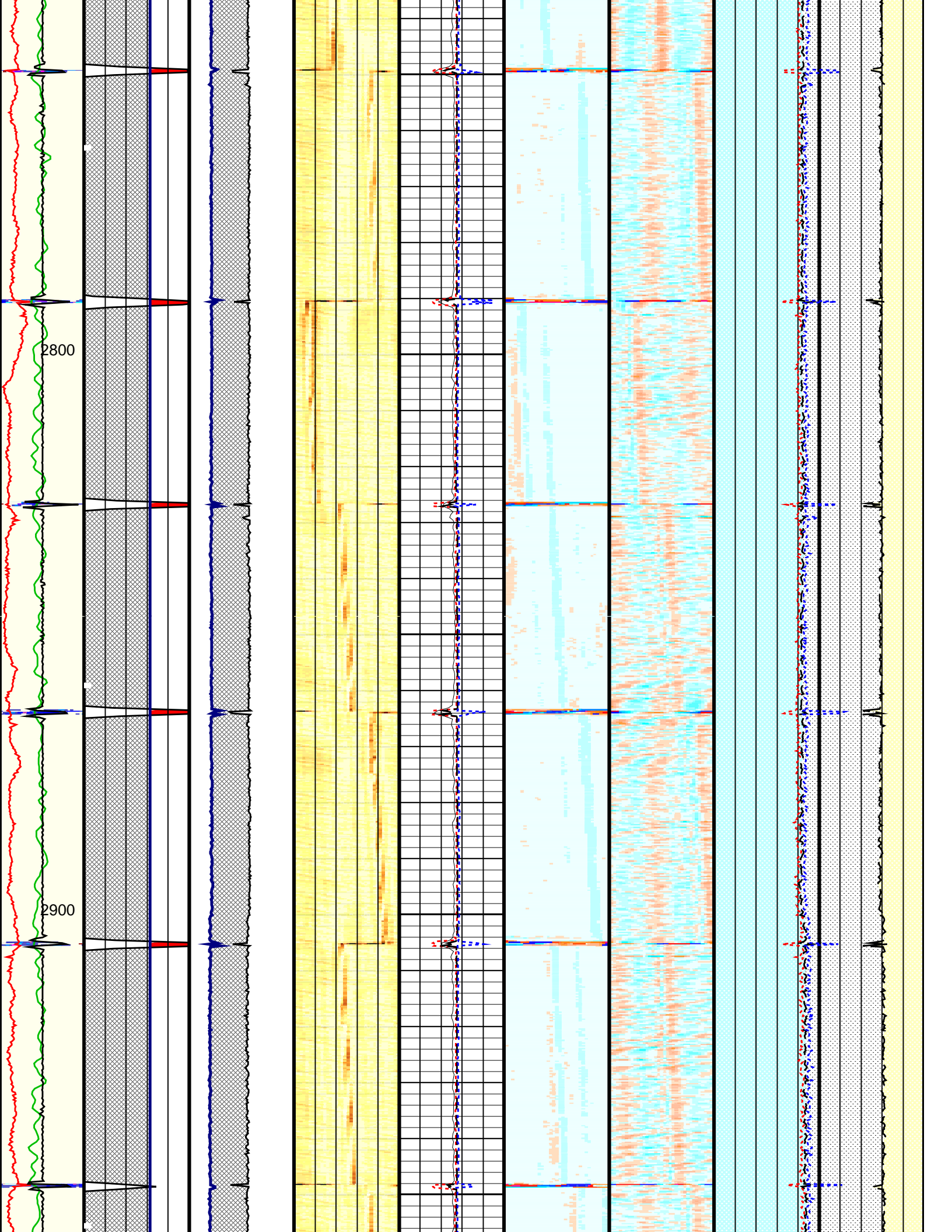


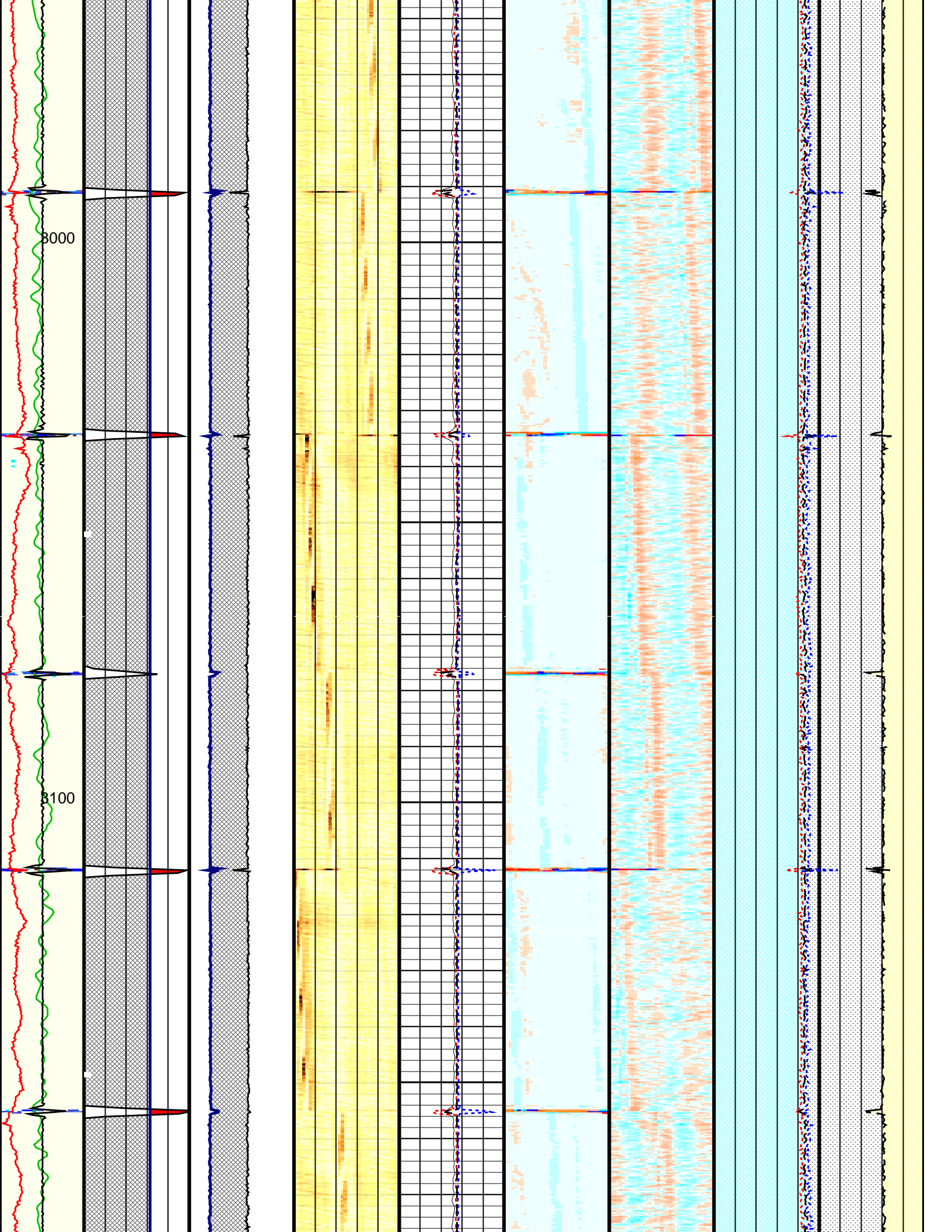


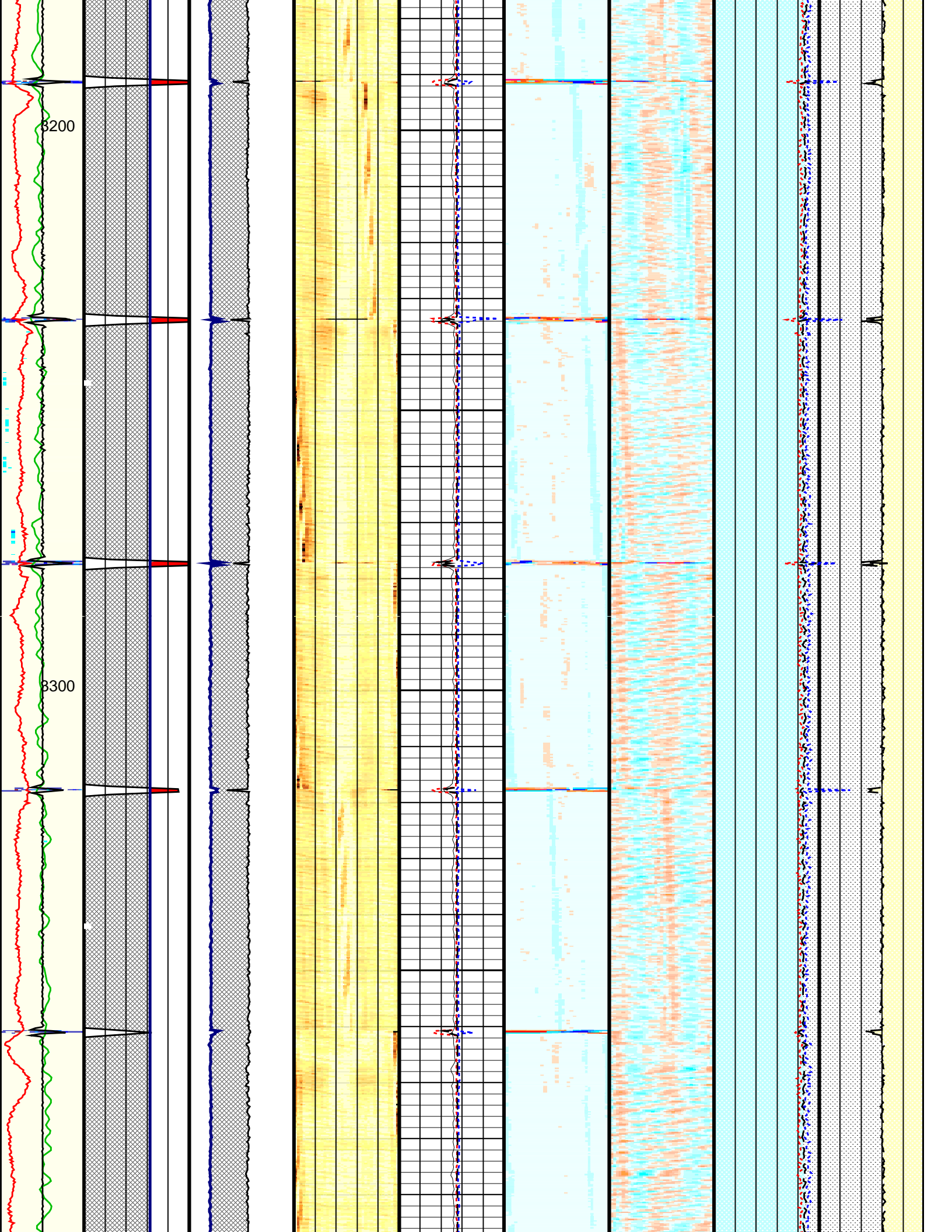


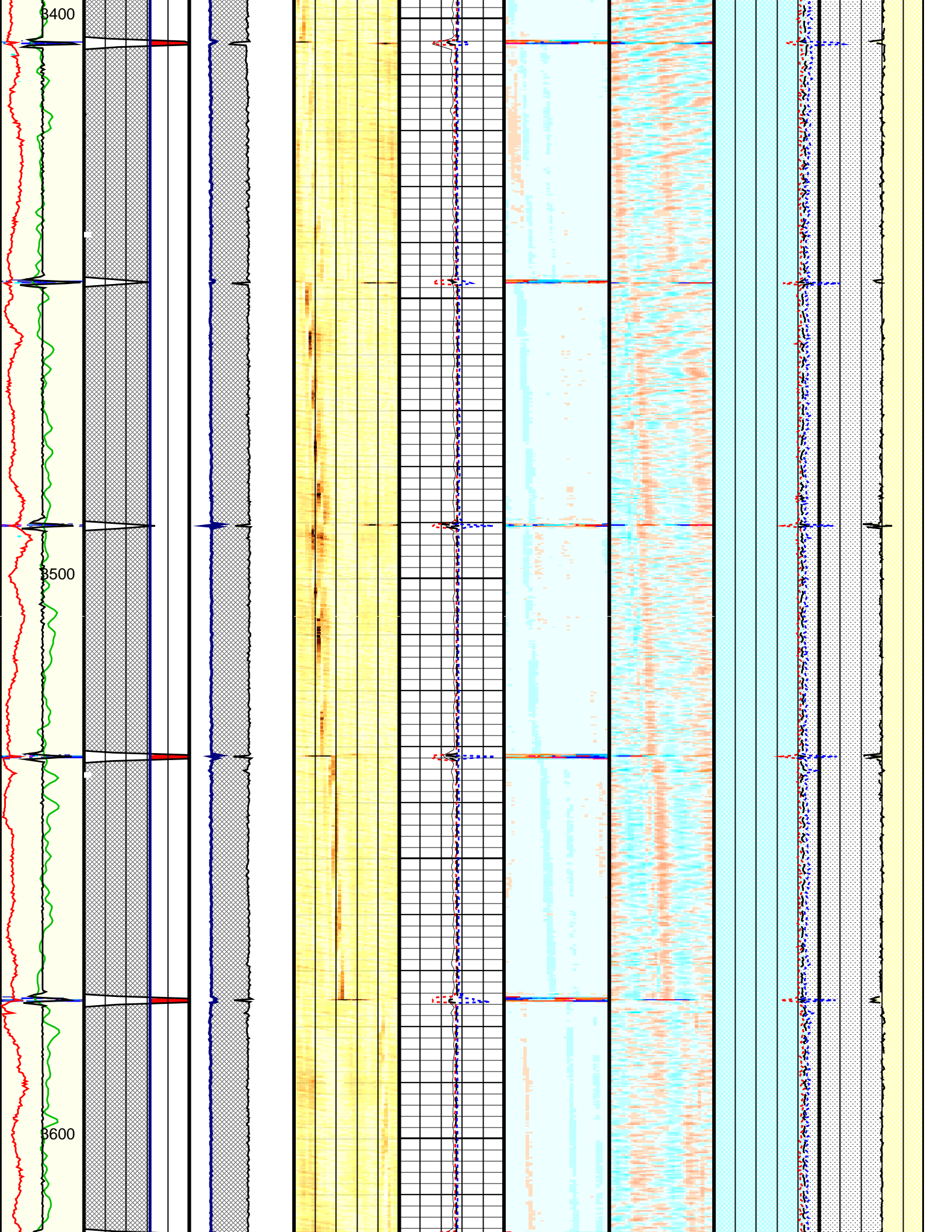


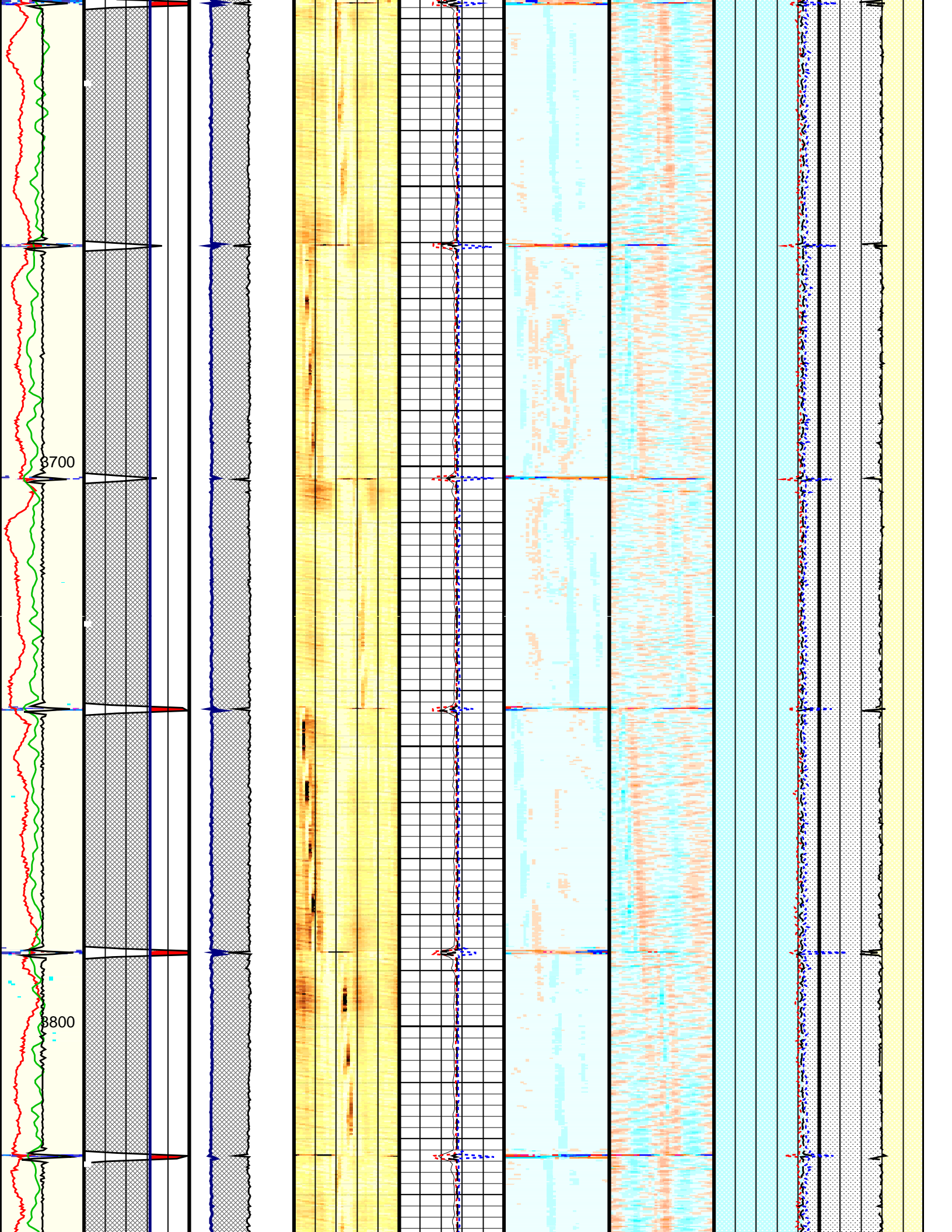


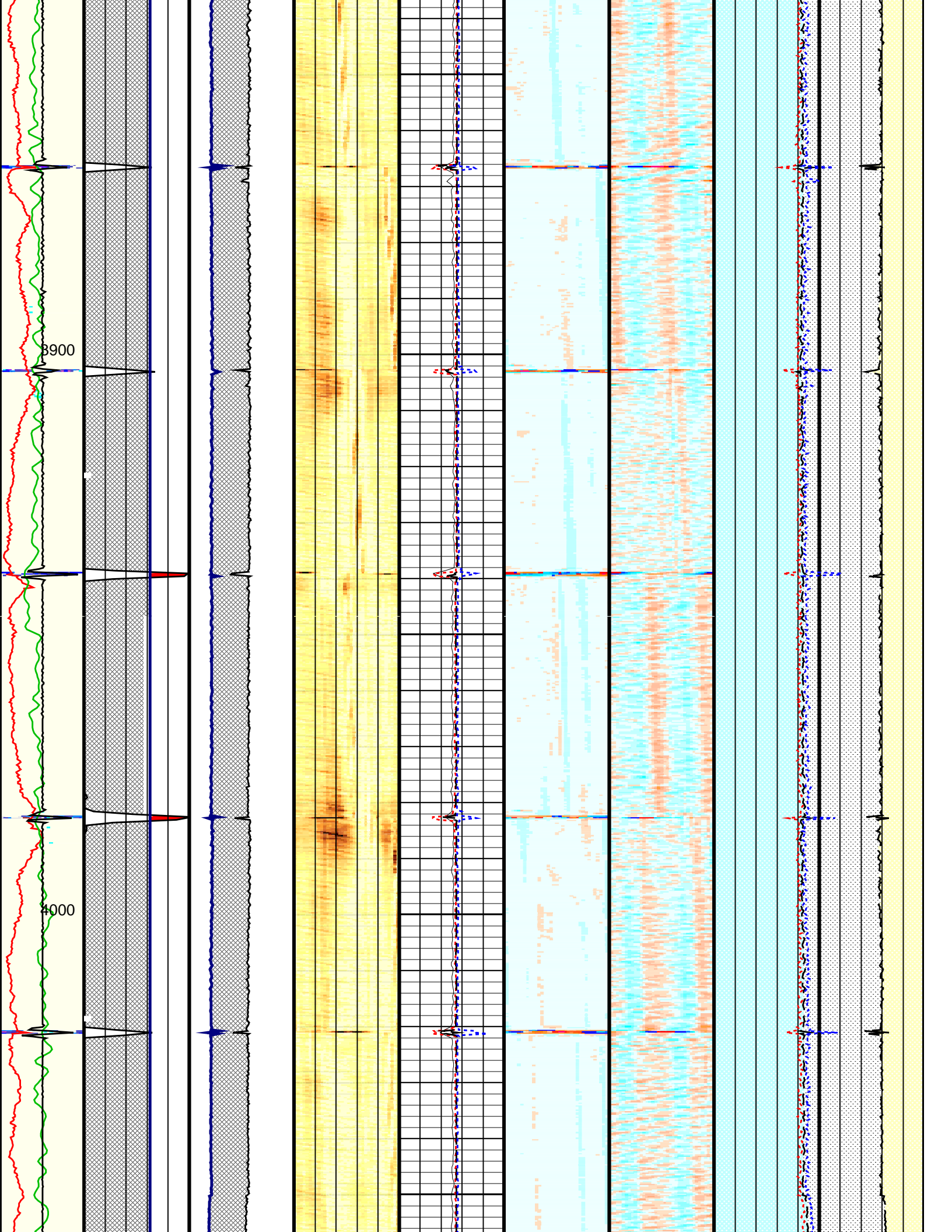


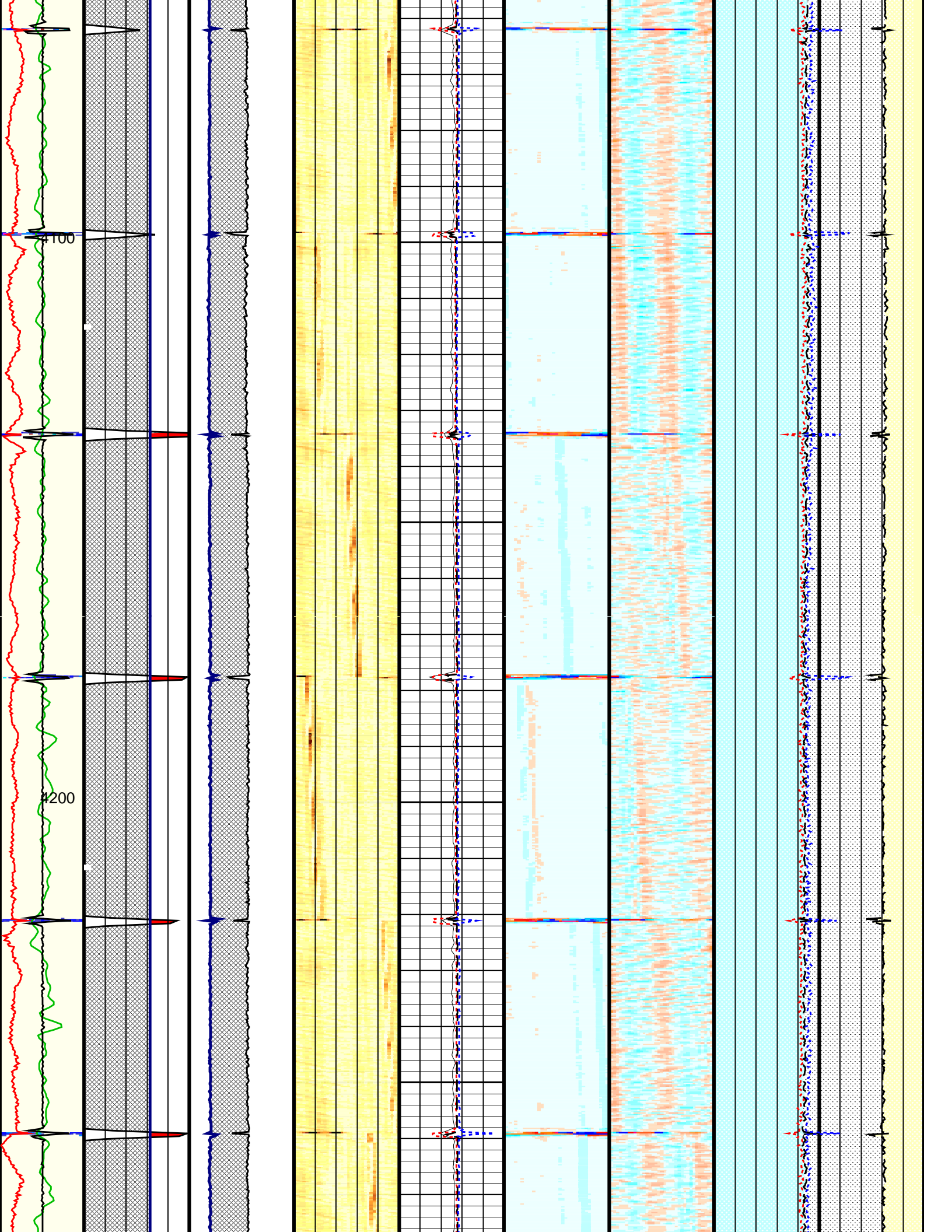


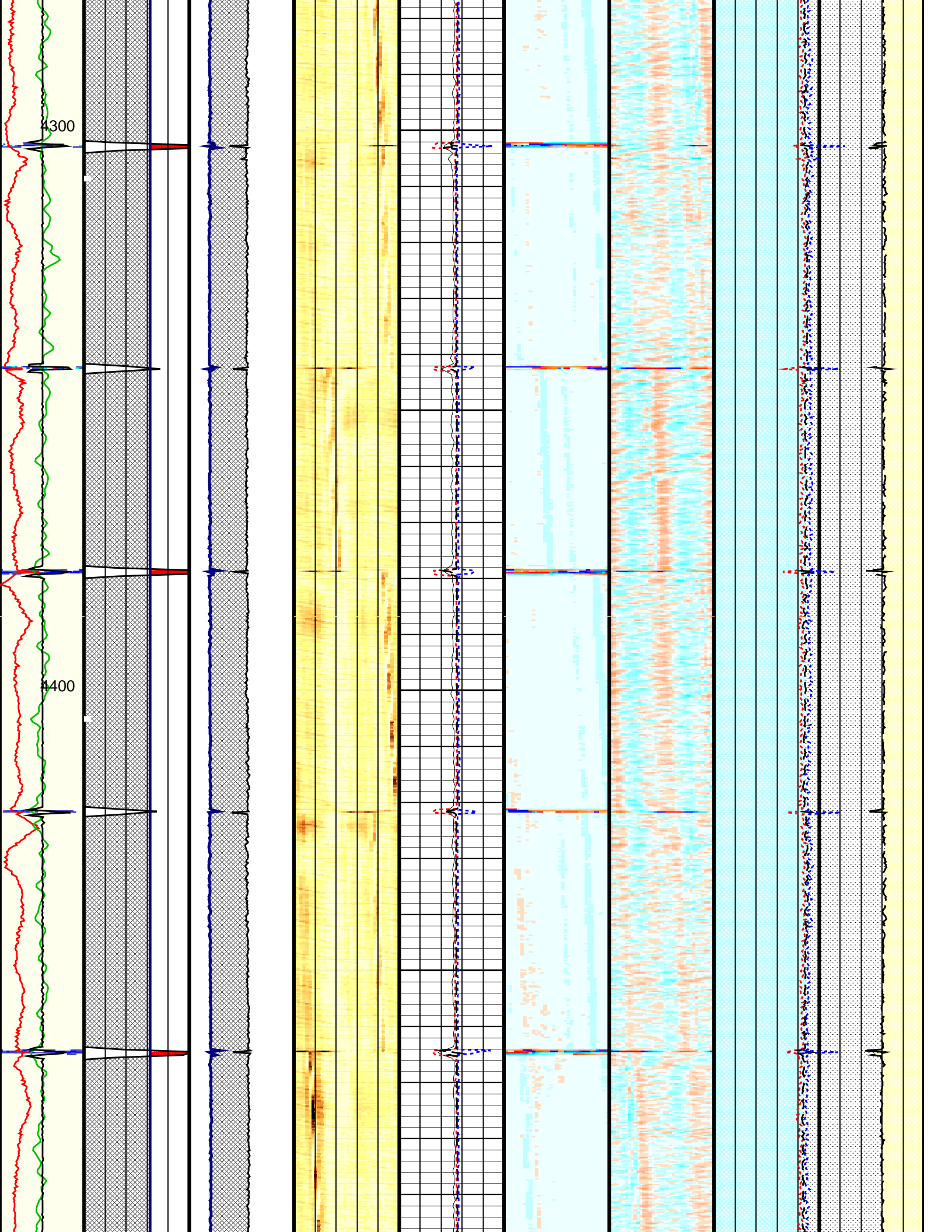


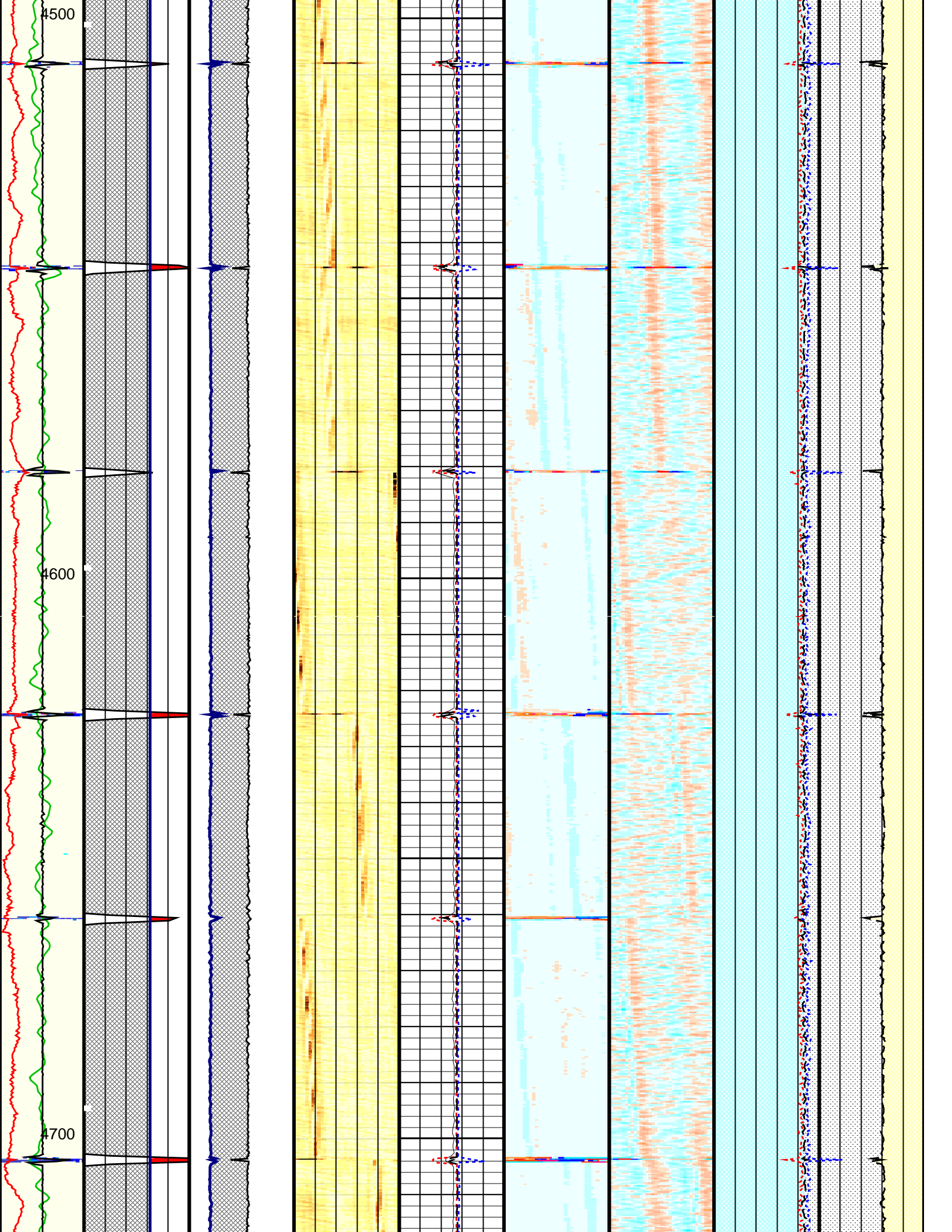


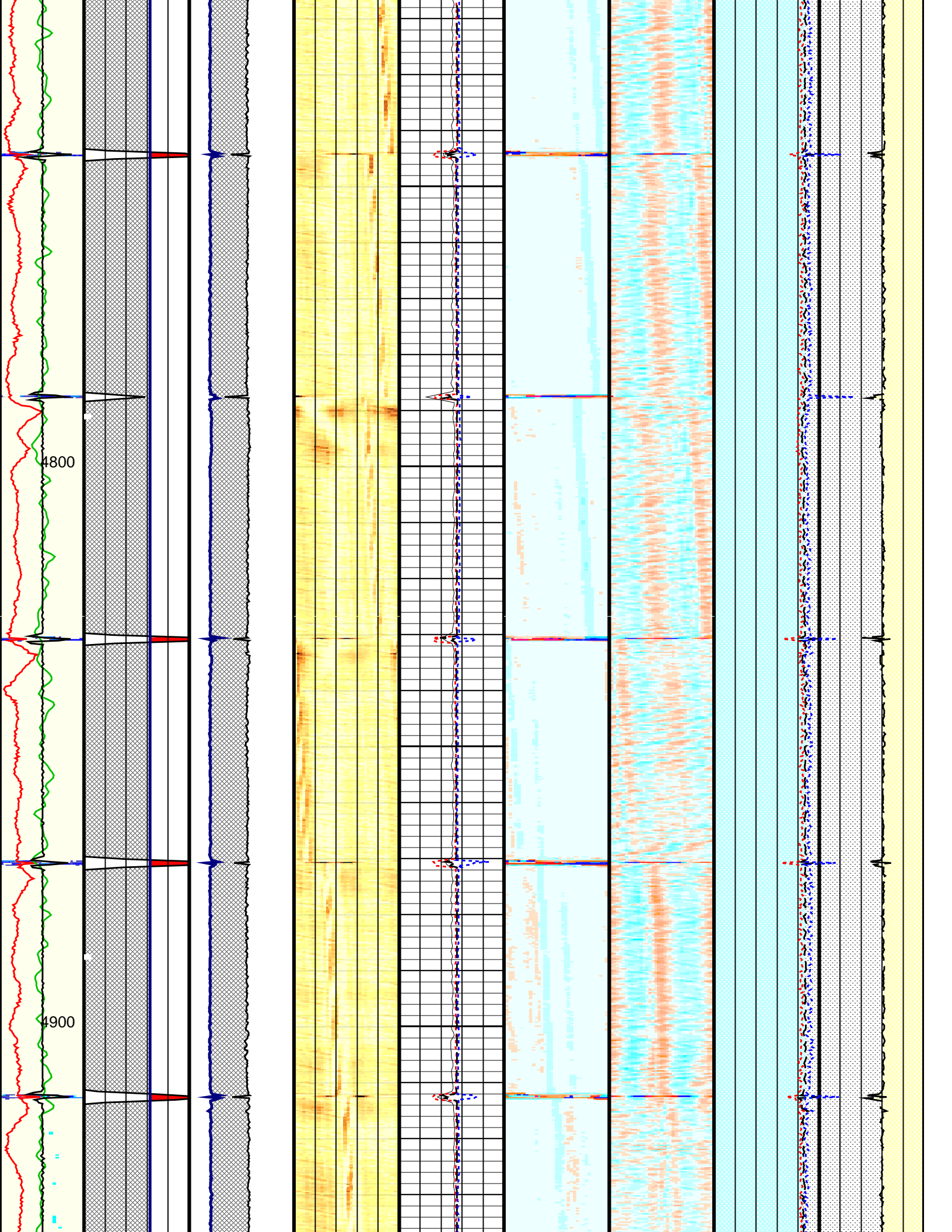


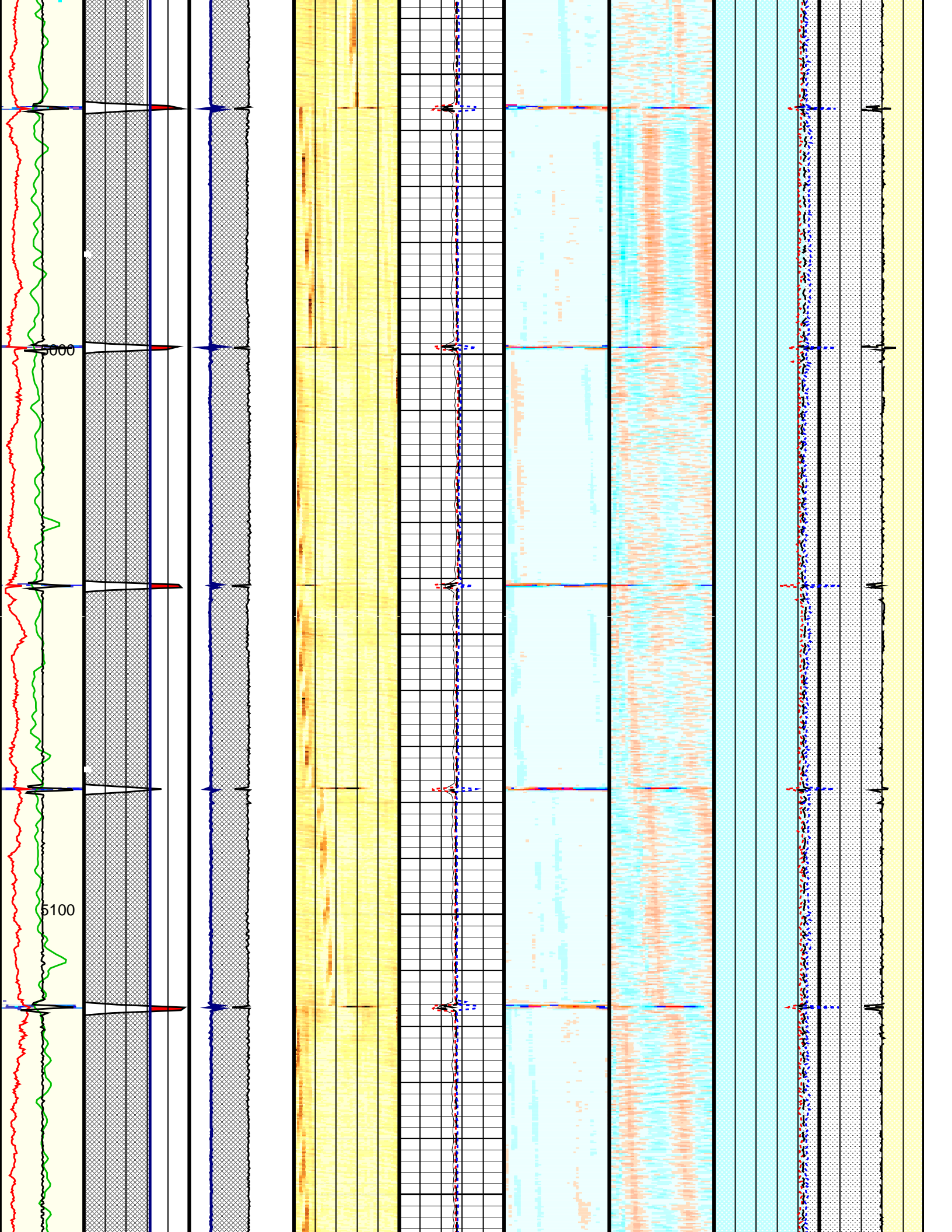


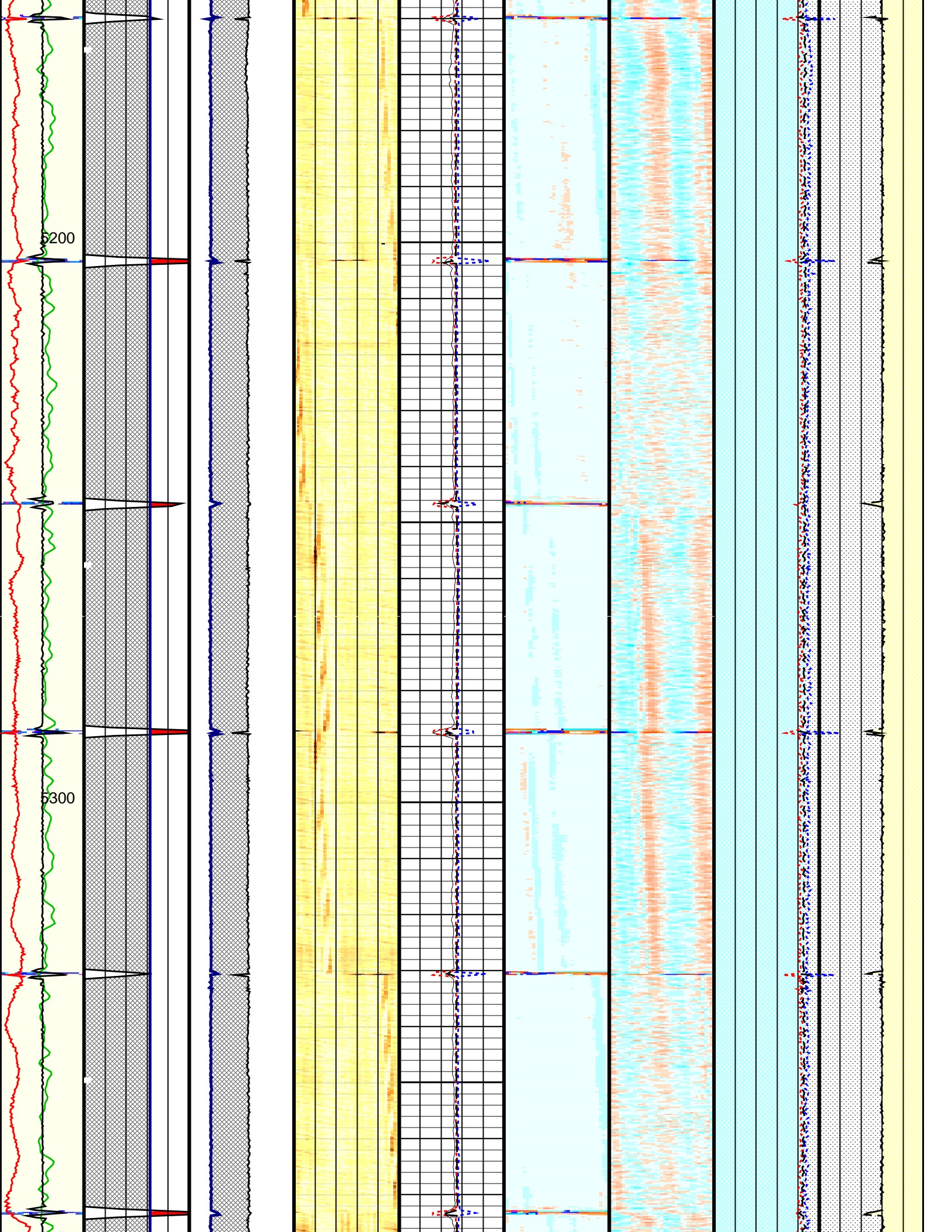


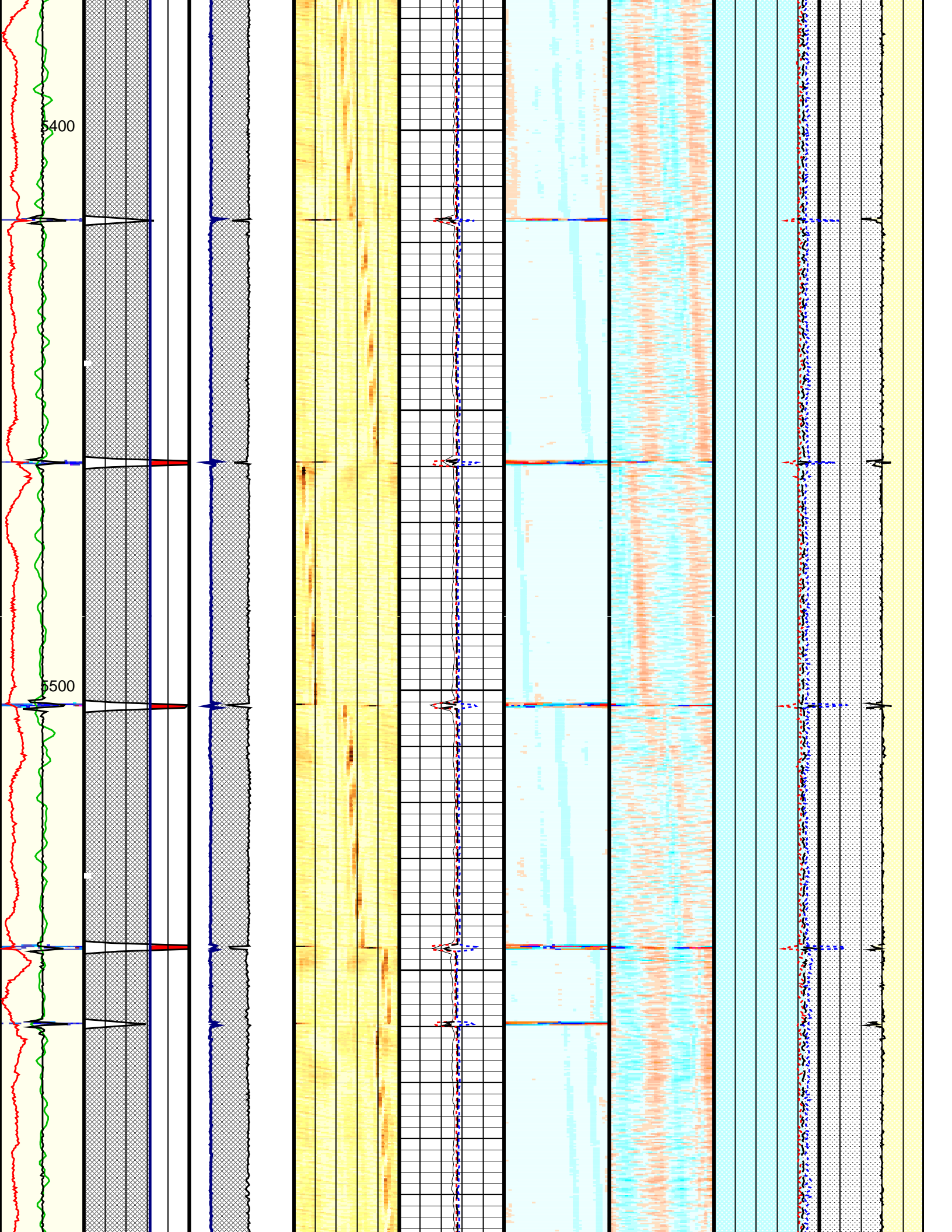


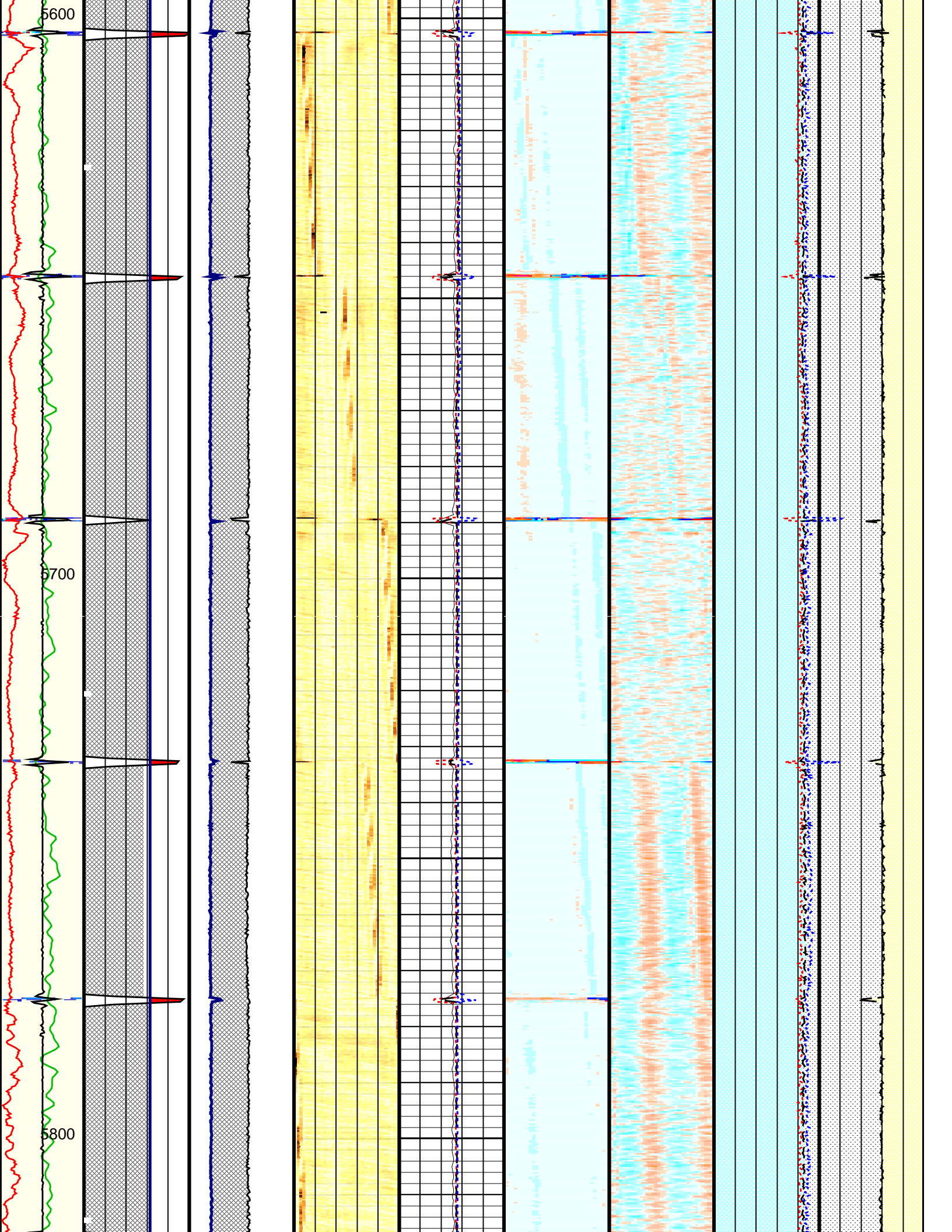


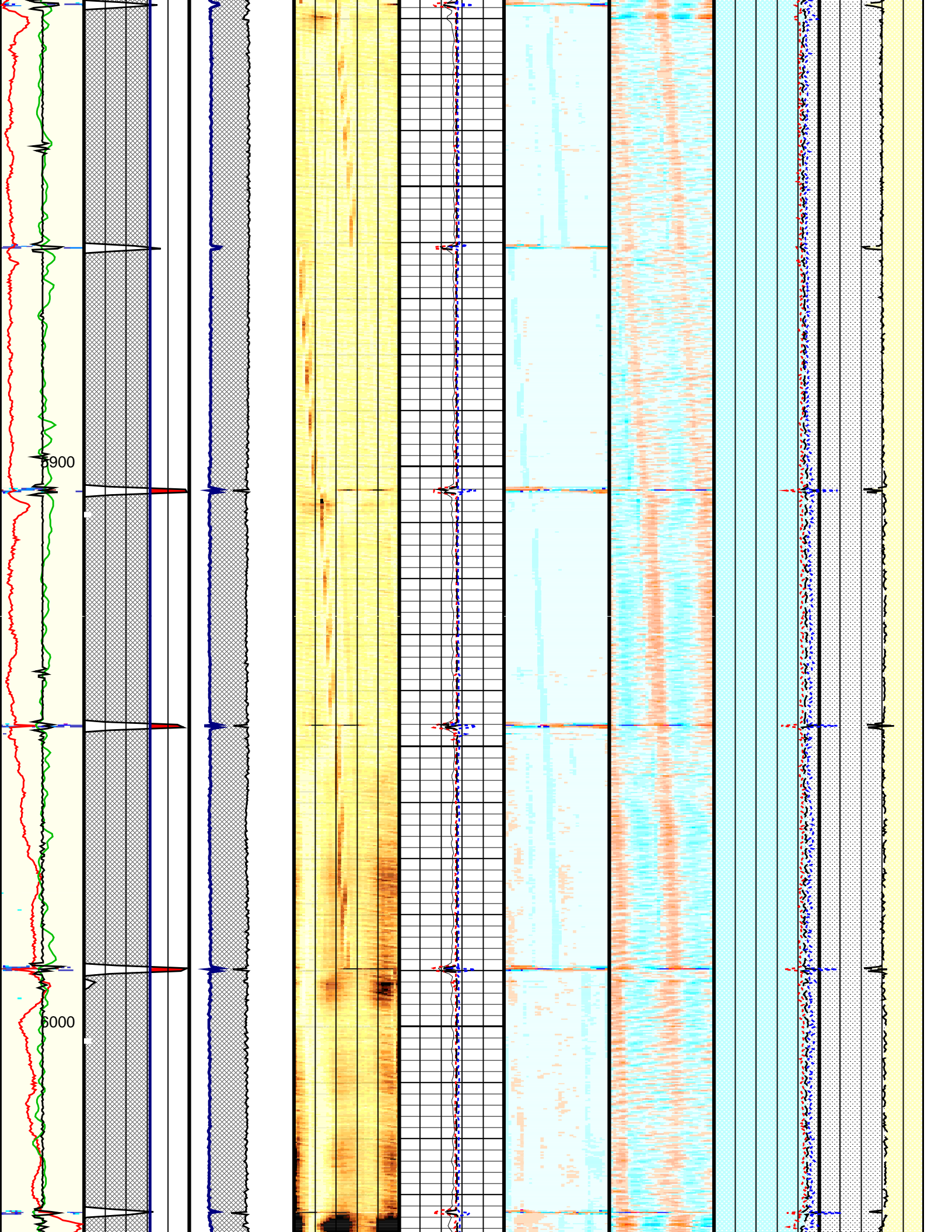


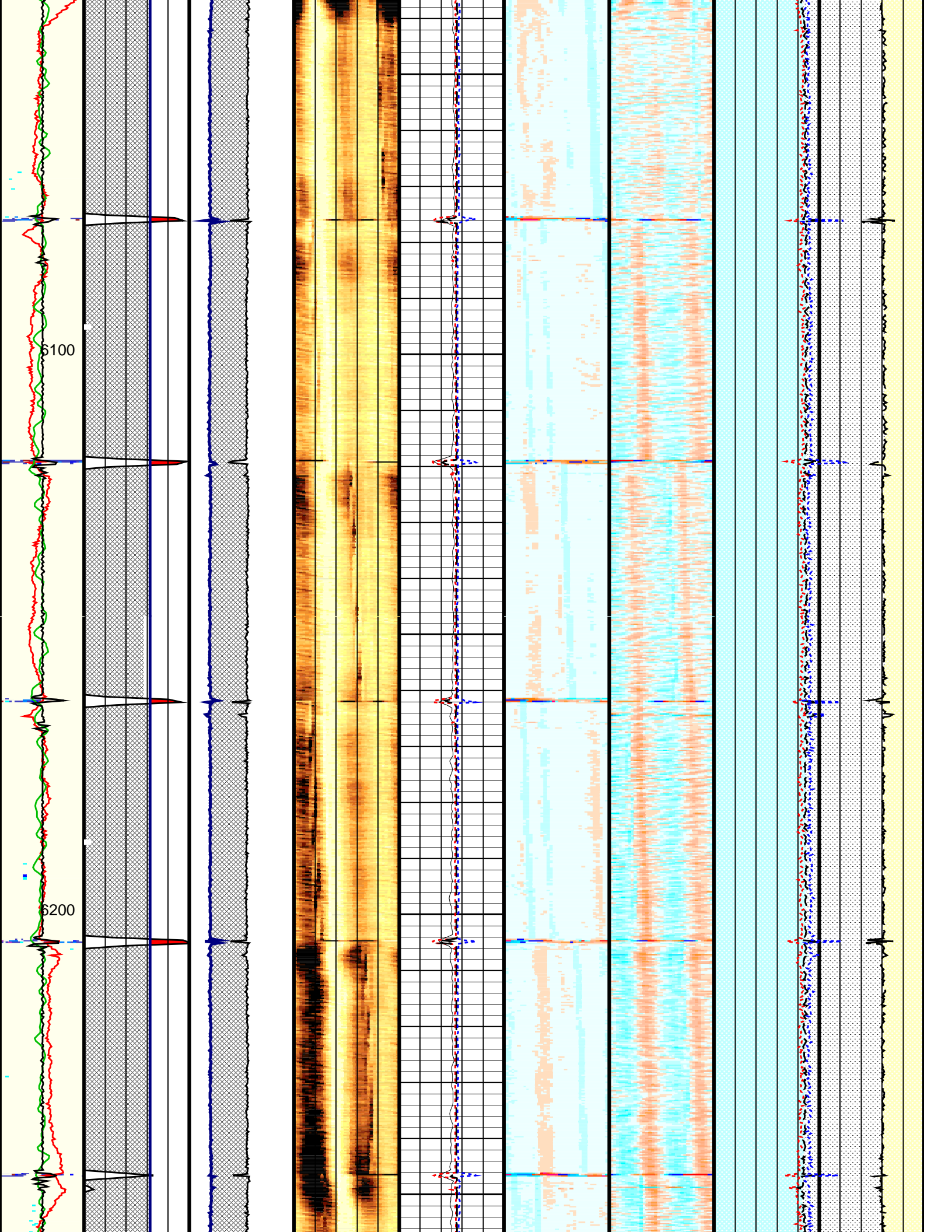


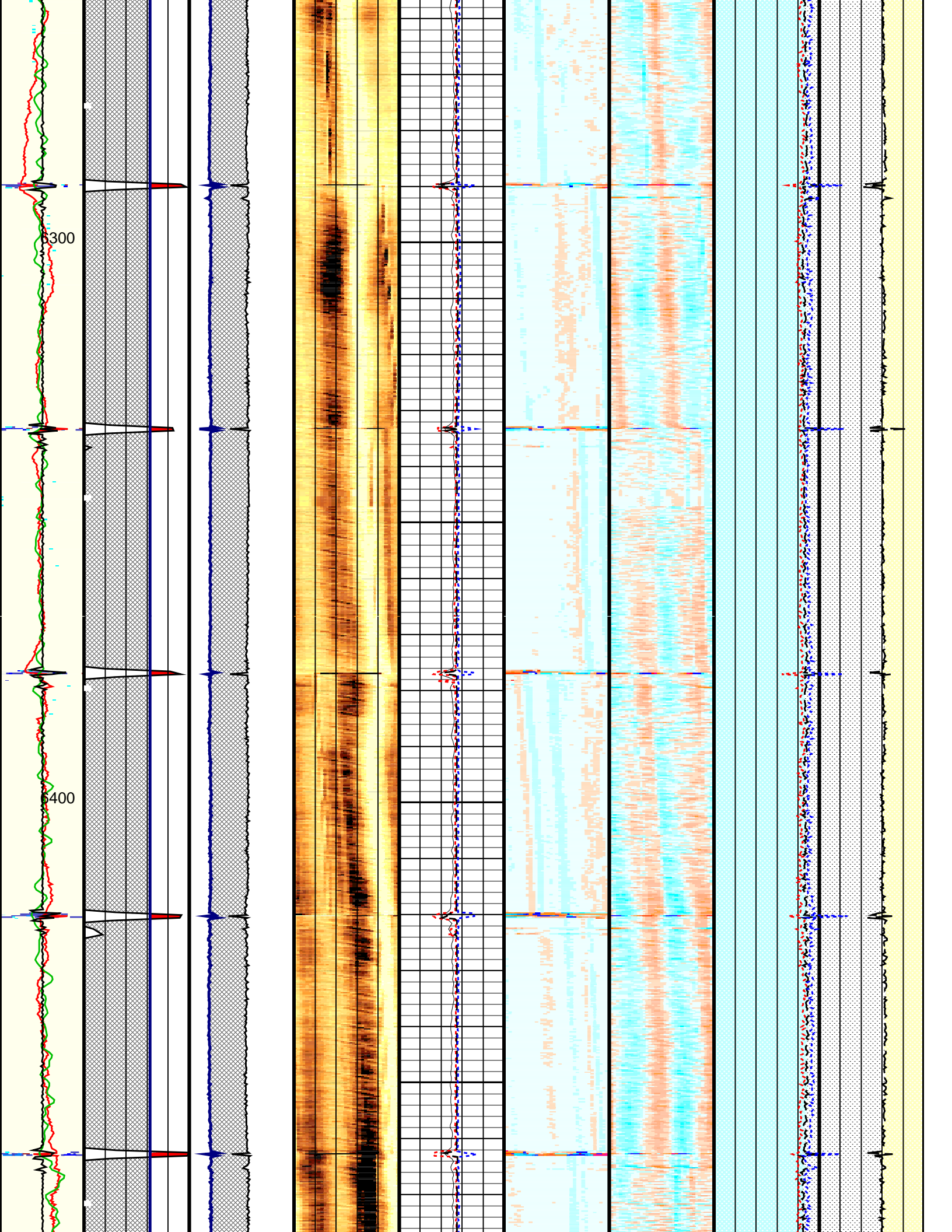


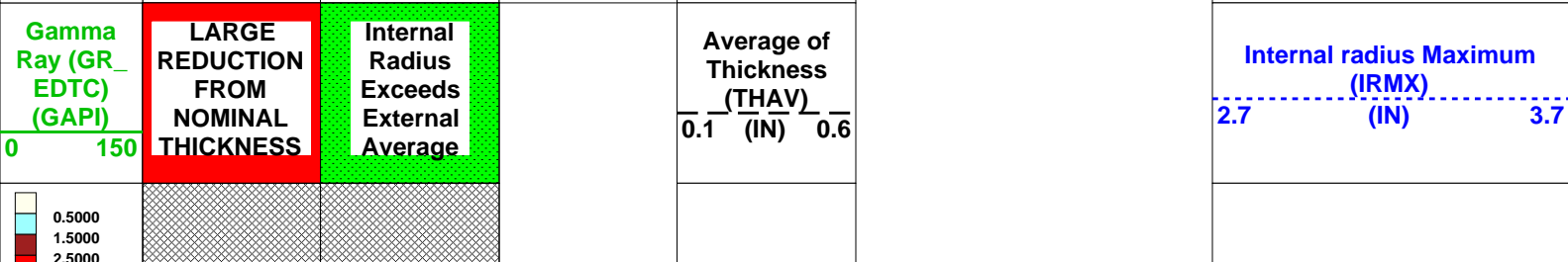
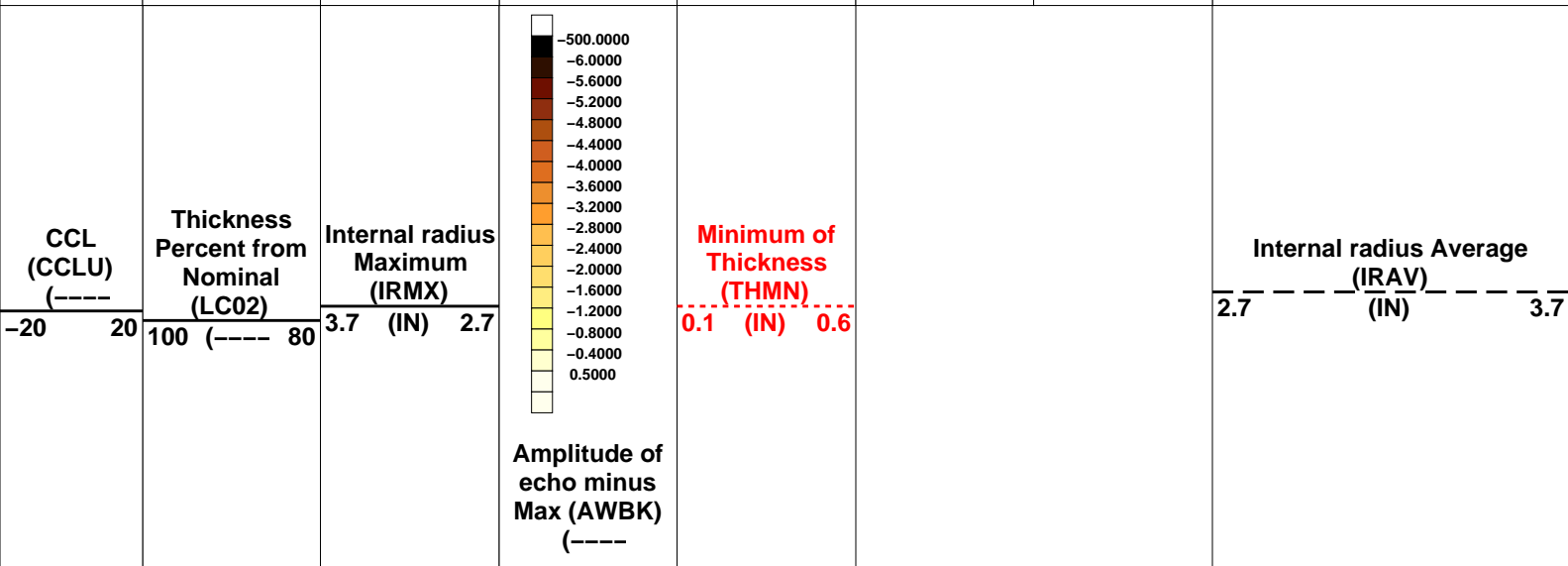
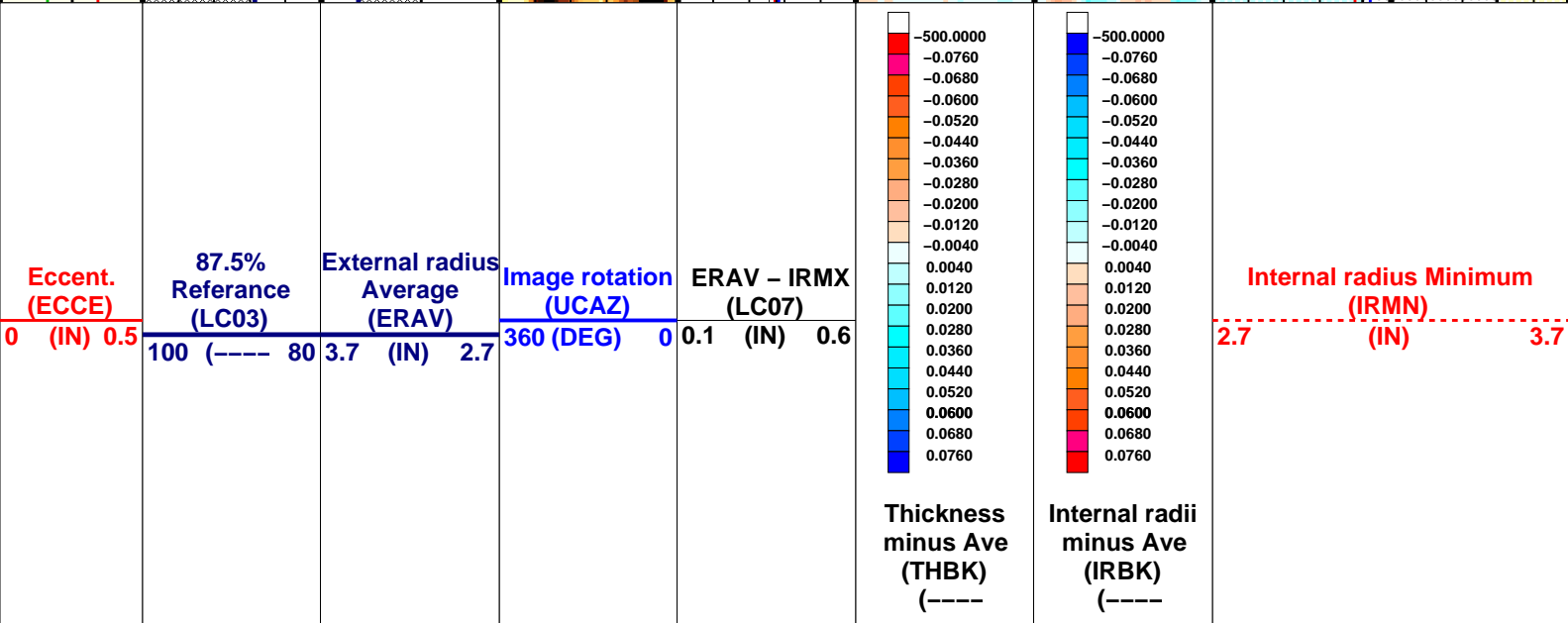
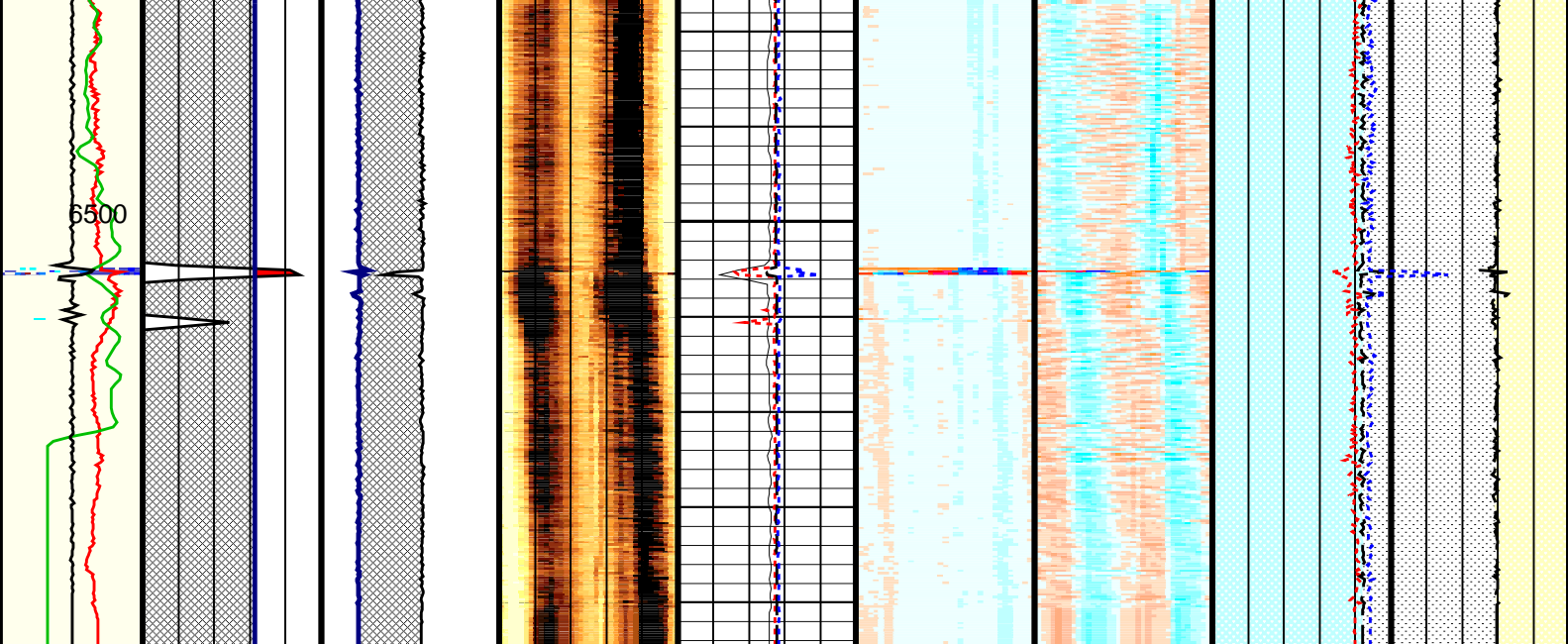












<div> <div>3.5000</div> <div>4.5000</div> <div>5.5000</div> <div>6.5000</div> <div>7.5000</div> <div>8.5000</div> <div>9.5000</div> </div>	<div> <div>CASING WITHIN 87.5% OF NOMINAL THICKNESS LIMIT</div> </div>	<div> <div>Casing Thickness (Between Max Internal and External Average)</div> </div>	<div> <div>Maximum of Thickness (THMX)</div> <div>0.1 (IN) 0.6</div> </div>	<div> <div>External radius Average (ERAV)</div> <div>2.7 (IN) 3.7</div> </div>
<div> <div>Process flags (UFLG)</div> <div>(----</div> </div>				

<div> <div>PIP SUMMARY</div> <div> <div>Time Mark Every 60 S</div> </div> </div>				
<div> <div>Format: USIT CASING 5 inch</div> <div>Vertical Scale: 5" per 100'</div> </div>		<div> <div>Graphics File Created: 27-Mar-2014 12:13</div> </div>		

<div> <div>OP System Version: 19C1-222</div> </div>				
<div> <div>USIT-E</div> </div>	<div> <div>19C1-222</div> </div>	<div> <div>EDTC-B</div> </div>	<div> <div>19C1-222</div> </div>	

COMPUTATION FLAGS LABELLING				
(0 – 1.5)	UFLG 1		UTIM error	
(1.5 – 2.5)	UFLG 2		Pulse origin not detected	
(2.5 – 3.5)	UFLG 3		WINLEN error	
(3.5 – 6.5)	UFLG 4	UFLG 5	UFLG 6	CASING THICKNESS error
(6.5 – 10)	UFLG 7	UFLG 8	UFLG 9	LOOP PROCESSING error

Parameters				
DLIS Name	Description	Value		
USIT-E: Ultrasonic Imaging – E				
AGMN	Minimum Gain of Cartridge	–4	DB	
AGMX	Maximum Gain of Cartridge	20	DB	
BERJ	Bad Echo Rejection	ON		
CDIA	Casing Outer Diameter	7	IN	
CSDE	Casing Density	486.94	LBCF	
CSID	Casing Inner Diameter	6.276	IN	
DFVL	Default Fluid Velocity	197	US/F	
DOT	Diameter of Transducer Sensor	2.874	IN	
EMXV	EMEX Voltage	82	V	
FDII	FPM Data Interpolation Interval	0	FT	
IMAR	Image Rotation	OFF		
MW	Mud Weight	8.4	LB/G	
RCOD	Reference Calibrator Outer Diameter	7	IN	
RCSO	Reference Calibrator Standoff	1.1811	IN	
RCTH	Reference Calibrator Thickness	0.2952	IN	
TCUB	T^3 Processing Level	Vax_Loop		
THDH	Maximum Search Thickness (percentage of nominal)	130		
THDL	Minimum Search Thickness (percentage of nominal)	70		
THDP	Thickness Detection Policy	Fundamental		
THNO	Nominal Thickness of Casing	0.362	IN	
UMAO	USIT Measurement Angular Offset	18	DEG	
USTO	Ultrasonic Time Offset	–2	US	
USUB	Ultrasonic Subassembly Identifier	Sub_7_inch		
UWKM	Ultrasonic Working Mode	10DEG_3IN_60U_LF		
VCAS	Ultrasonic Transversal Velocity in Casing	51.4	US/F	
WLEN	T^3 Processing Length	21.7078	US	
ZCAS	Acoustic Impedance of Casing	46.25	MRAY	
ZINI	Initial Estimate of Cement Impedance	–1	MRAY	
ZMUD	Acoustic Impedance of Mud	1.7	MRAY	
ZTCM	Acoustic Impedance Threshold for Cement	2.6	MRAY	
ZTGS	Acoustic Impedance Threshold for Gas	0.3	MRAY	
System and Miscellaneous				
CWEI	Casing Weight	26.00	LB/F	

DO
PP

Depth Offset for Playback
Playback Processing


3.0 FT
RECOMPUTE

Input DLIS Files

DEFAULT USI_012LUP FN:11 PRODUCER 27-Mar-2014 09:52 6541.5 FT 100.2 FT

Output DLIS Files

DEFAULT USI_020PUP FN:19 PRODUCER 27-Mar-2014 12:13



Repeat Pass– Hi Res
5" = 100'

MAXIS Field Log

Input DLIS Files

DEFAULT USI_010LUP FN:9 PRODUCER 27-Mar-2014 09:22 6541.0 FT 5961.7 FT

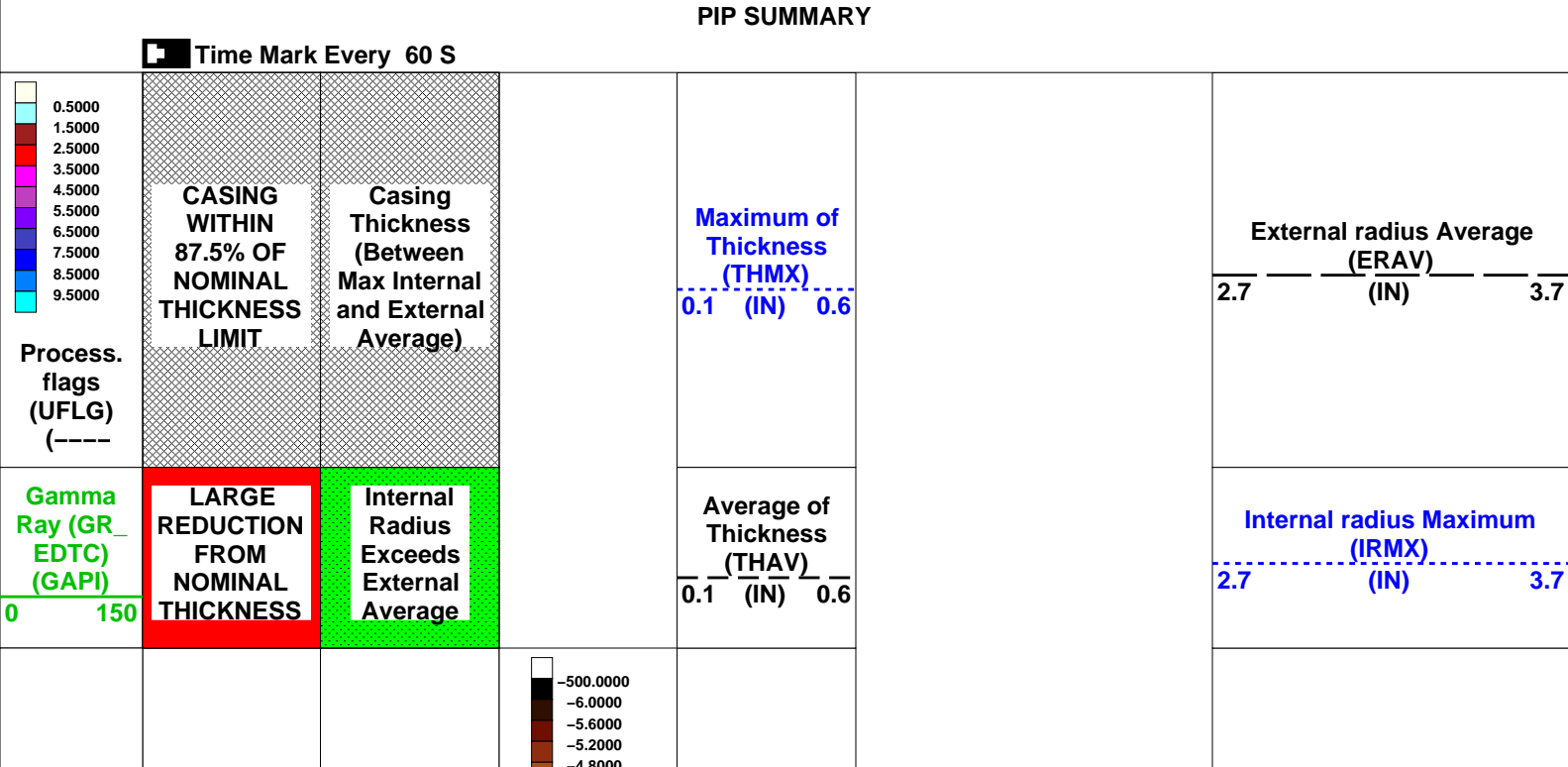
Output DLIS Files

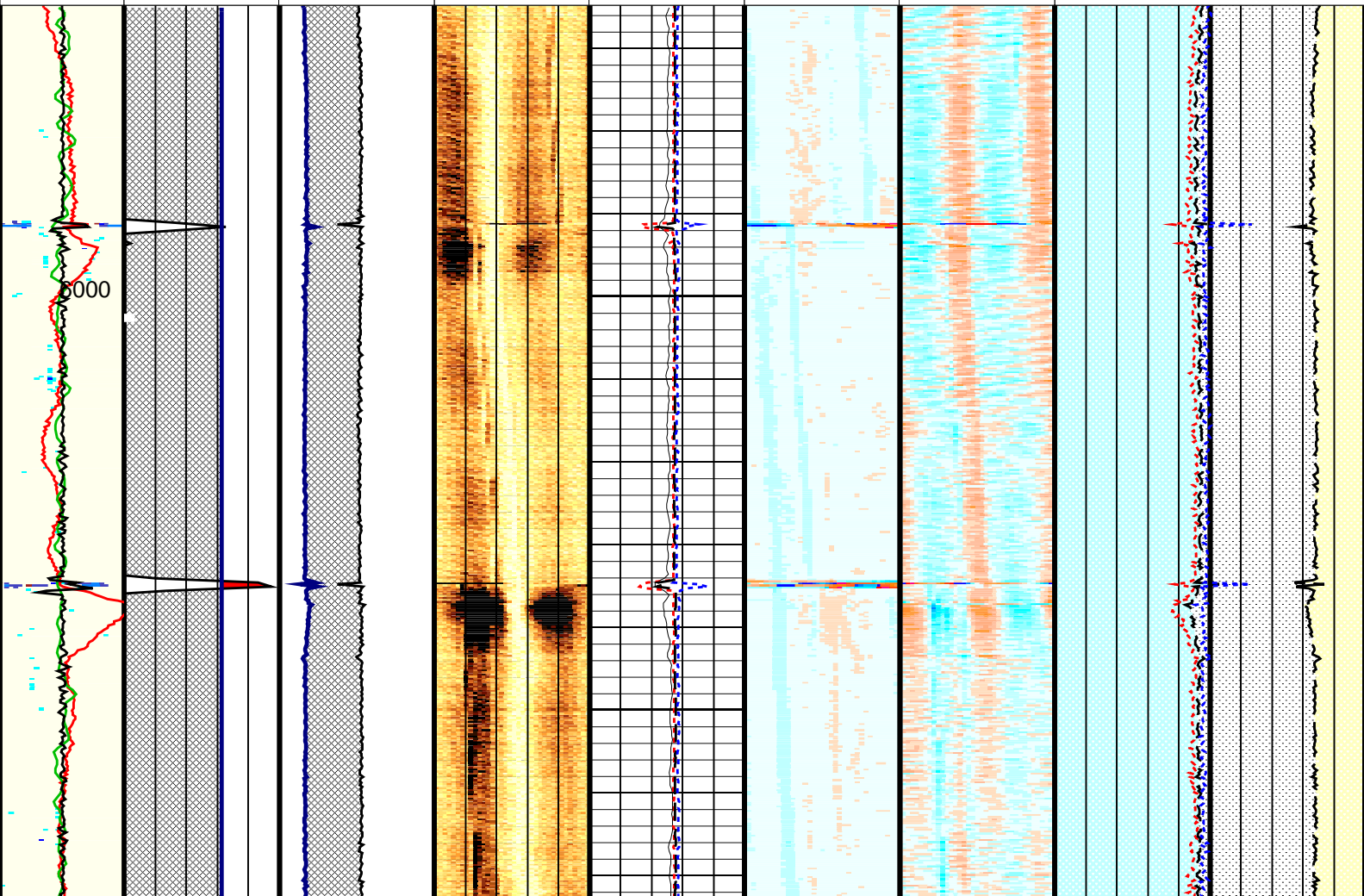
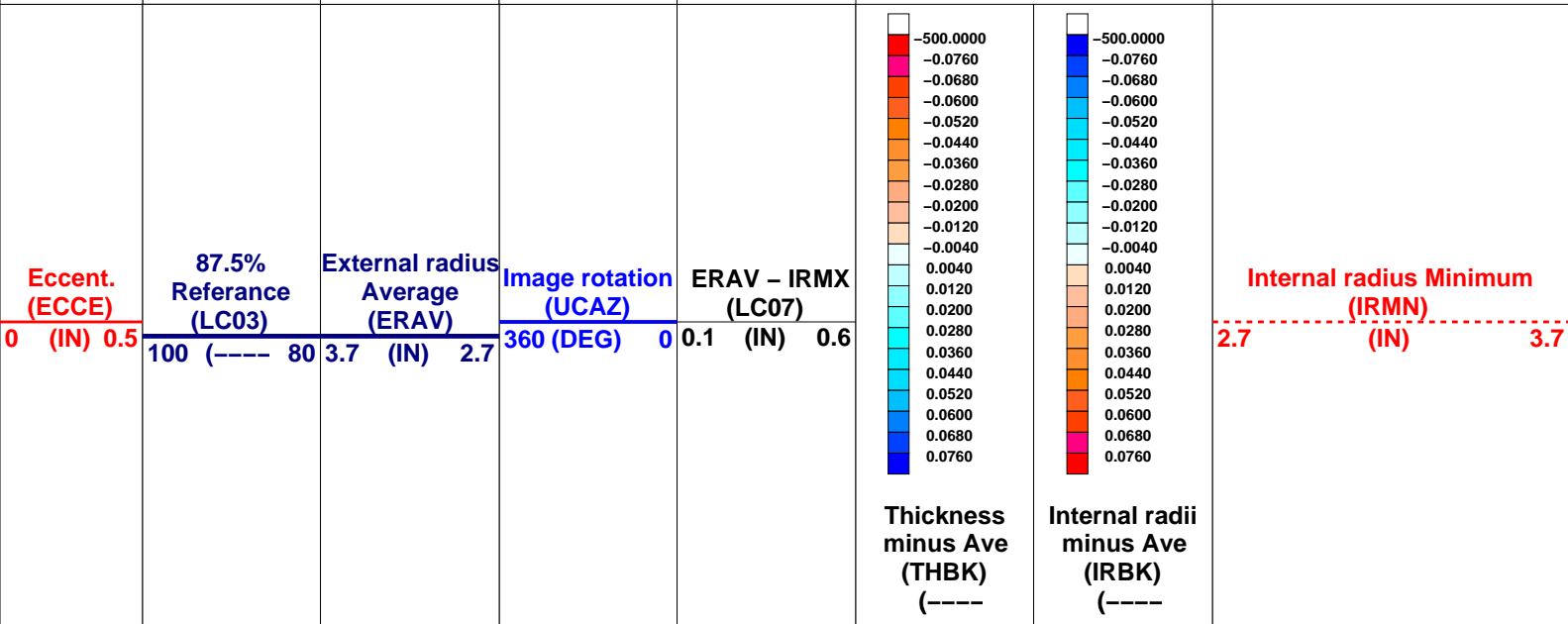
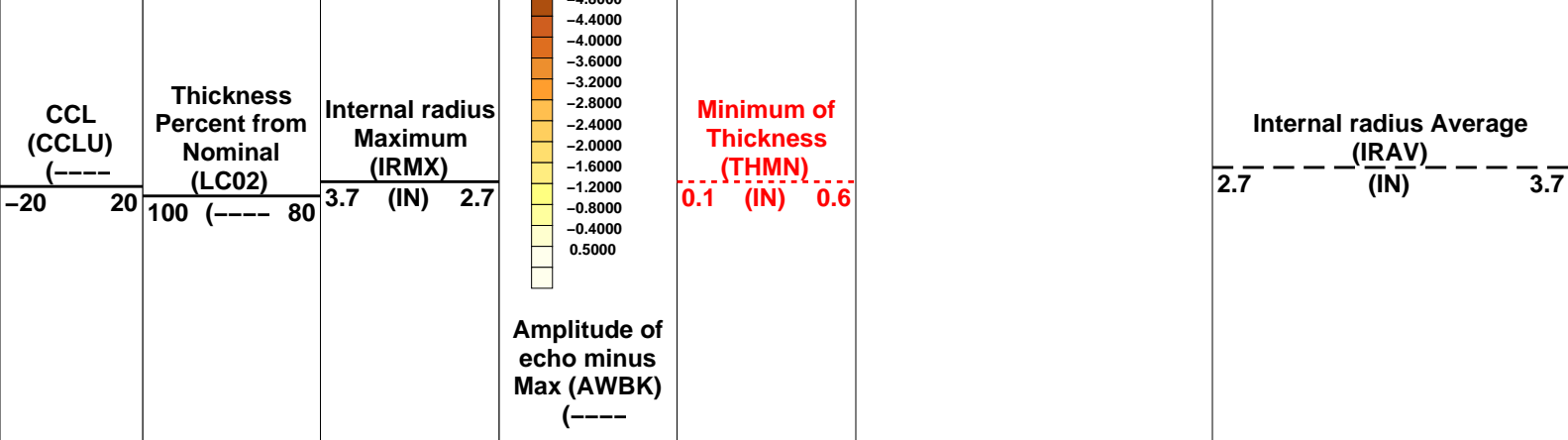
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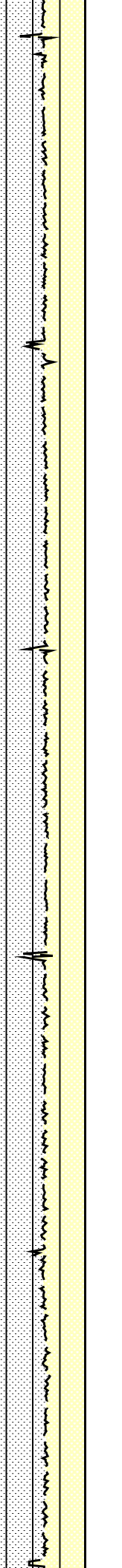
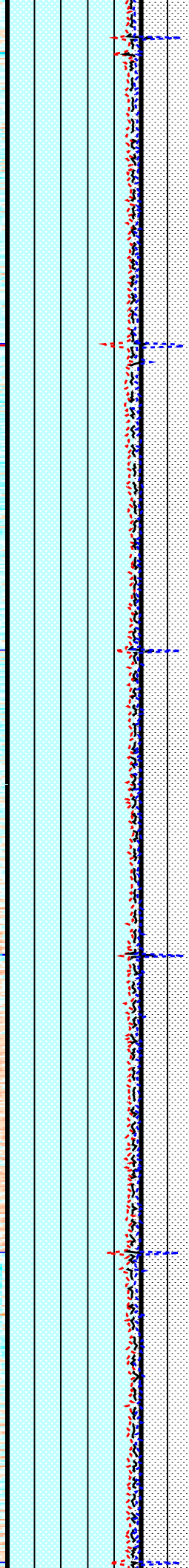
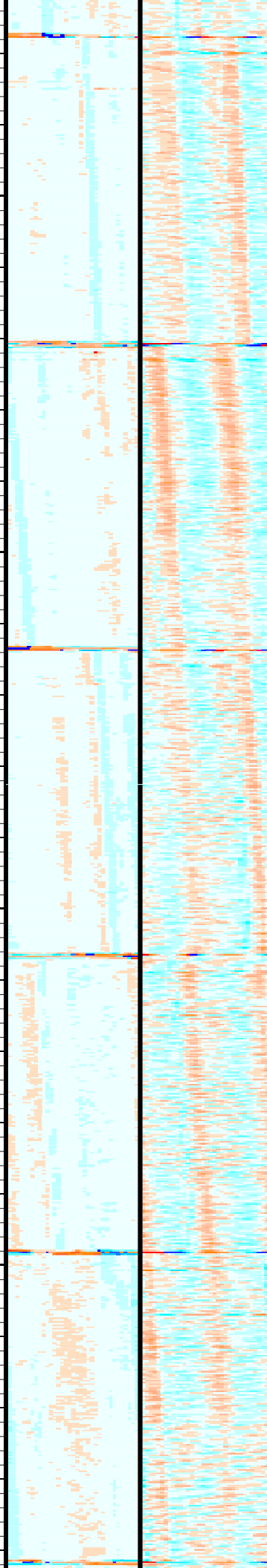
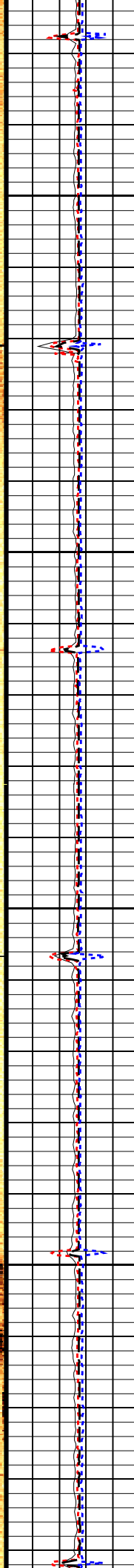
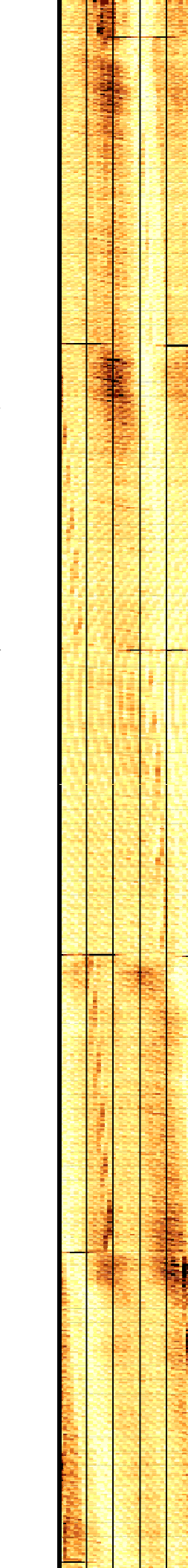
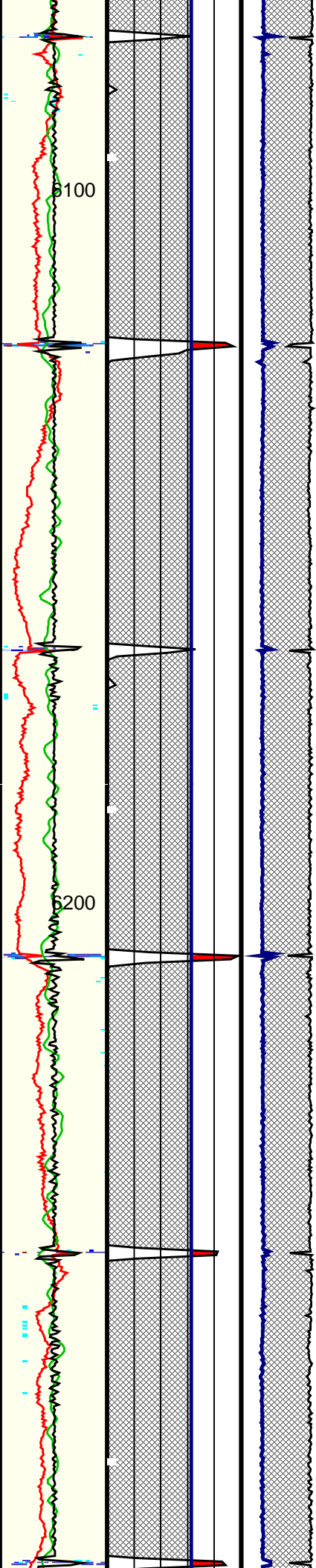
OP System Version: 19C1-222

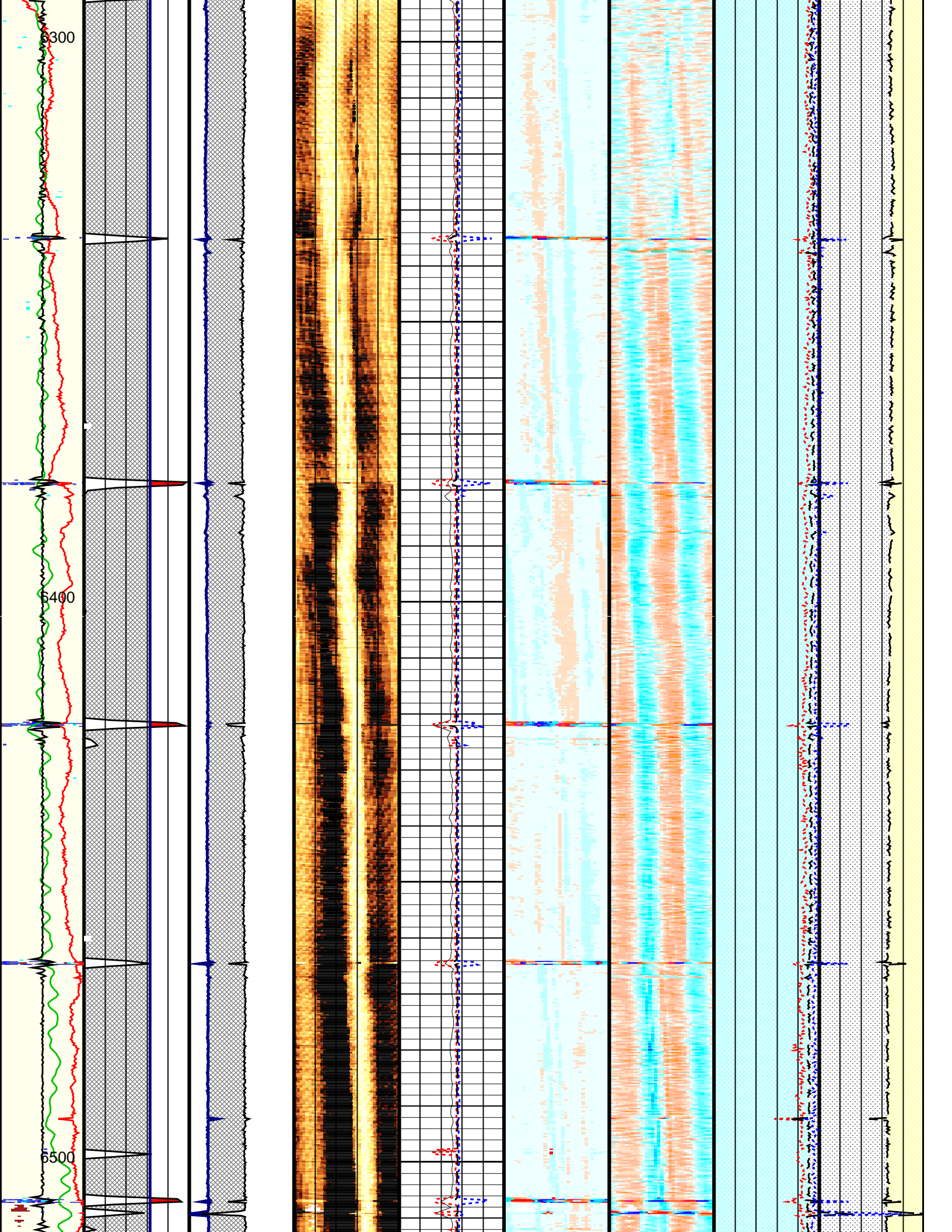
USIT-E 19C1-222 EDTC-B 19C1-222

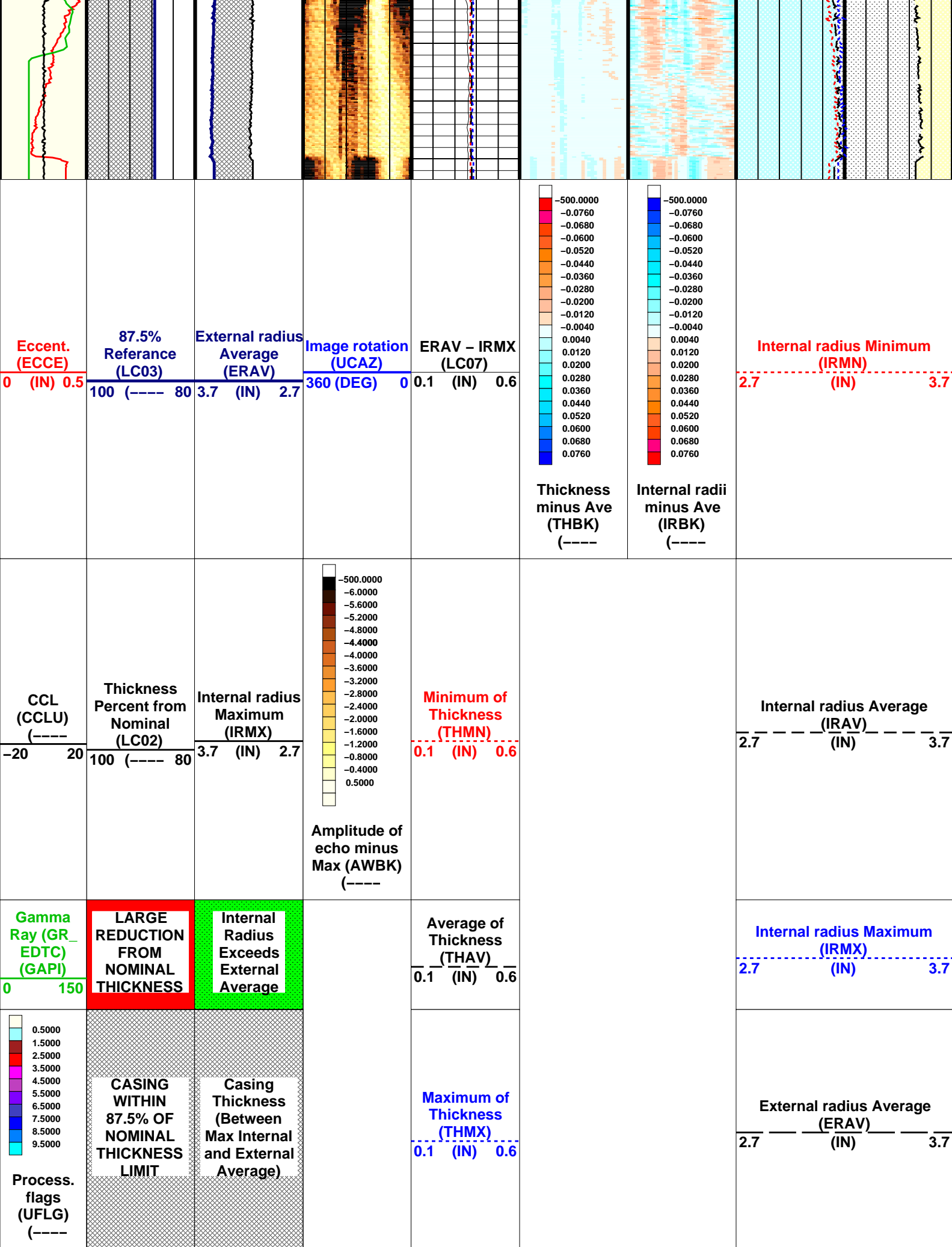
Changed Parameter Summary					
DLIS Name		New Value		Previous Value	Depth & Time
DFVL		186 US/F		199 US/F	6543.5 12:19:53
ZMUD		1.77 MRAY		1.71 MRAY	6543.5 12:19:53











OP System Version: 19C1-222

USIT-E	19C1-222	EDTC-B	19C1-222
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COMPUTATION FLAGS LABELLING

(0 – 1.5)	UFLG 1	UTIM error
(1.5 – 2.5)	UFLG 2	Pulse origin not detected
(2.5 – 3.5)	UFLG 3	WINLEN error
<hr/>		
(3.5 – 6.5)	UFLG 4 UFLG 5 UFLG 6	CASING THICKNESS error
<hr/>		
(6.5 – 10)	UFLG 7 UFLG 8 UFLG 9	LOOP PROCESSING error

Parameters

DLIS Name	Description	Value
USIT-E: Ultrasonic Imaging – E		
AGMN	Minimum Gain of Cartridge	-4 DB
AGMX	Maximum Gain of Cartridge	20 DB
BERJ	Bad Echo Rejection	ON
CDIA	Casing Outer Diameter	7 IN
CSDE	Casing Density	486.94 LBCF
CSID	Casing Inner Diameter	6.276 IN
DFVL	Default Fluid Velocity	199 US/F
DOT	Diameter of Transducer Sensor	2.874 IN
EMXV	EMEX Voltage	82 V
FDII	FPM Data Interpolation Interval	0 FT
IMAR	Image Rotation	OFF
MW	Mud Weight	8.4 LB/G
RCOD	Reference Calibrator Outer Diameter	7 IN
RCSO	Reference Calibrator Standoff	1.1811 IN
RCTH	Reference Calibrator Thickness	0.2952 IN
TCUB	T^3 Processing Level	Vax_Loop
THDH	Maximum Search Thickness (percentage of nominal)	130
THDL	Minimum Search Thickness (percentage of nominal)	70
THDP	Thickness Detection Policy	Fundamental
THNO	Nominal Thickness of Casing	0.362 IN
UMAO	USIT Measurement Angular Offset	18 DEG
USTO	Ultrasonic Time Offset	-2 US
USUB	Ultrasonic Subassembly Identifier	Sub_7_inch
UWKM	Ultrasonic Working Mode	10DEG_3IN_60U_LF
VCAS	Ultrasonic Transversal Velocity in Casing	51.4 US/F
WLEN	T^3 Processing Length	21.7078 US
ZCAS	Acoustic Impedance of Casing	46.25 MRAY
ZINI	Initial Estimate of Cement Impedance	-1 MRAY
ZMUD	Acoustic Impedance of Mud	1.71 MRAY
ZTCM	Acoustic Impedance Threshold for Cement	2.6 MRAY
ZTGS	Acoustic Impedance Threshold for Gas	0.3 MRAY
System and Miscellaneous		
CWEI	Casing Weight	26.00 LB/F
DO	Depth Offset for Playback	2.5 FT
PP	Playback Processing	RECOMPUTE

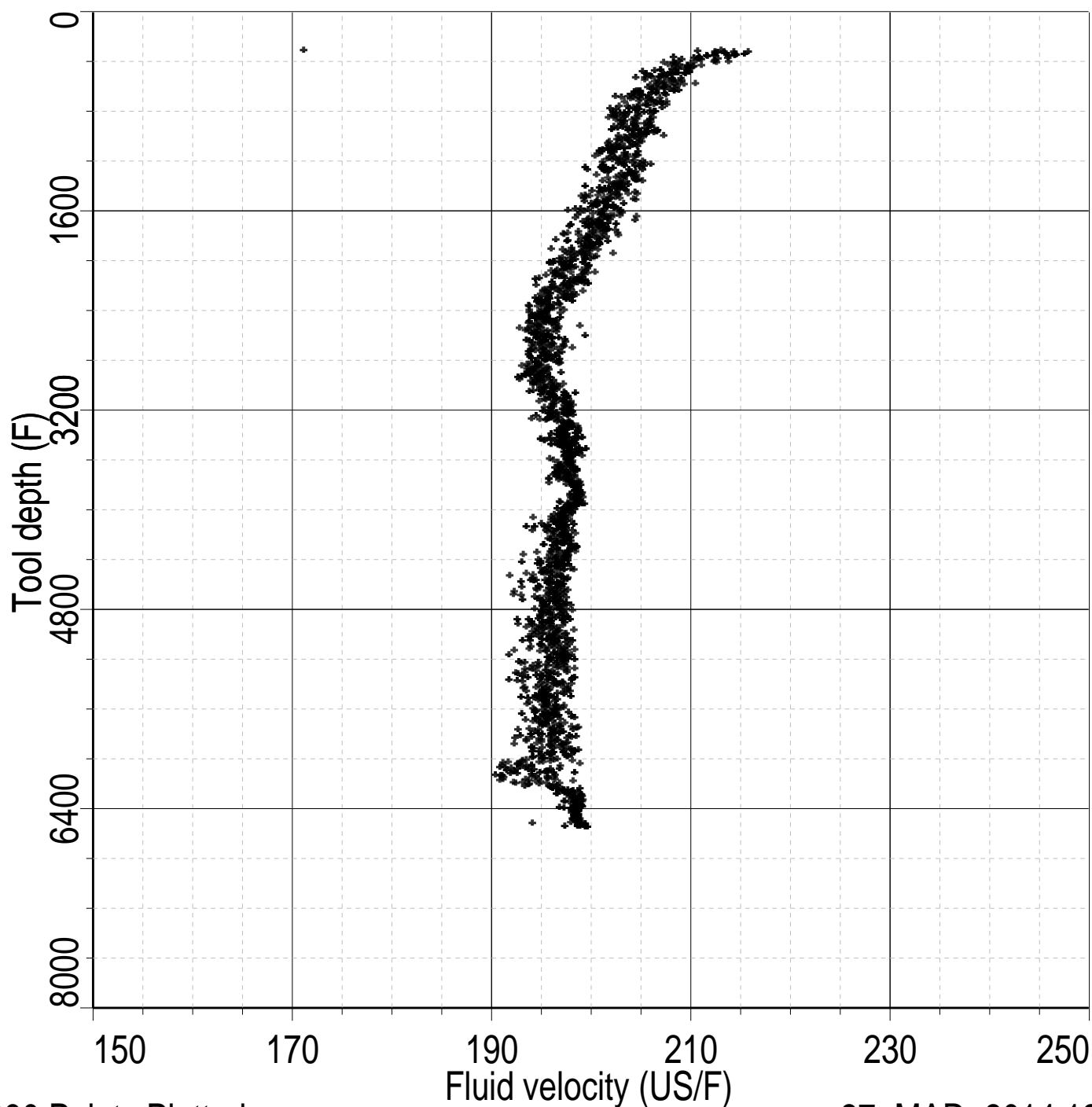
Input DLIS Files

DEFAULT	USI_010LUP	FN:9	PRODUCER	27-Mar-2014 09:22	6541.0 FT	5961.7 FT
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Output DLIS Files

DEFAULT	USI_021PUP	FN:20	PRODUCER	27-Mar-2014 12:19
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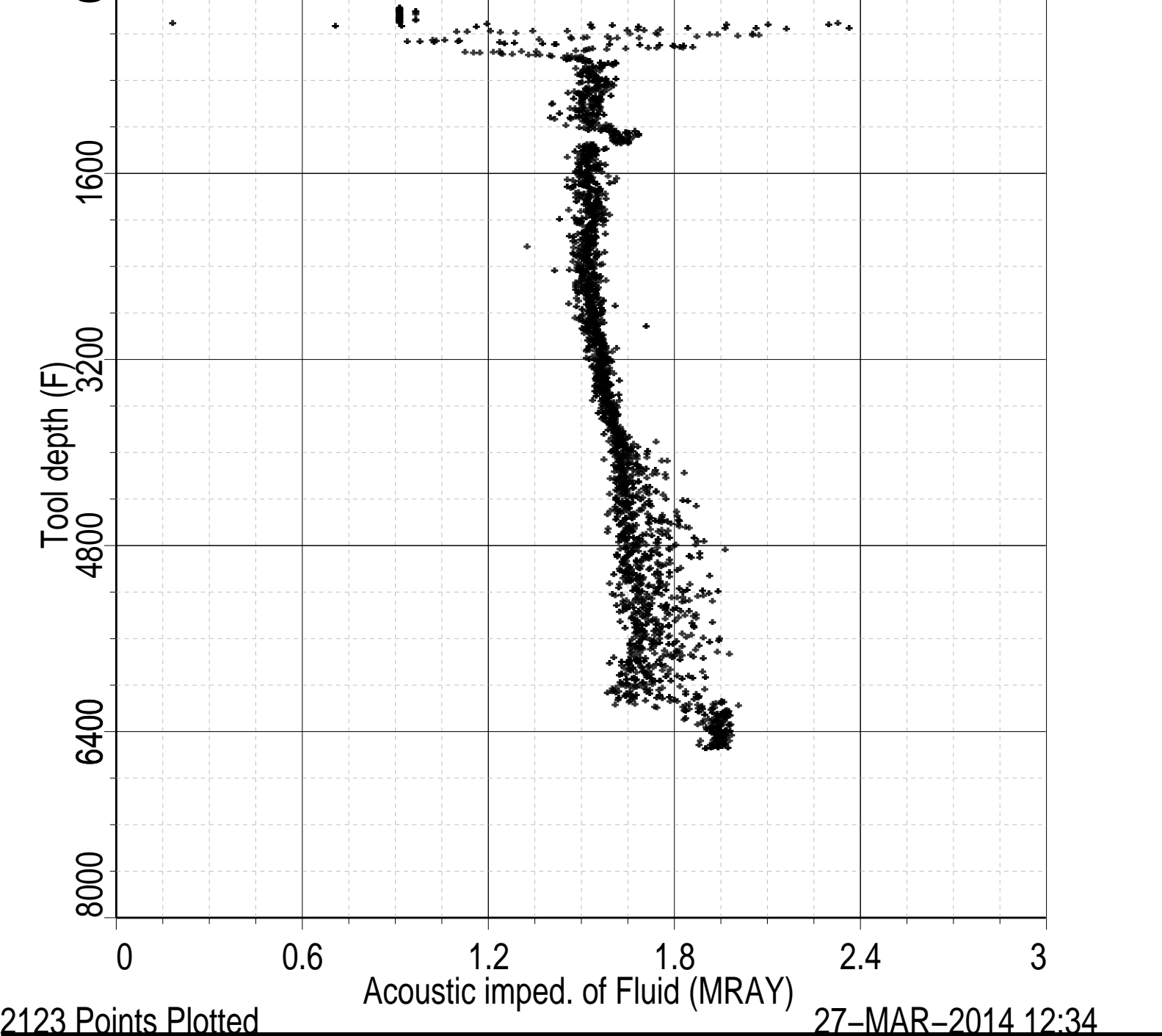
Index: 6544.0 – 178.0 FT



2080 Points Plotted

27-MAR-2014 12:34

Index: 6544.0 – 178.0 FT



2123 Points Plotted

27-MAR-2014 12:34

Company: **Noble Energy Inc**

Schlumberger

Well: **Wells Ranch AA35-68-1AHNA**

Field: **Wattenberg**

County: **Weld**

State: **Colorado**

Ultrasonic Imaging Tool
Casing Evaluation