Schlumberger

Company: Southern California Gas Company

Well: Fernando Fee 32H

Field: Aliso Canyon

County: Los Angeles State: California

County: Los Angeles
Field: Aliso Canyon
Location: North: 34.313493
Well: Fernando Fee 32H
Company: Southern California Gas Company

Ultrasonic Imager

Gamma Ray - CCL

Location:			
North: 34.313493		Elev.: K.B.	2021.50 ft
West: 118.539779		G.L.	1999.00 ft
NAD 83		D.F.	
Permanent Datum:	Ground Level	Elev.:	1999.00 f
Log Measured From:	Kelly Bushing	22.50 ft	above Perm.Datum
Drilling Measured From:	Kelly Bushing		

API Serial No.	Section:	Township:	Range:
037-30456	27	3N	16W

Logging Date		03-Aug-2015	
Run Number		2.B	
Depth Driller		7967.00 ft	
Schlumberger Depth		7974.00 ft	
Bottom Log Interval		7507.00 ft	
Top Log Interval		35.00 ft	
Casing Fluid Type		3% KCl/Geozan	
Salinity			
Density		8.5 lbm/gal	
Fluid Level		8.00 ft	
BIT/CASING/TUBING STRING			
Bit Size		8.50 in	
From		7505.00 ft	
To		7974.00 ft	
Casing/Tubing Size		9.625 in	
Weight		47 lbm/ft	
Grade		L80	
From		0.00 ft	
To		7507.00 ft	
Max Recorded Temperatures		163.8 degF	
Logger on Bottom	Time	03-Aug-2015 17:30:00	
Unit Number	Location:	2222 Long Beach	
Recorded By		Amber Monterosso	
Witnessed By		Kevin Katolas	

Disclaimer

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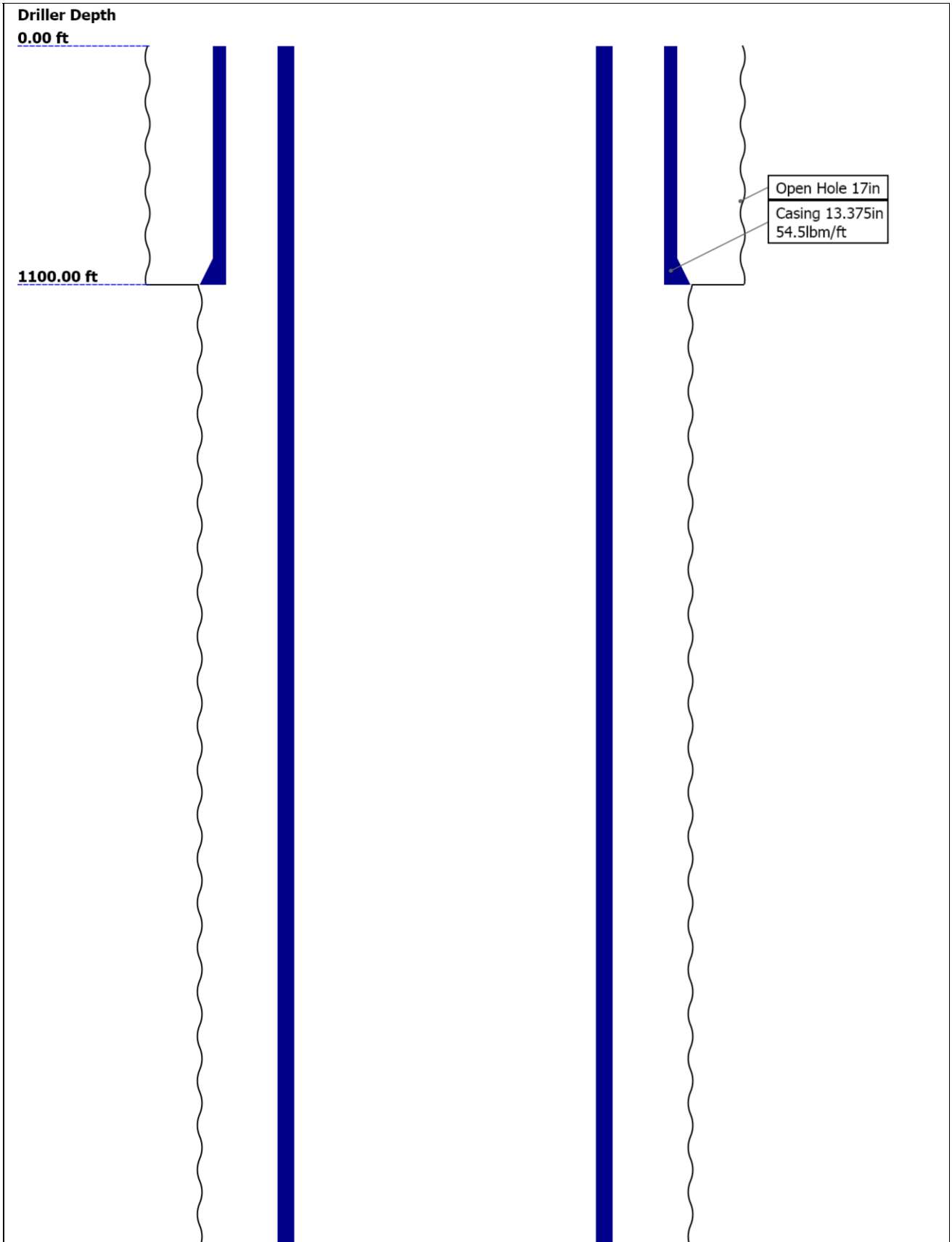
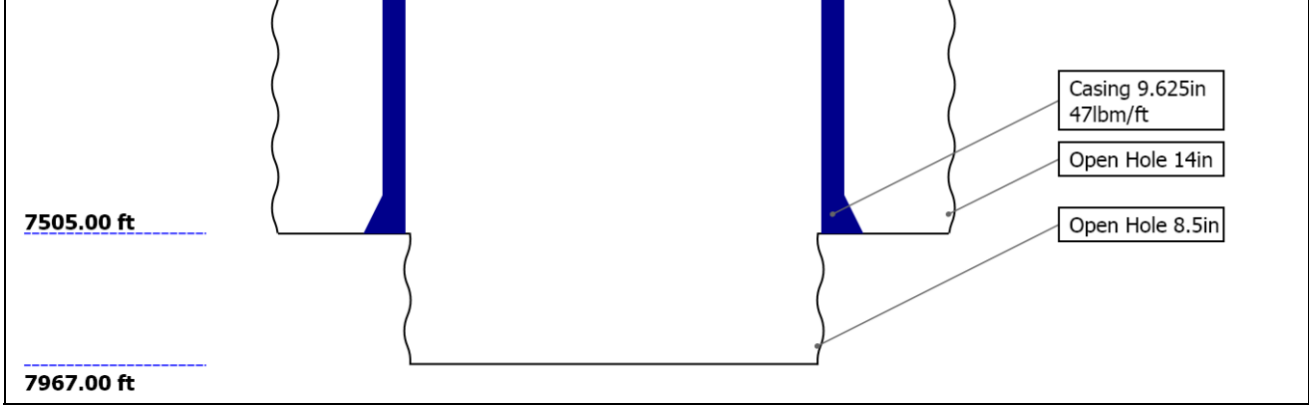
Well Sketch



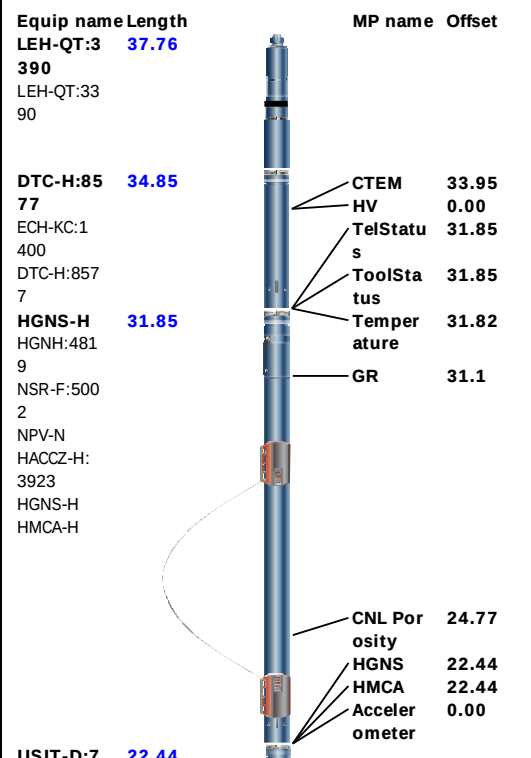


Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	17	14	8.5			
Top Driller (ft)	0	1100	7505			
Top Logger (ft)	0	1100	7505			
Bottom Driller (ft)	1100	7505	7967			
Bottom Logger (ft)	1100	7505	7974			
Casing						
Size (in)	13.375	9.625				
Weight (lbm/ft)	54.5	47				
Inner Diameter (in)	12.615	8.681				
Grade	L80	L80				
Top Driller (ft)	0	0				
Top Logger (ft)	0	0				
Bottom Driller (ft)	1100	7505				
Bottom Logger (ft)	1100	7507				

Remarks and Equipment Summary

2.B: Toolstring



2.B: Remarks

Rig: 587

Toolstring ran as per toolsketch.

Two centralizers on USIS and two CME-Y used to centralize ultrasonic tool.

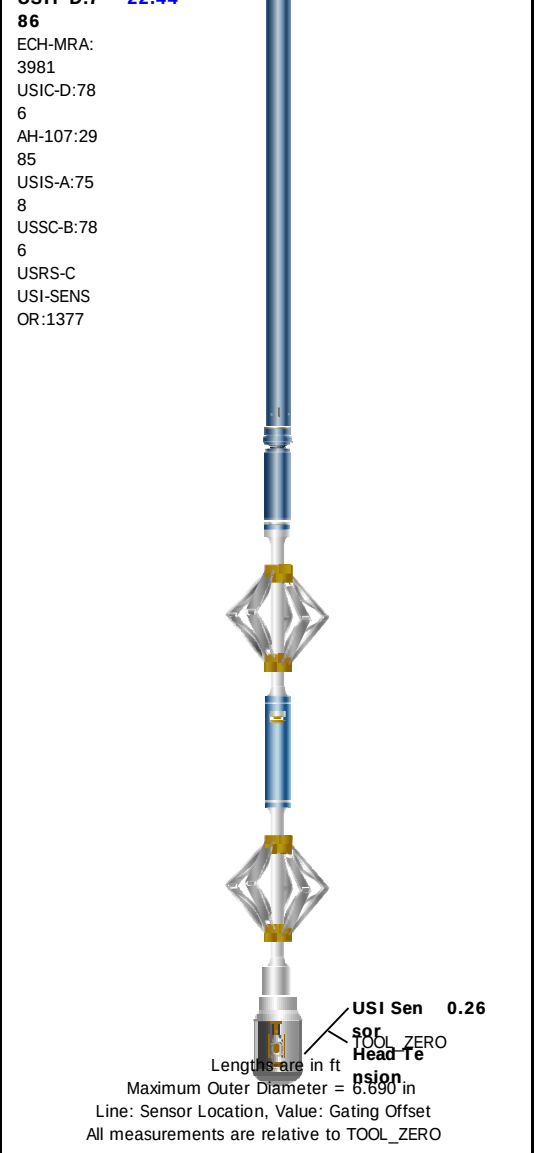
Logged 9.625" 47# casing from casing shoe to surface.
Started log a few feet shy of casing shoe to avoid entering open hole.

ICE processing used with USI_FVEL = AUTO and USI_ZMUD=FreePipeNorm

Correlated to Schlumberger Platform Express dated 26-Jul-2015

Schlumberger crew: S. Duff / S. Alvarez

Thank you for choosing Schlumberger!



Depth Summary

	2.B		
Depth Measuring Device			
Type	IDW-B		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Calibration Cable Type			
Wheel Correction 1	0		
Wheel Correction 2	0		
Tension Device			
Type	CMTD-B/A		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Number of Calibration Points	0		
Logging Cable			
Type	7-46NT-XS		
Serial Number			
Length	24000.00 ft		
Conveyance Type	Wireline		
Rig Type			

2.B:Depth Control Parameters		Depth Control Remarks
Log Sequence	First Log In the Well	

Rig Up Length At Surface

Rig Up Length At Bottom

Rig Up Length Correction

Stretch Correction

Tool Zero Check At Surface

2.B

GR-CCL Correlation 5 IN = 100 FT

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
2.B	Log[4]:Up	Up	22.62 ft	7516.79 ft	03-Aug-2015 5:35:50 PM	03-Aug-2015 7:56:54 PM	ON	6.58 ft	Yes

All depths are referenced to toolstring zero

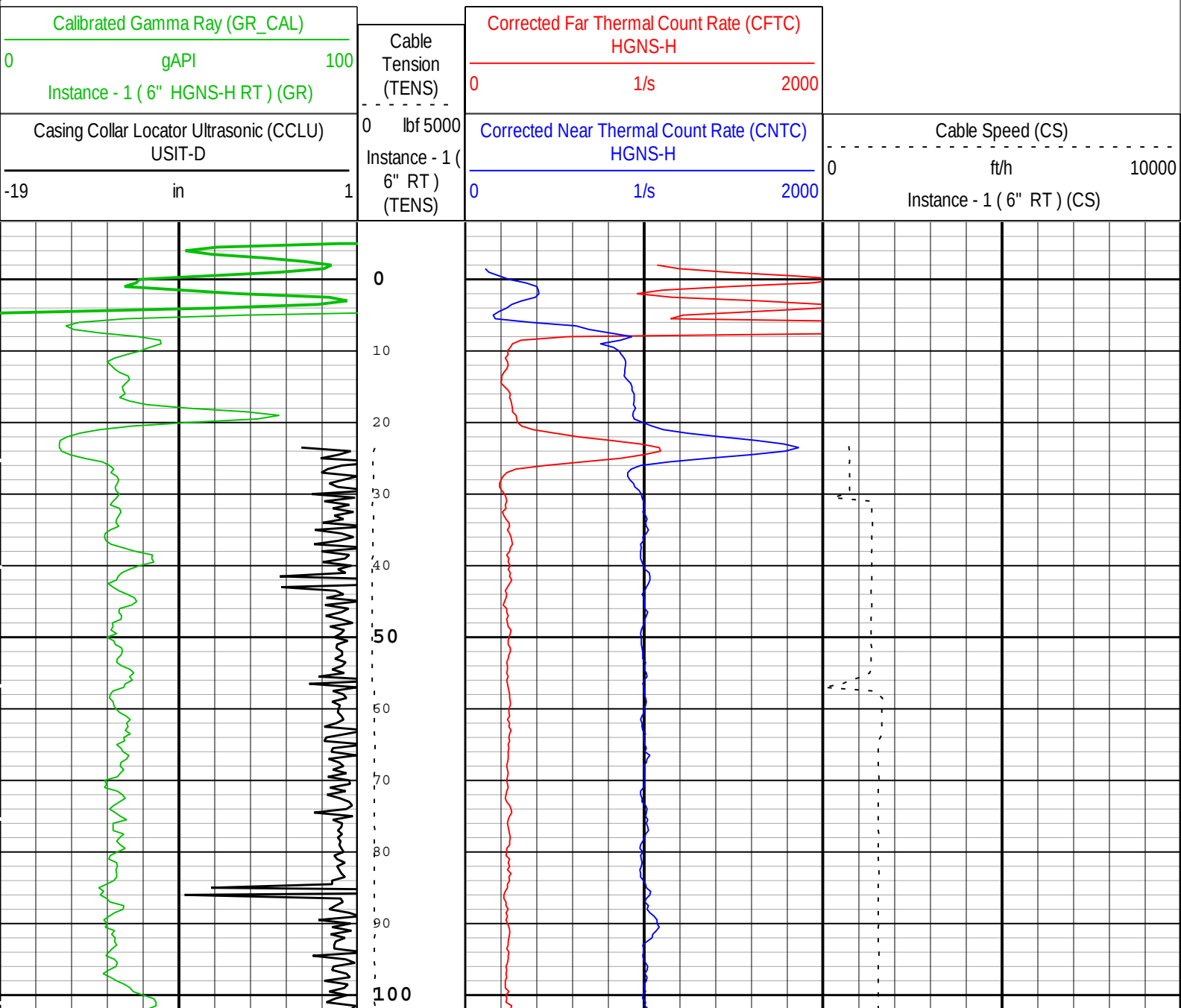
Log

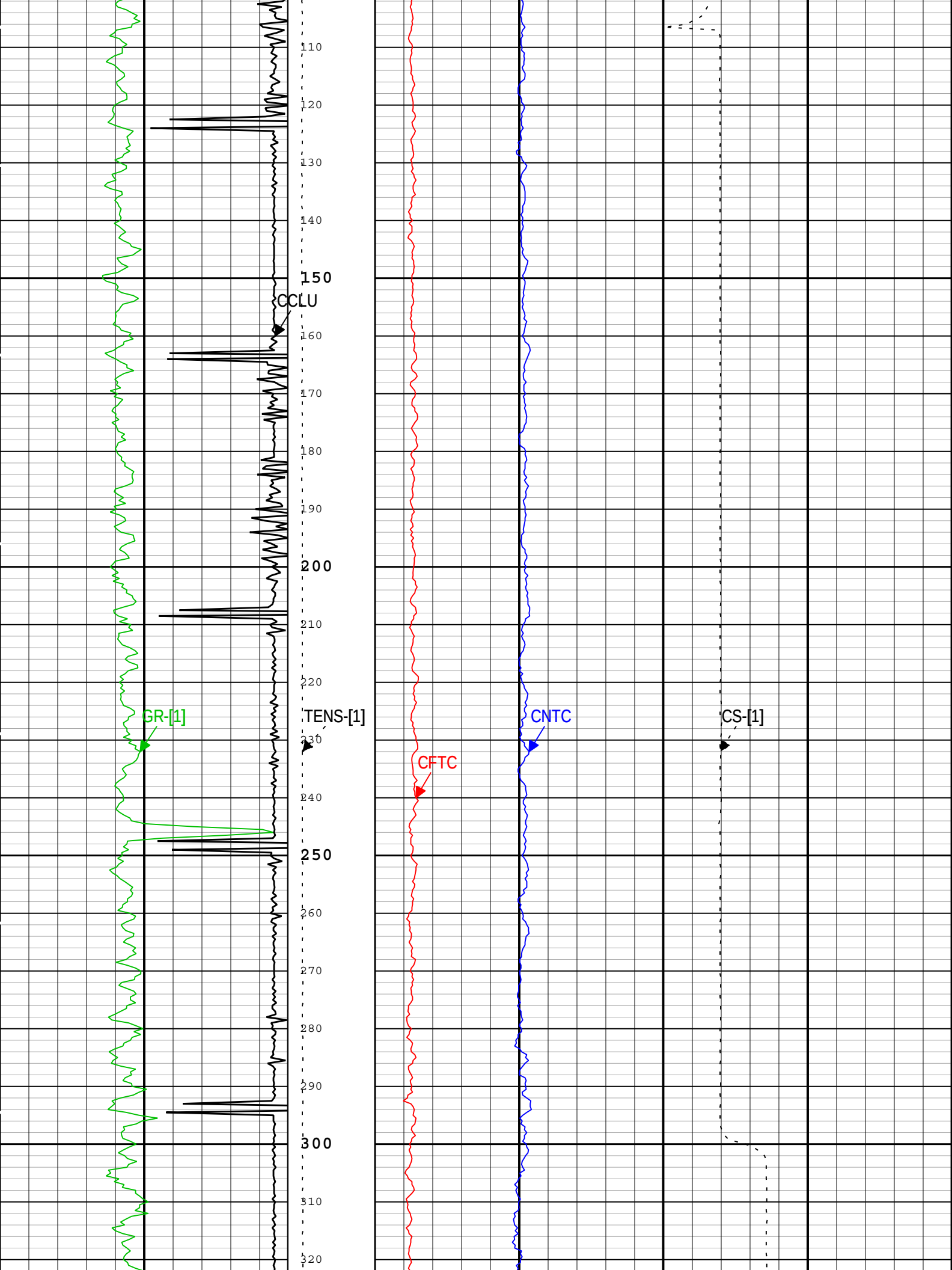
Company:Southern California Gas Company Well:Fernando Fee 32H

2.B: Log[4]:Up:S037

Description: Format: Log (GR-CCLU Correlation) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 03-Aug-2015 21:34:37

TIME_1900 - Time Marked every 60.00 (s)

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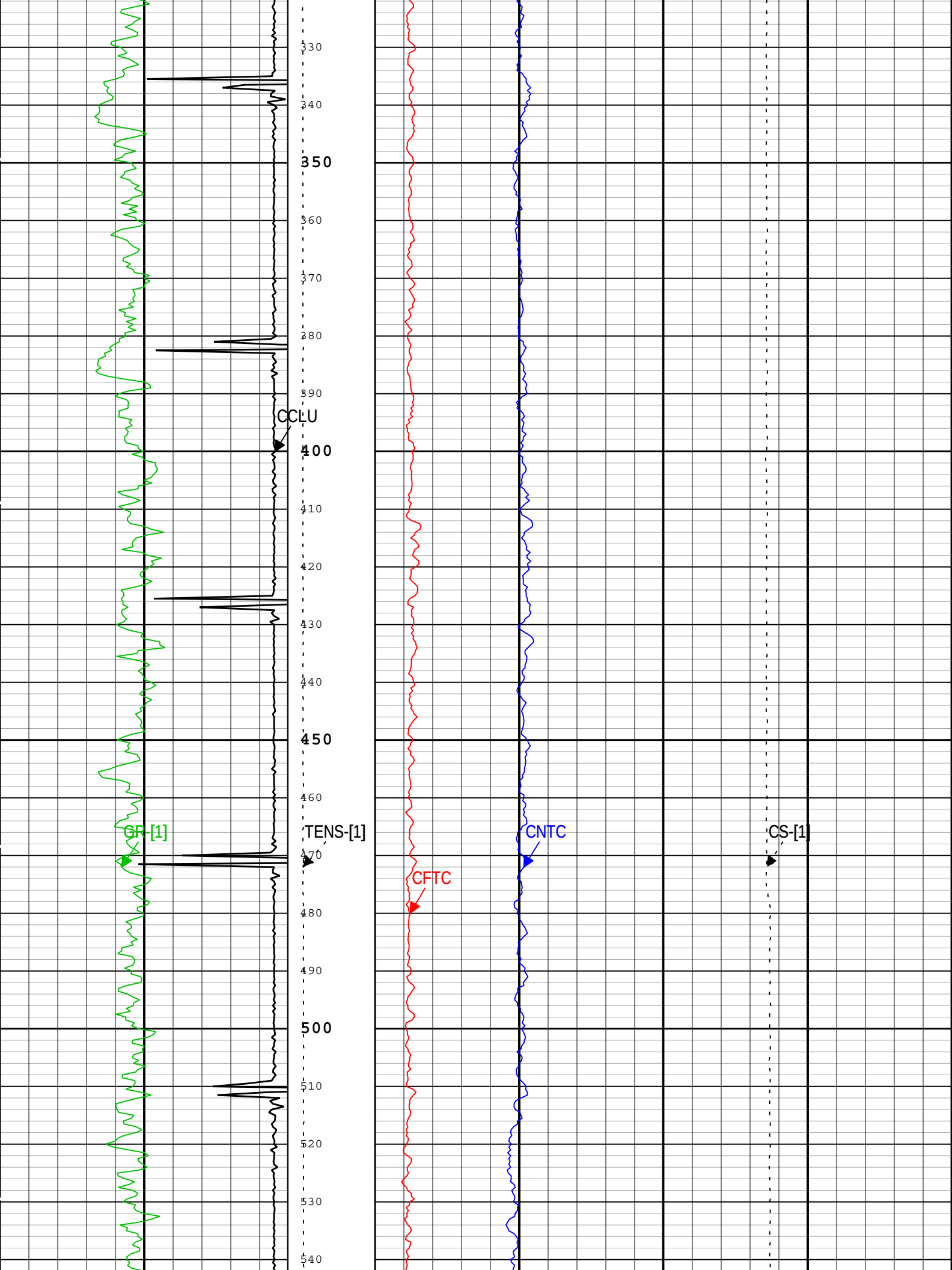
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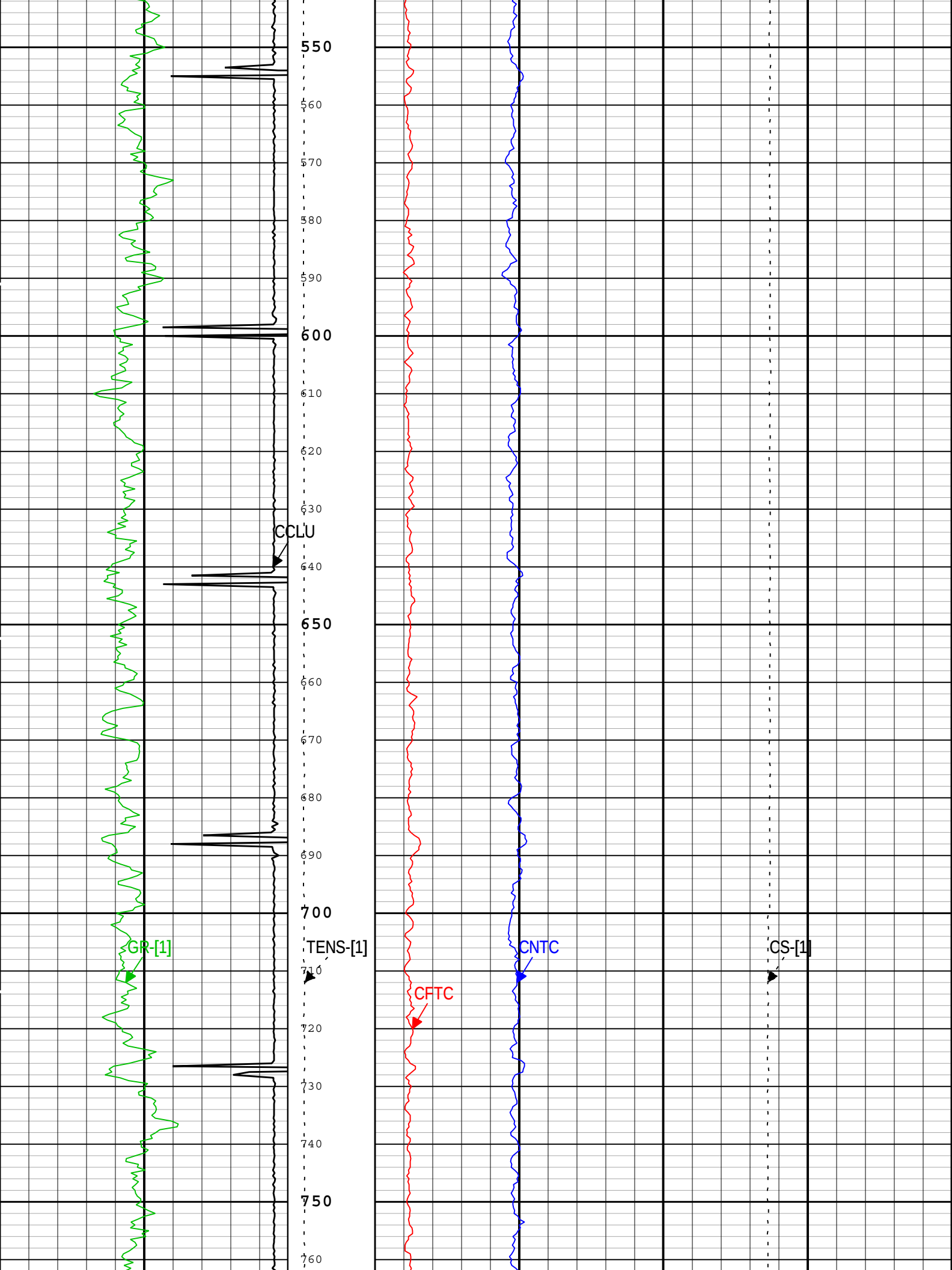
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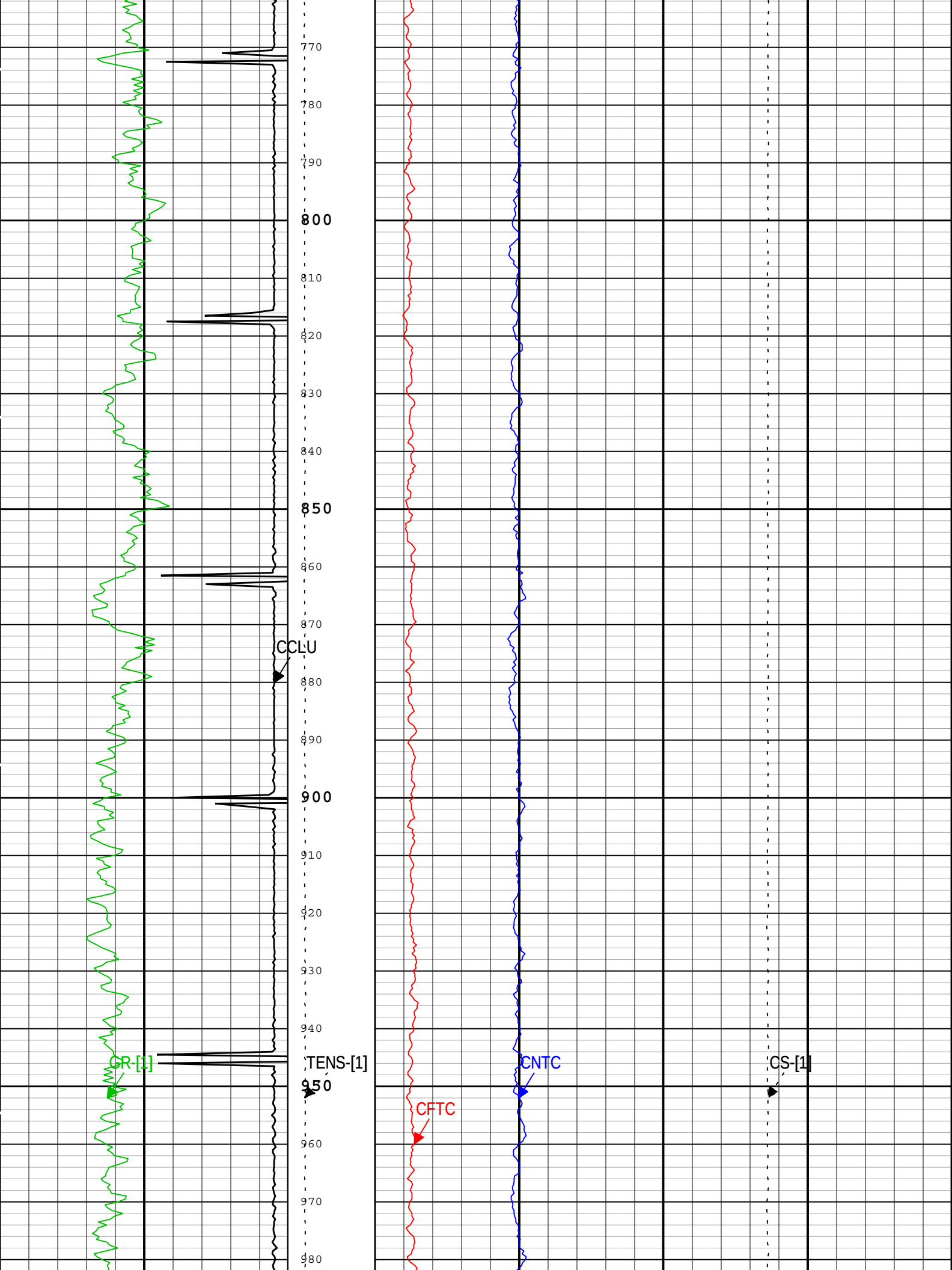
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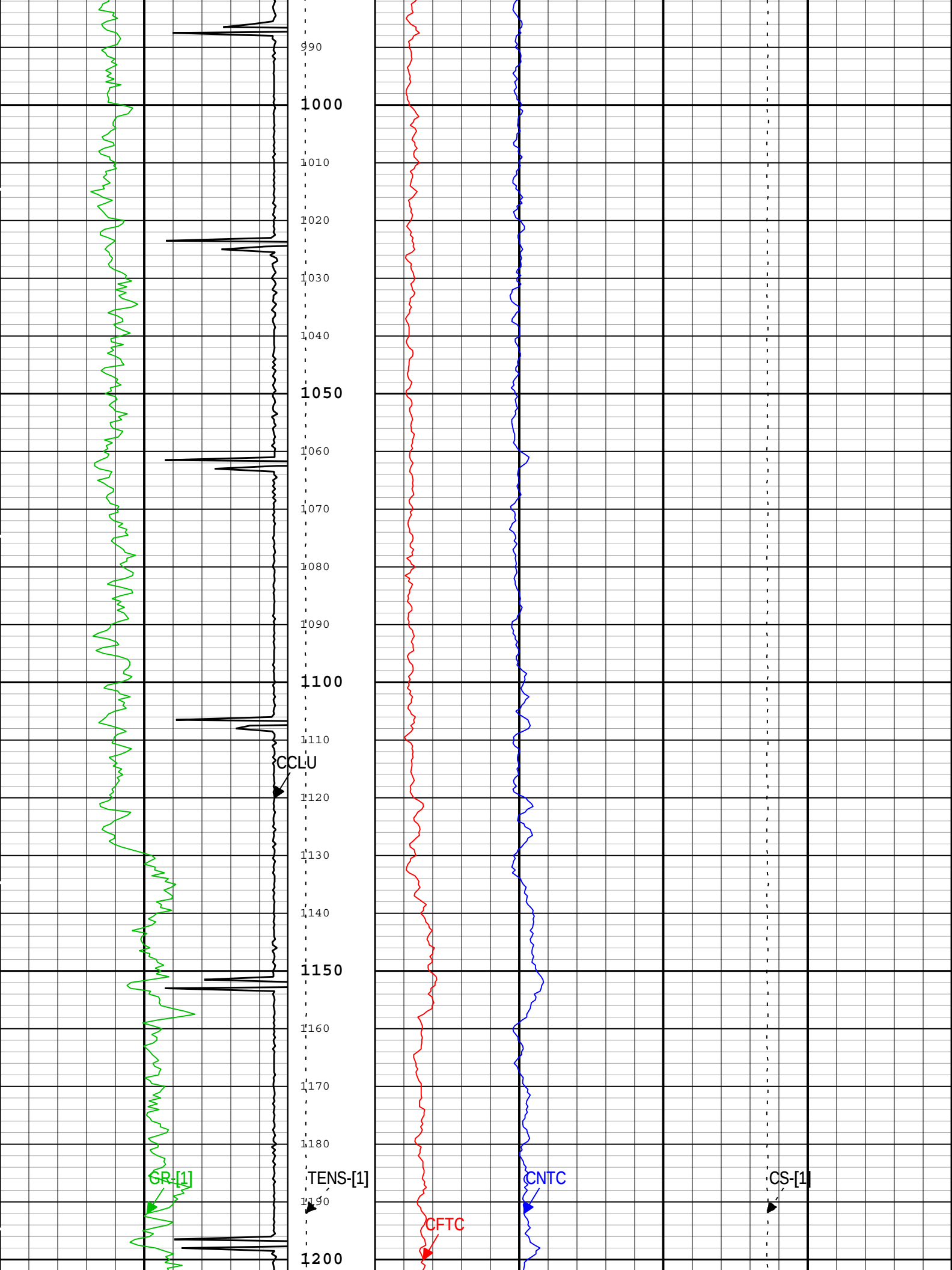
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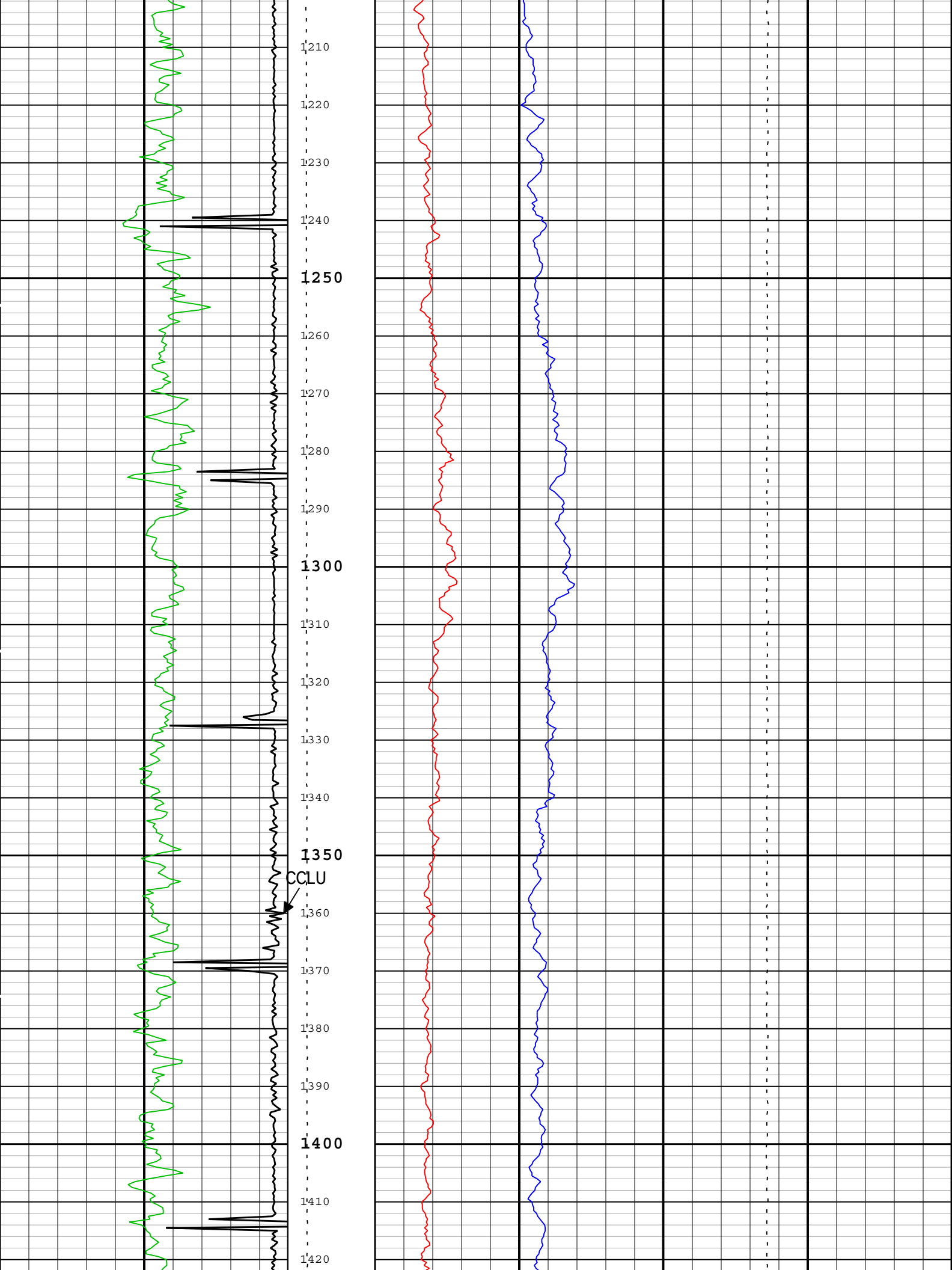
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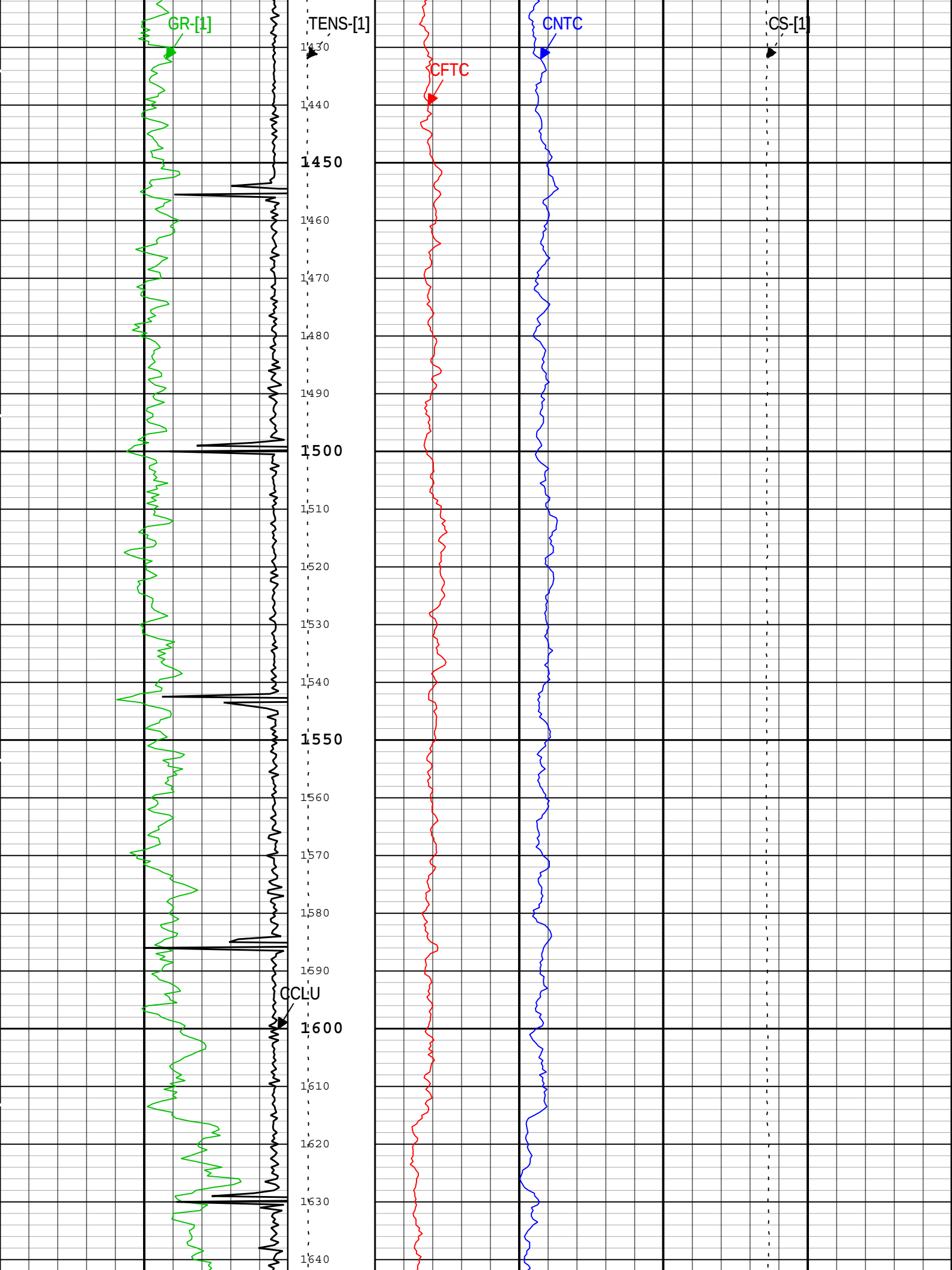
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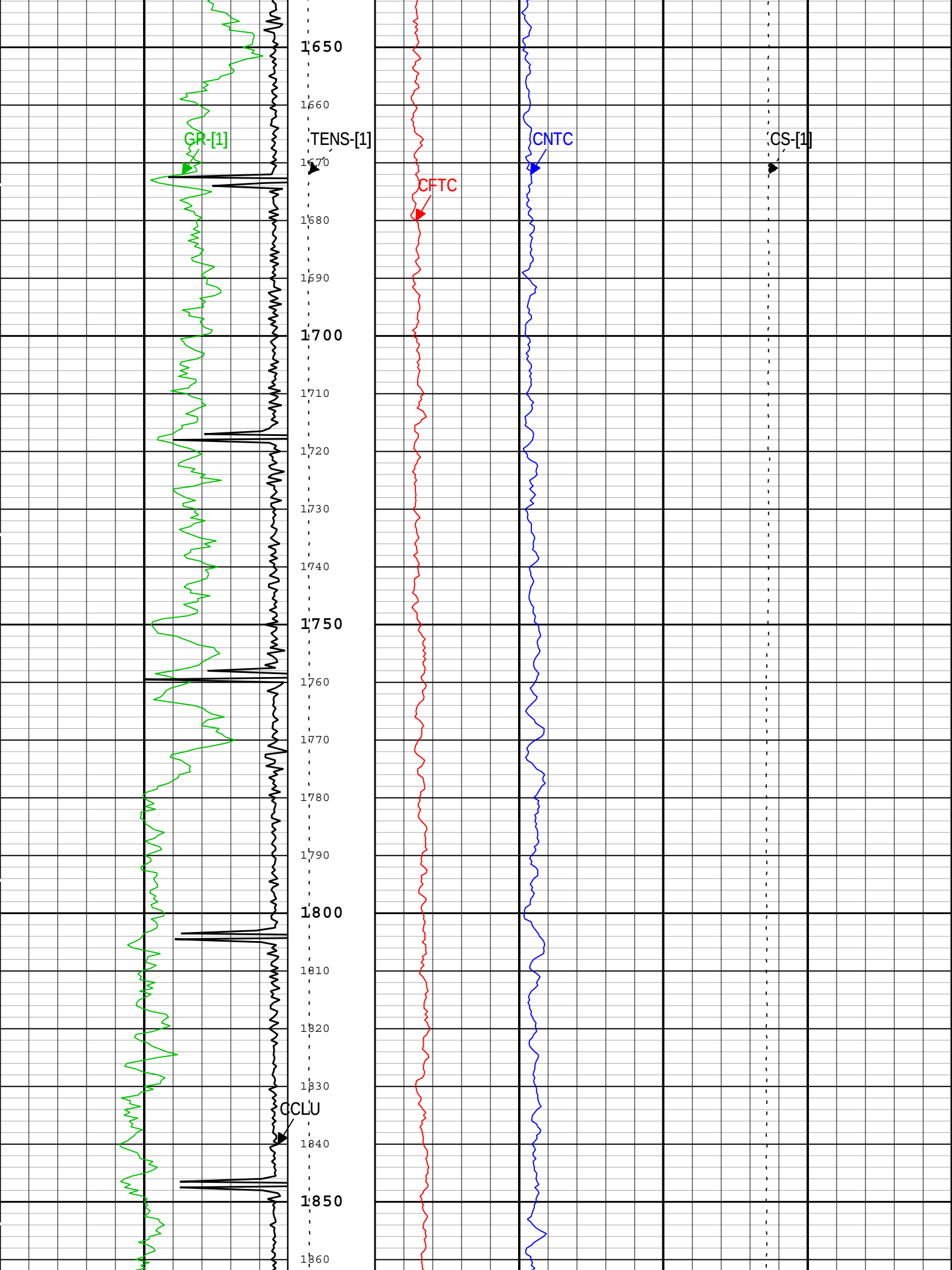
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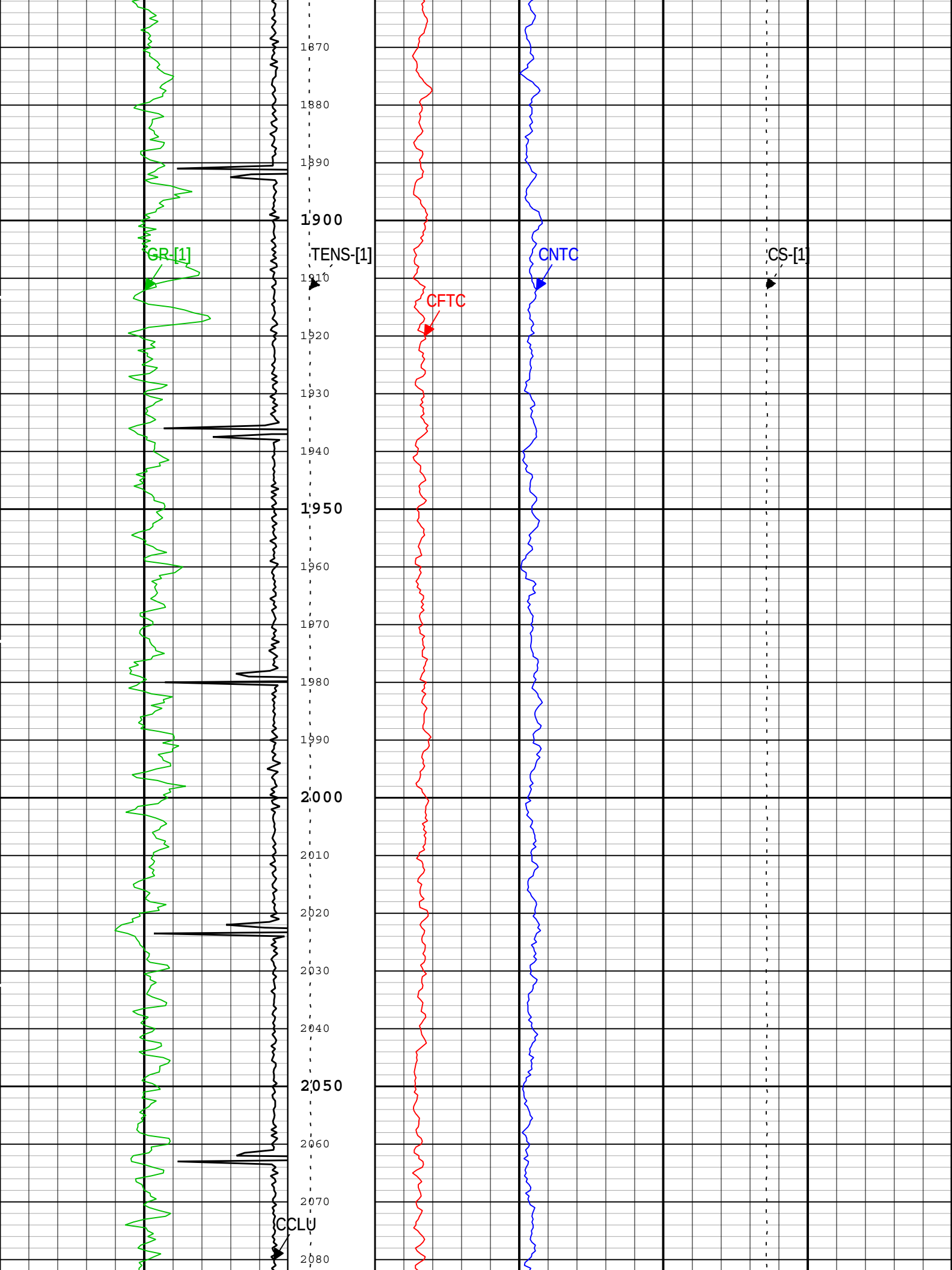
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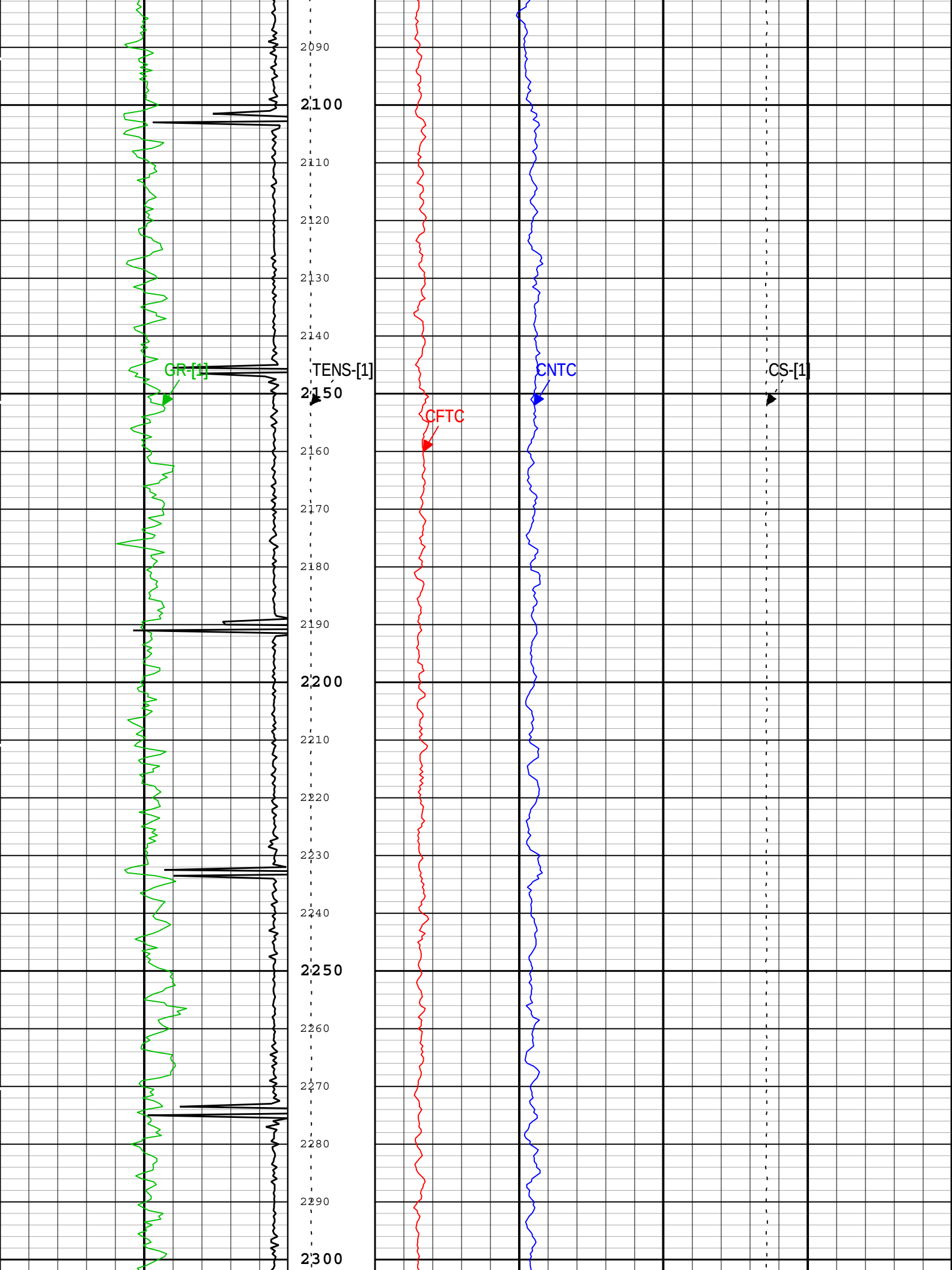
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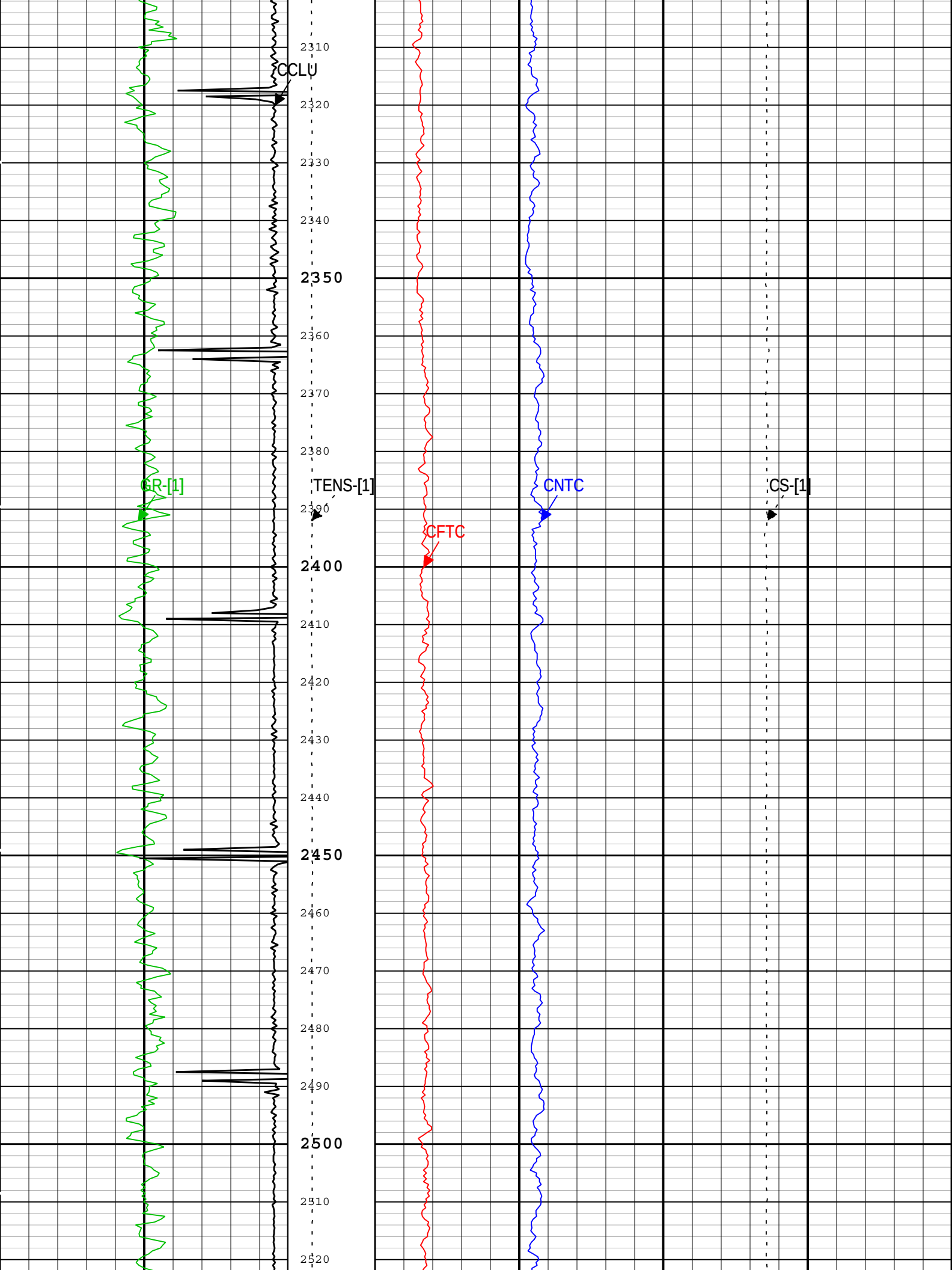
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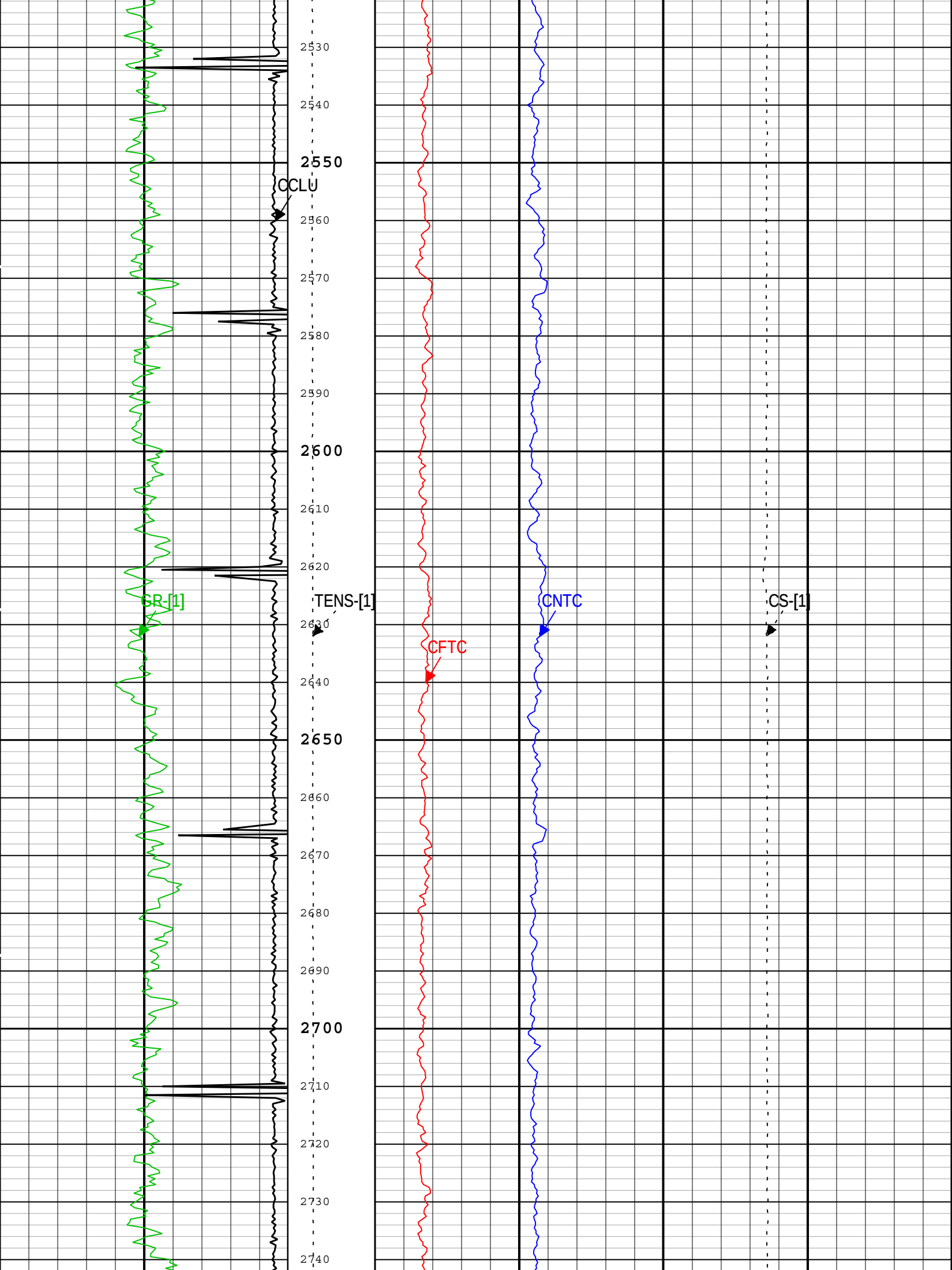
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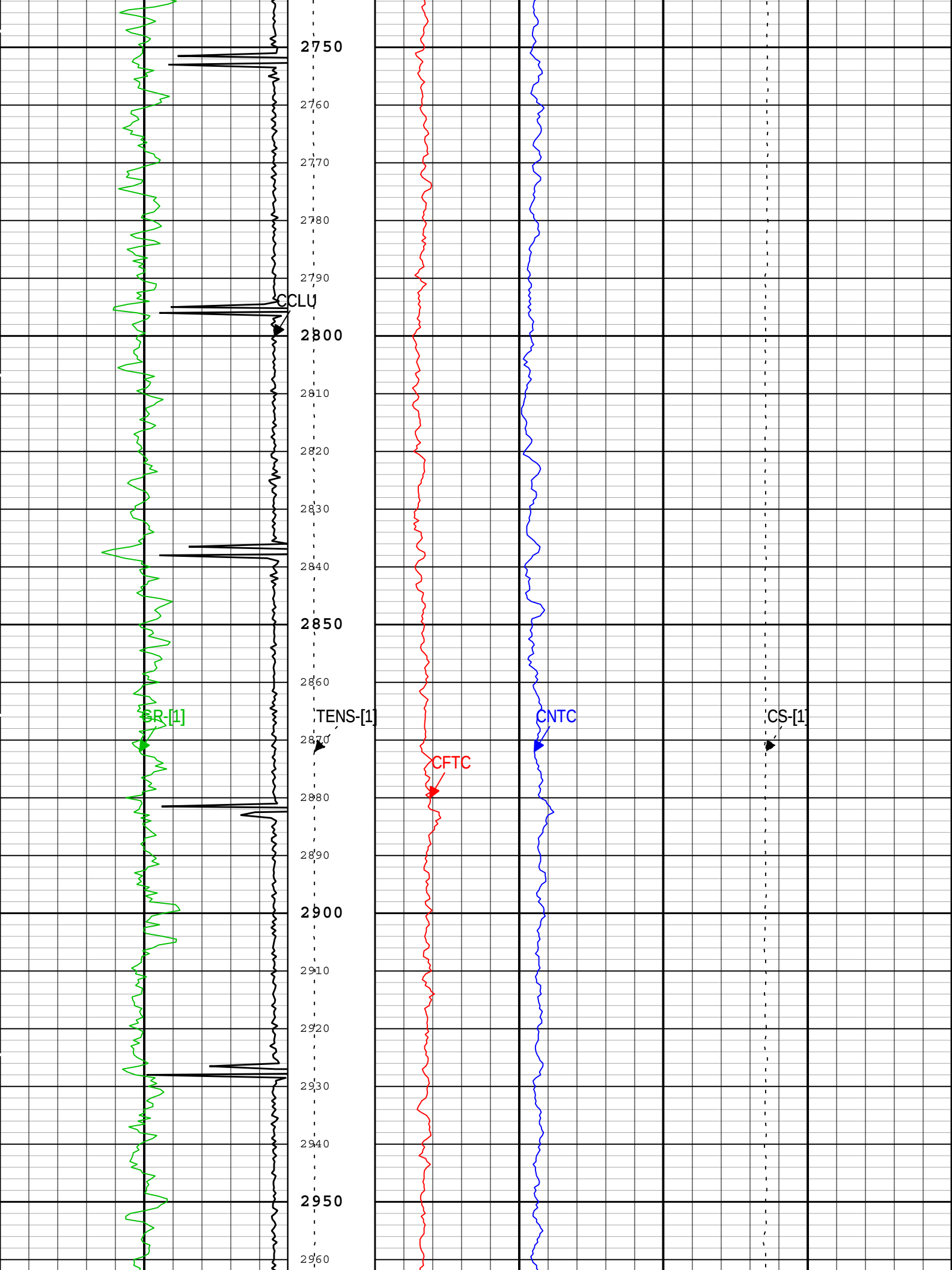
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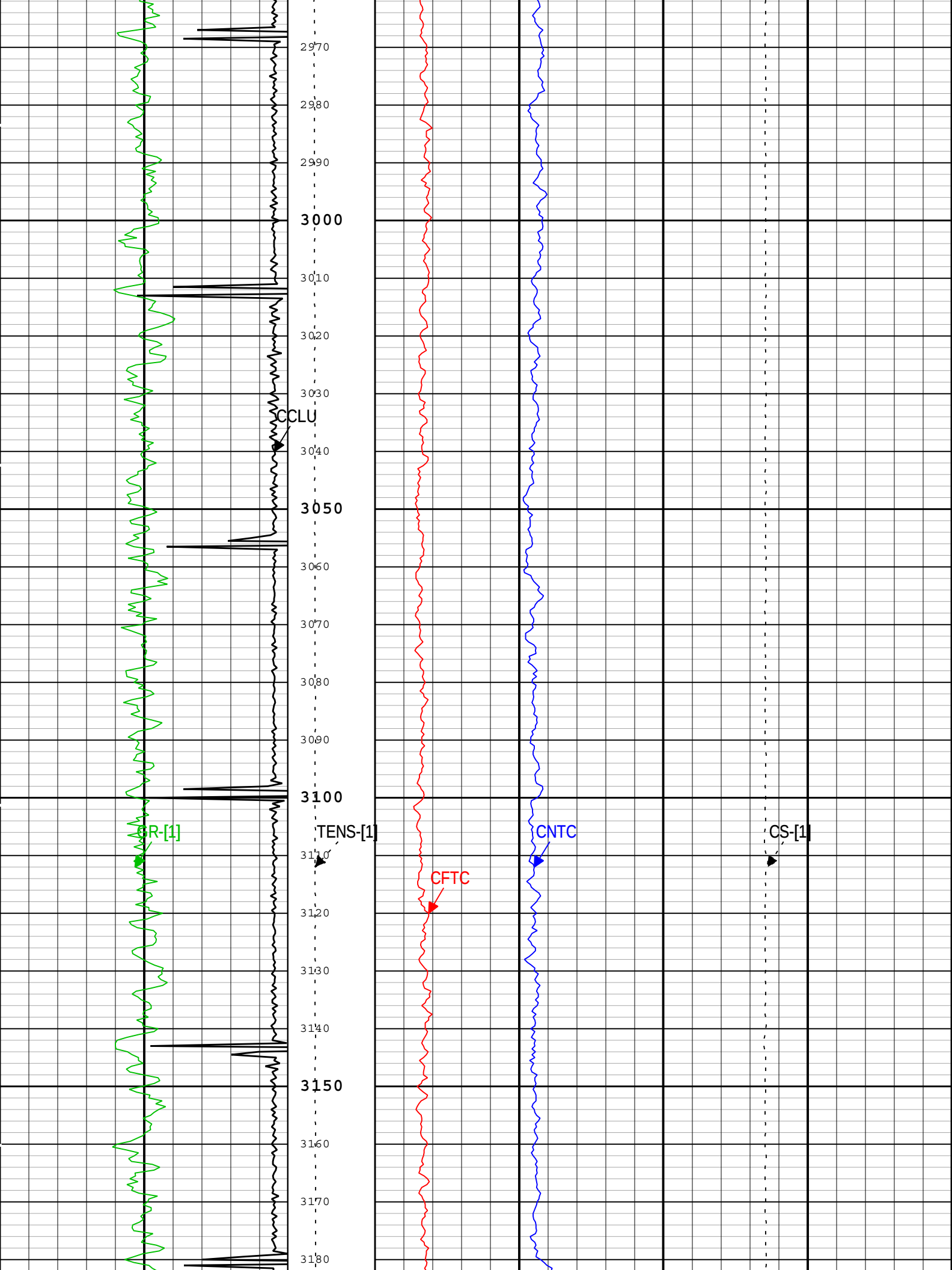
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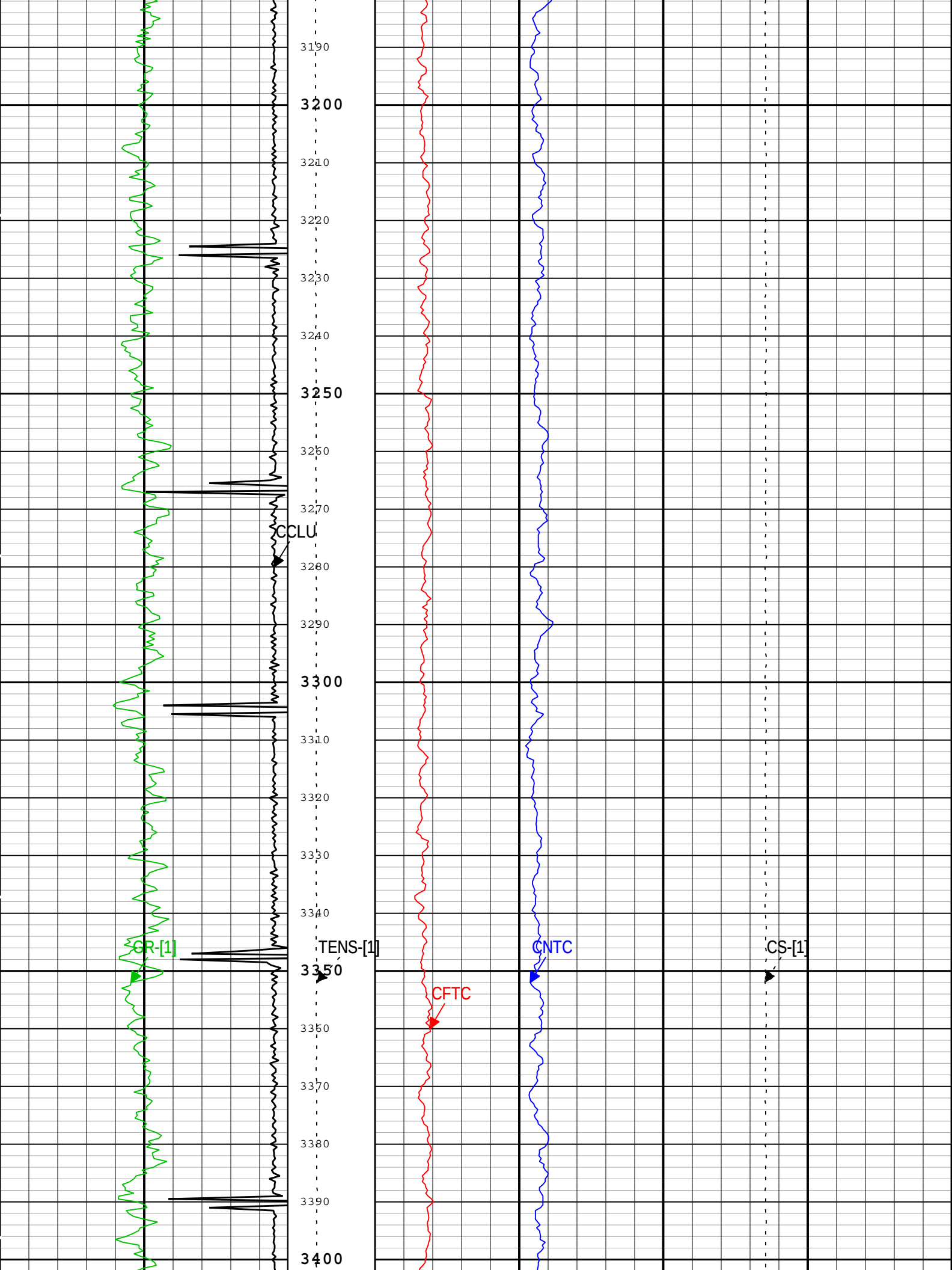
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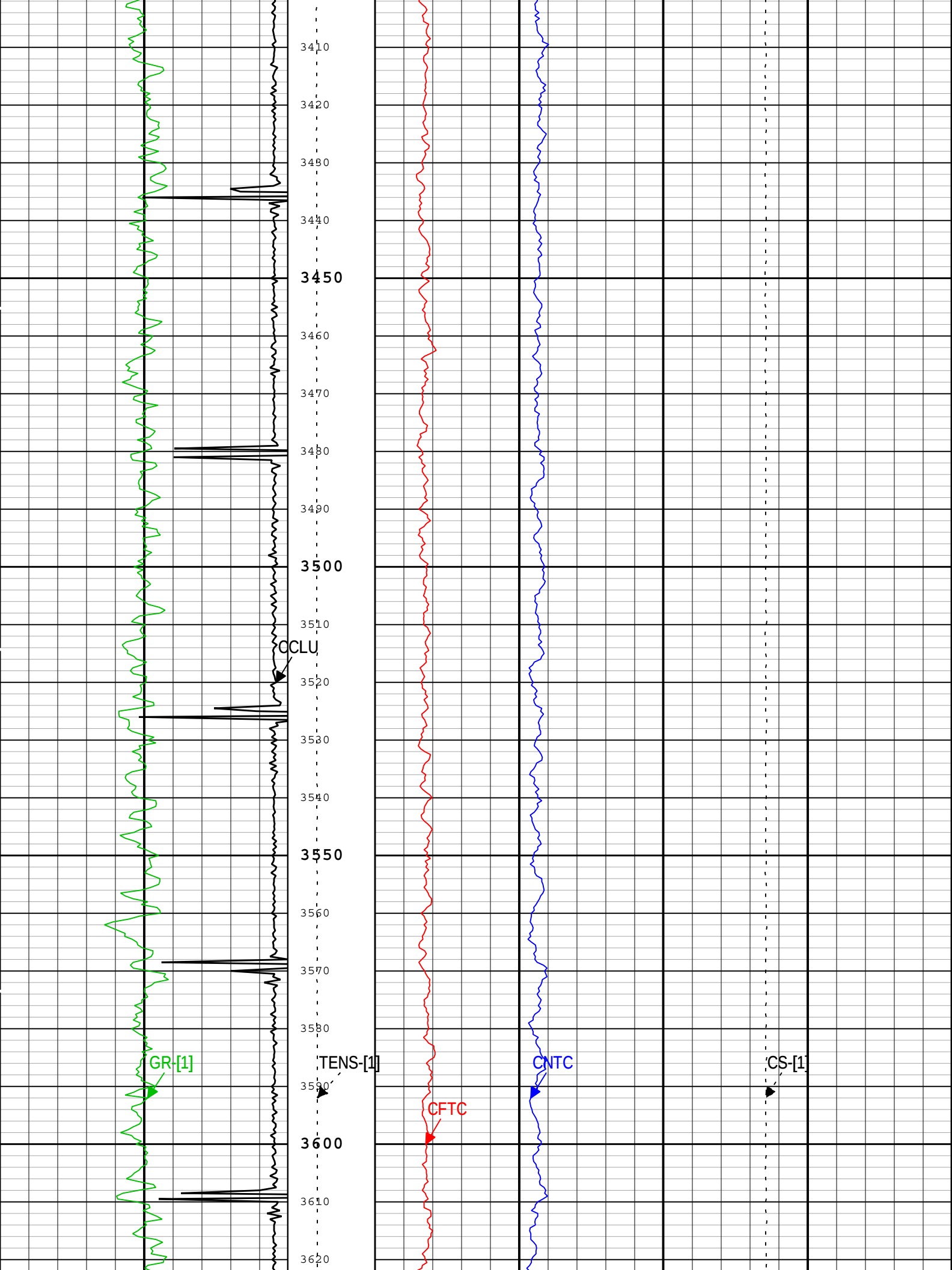
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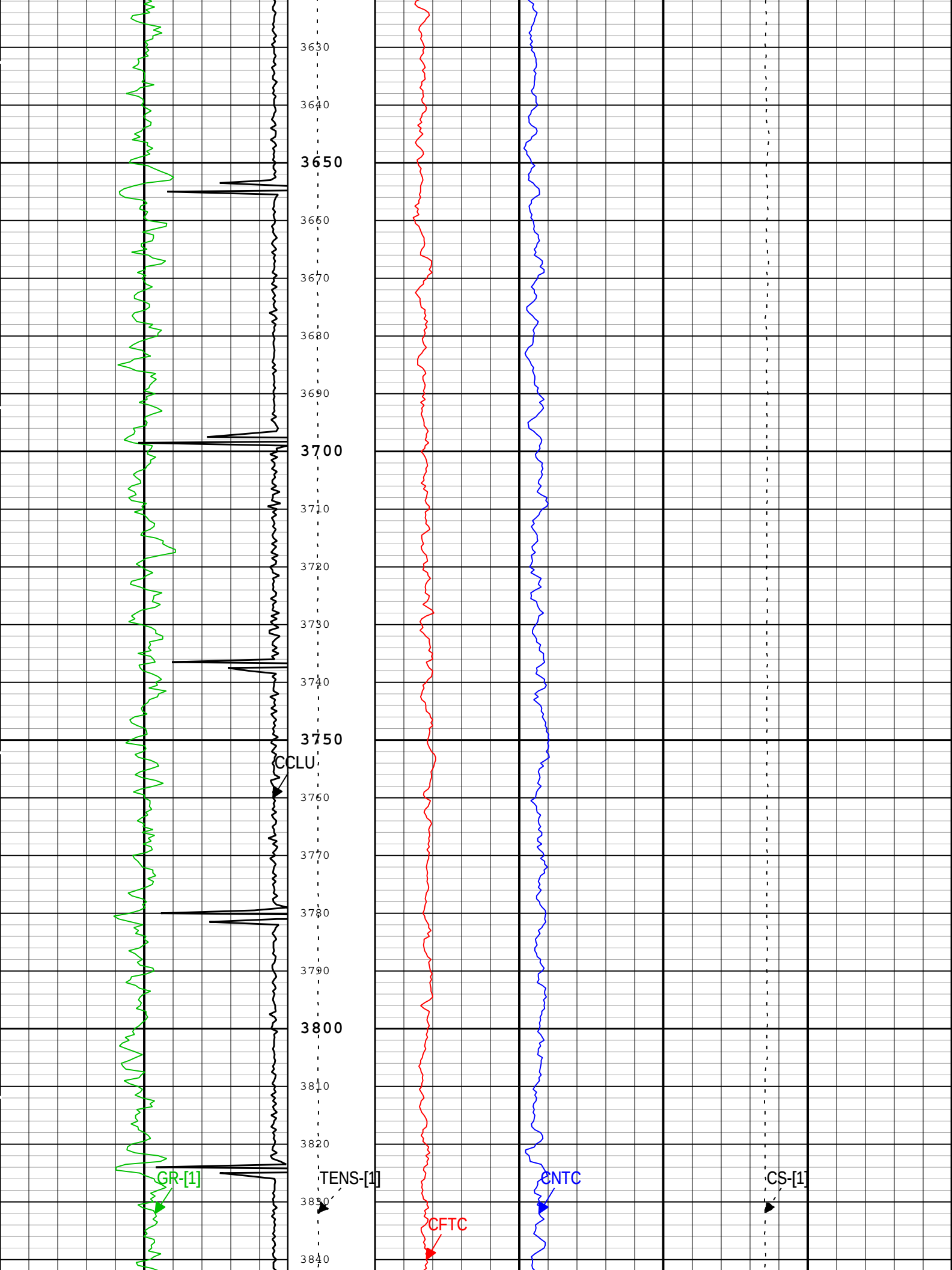
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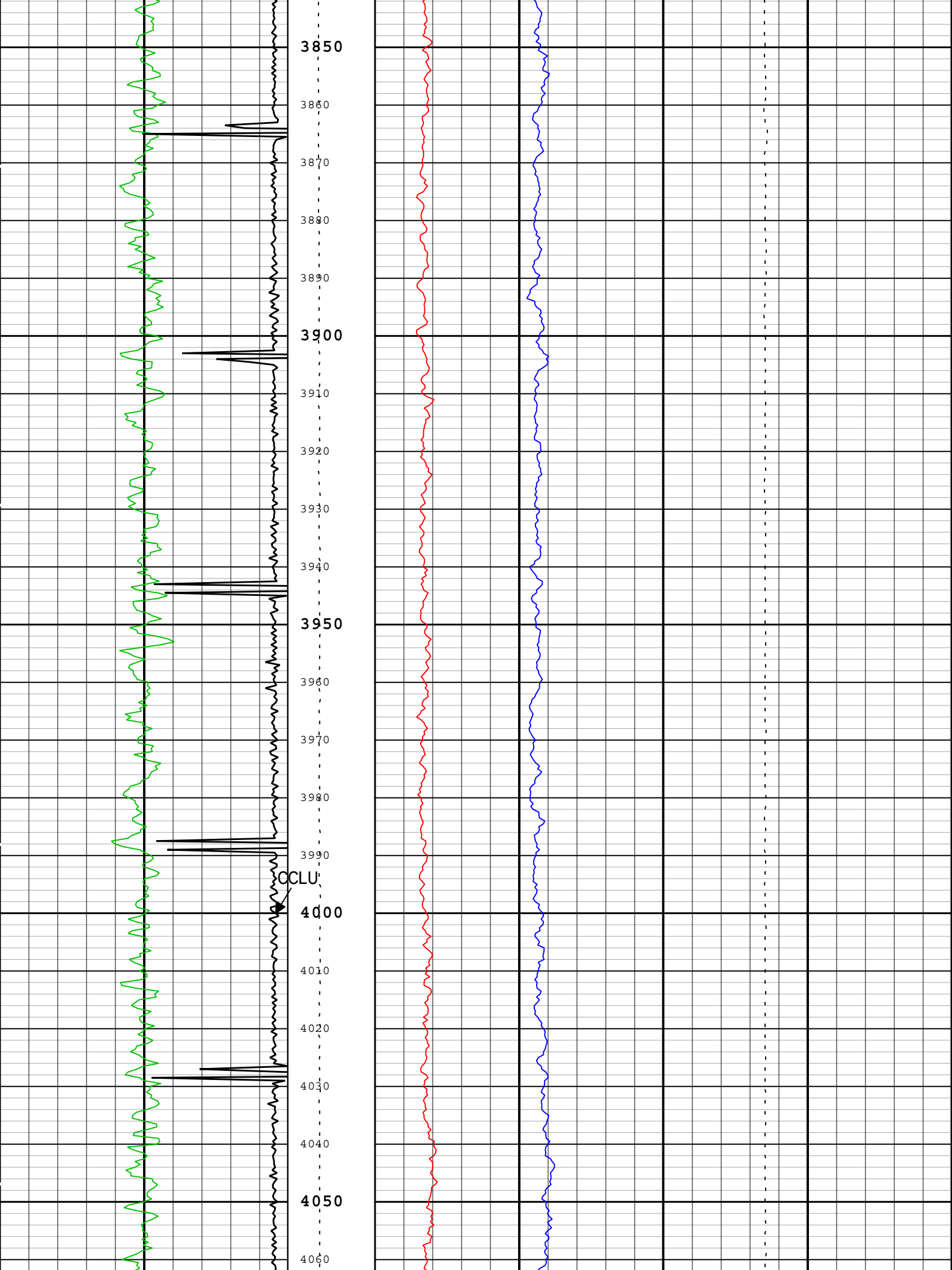
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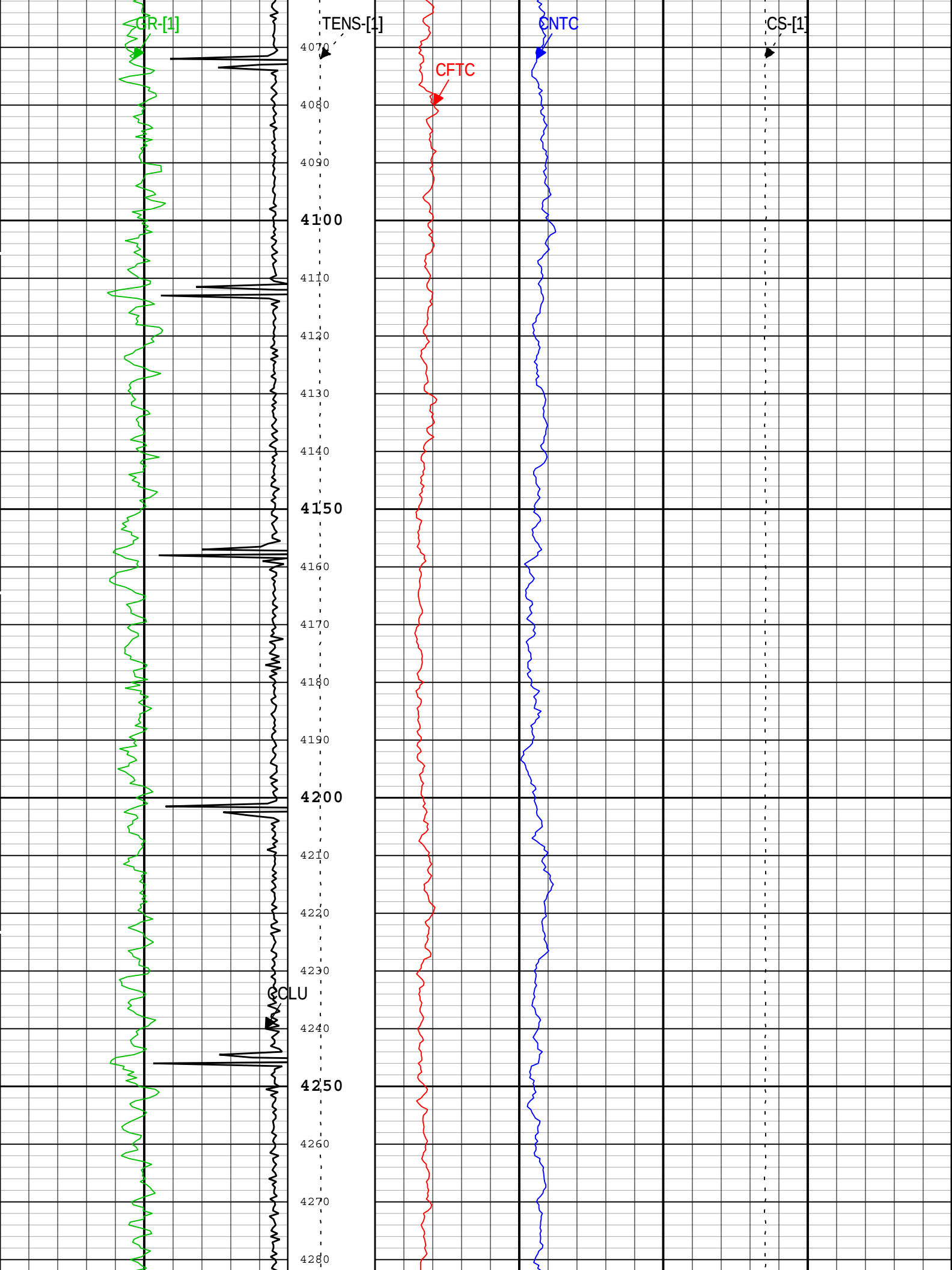
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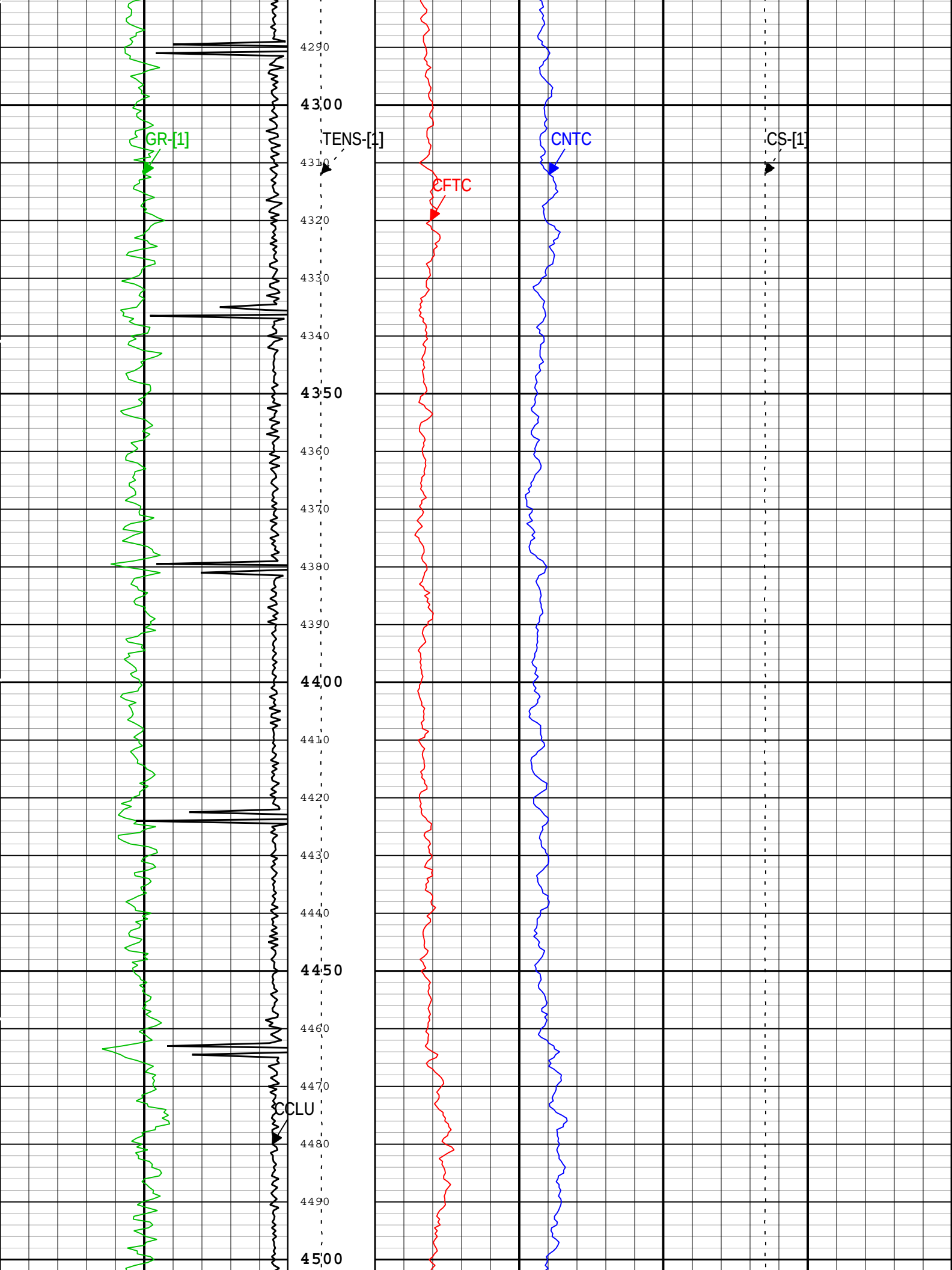
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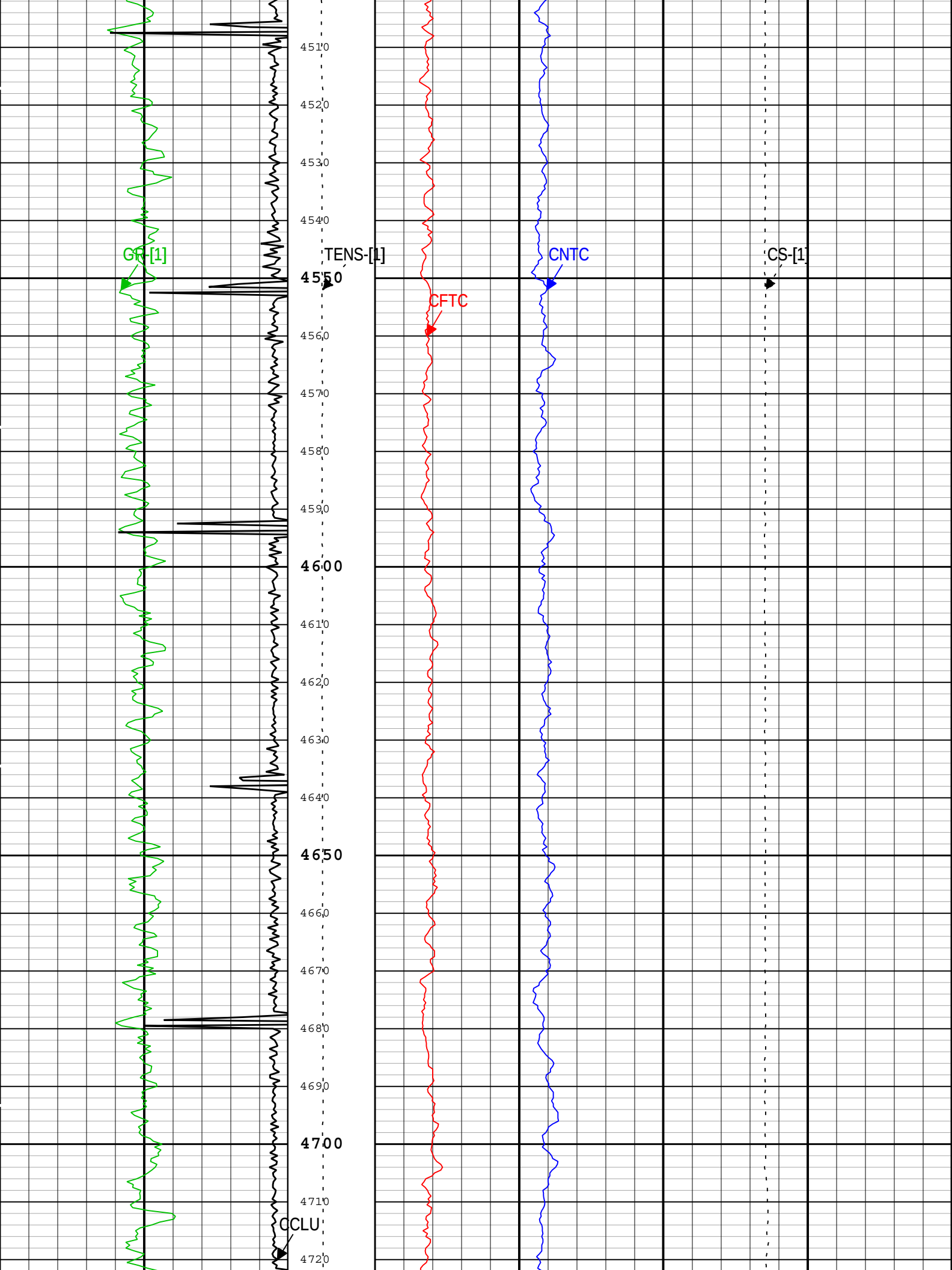
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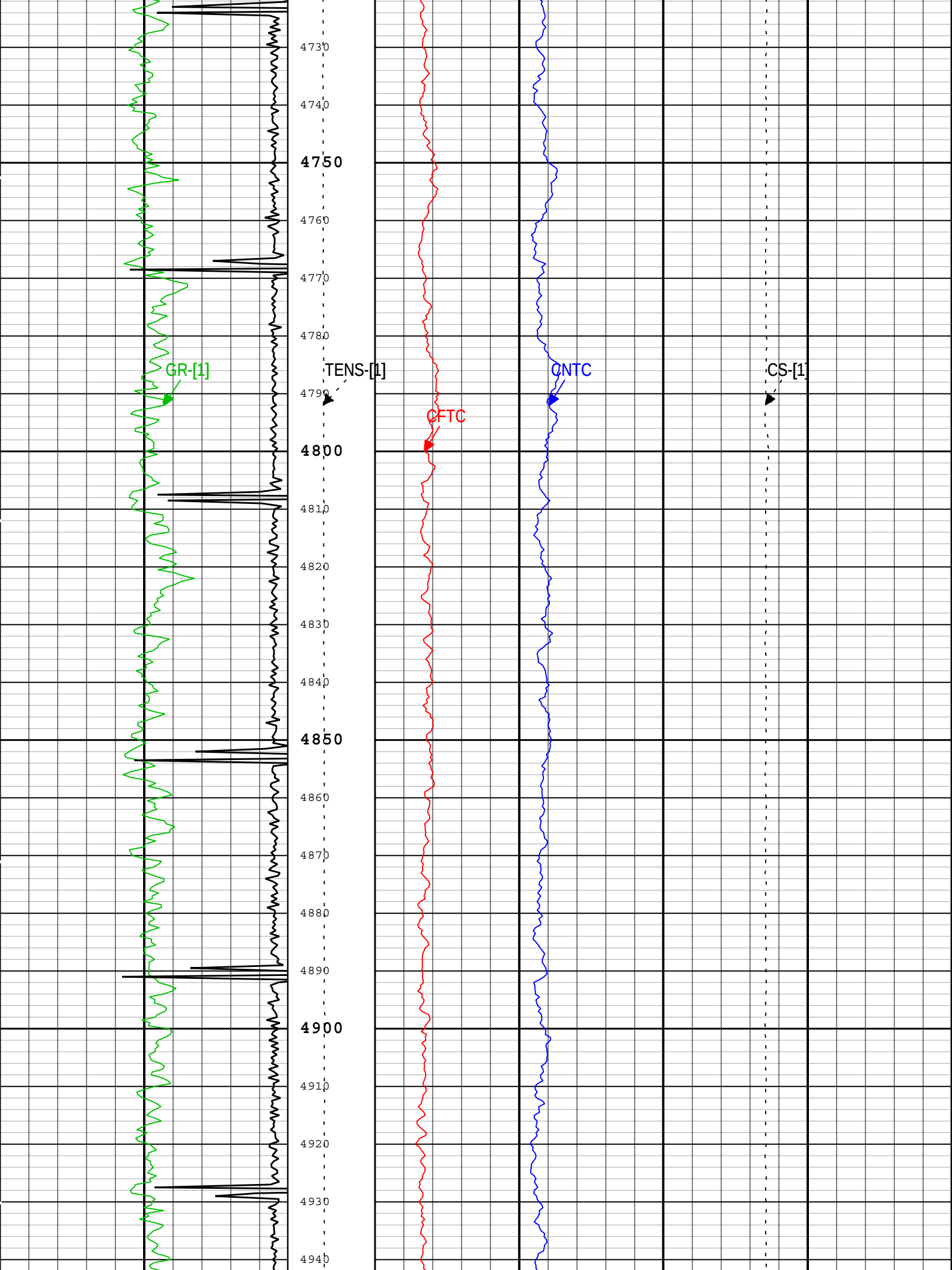
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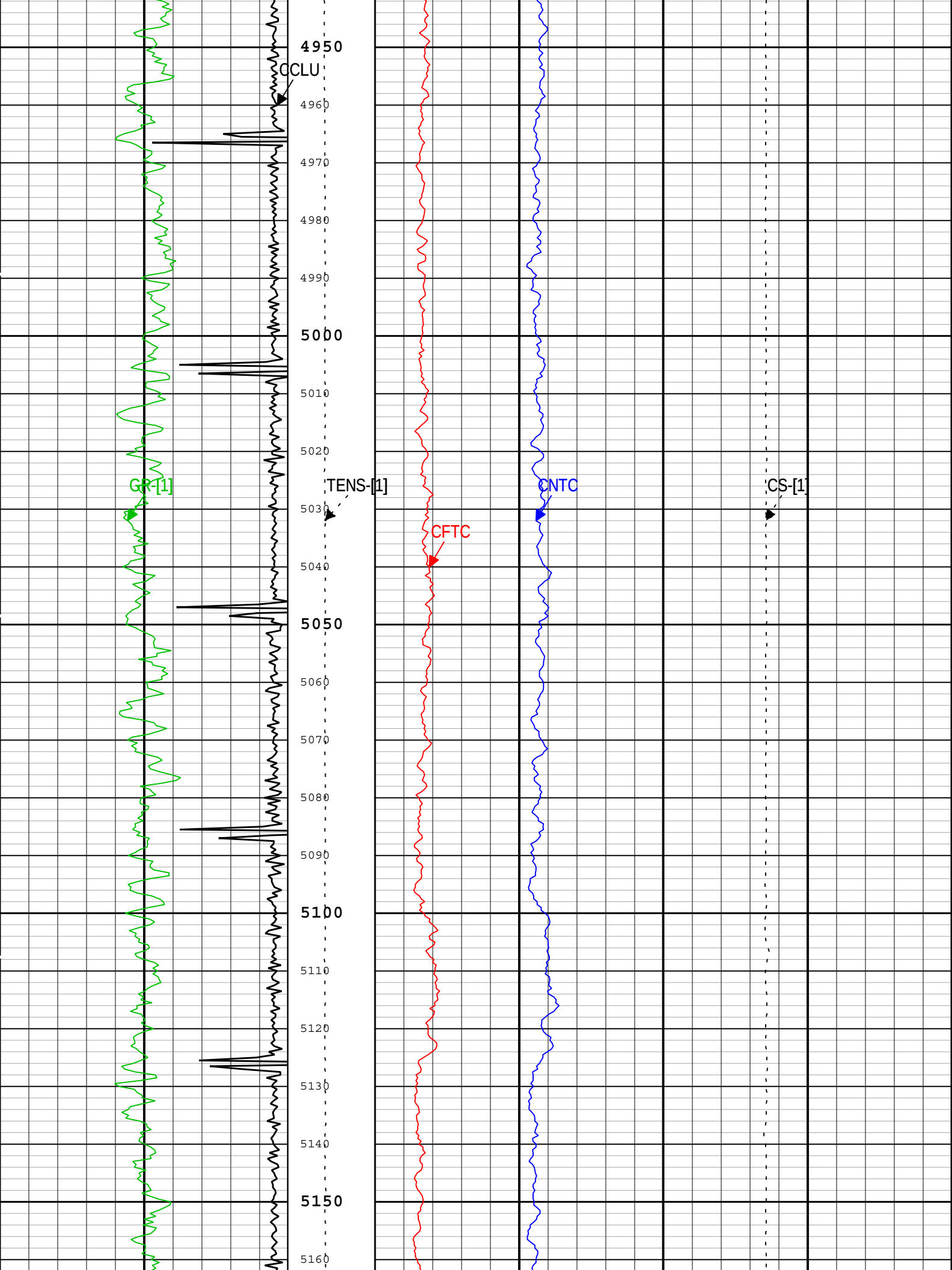
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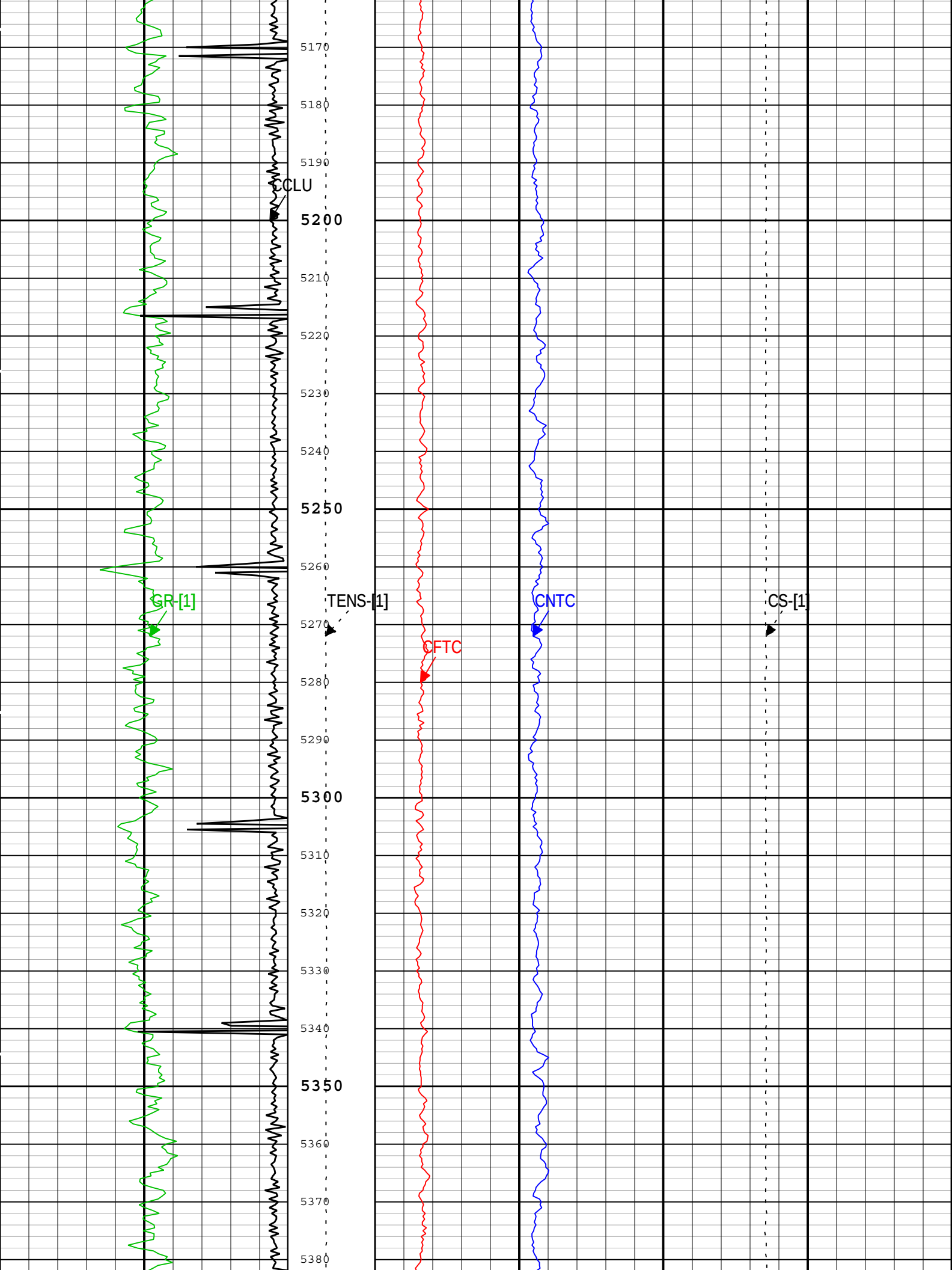
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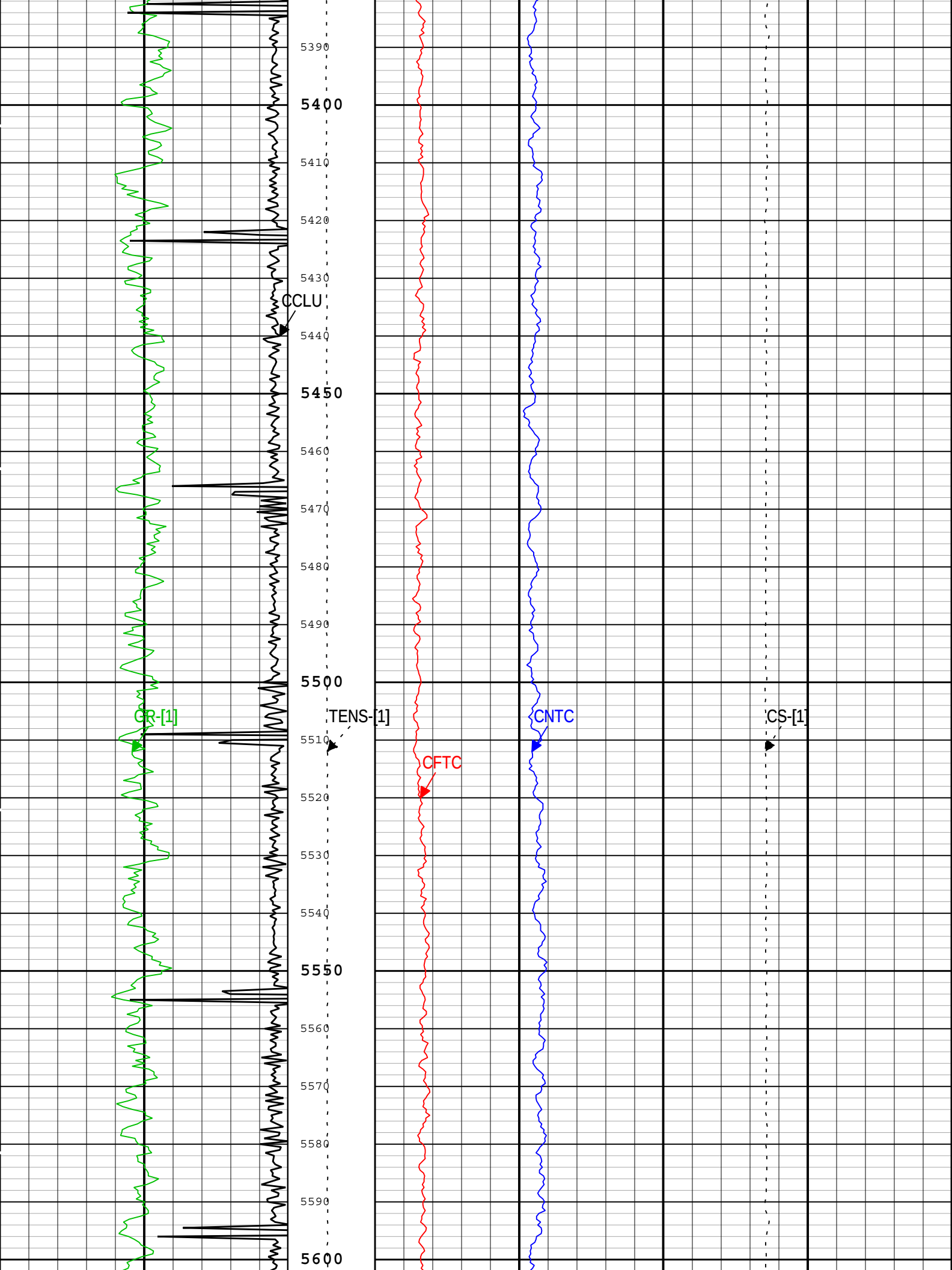
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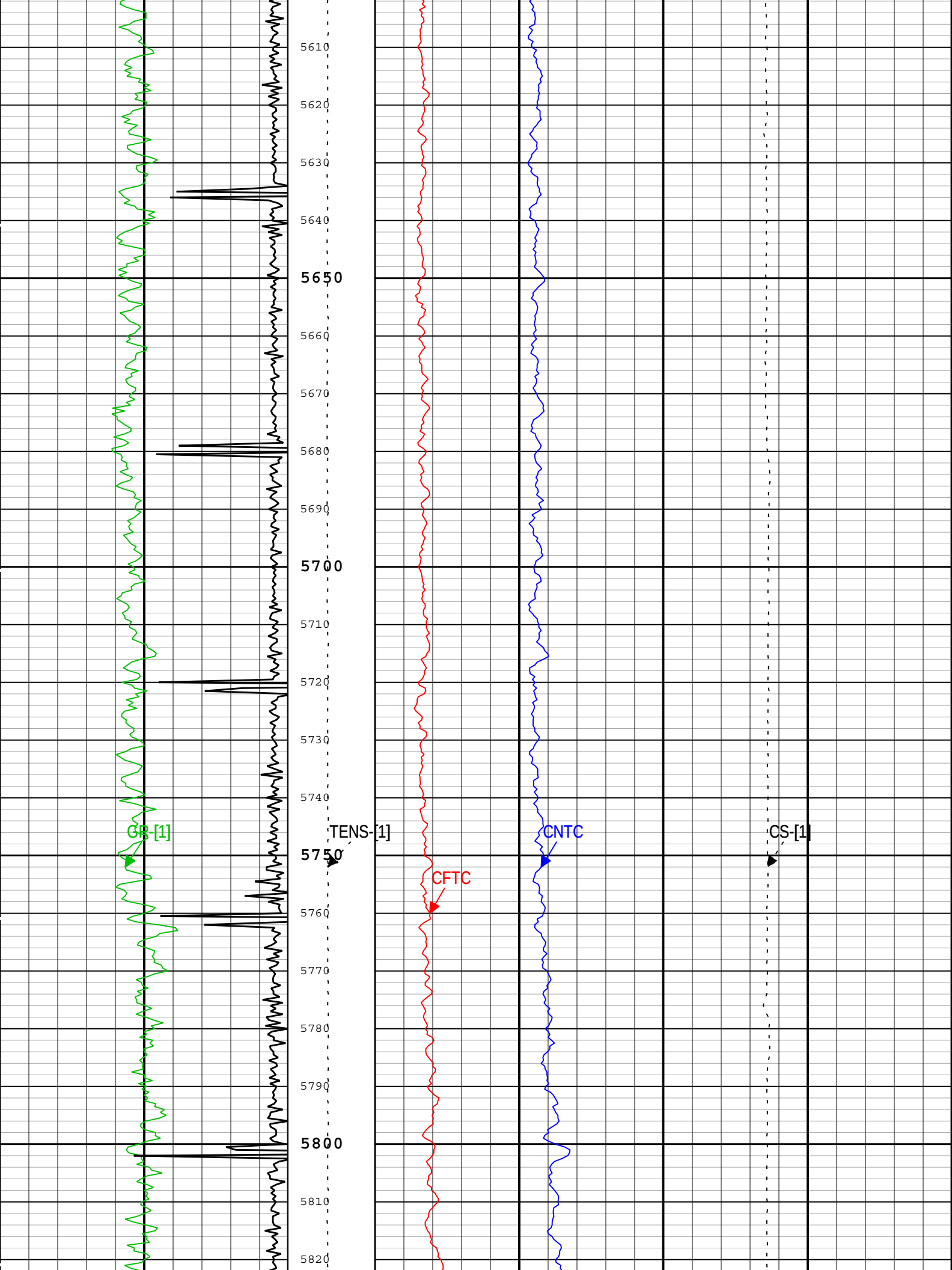
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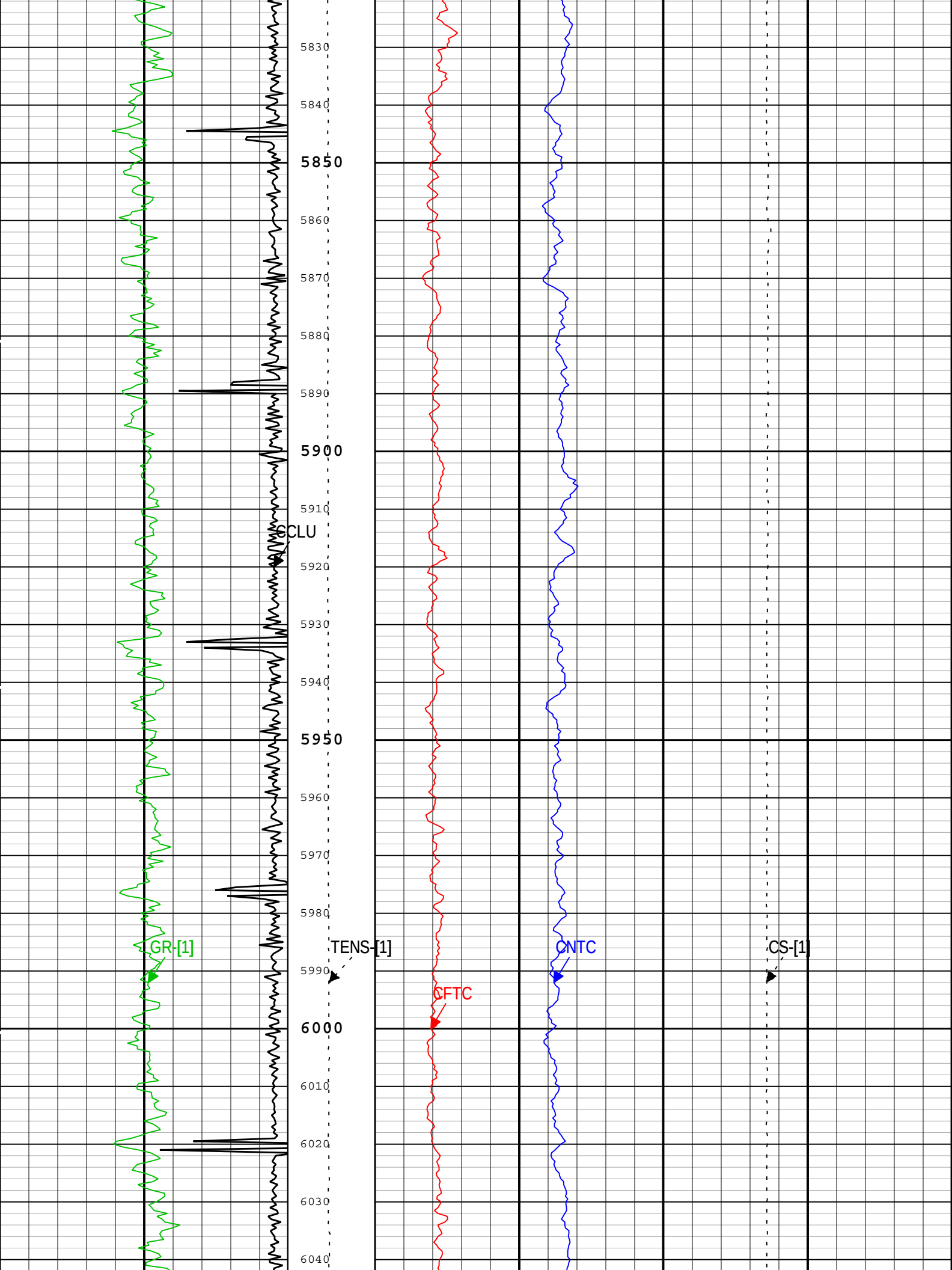
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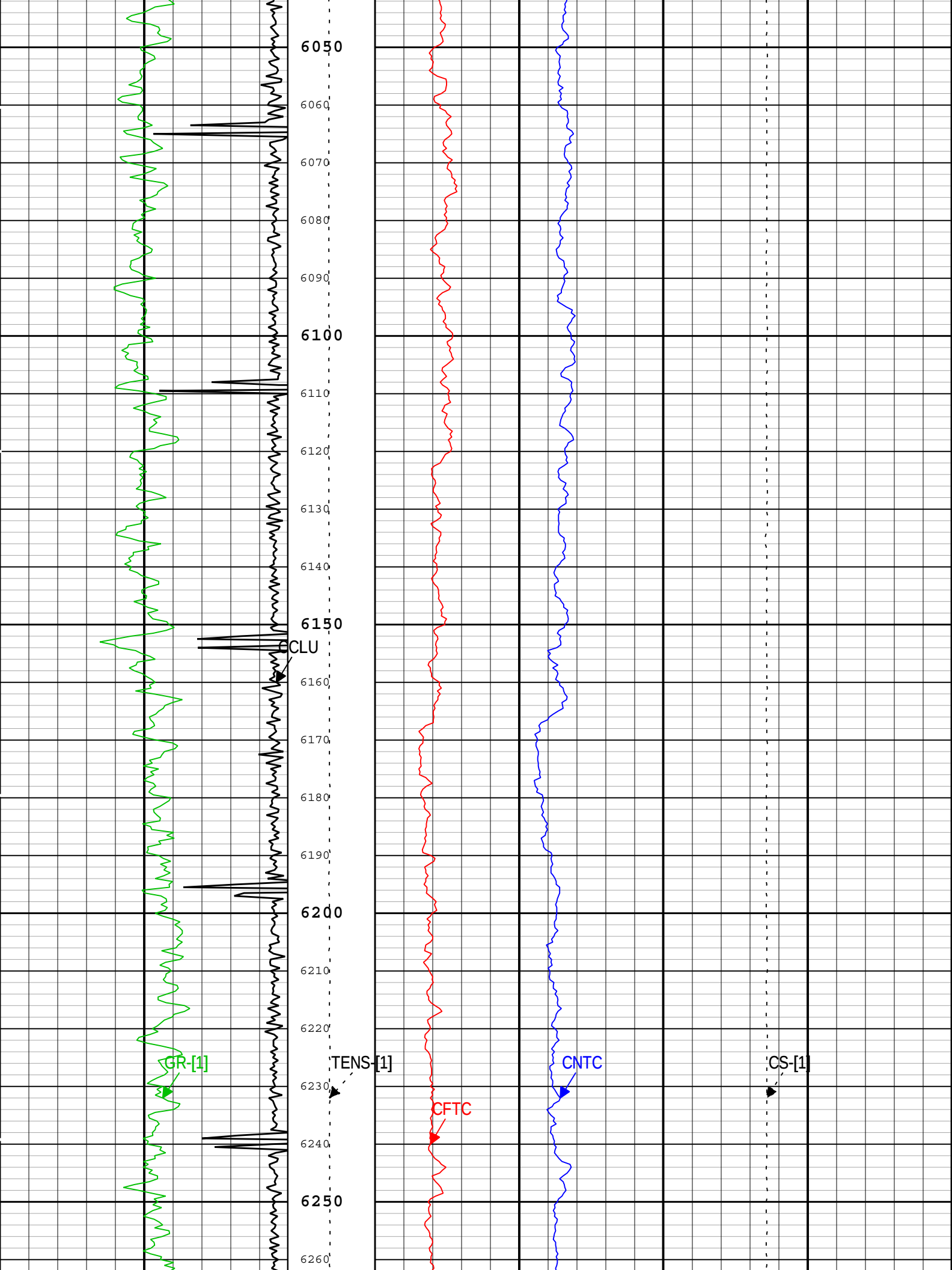
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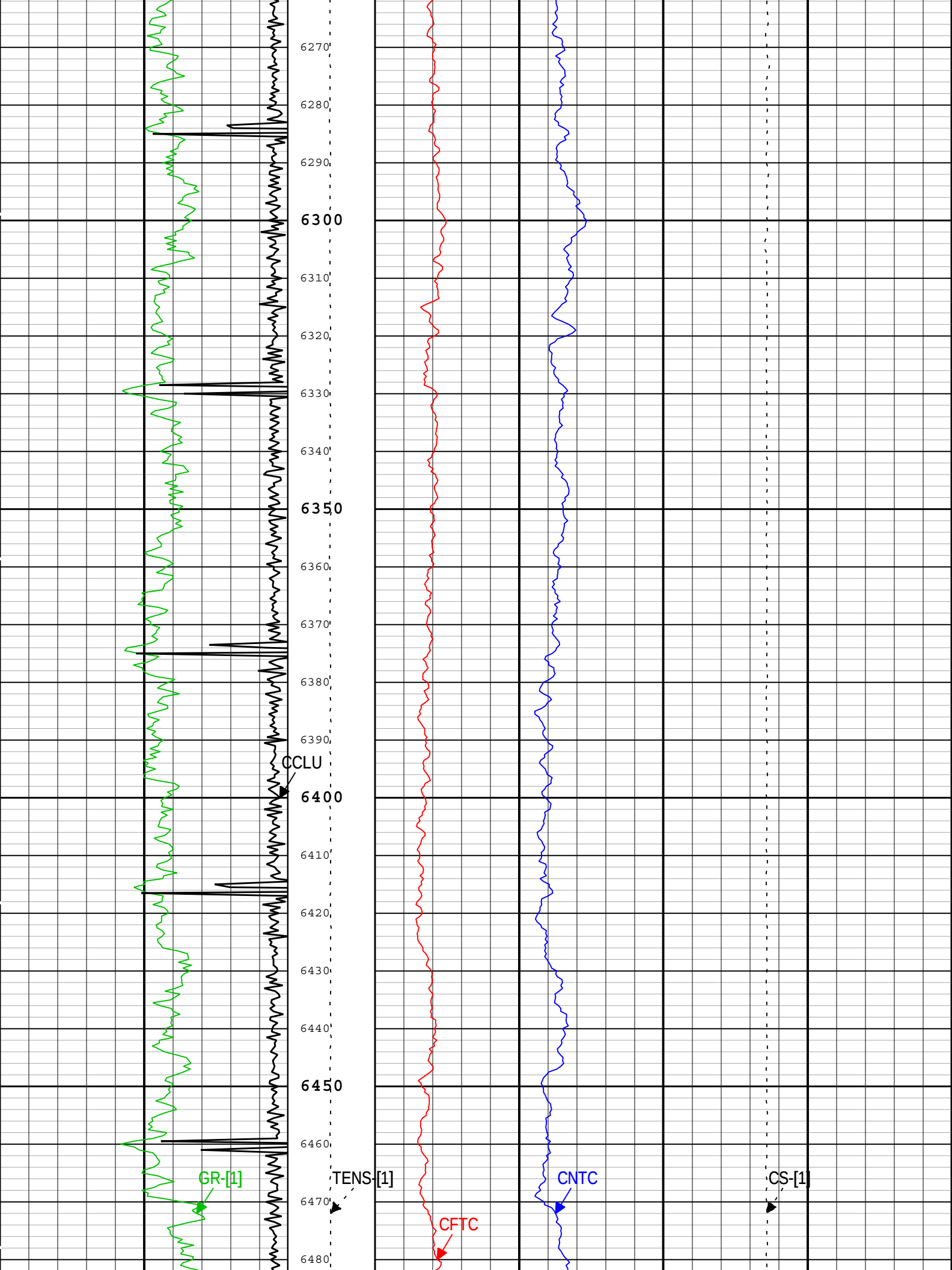
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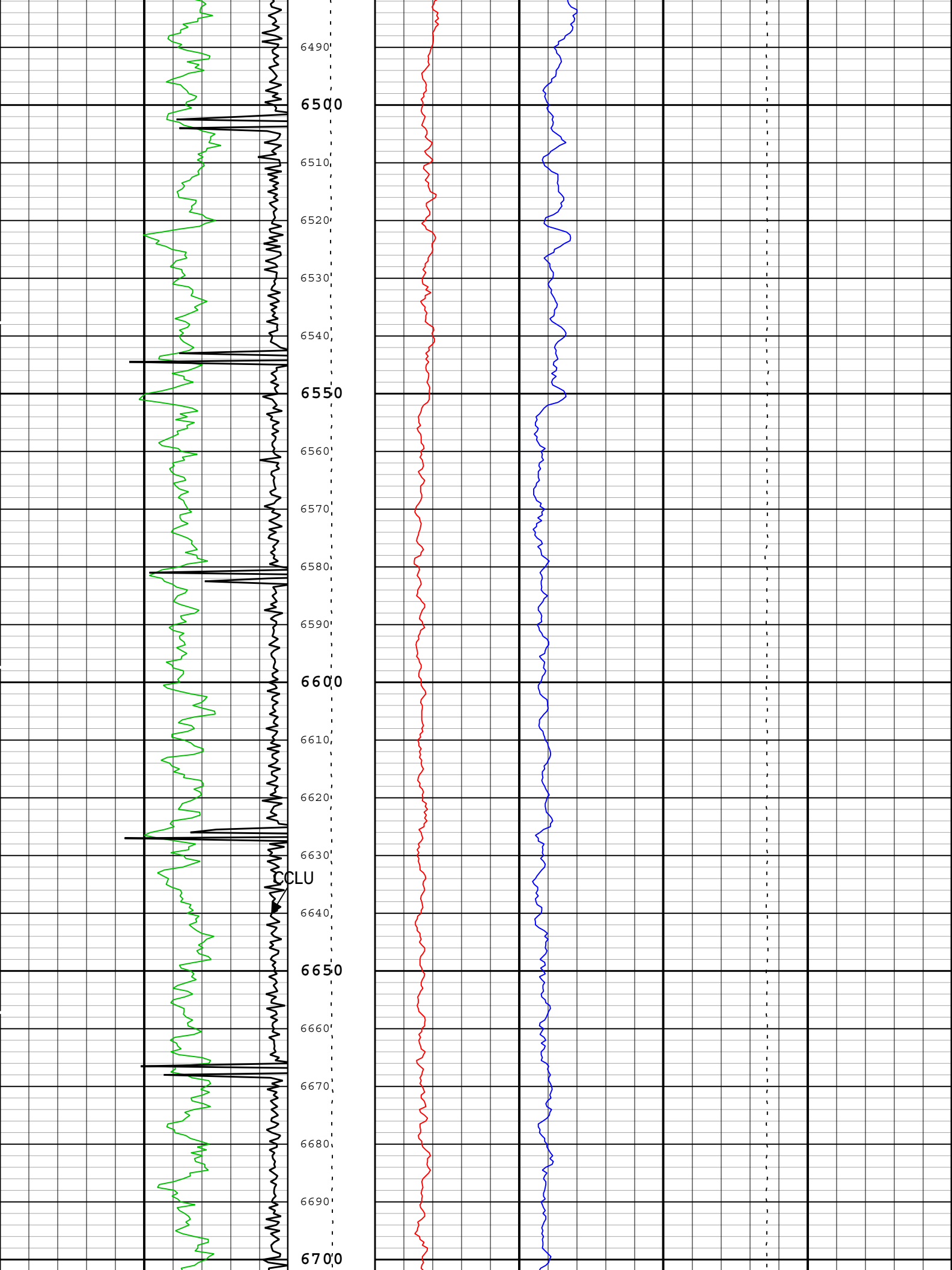
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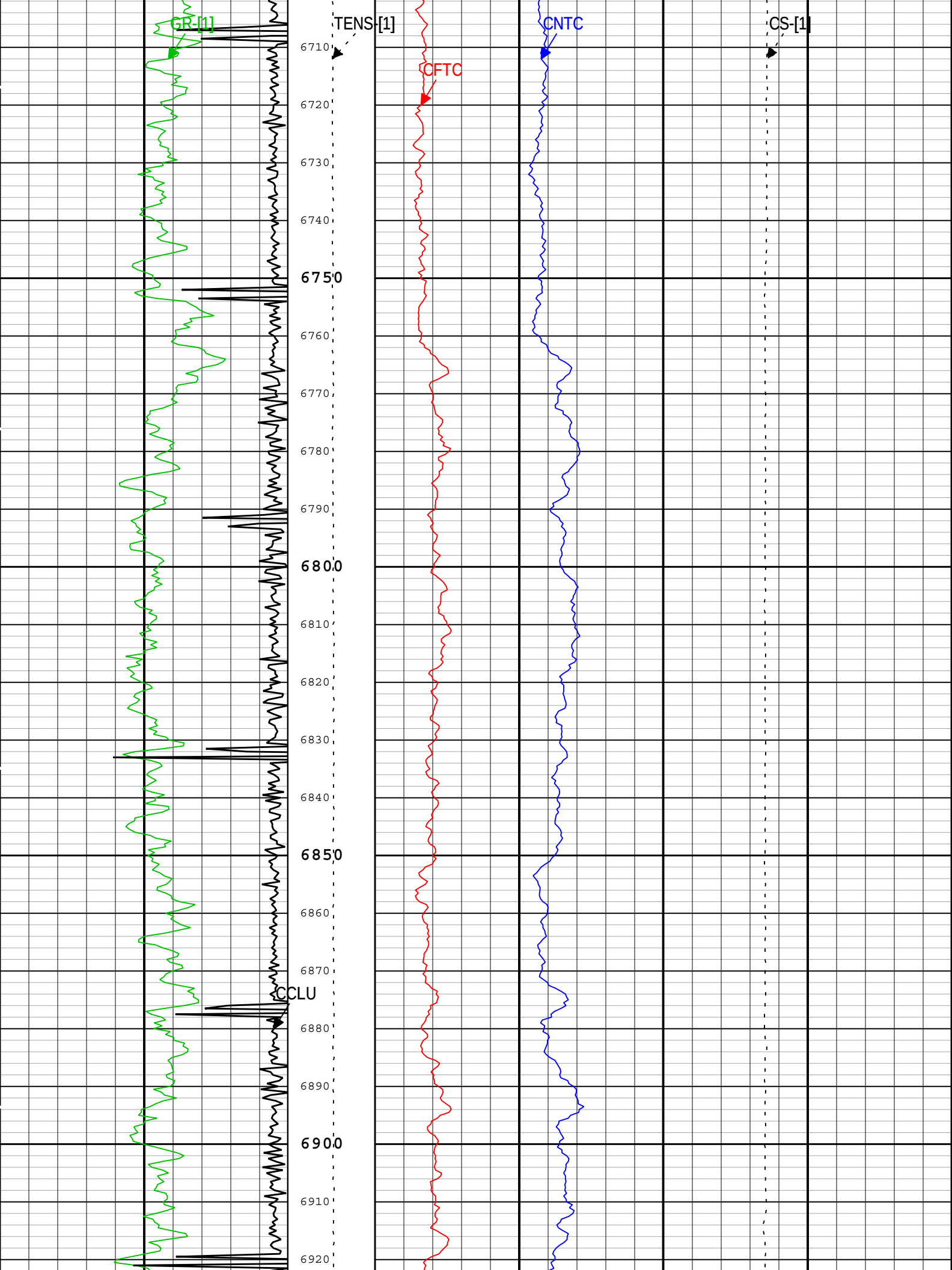
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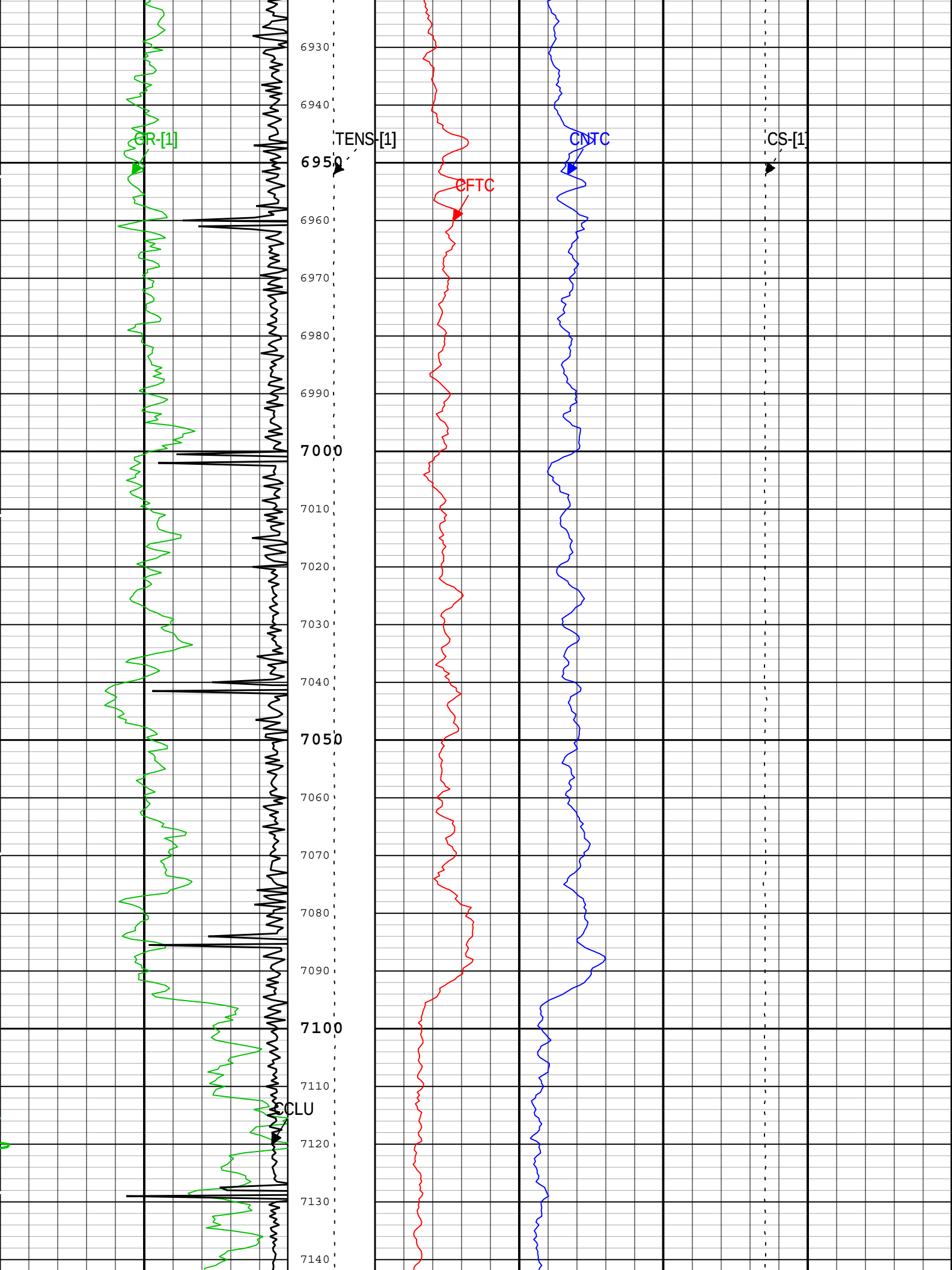
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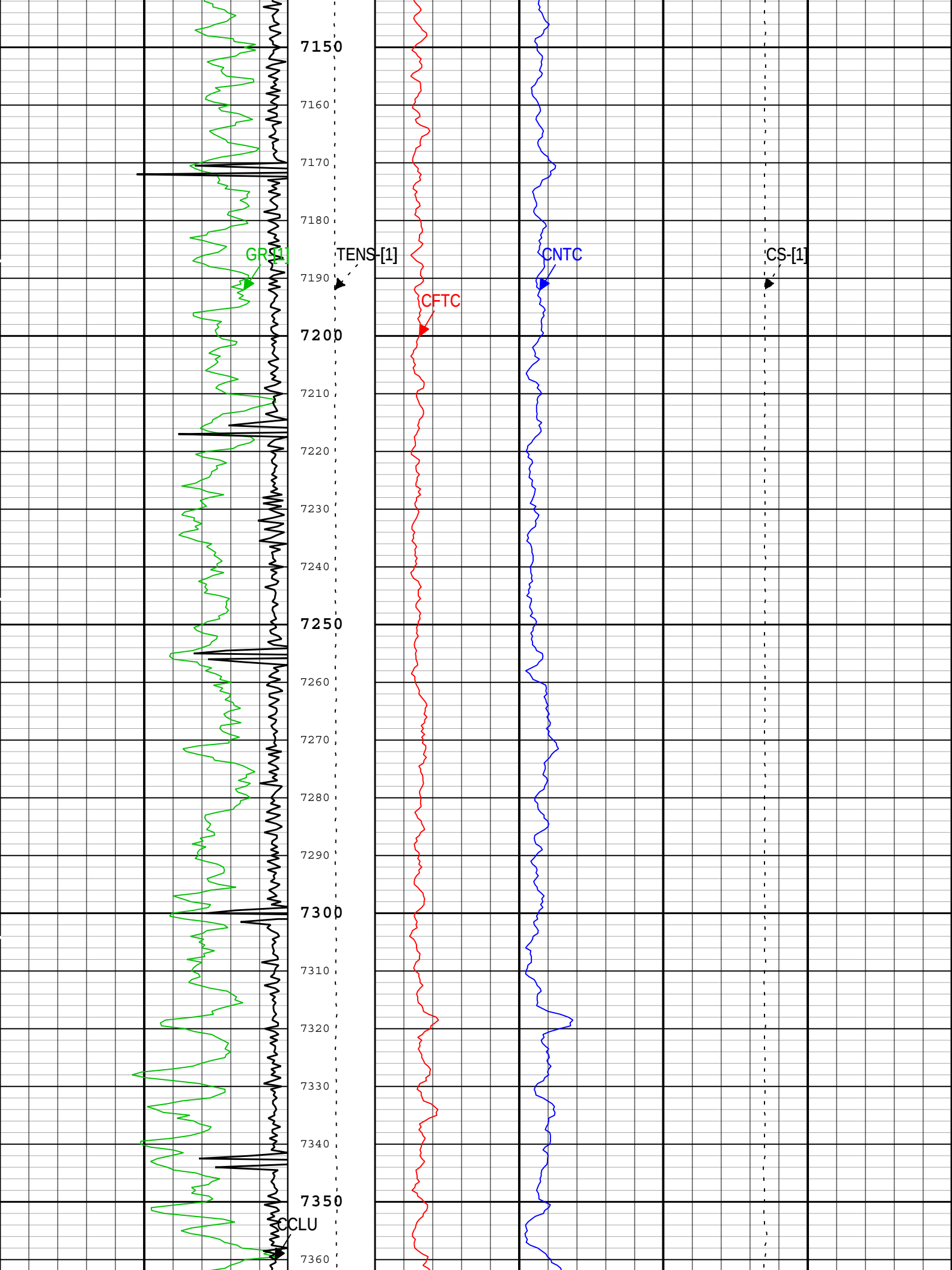
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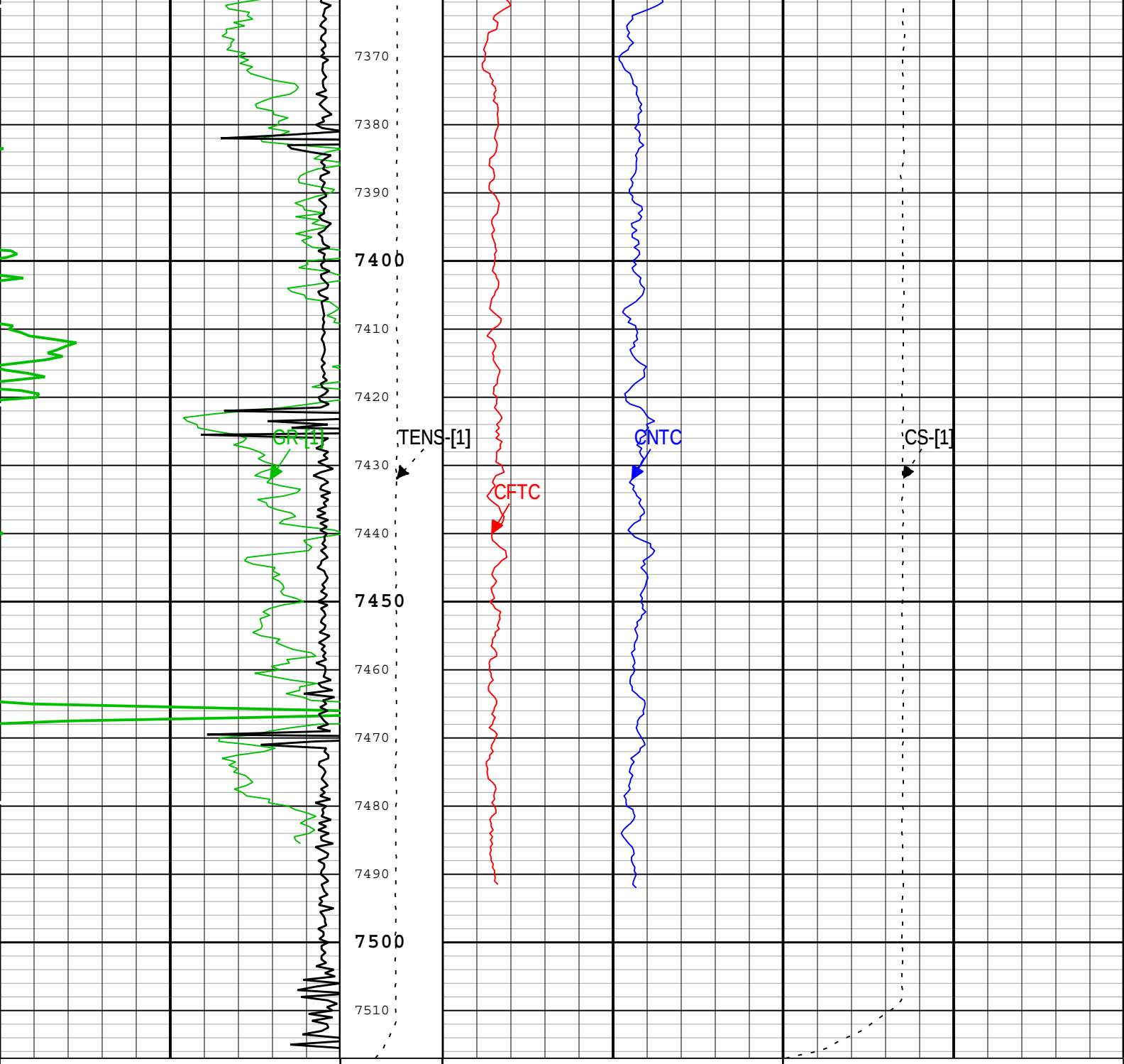


TIME_1900 - Time Marked every 60.00 (s)

Description: Format: Log (GR-CCLU Correlation) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 03-Aug-2015 21:34:37

USIT - Fluid Properties Measurement

Run Name	Pass Name	Start Depth(ft)	Stop Depth(ft)
Run 2	Log[4]:Up	7516.79	22.62

Fluid Velocity = "Automatic".
CFVL equals DFSL channel

Start Depth(ft)	Stop Depth(ft)	Start Value(us/ft)	End Value(us/ft)

Start Depth(ft)	Stop Depth(ft)	Start Value(us/ft)	End Value(us/ft)

Mud Impedance = "FreePipe Norm.".
Free Pipe normalization zone is : 303.36m(995.26ft) to 305.39m(1001.93ft)
MUD_N_FRP = 1.20
DFD = 1.02g/cm3(8.50lbm/gal)
CZMD median computed in free pipe normalization interval = 1.91 MRayl

Start Depth(ft)	Stop Depth(ft)	Start Value(Mrayl)	End Value(Mrayl)

2.B

Main Pass 5 IN = 100 FT

Software Version

Acquisition System	Version
Maxwell	5.2.40401.3100

Computation	Description	Version
Cementation	Cementation Computation Application	5.2.40401.3100
CORROSION Ensemble	CORROSION Ensemble	5.2.40401.3100

SoftwareVersion_Tool	SoftwareVersion_Run Version	SoftwareVersion_Build Version
WAFE-SEC	Synergy SV451EC version 9.10	Synergy SV451EC version 9.10
WAFE-FEC	Synergy SV451EC version 9.10	Synergy SV451EC version 9.10
WAFE-TMDI	Synergy SV451EC version 46.19	Synergy SV451EC version 46.19

Tool Elements	Description	Software Version	Firmware Version
USI-SENSOR	USIT Transducer Element	5.2.40401.3100	DHC: P321617

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
2.B	Log[4]:Up	Up	22.62 ft	7516.79 ft	03-Aug-2015 5:35:50 PM	03-Aug-2015 7:56:54 PM	ON	6.58 ft	Yes

All depths are referenced to toolstring zero

Log

Company:Southern California Gas Company Well:Fernando Fee 32H

2.B: Log[4]:Up:S037

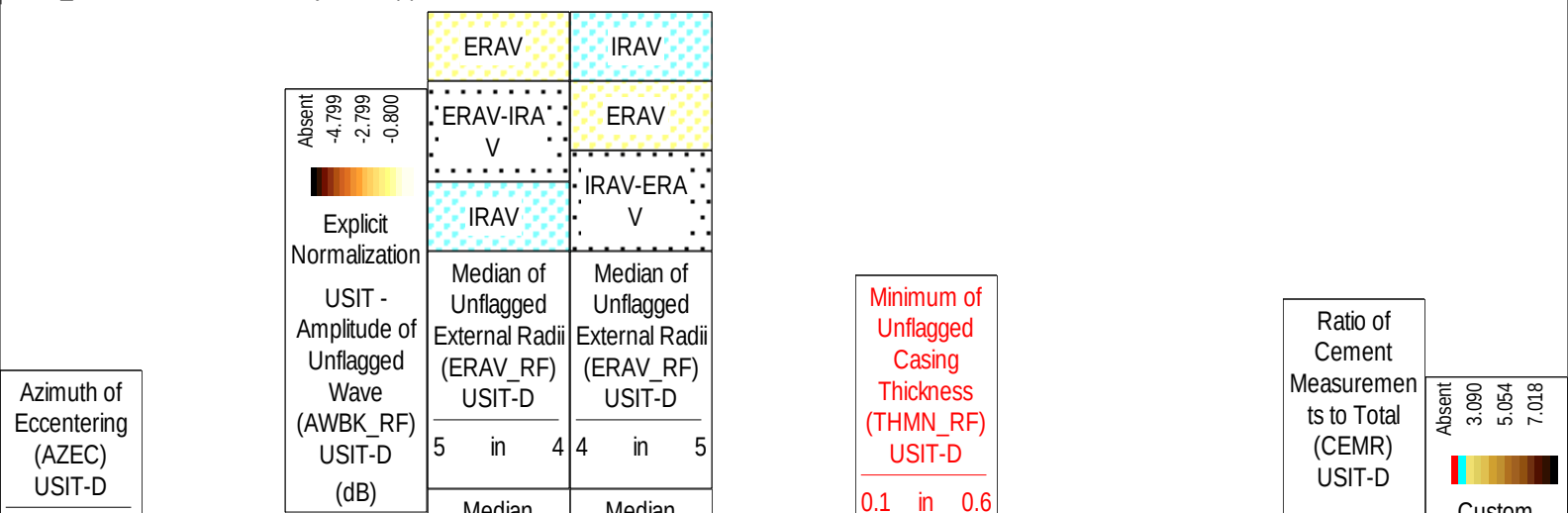
Description: USI Composite Format: Log (UCRC_USI Composite 9.625inch) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth
Creation Date: 03-Aug-2015 21:34:46

USIT Processing Flags (UFLG[0]) USIT-D

1 - UFLG 1 Value within [0.0 - 1.5] - :
2 - UFLG 2 Value within [1.5 - 2.5] - :
3 - UFLG 3 Value within [2.5 - 3.5] - :
4 - UFLG 4 UFLG 5 UFLG 6 Value within [3.5 - 6.5] - :
5 - UFLG 7 UFLG 8 UFLG 9 Value within [6.5 - 10] - :

- UTIM Error
- Pulse Origin Not Detected
- WINLEN Error
- Casing Thickness Error
- Loop Processing Error

TIME_1900 - Time Marked every 60.00 (s)



0 deg 360

Casing Collar Locator Ultrasonic (CCLU) USIT-D

-30 in 10

Amplitude of Eccentering for Unflagged Waves (ECCE_RF) USIT-D

0 in 0.5

Motor Revolution Speed (RSAV) USIT-D

6 c/s 8

Absent 1.500 3.500

Explicit Normalization

USIT - USIT Processing Flags (UFLG) USIT-D

USIT Processing Flags (UFLG[0]) USIT-D

1 5

Dog Leg Severity (DLS)

0 10 deg/100ft

Minimum of Unflagged Wave Amplitude (AWMN_RF) USIT-D

0 dB 75

Average of Unflagged Wave Amplitude (AWAV_RF) USIT-D

0 dB 75

Maximum of Unflagged Wave Amplitude (AWMX_RF) USIT-D

0 dB 75

Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-D

5 in 4

Maximum of Unflagged Internal Radii (IRMX_RF) USIT-D

5 in 4

Minimum of Unflagged Internal Radii (IRMN_RF) USIT-D

5 in 4

Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-D

4 in 5

Maximum of Unflagged Internal Radii (IRMX_RF) USIT-D

4 in 5

Minimum of Unflagged Internal Radii (IRMN_RF) USIT-D

4 in 5

Absent -0.051 -0.012 0.028 0.068

Explicit Normalization

USIT - Unflagged Internal Radii minus Median Internal Radius (IRBKM_RF) USIT-D (in)

Nominal Casing Thickness (THNO) USIT-D

0.1 in 0.6

Median of Unflagged Casing Thickness (THAV_RF) USIT-D

0.1 in 0.6

Maximum of Unflagged Casing Thickness (THMX_RF) USIT-D

0.1 in 0.6

Absent -0.051 -0.012 0.028 0.068

Explicit Normalization

USIT - Unflagged Casing Thickness minus Median of Unflagged Casing Thickness (THBKM_RF) USIT-D (in)

Absent 1.500 3.500 5.500 7.500

Custom Normalization

USIT - Acoustic Impedance (AIBK) USIT-D (Mrayl)

1 0

Micro-debonding Ratio (MDR) USIT-D

1 0

Ratio of Gas Measurements to Total (GASR) USIT-D

1 0

Bonded

Gas

Liquid

Micro-debonding

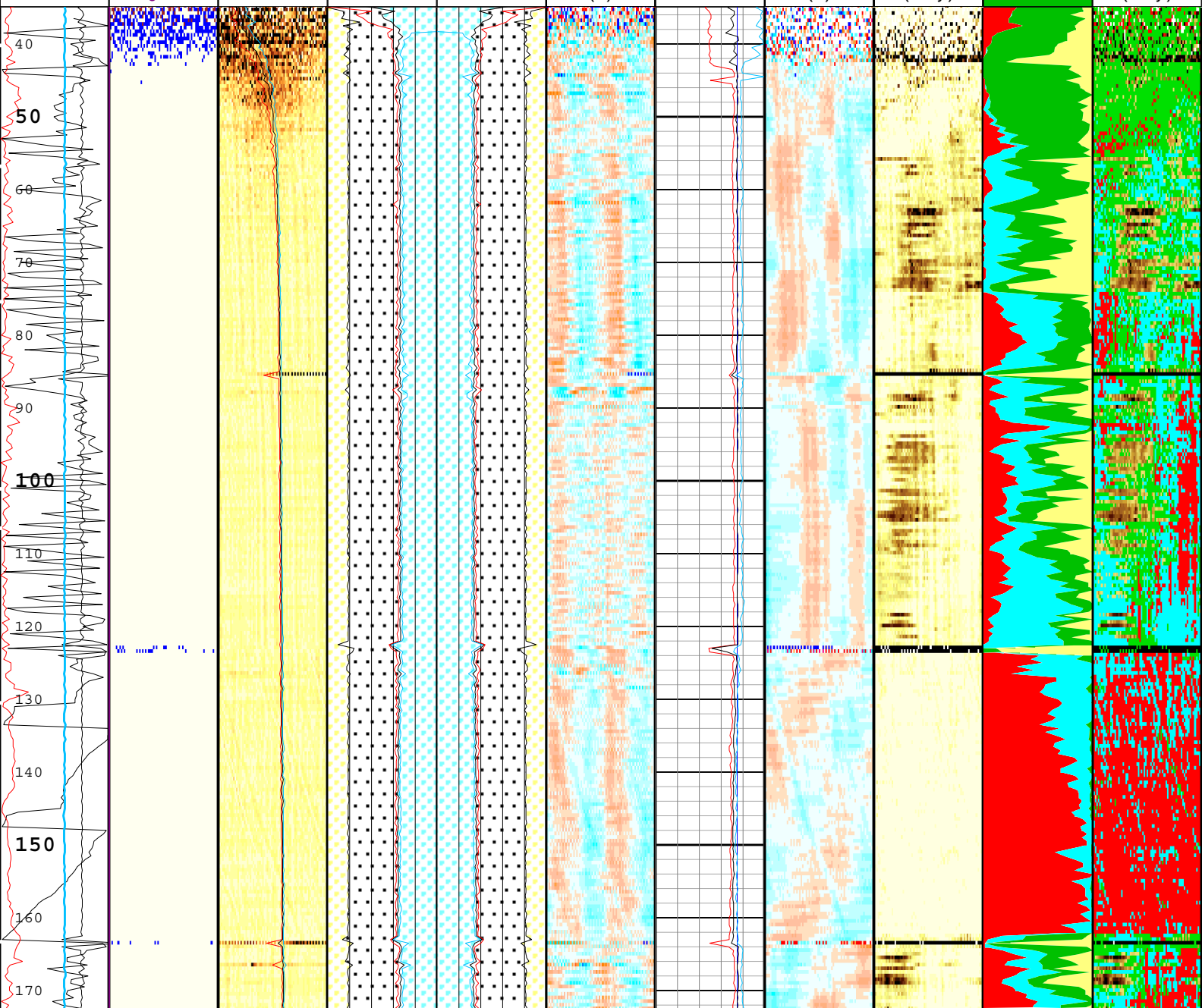
Custom Normalization

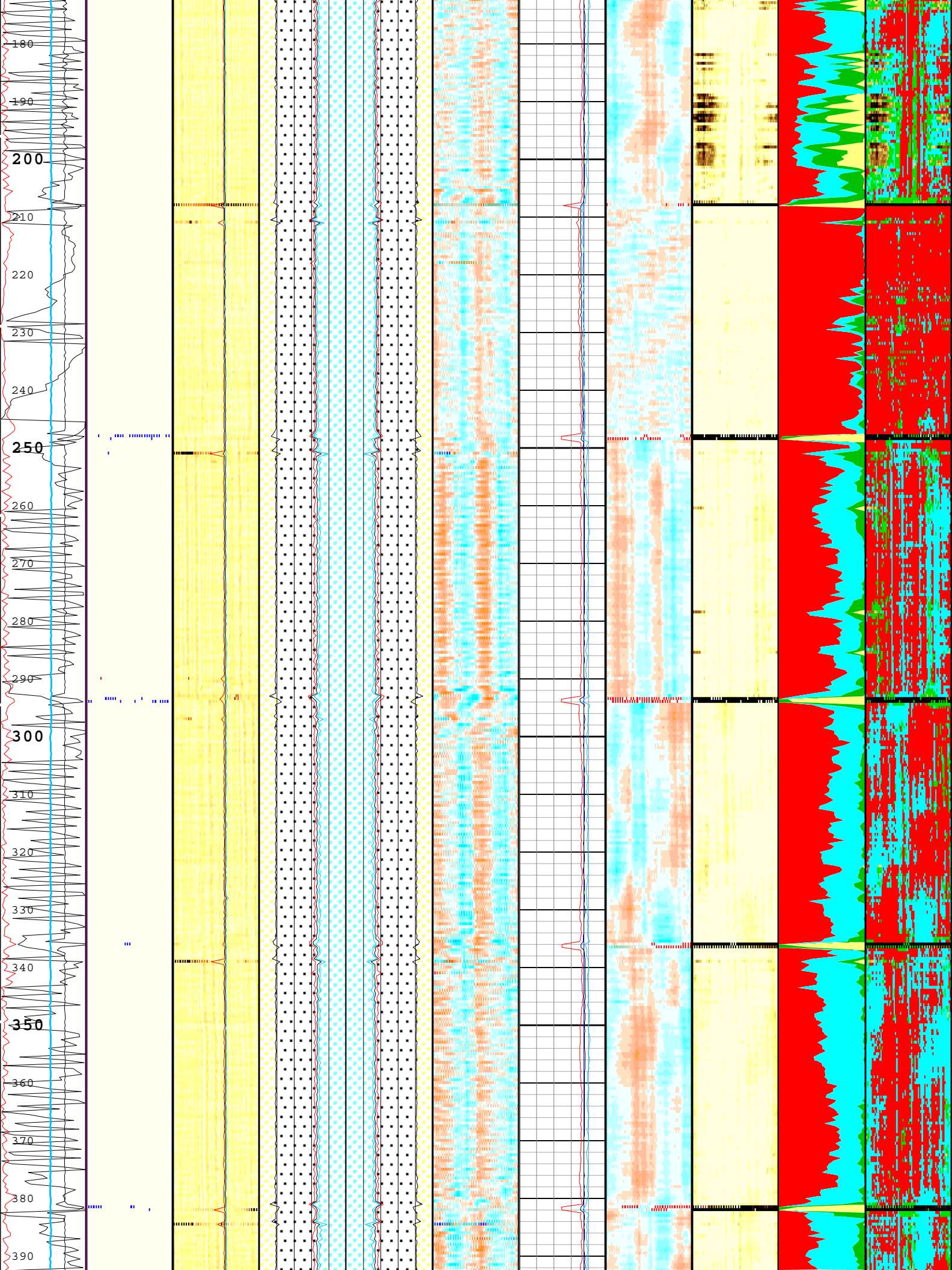
USIT - Acoustic Impedance (AIBK) USIT-D (Mrayl)

Absent 2.599 4.563 6.527

Custom Normalization

USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-D (Mrayl)

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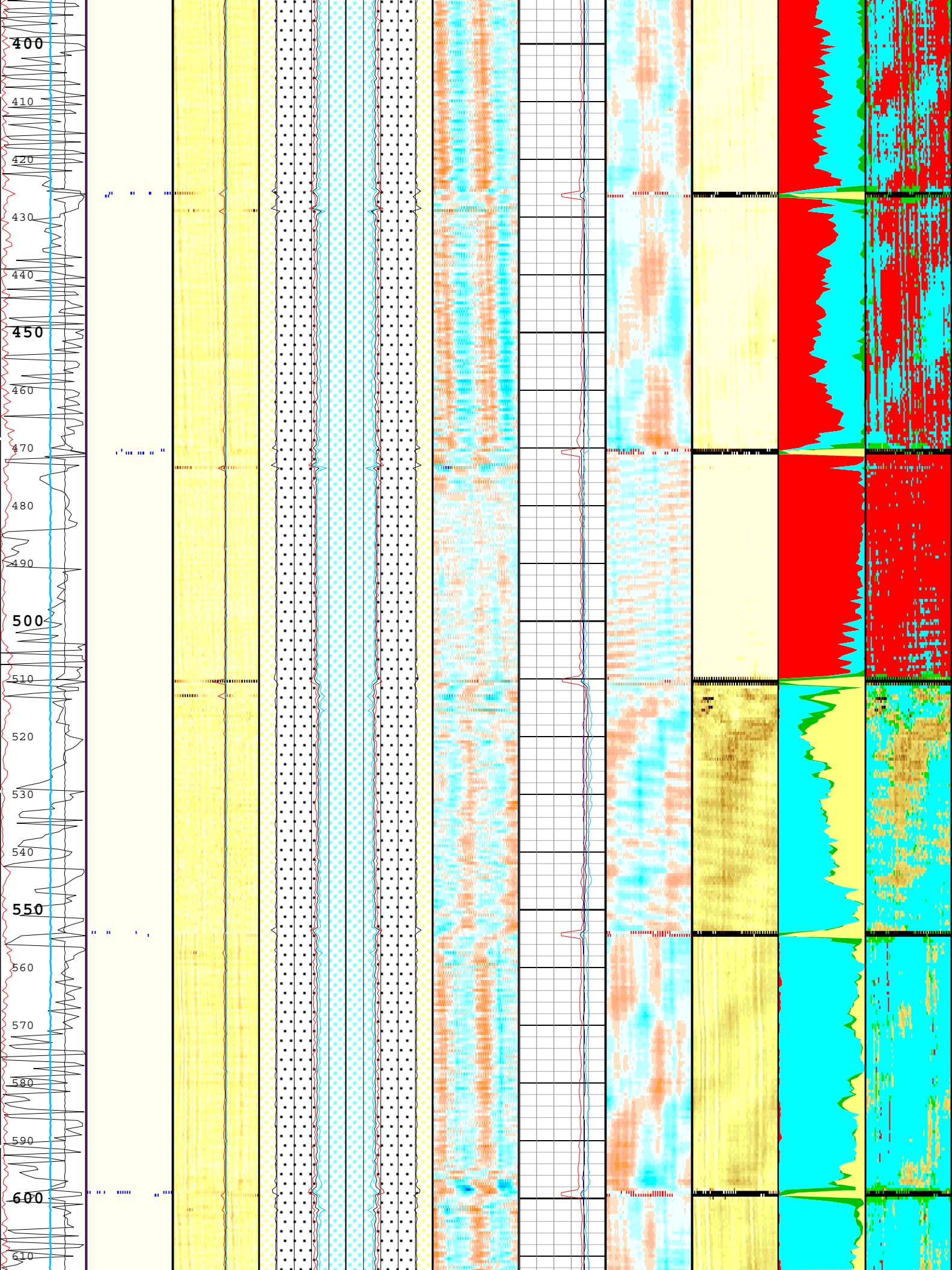
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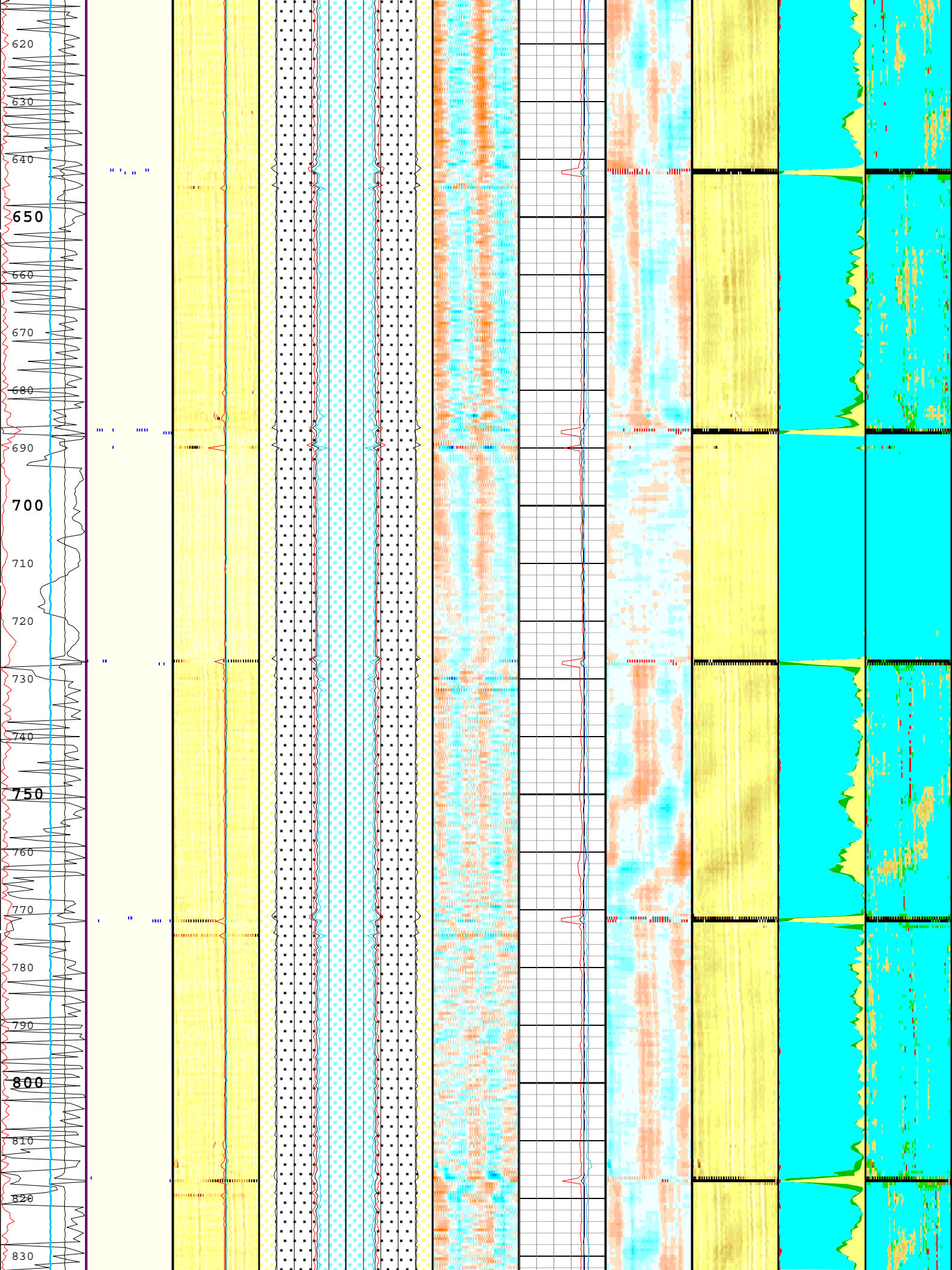
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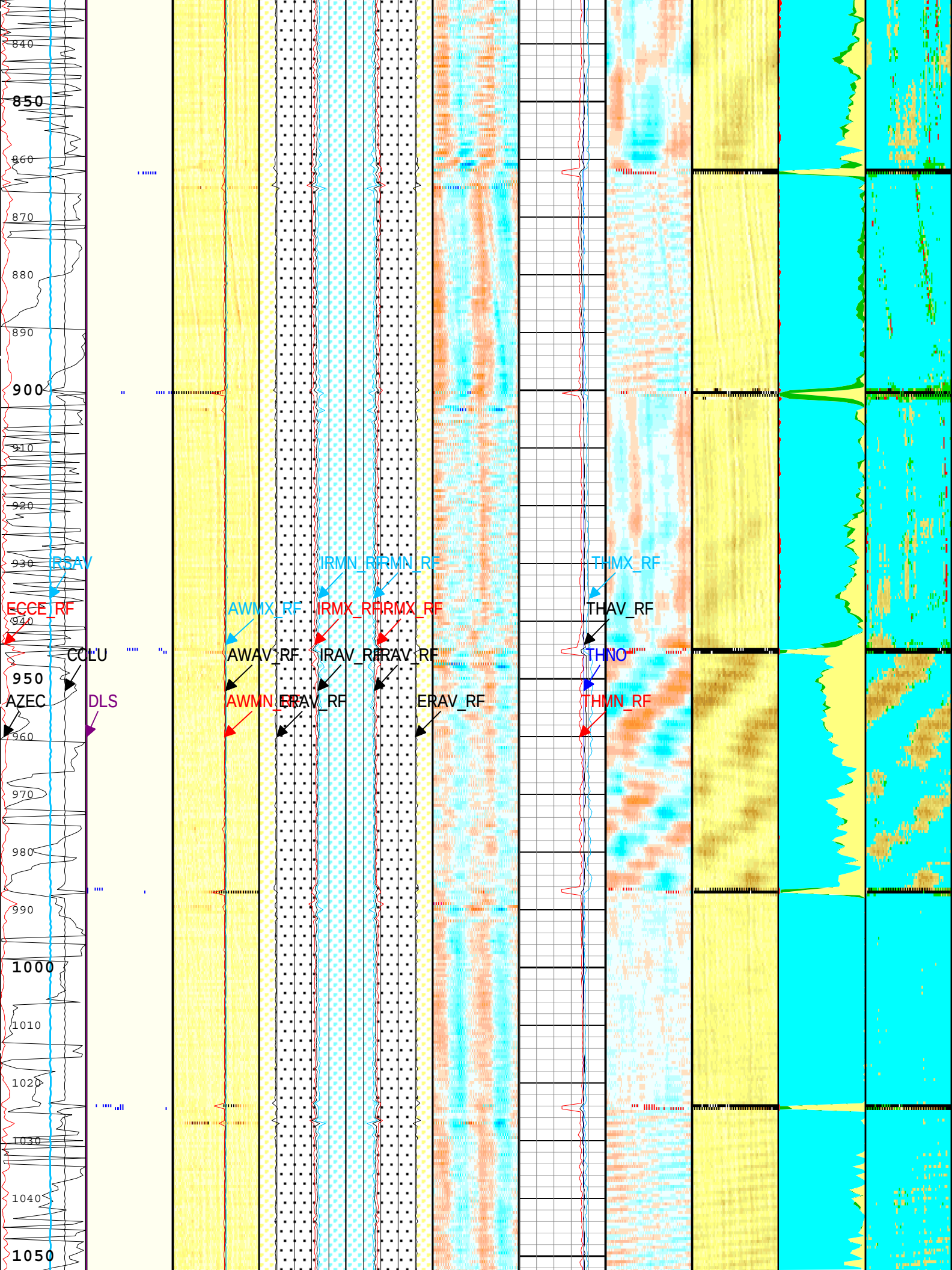
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AWAV_RF
AWMN_RF
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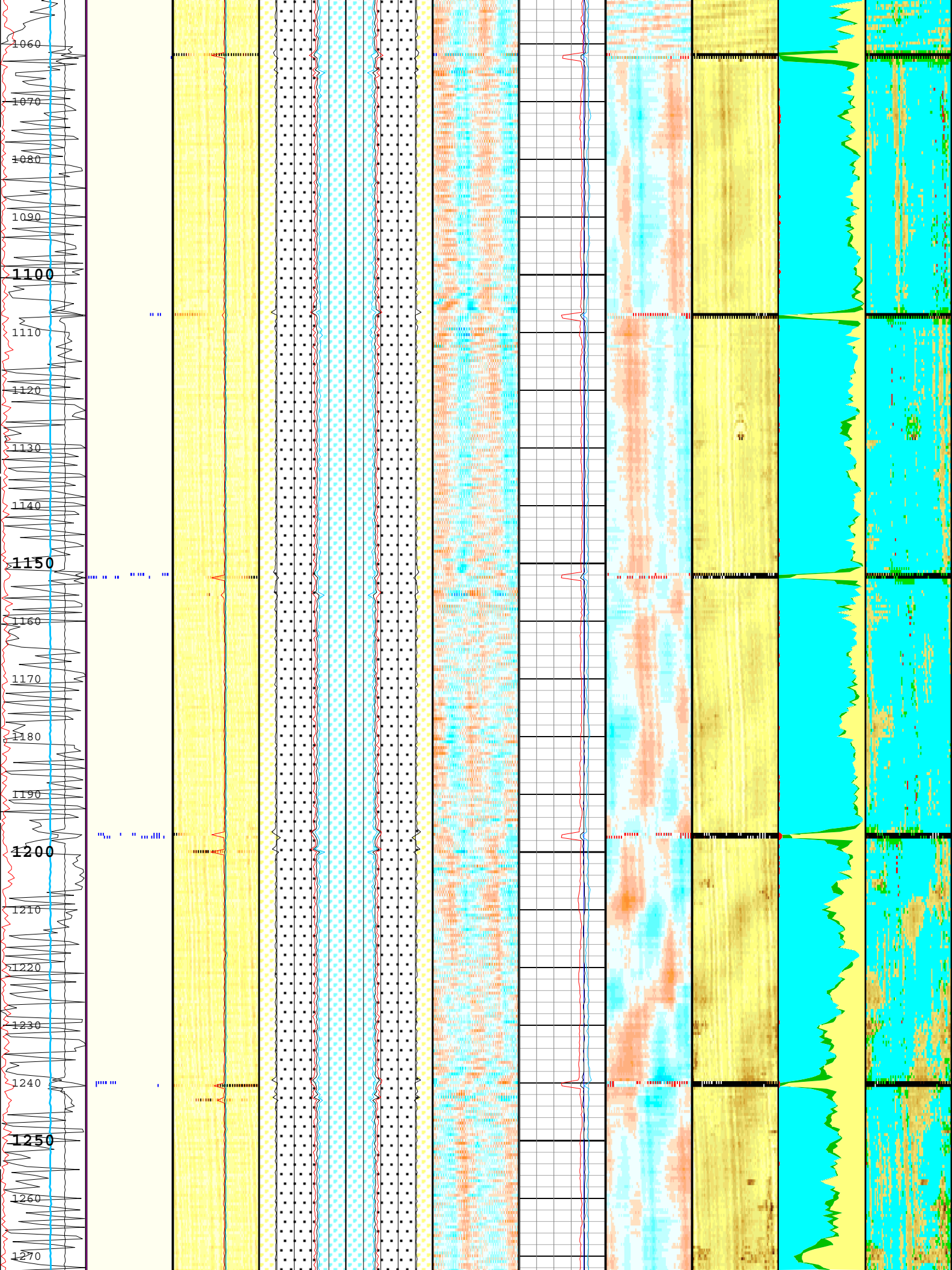
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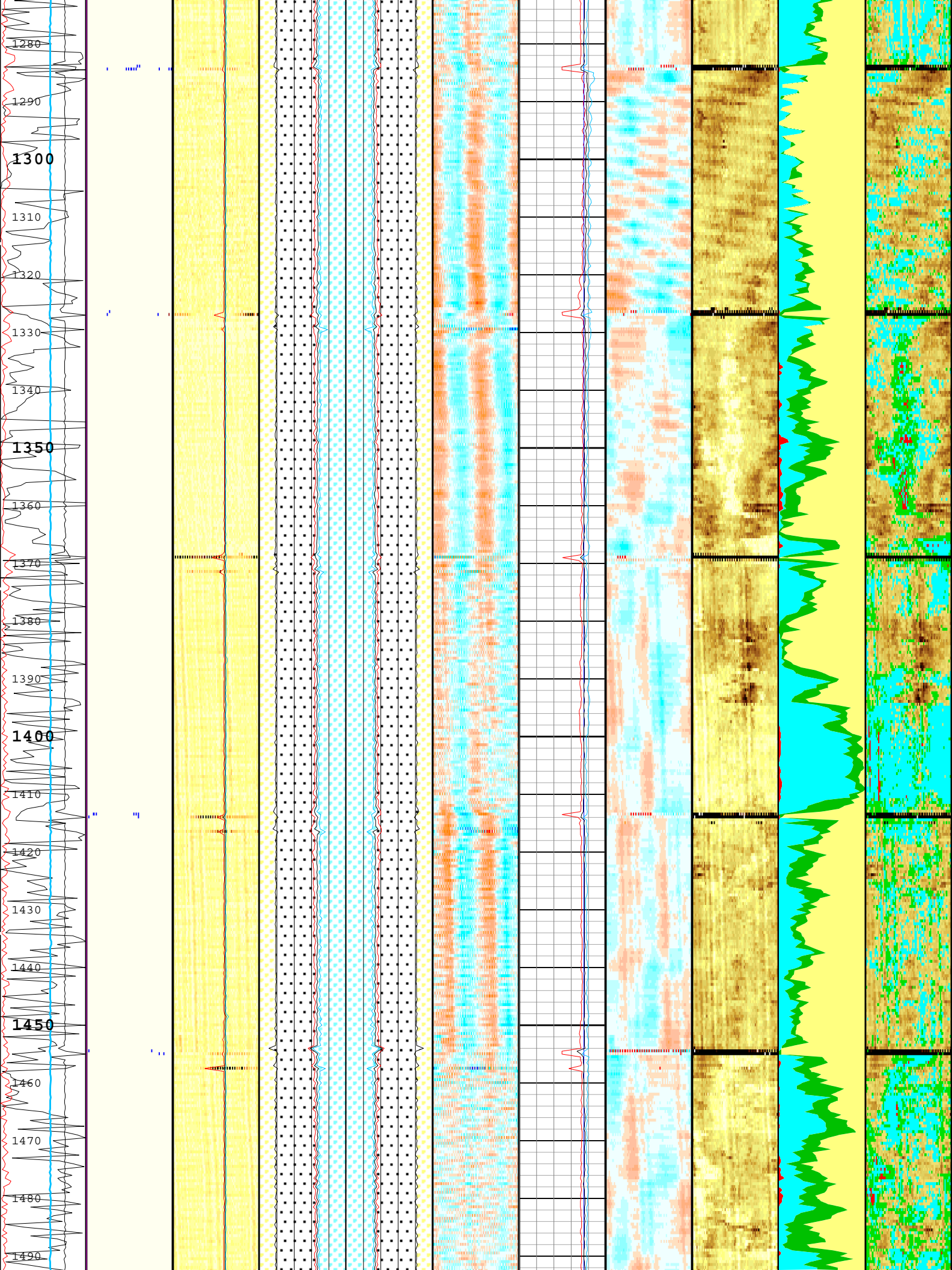
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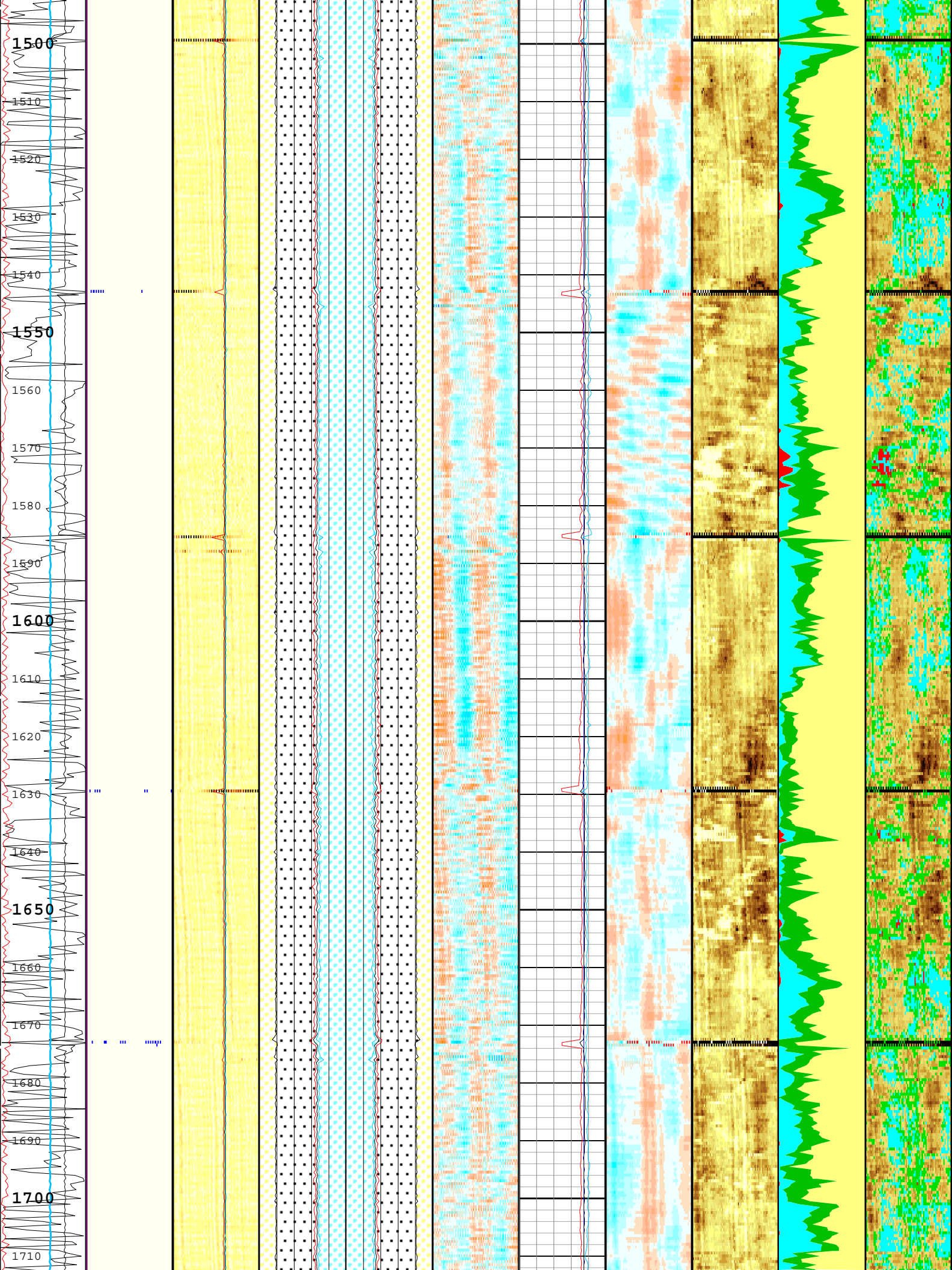
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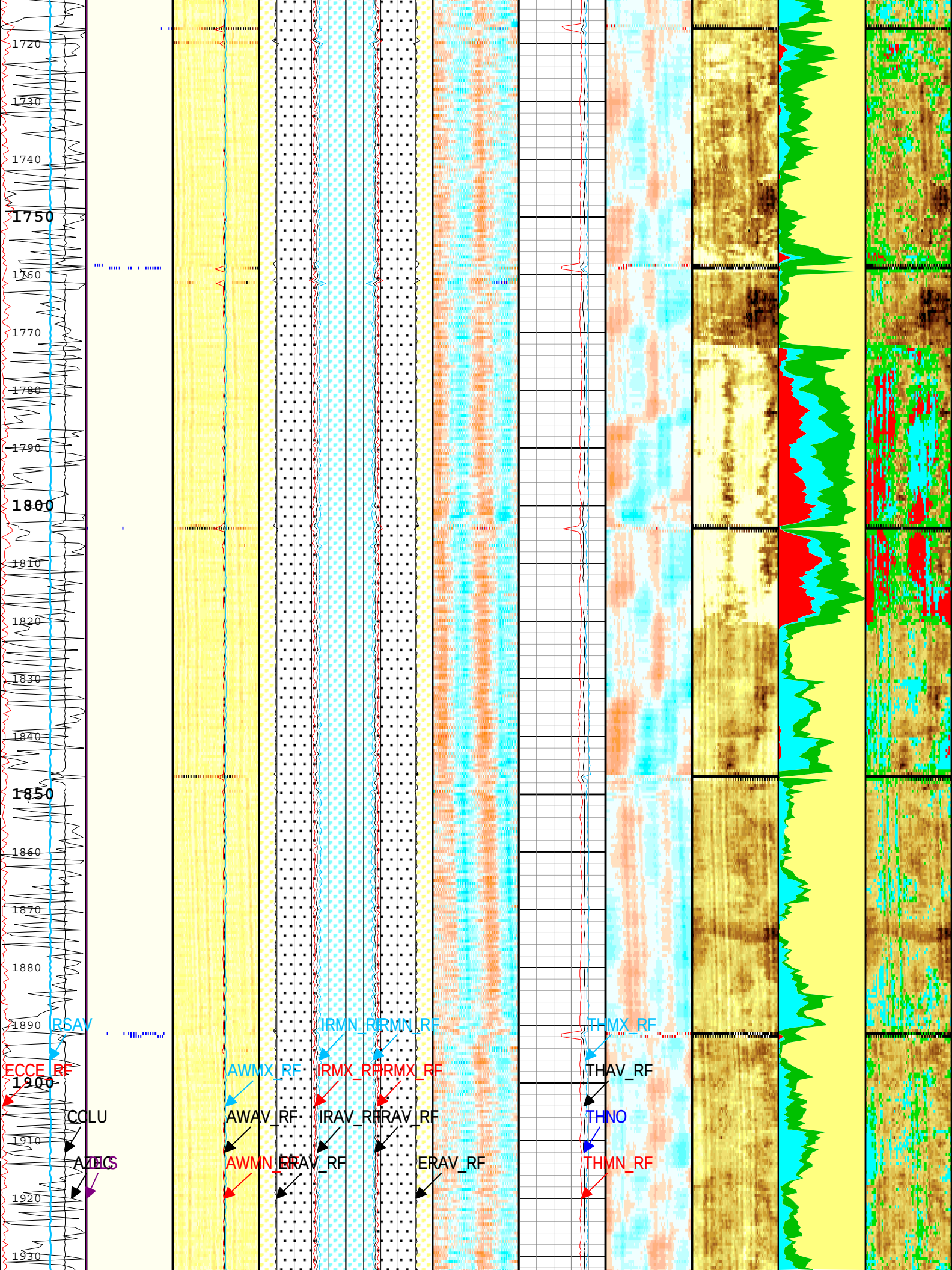
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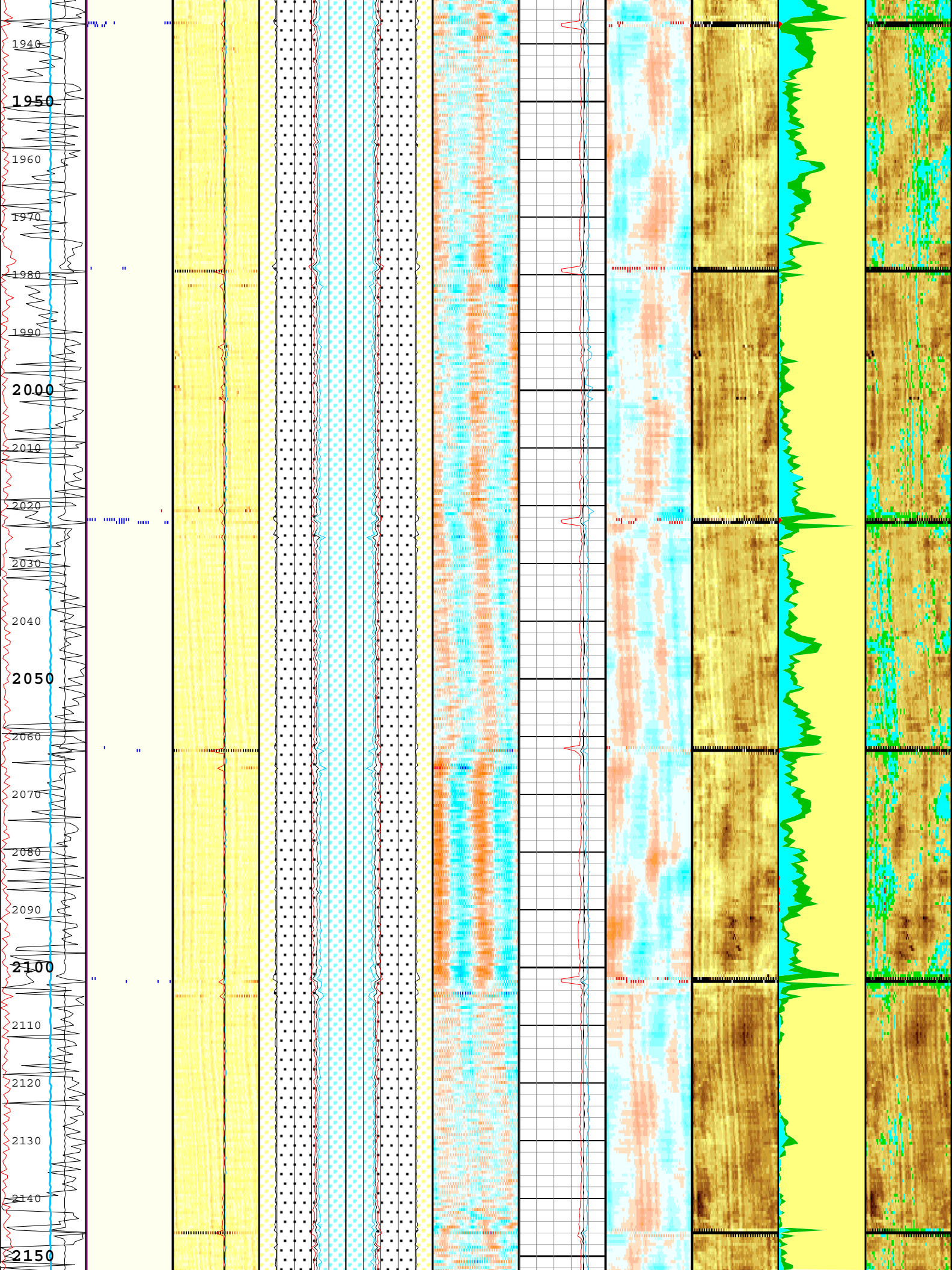
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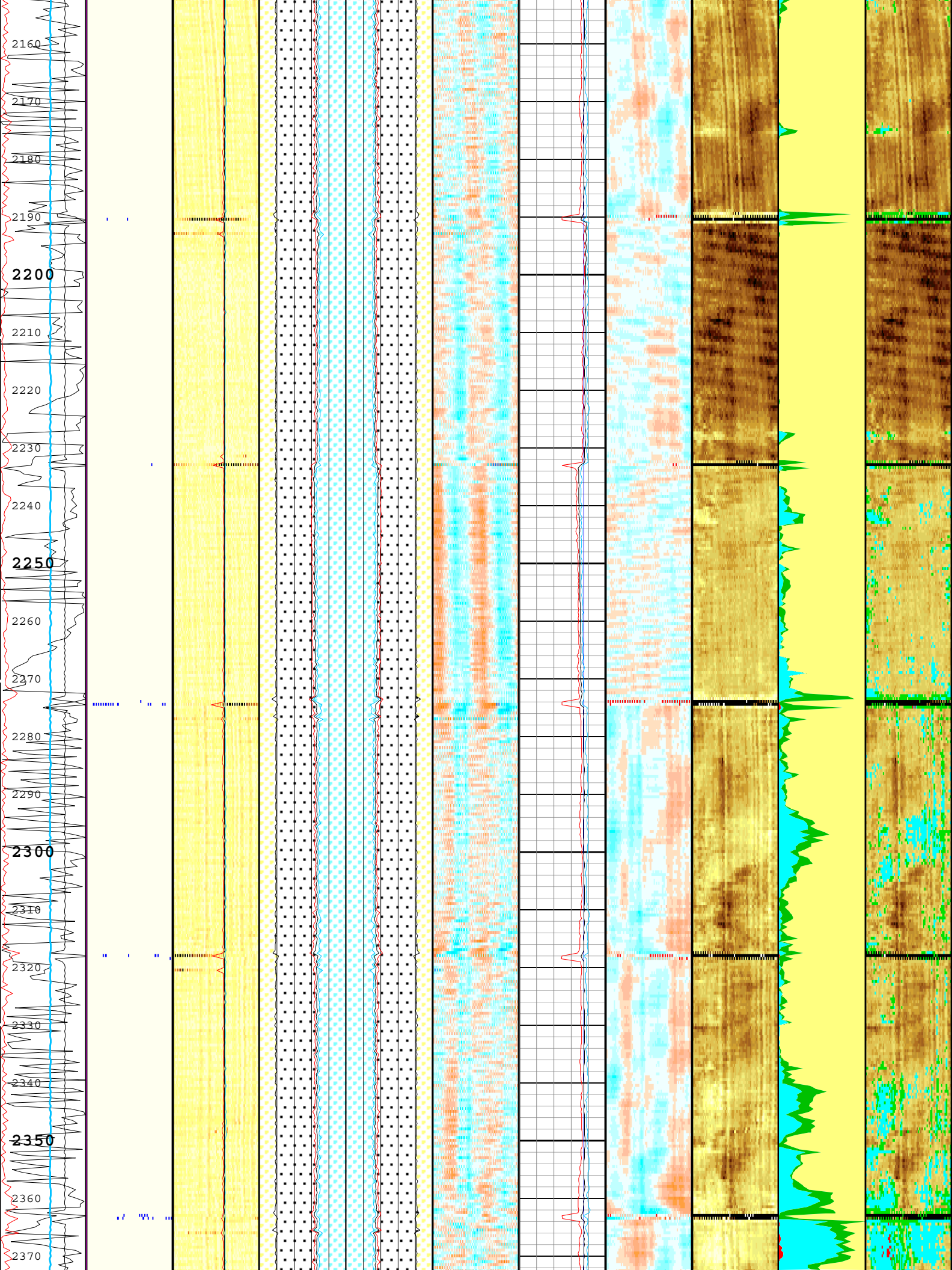
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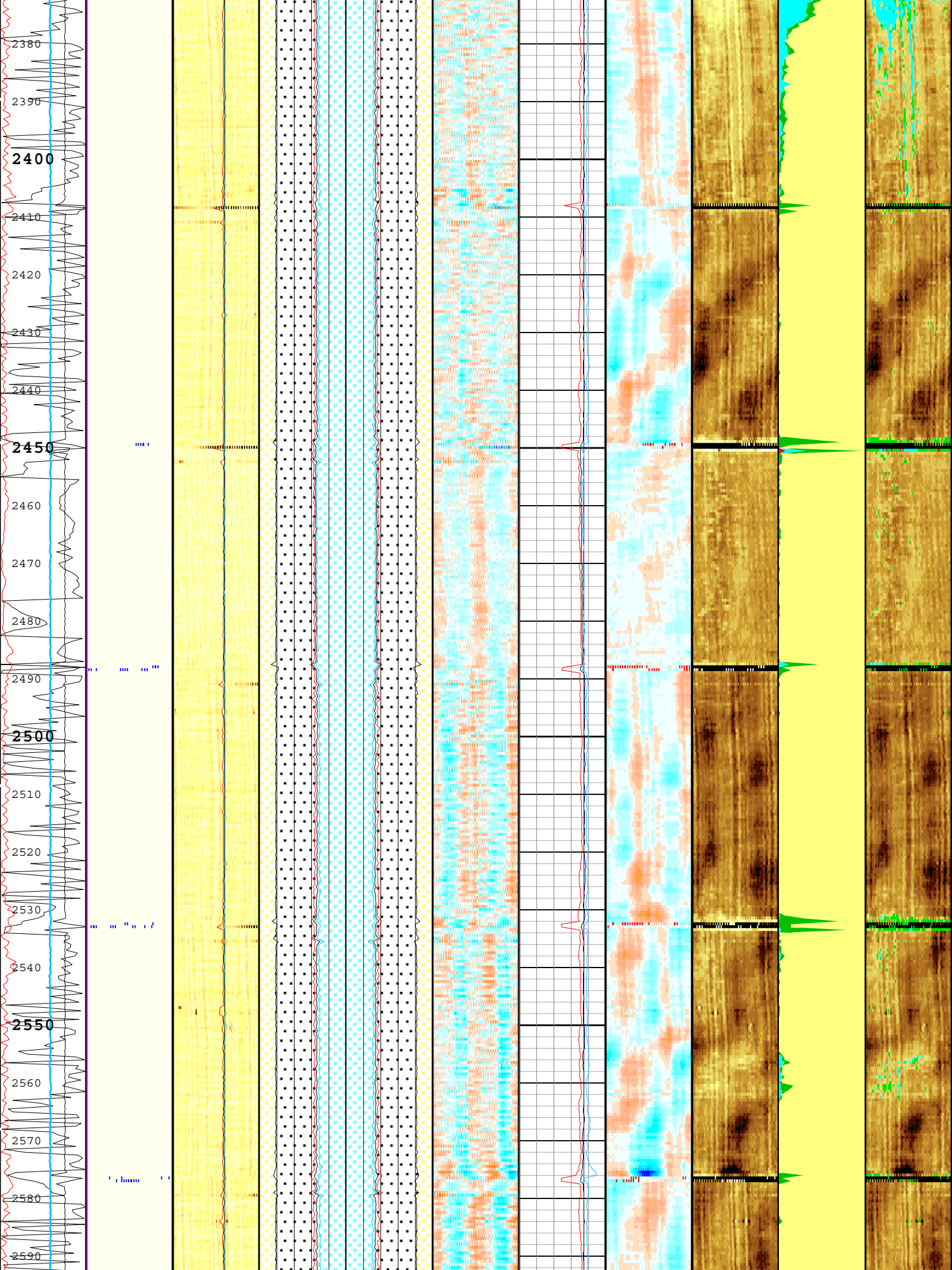
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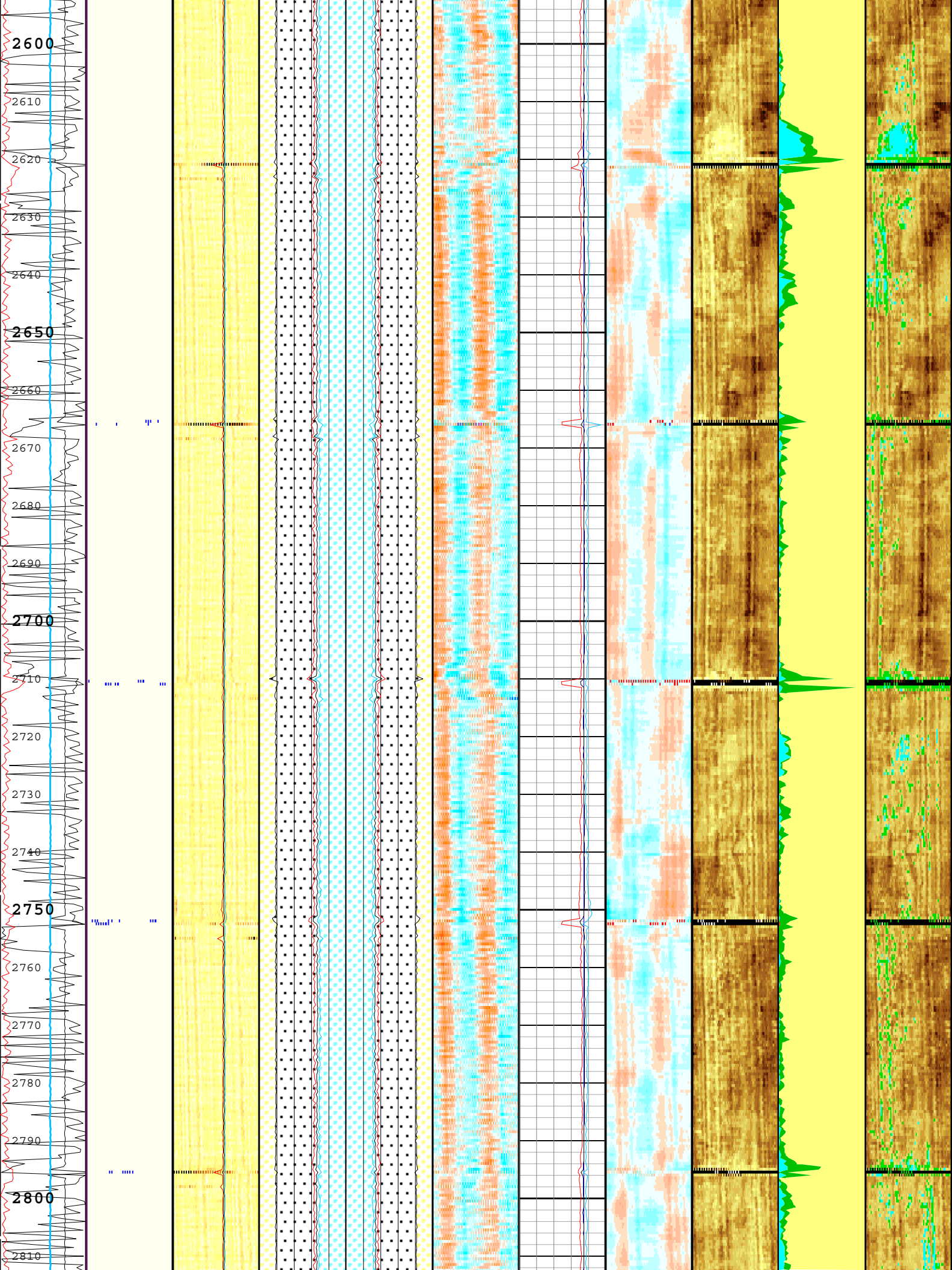
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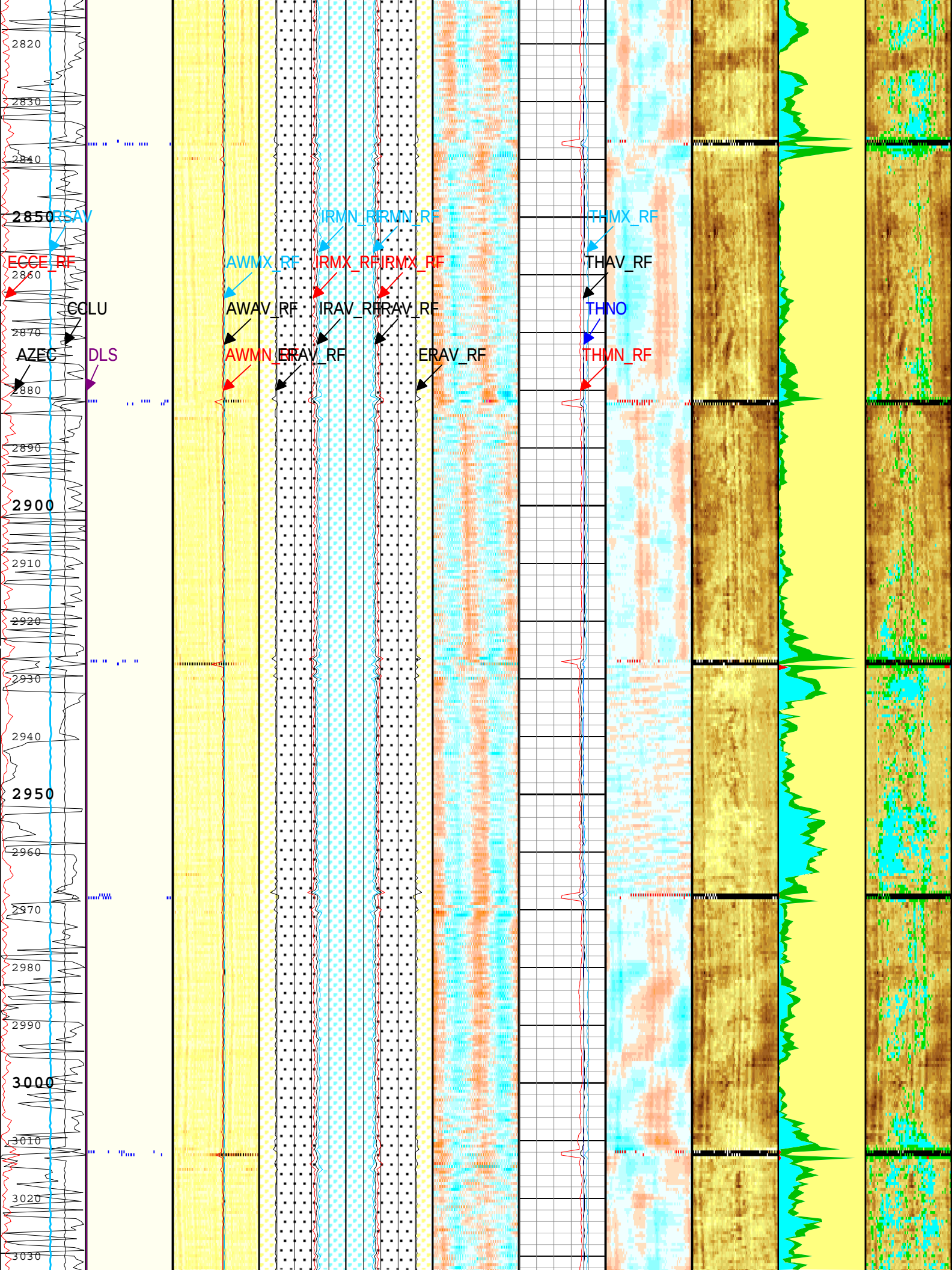
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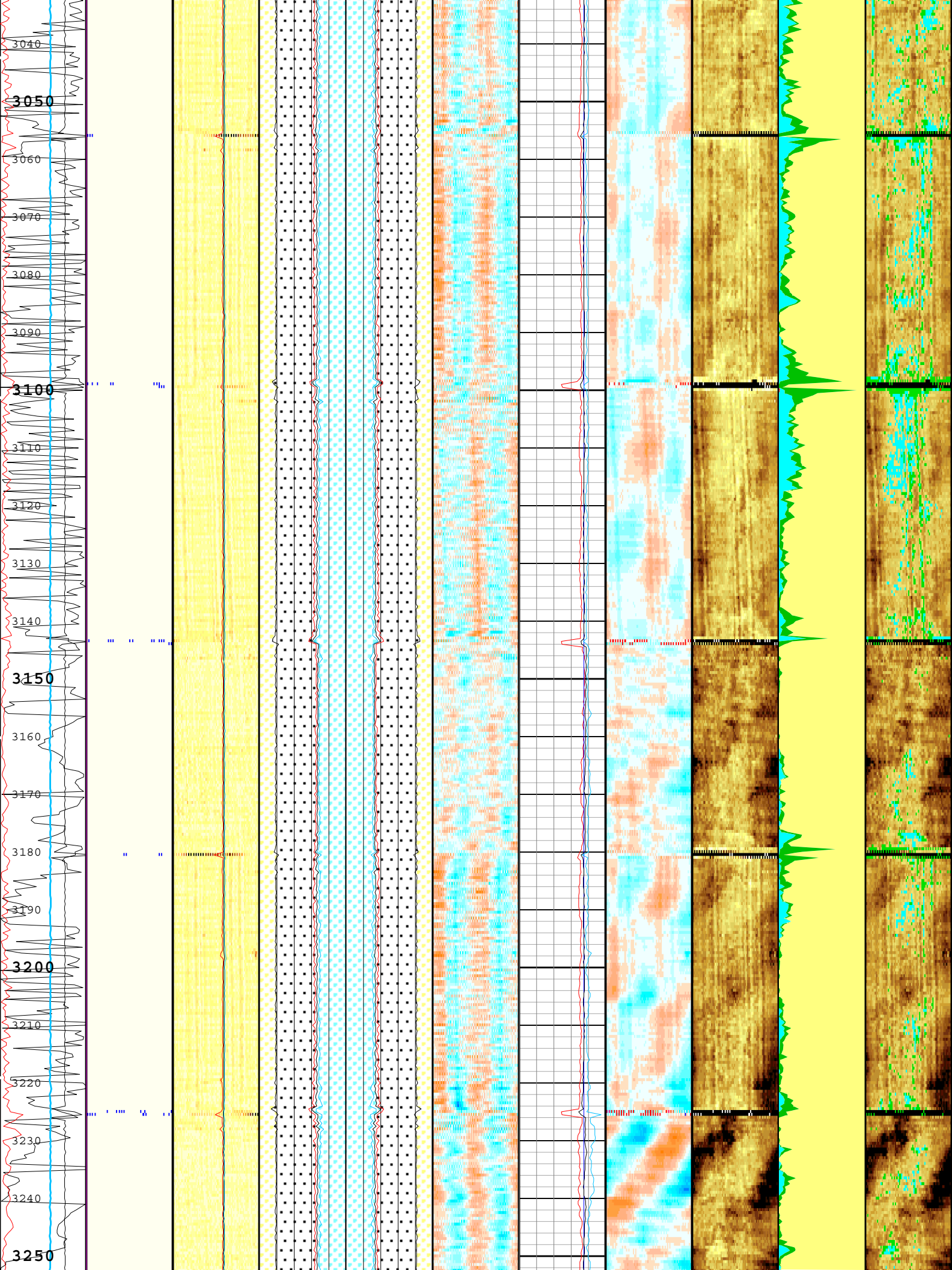
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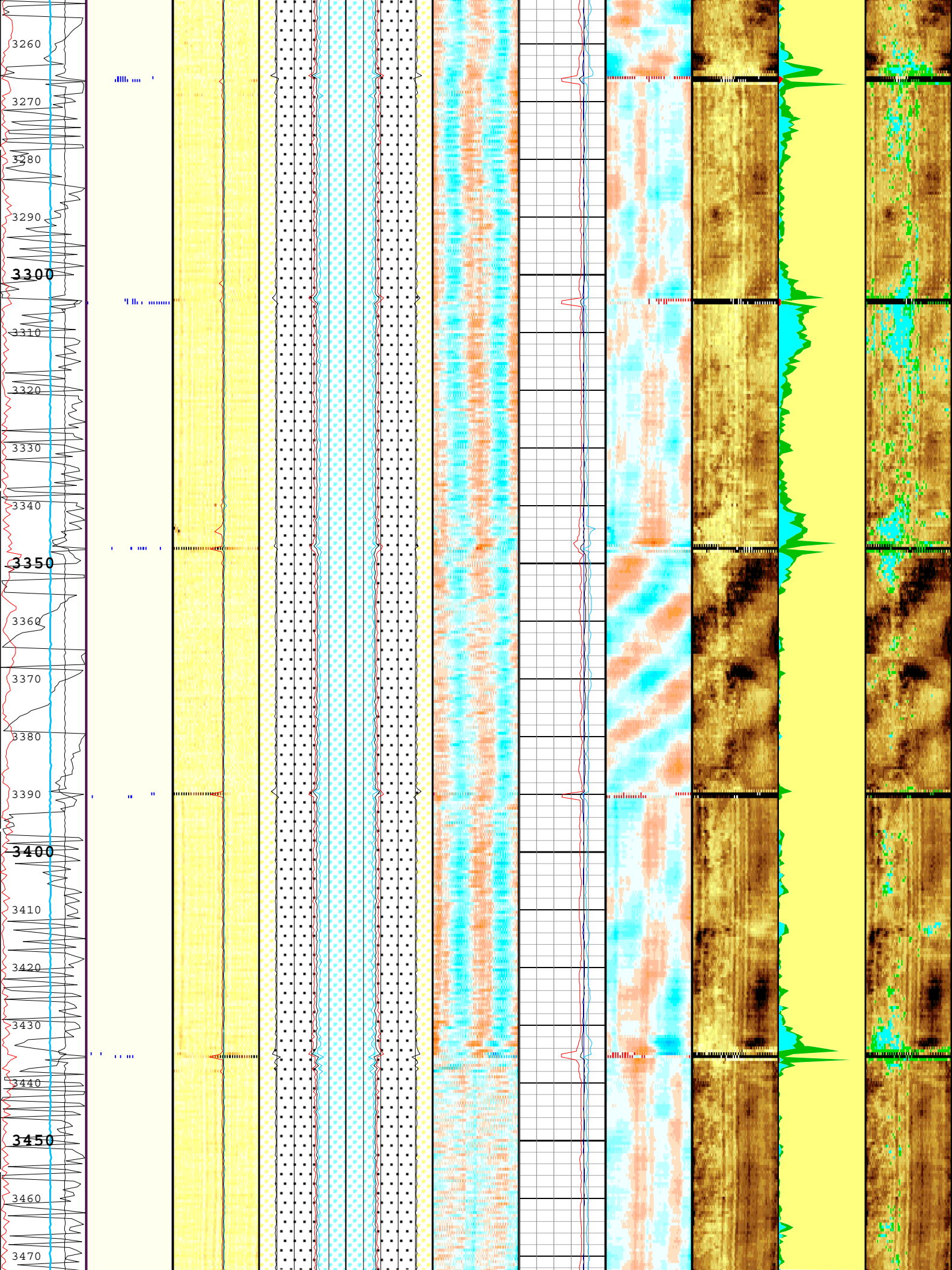
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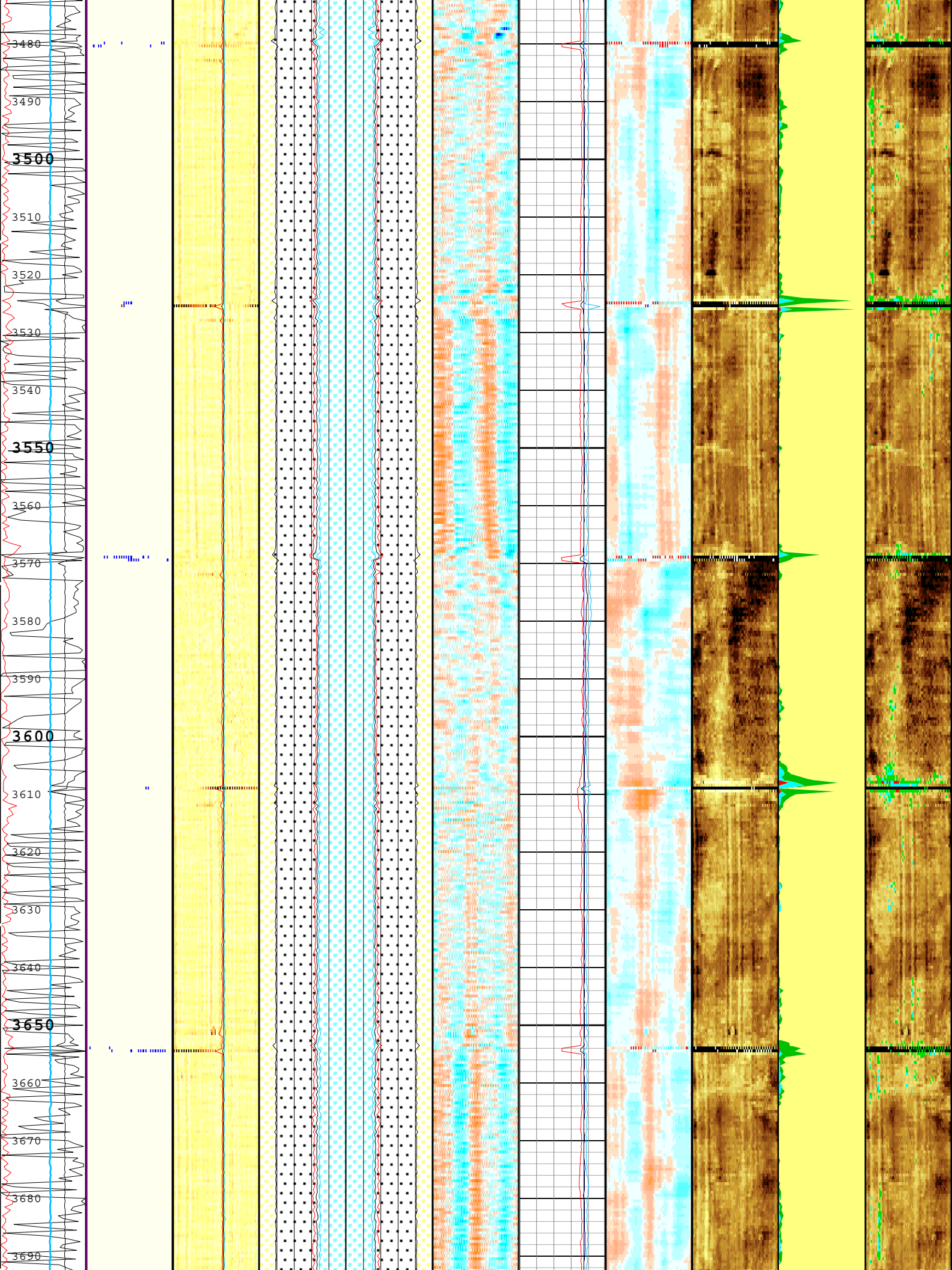
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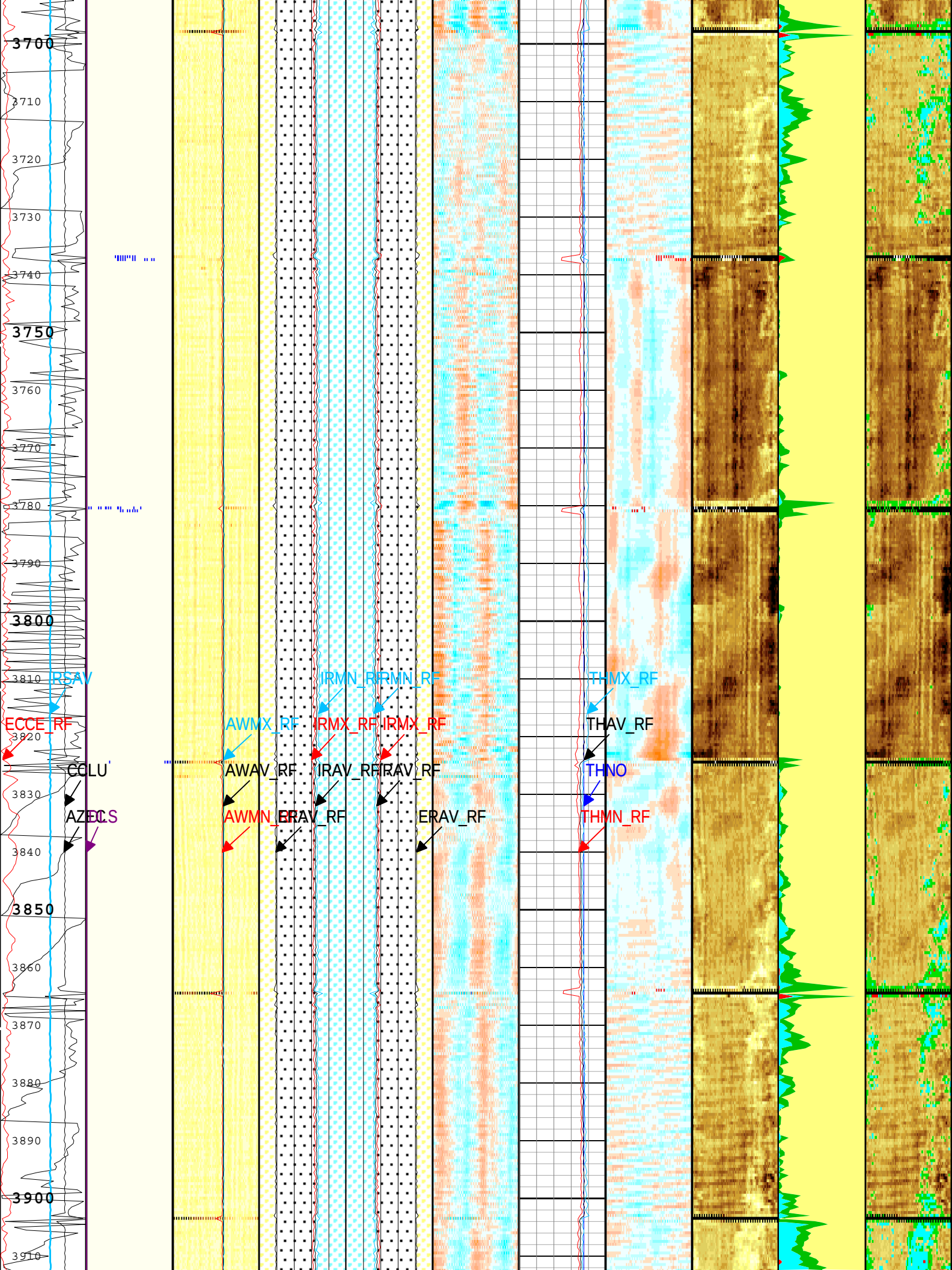
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CCLU
AZEC
CCLS
AWMX_RF
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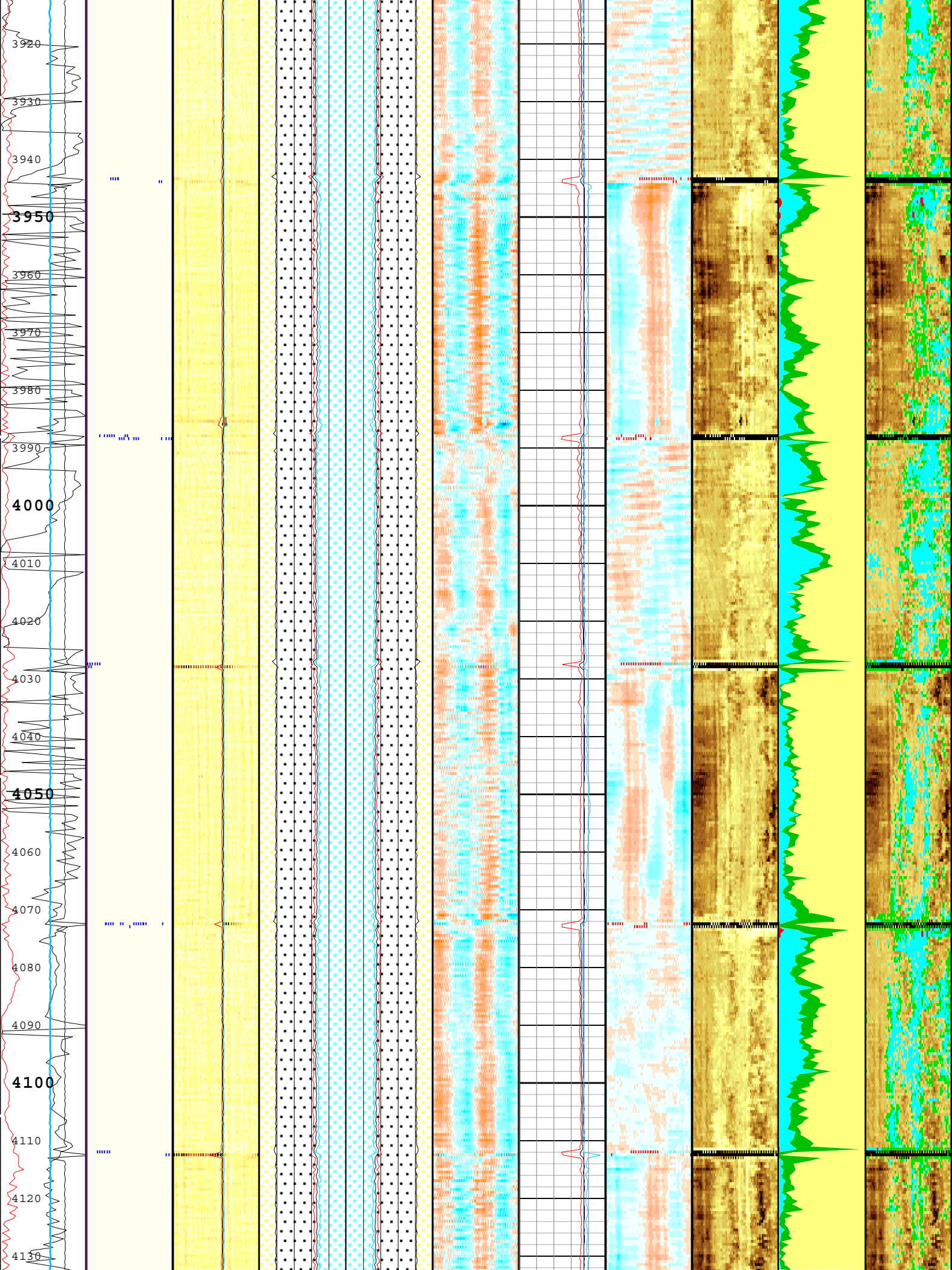
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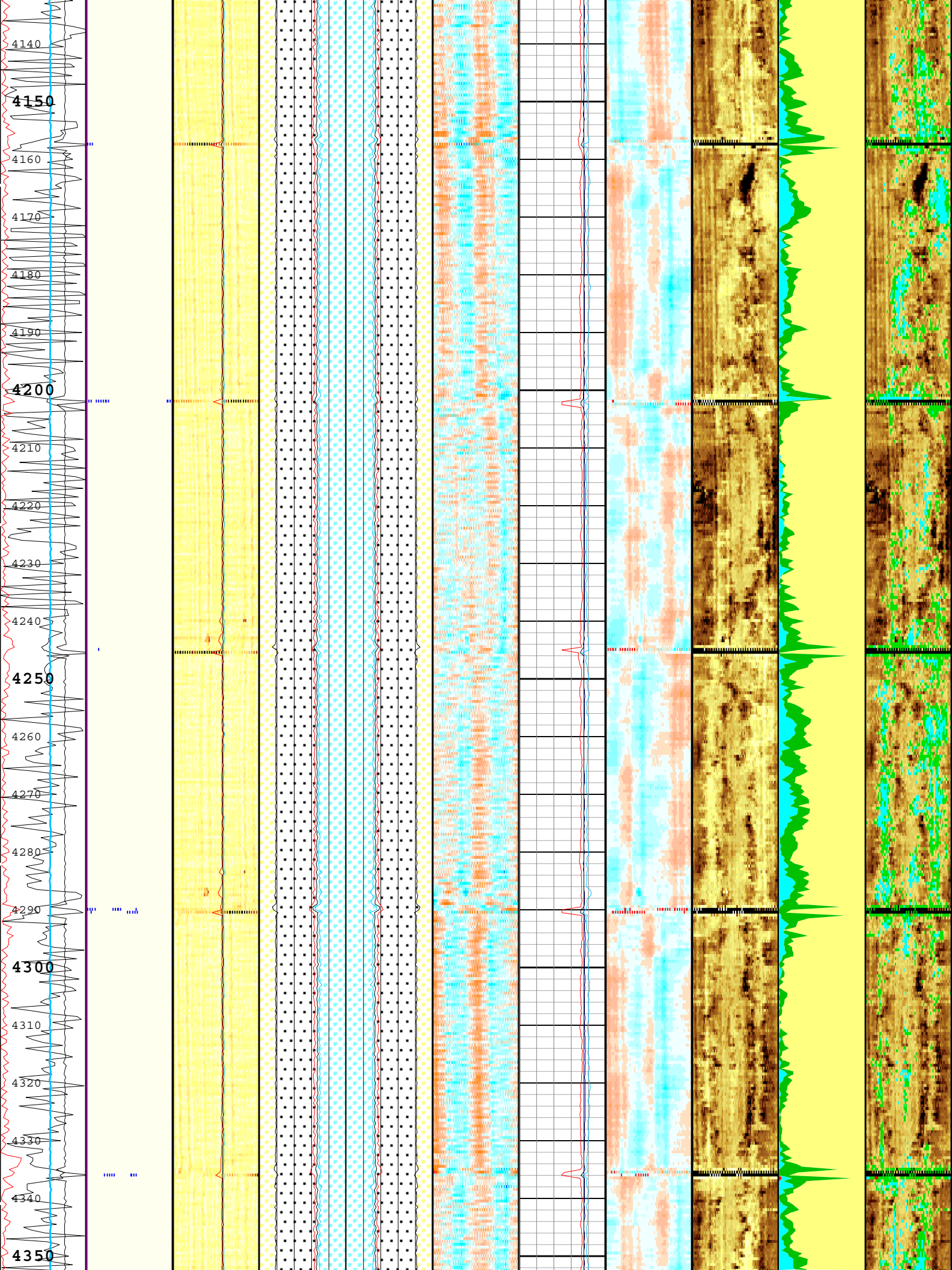
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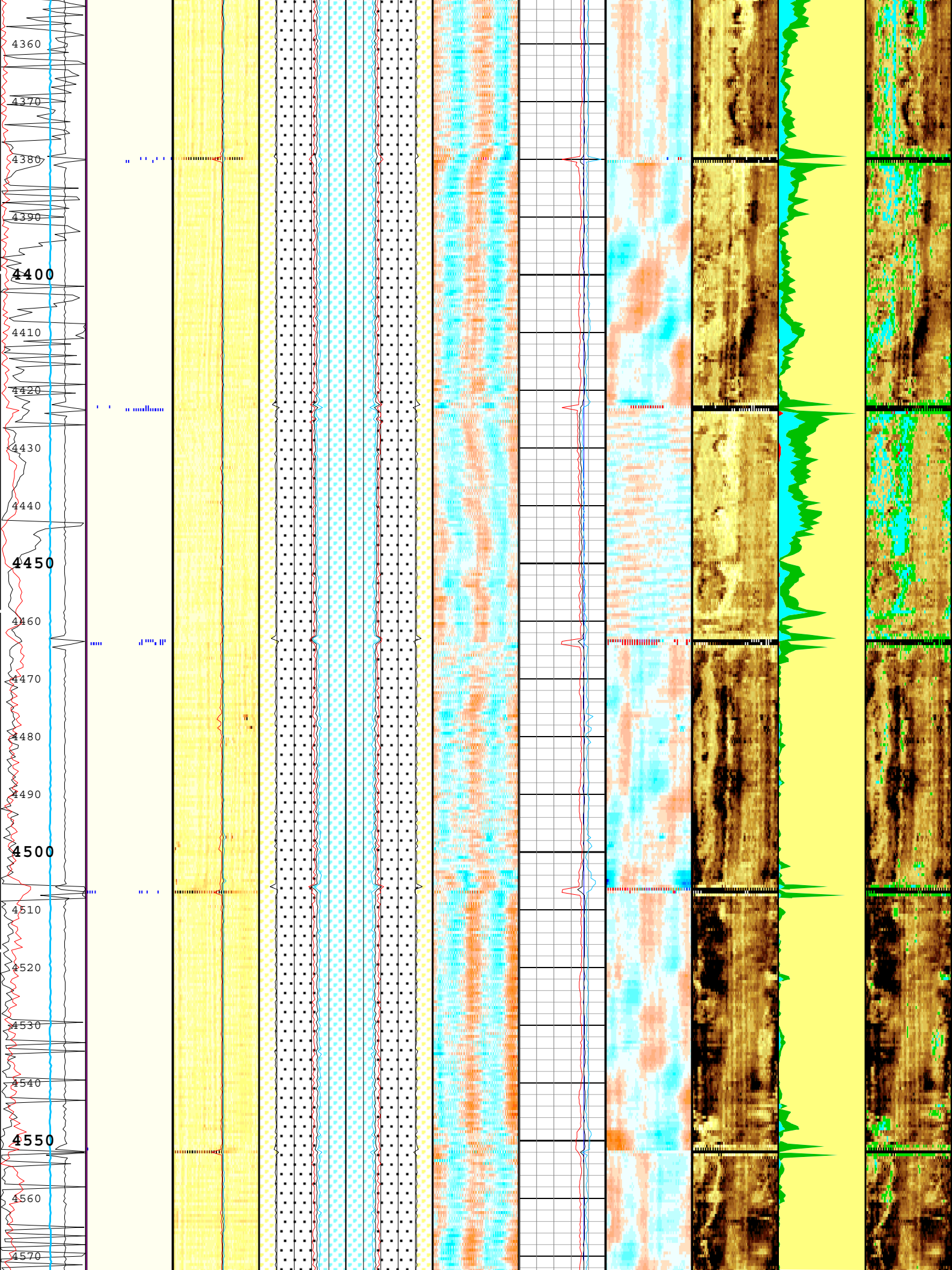
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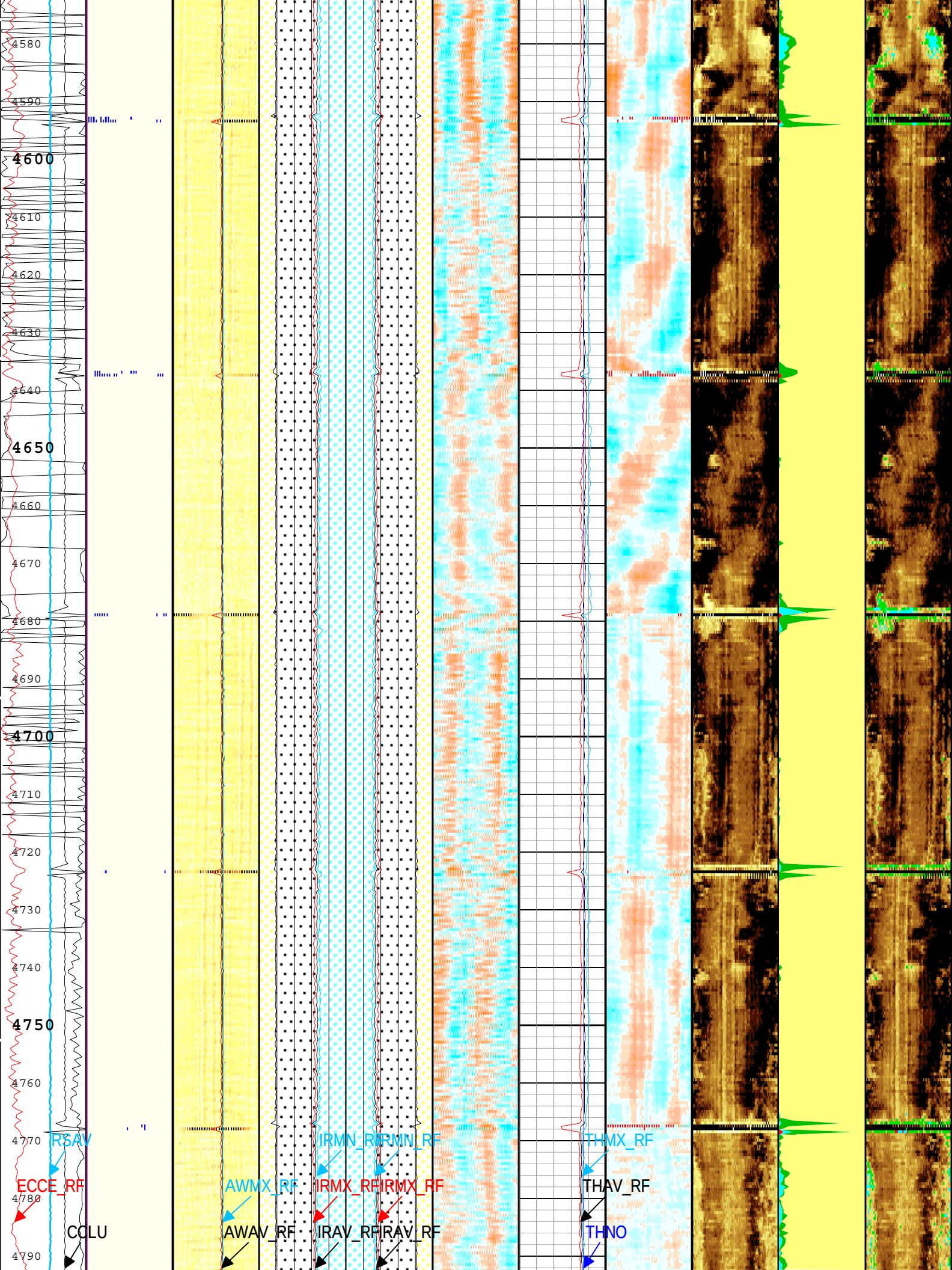
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COLU
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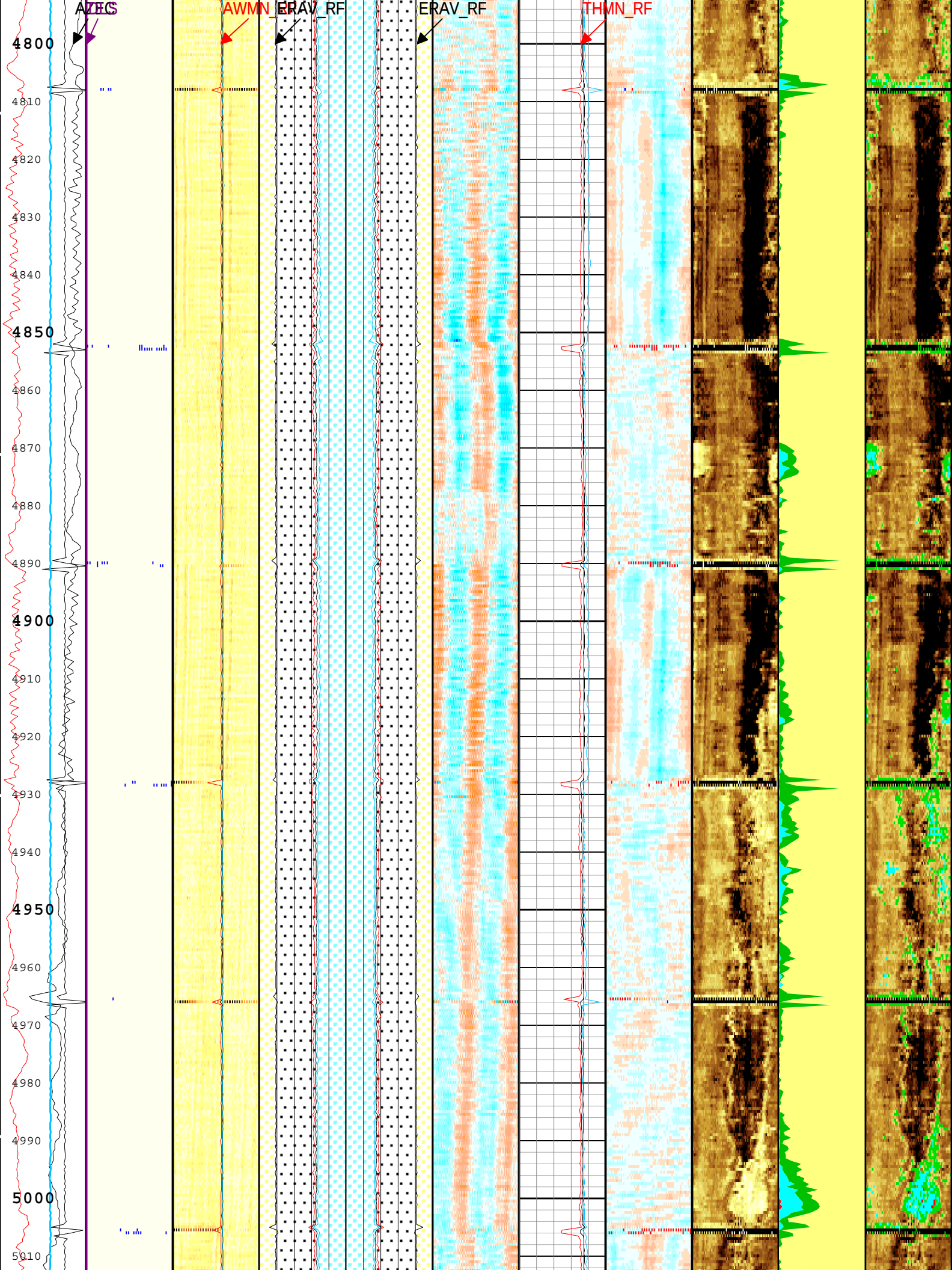
IRAV_RF
IRAV_RF
THMX_RF
THAV_RF
THNO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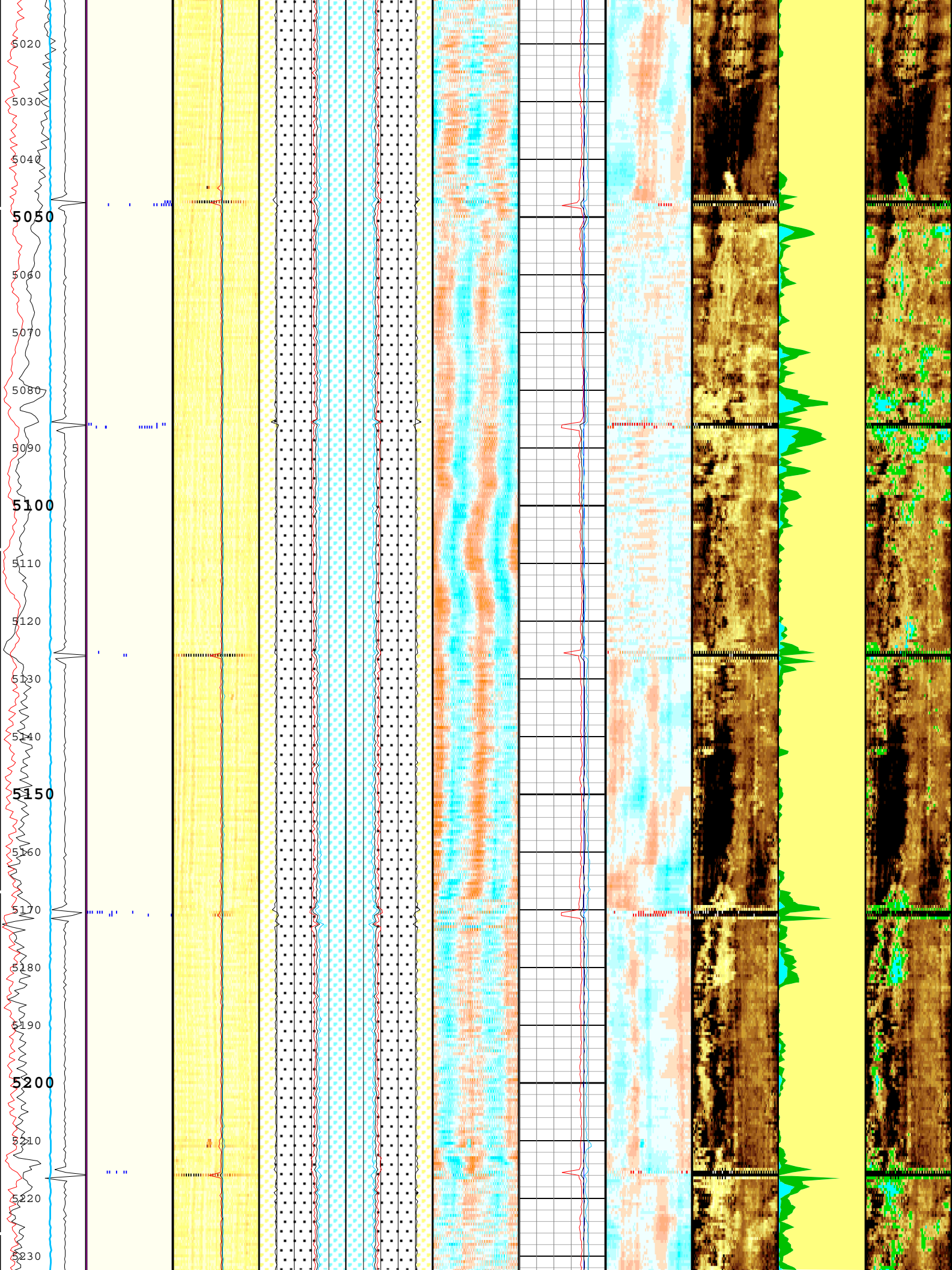
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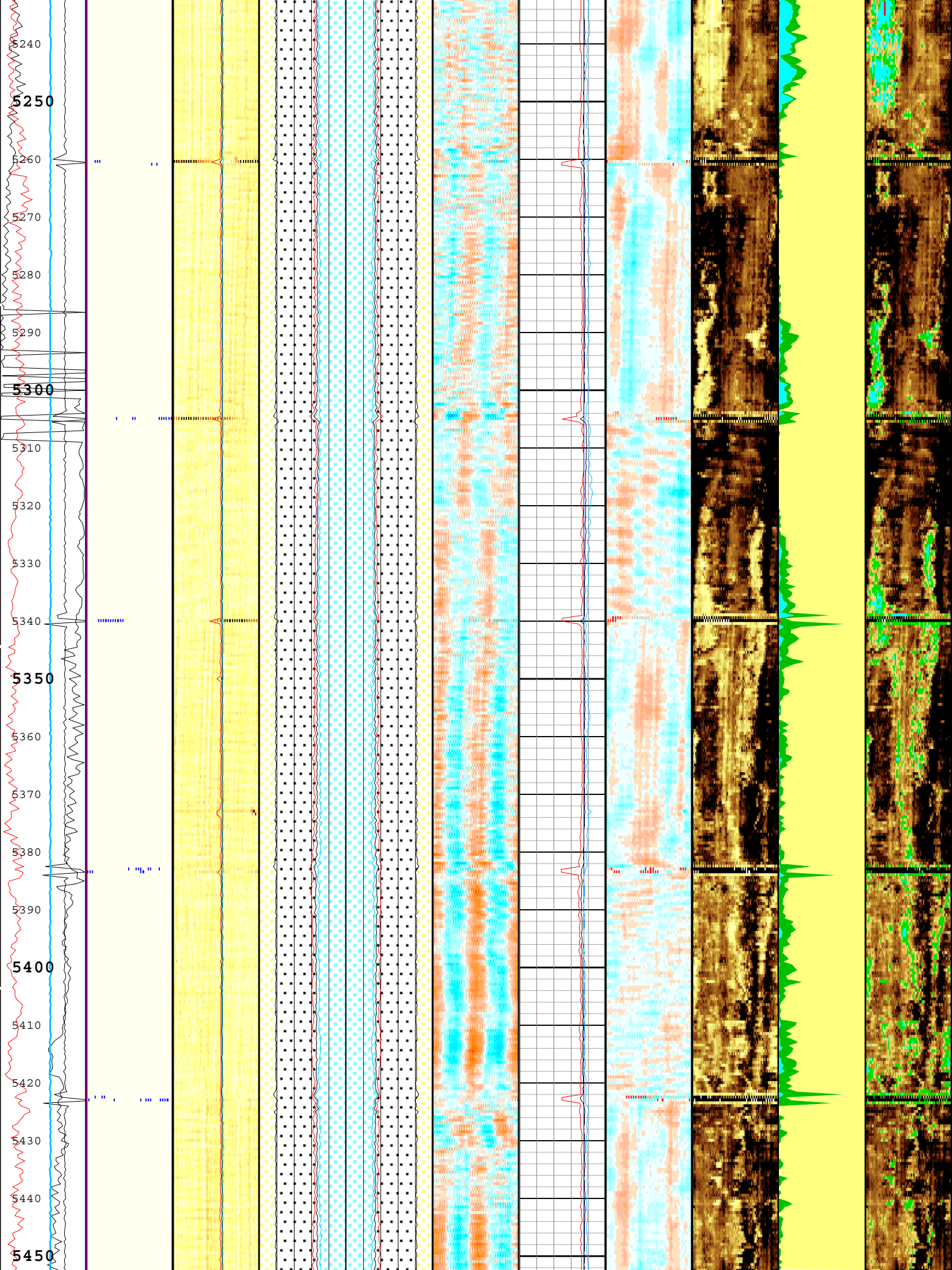
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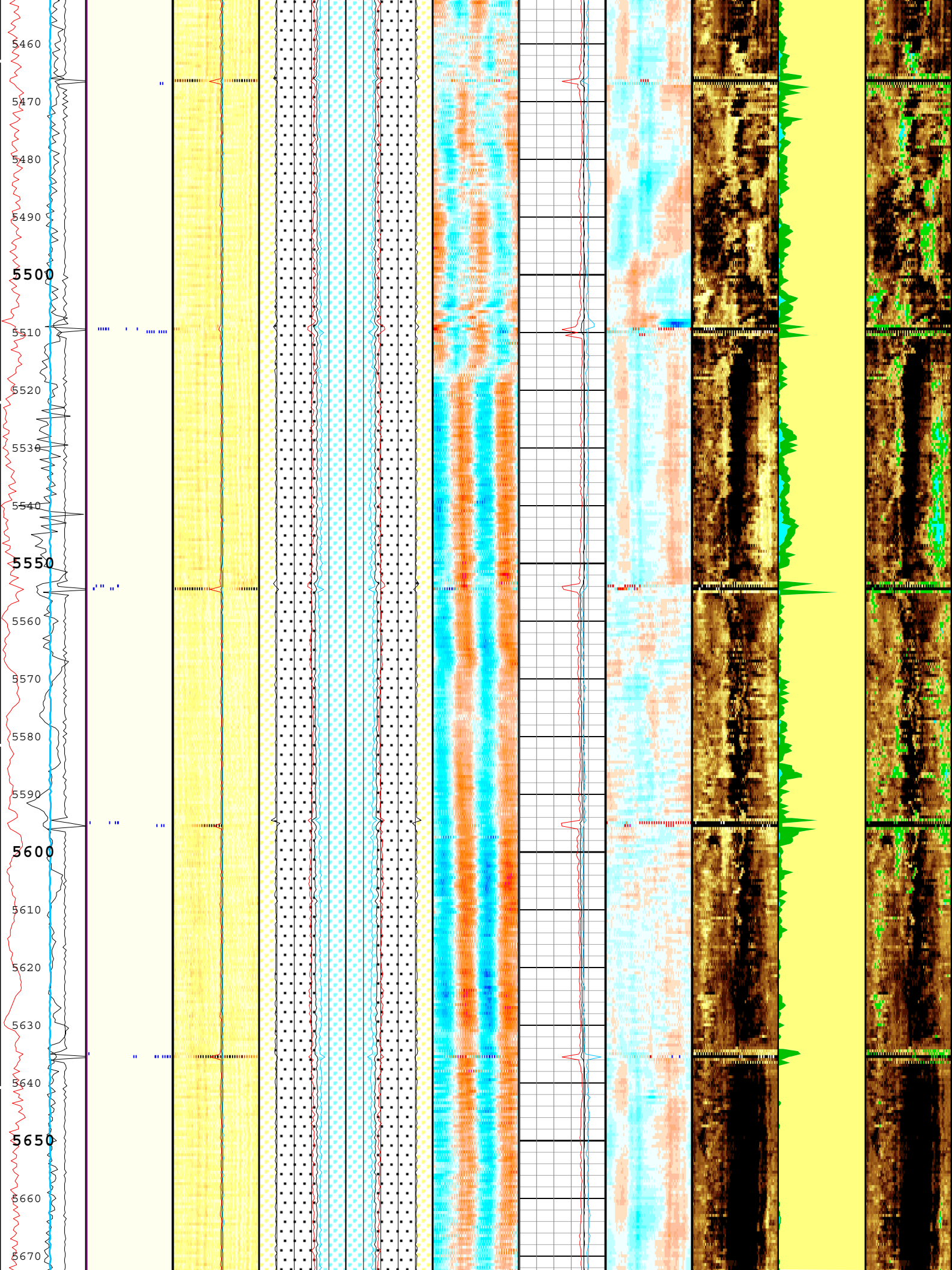
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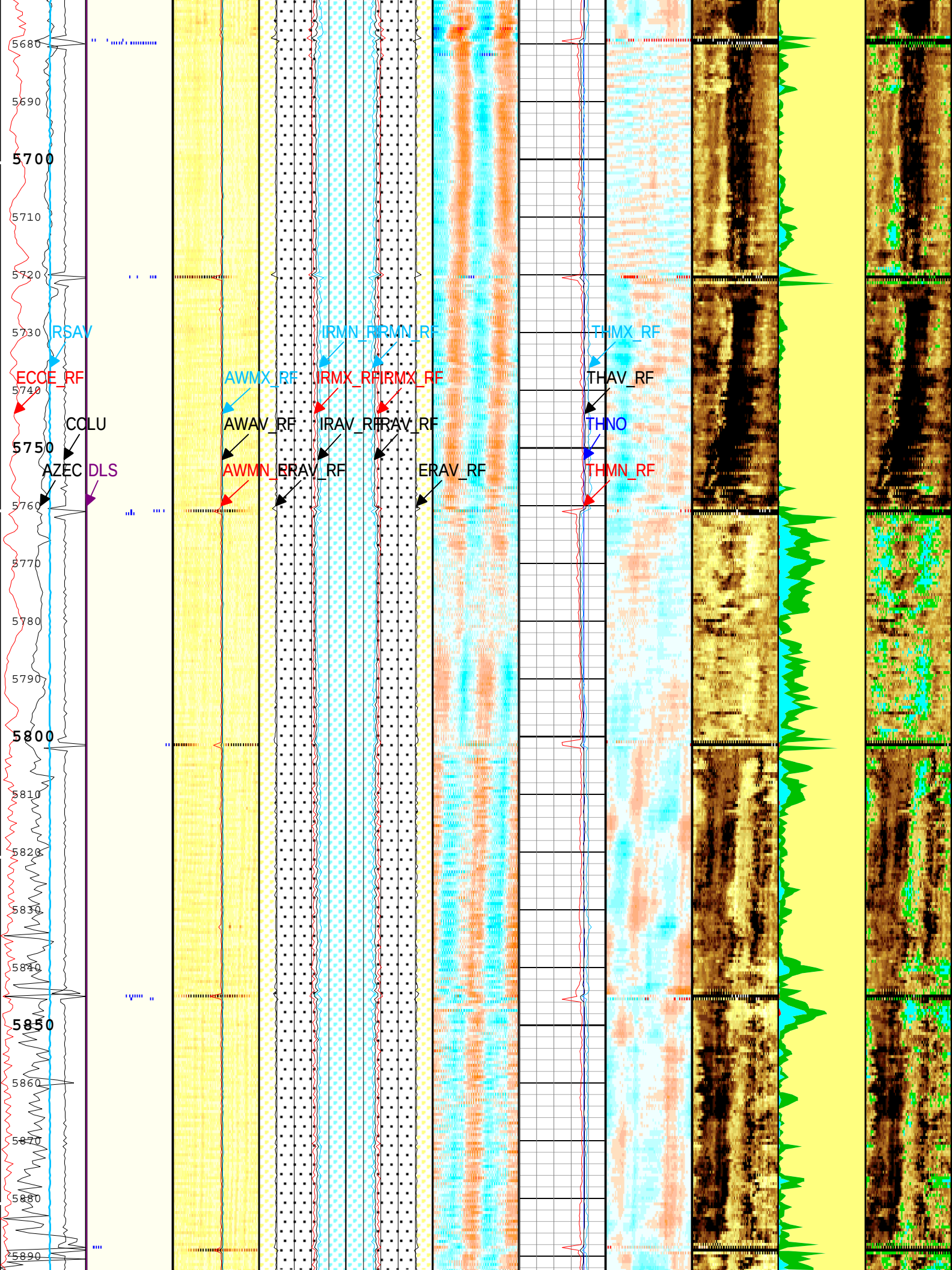
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AWAV_RF
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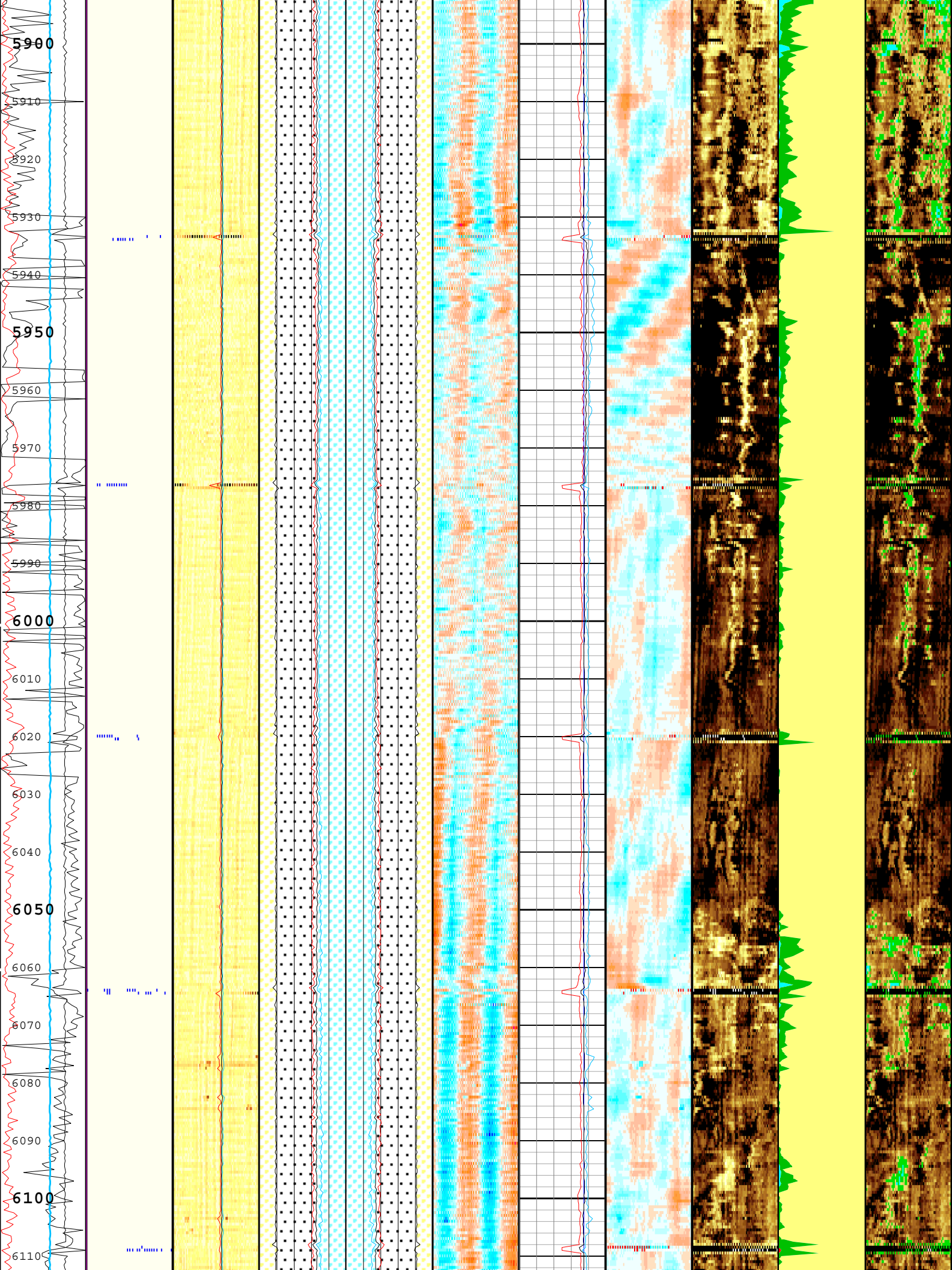
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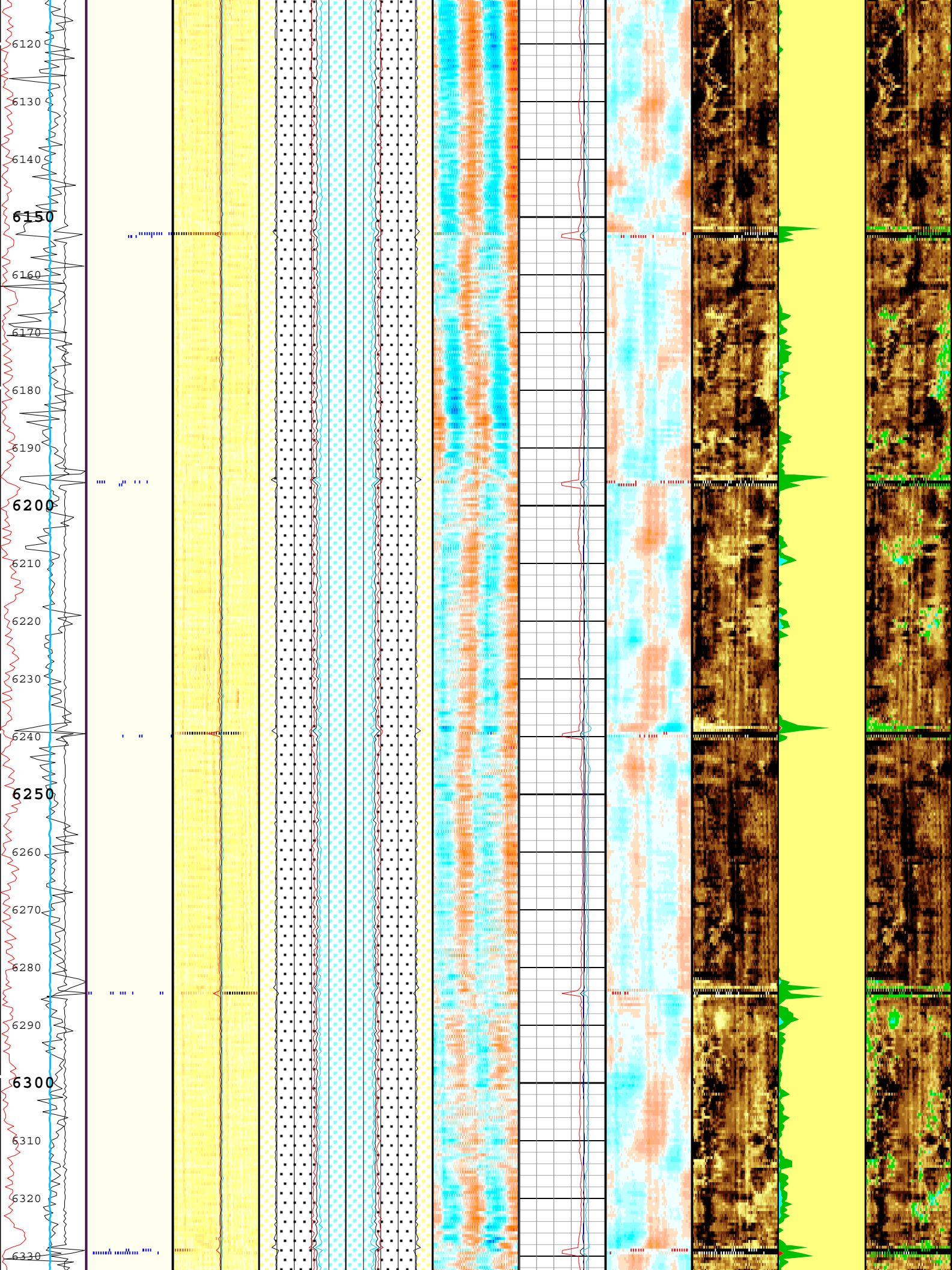
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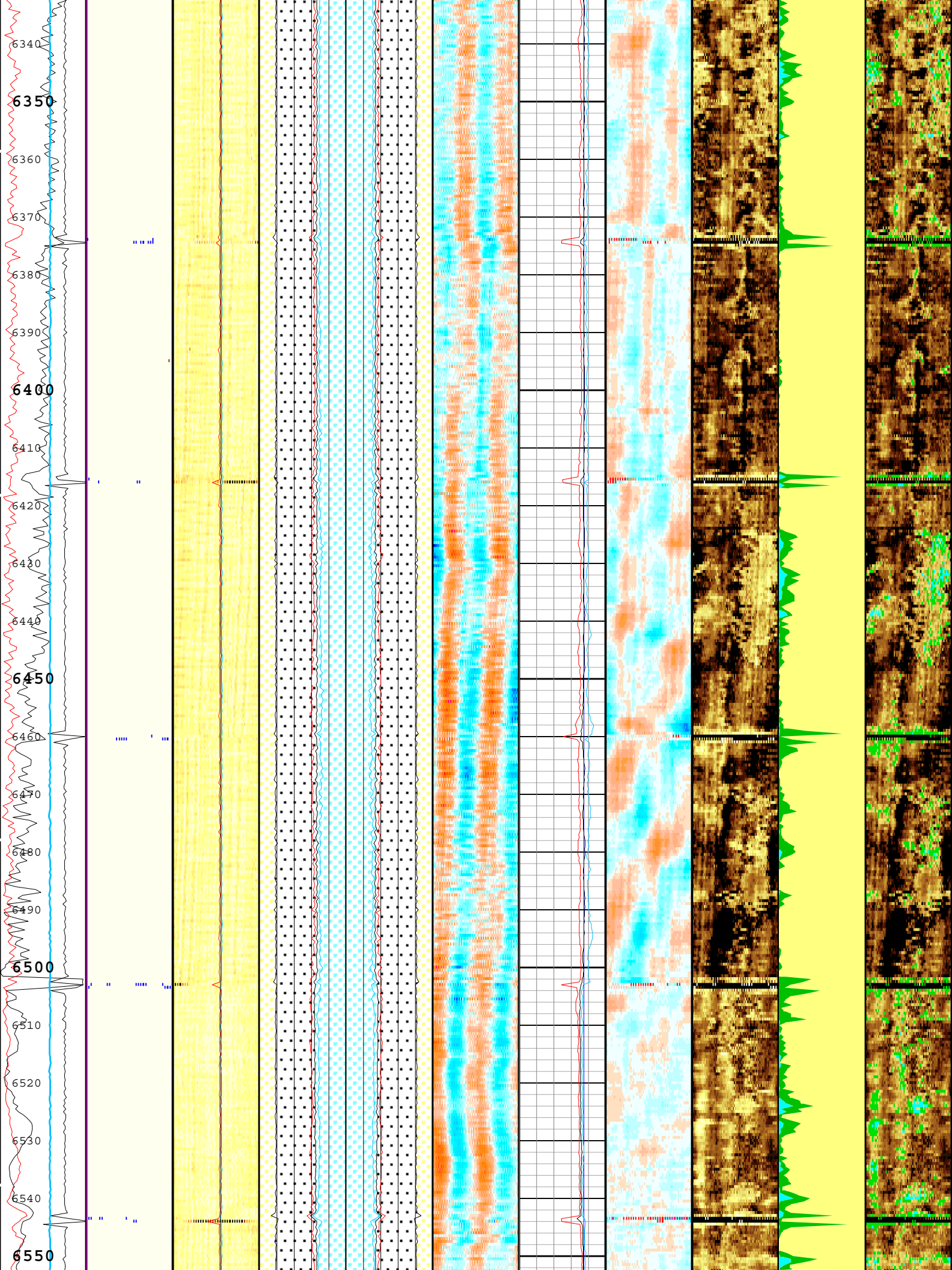
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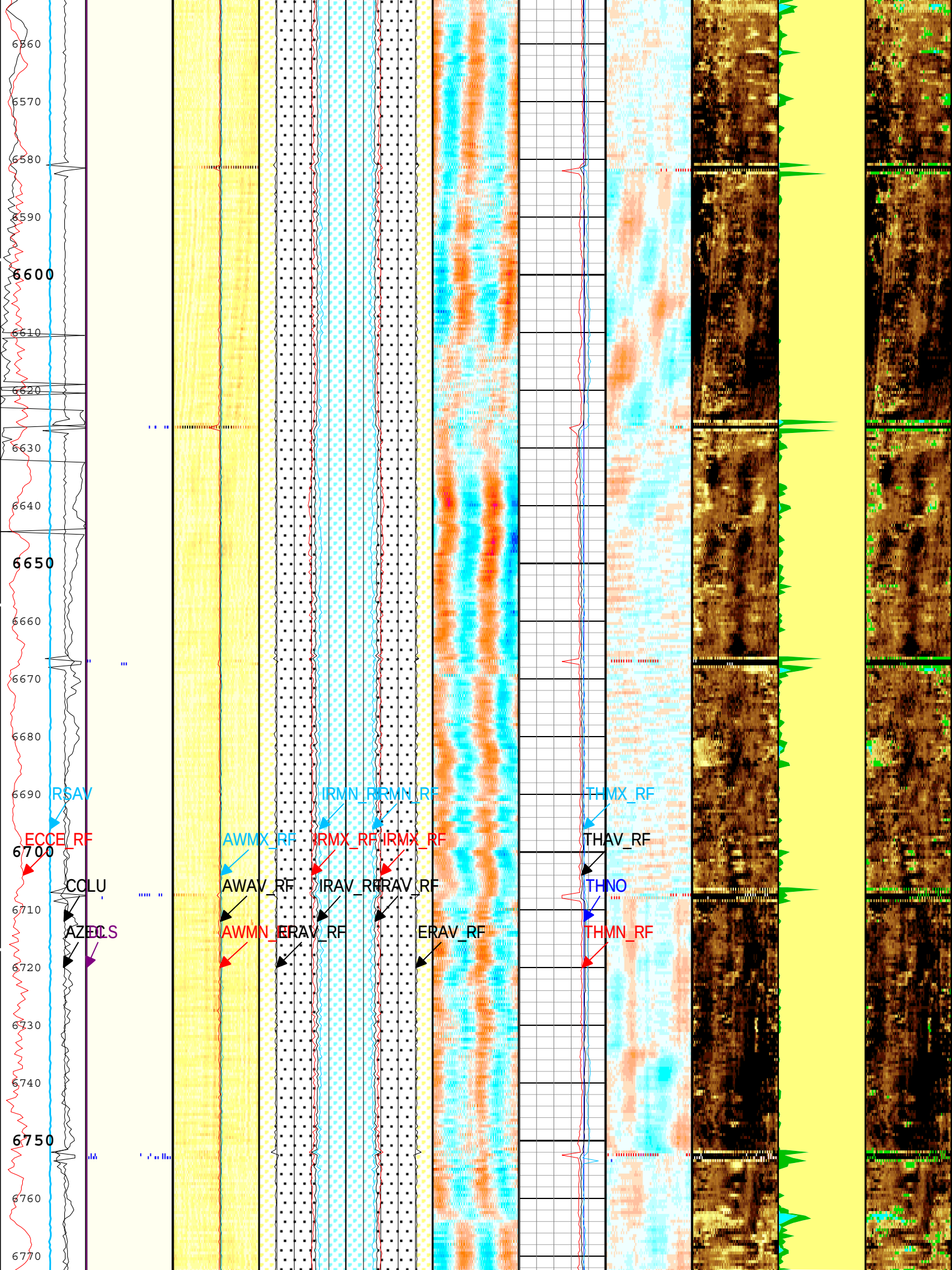
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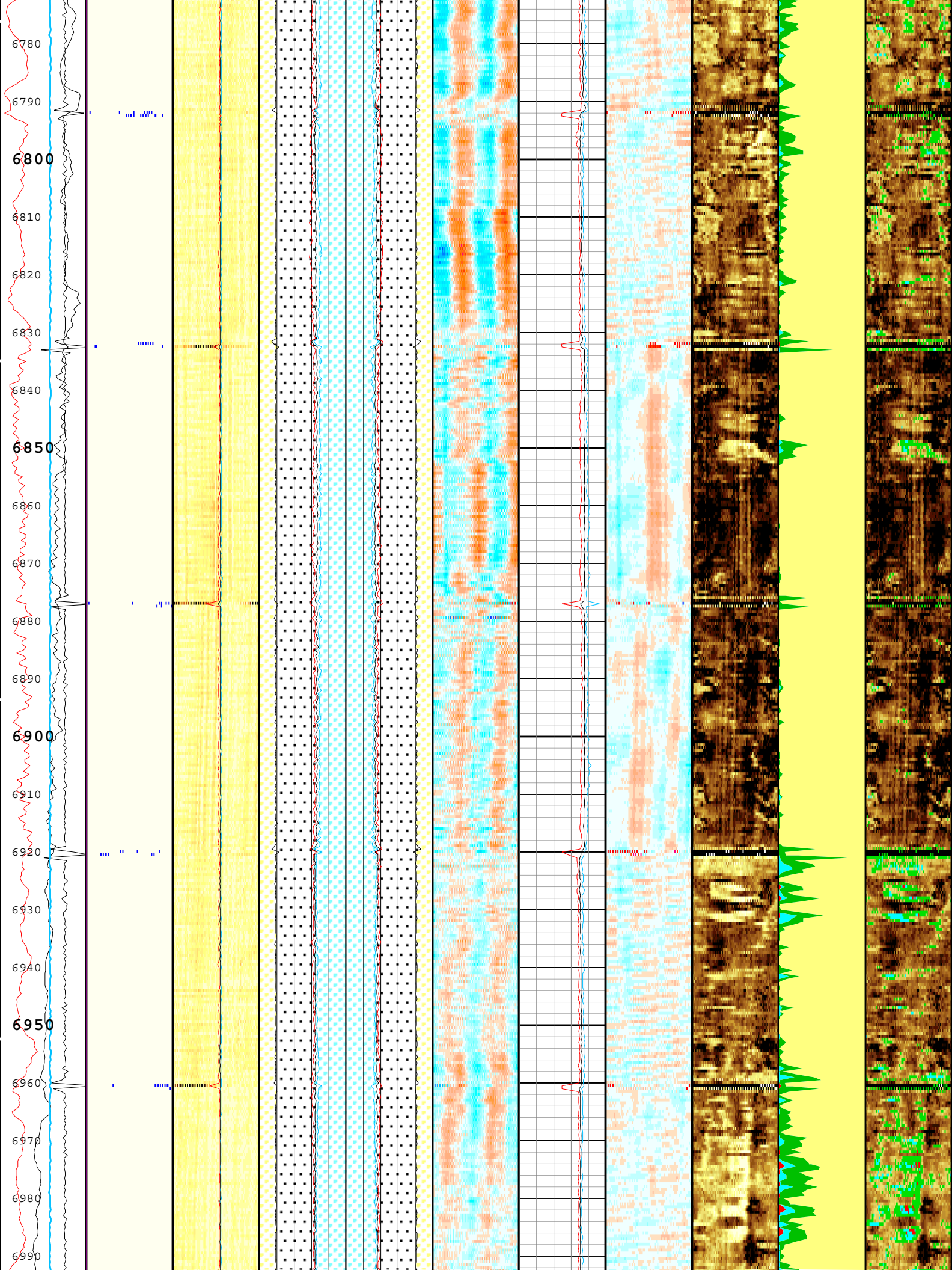
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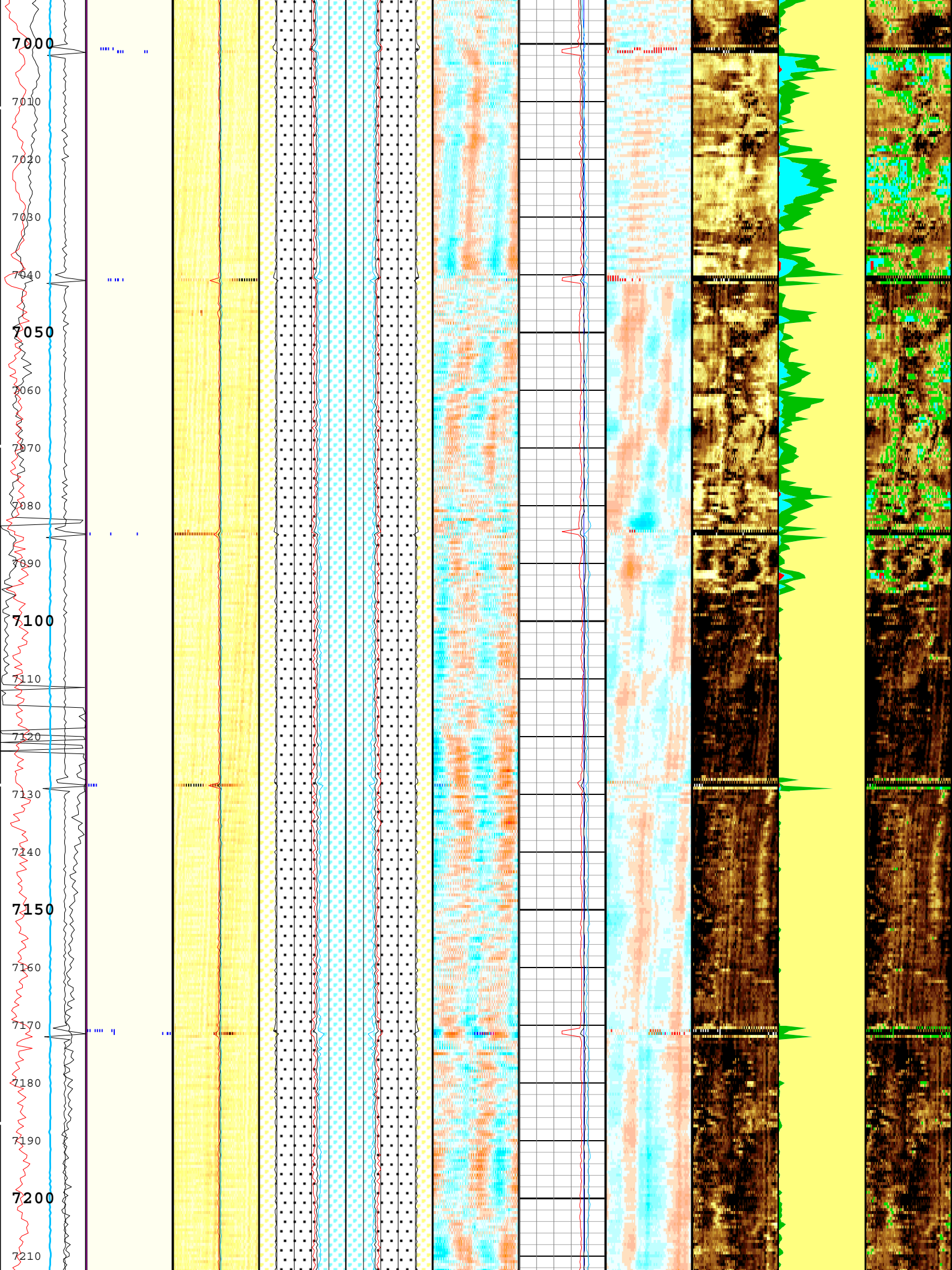
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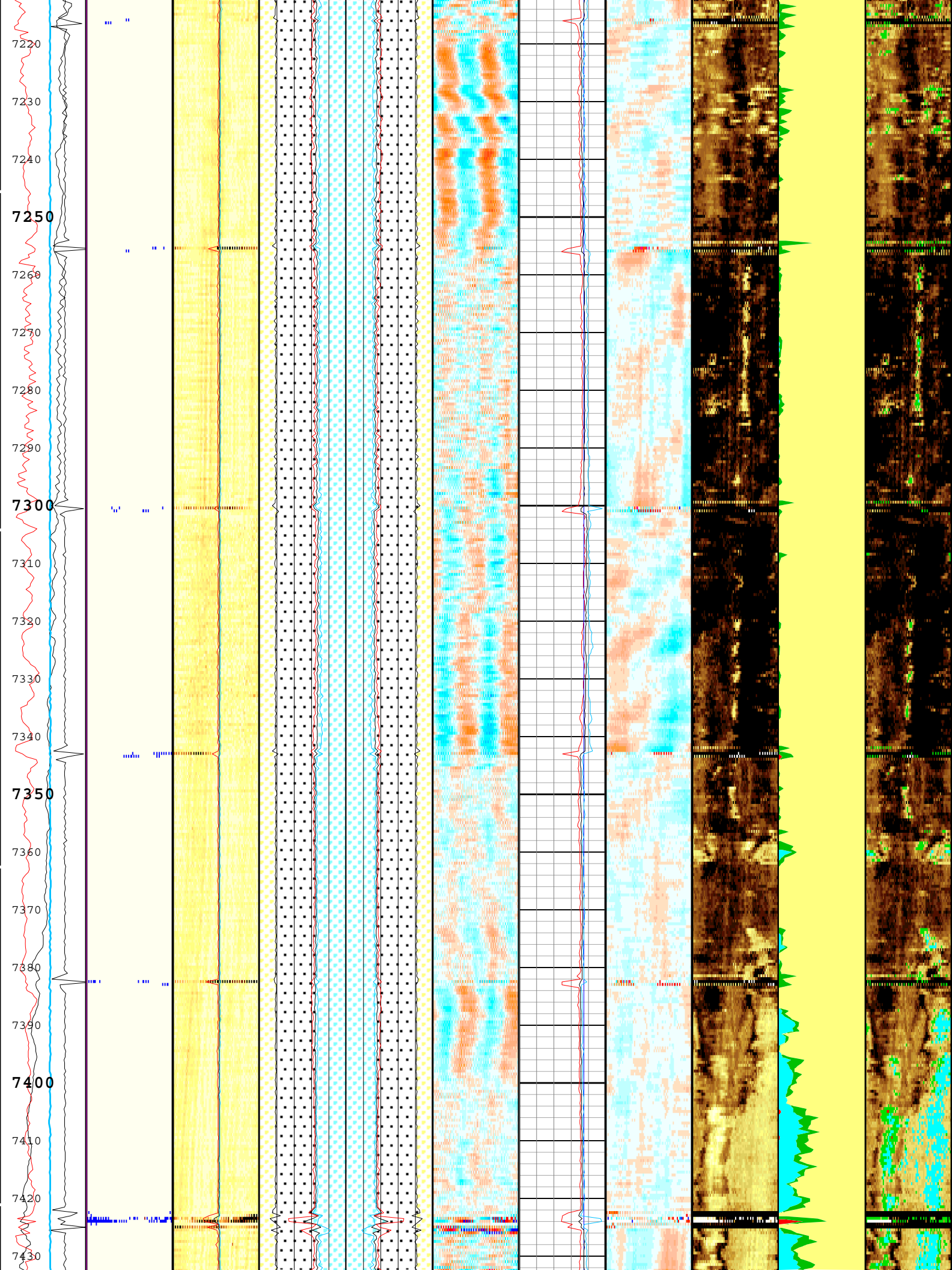
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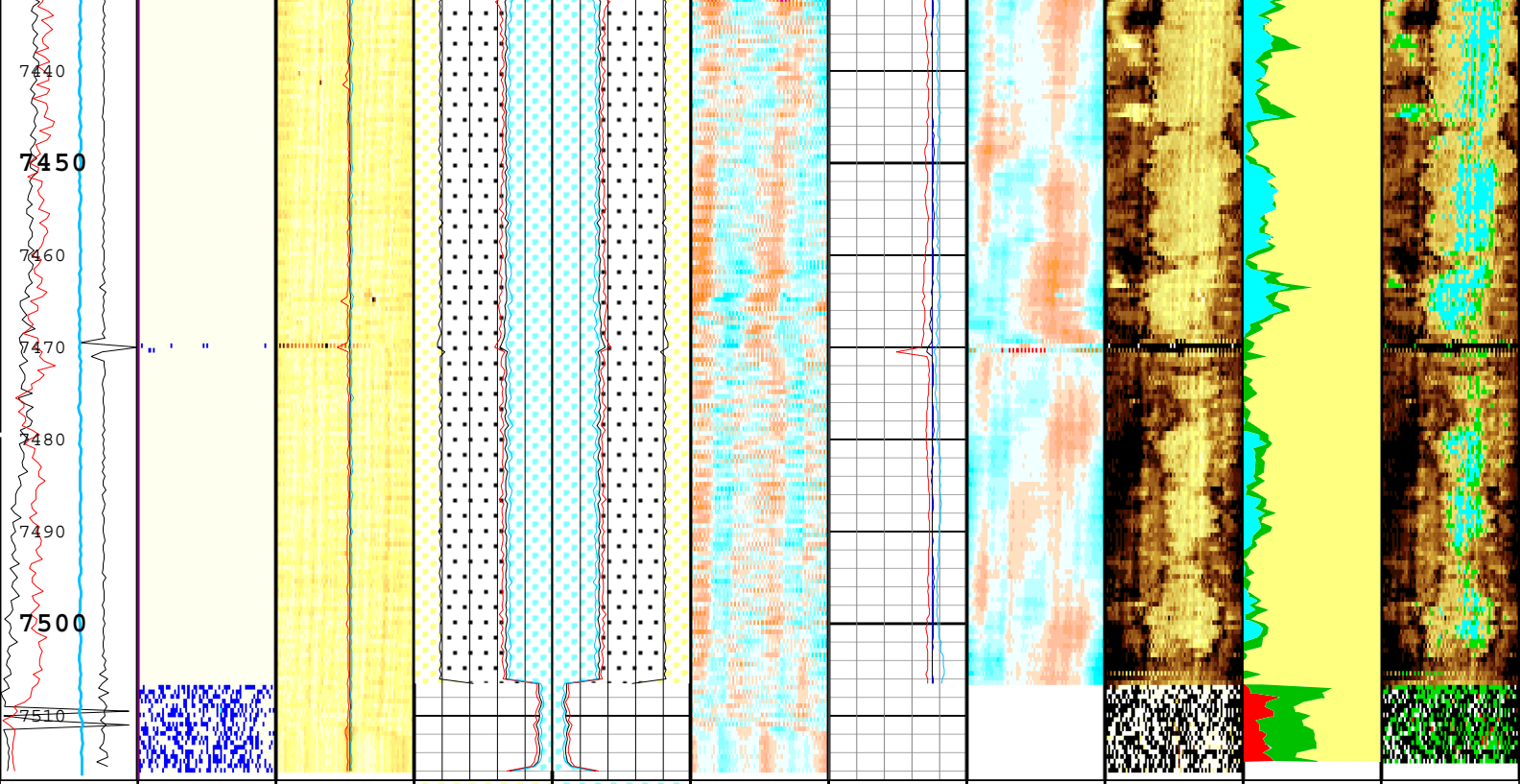


Azimuth of Eccentering (AZEC) USIT-D
0 deg 360

Casing Collar Locator Ultrasonic (CCLU) USIT-D
-30 in 10

Amplitude of Eccentering for Unflagged Waves (ECCE_RF) USIT-D
0 in 0.5

Motor Revolution Speed (RSAV) USIT-D
6 c/s 8

Absent 1.500 3.500
Explicit Normalization
USIT - USIT Processing Flags (UFLG) USIT-D

USIT Processing Flags (UFLG[0]) USIT-D
1 5

Dog Leg Severity (DLS)
0 10 deg/100ft

Absent -4.799 -2.799 -0.800
Explicit Normalization
USIT - Amplitude of Unflagged Wave (AWBK_RF) USIT-D (dB)

Minimum of Unflagged Wave Amplitude (AWMN_RF) USIT-D
0 dB 75

Average of Unflagged Wave Amplitude (AWAV_RF) USIT-D
0 dB 75

Maximum of Unflagged Wave Amplitude (AWMX_RF) USIT-D
0 dB 75

ERAV
ERAV-IRAV
IRAV

Median of Unflagged External Radii (ERAV_RF) USIT-D
5 in 4

Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-D
5 in 4

Maximum of Unflagged Internal Radii (IRMX_RF) USIT-D
5 in 4

Minimum of Unflagged Internal Radii (IRMN_RF) USIT-D
5 in 4

IRAV
ERAV
IRAV-ERAV

Median of Unflagged External Radii (ERAV_RF) USIT-D
4 in 5

Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-D
4 in 5

Maximum of Unflagged Internal Radii (IRMX_RF) USIT-D
4 in 5

Minimum of Unflagged Internal Radii (IRMN_RF) USIT-D
4 in 5

Absent -0.051 -0.012 0.028 0.068
Explicit Normalization
USIT - Unflagged Internal Radii minus Median Internal Radius (IRBKM_RF) USIT-D (in)

Minimum of Unflagged Casing Thickness (THMN_RF) USIT-D
0.1 in 0.6

Nominal Casing Thickness (THNO) USIT-D
0.1 in 0.6

Median of Unflagged Casing Thickness (THAV_RF) USIT-D
0.1 in 0.6

Maximum of Unflagged Casing Thickness (THMX_RF) USIT-D
0.1 in 0.6

Absent -0.051 -0.012 0.028 0.068
Explicit Normalization
USIT - Unflagged Casing Thickness minus Median of Unflagged Casing Thickness (THBKM_RF) USIT-D (in)

Absent 1.500 3.500 5.500 7.500
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D (Mrayl)

Ratio of Cement Measurements to Total (CEMR) USIT-D
1 0

Micro-debonding Ratio (MDR) USIT-D
1 0

Ratio of Gas Measurements to Total (GASR) USIT-D
1 0

Bonded
Gas
Liquid
Micro-debonding

Absent 3.090 5.054 7.018
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D (Mrayl)

Absent 2.599 4.563 6.527
Custom Normalization
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-D (Mrayl)

TIME_1900 - Time Marked every 60.00 (s)

USIT Processing Flags (UFLG[0]) USIT-D

1 - UFLG 1 Value within [0.0 - 1.5] - :	UTIM Error
2 - UFLG 2 Value within [1.5 - 2.5] - :	Pulse Origin Not Detected
3 - UFLG 3 Value within [2.5 - 3.5] - :	WINLEN Error
4 - UFLG 4 UFLG 5 UFLG 6 Value within [3.5 - 6.5] - :	Casing Thickness Error
5 - UFLG 7 UFLG 8 UFLG 9 Value within [6.5 - 10] - :	Loop Processing Error

Description: USI Composite Format: Log (UCRC_USI Composite 9.625inch) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth
Creation Date: 03-Aug-2015 21:34:46

Channel Processing Parameters

2.B: Parameters

Parameter	Description	Tool	Value	Unit
AFVU	Automatic Fluid Velocity Update	USIT-D	On	
ISSBAR	Barite Mud Presence Flag	Borehole	No	
BERJ	Bad Echo Rejection	USIT-D	On	
BS	Bit Size	WLSESSION	Depth Zoned	in
CASING_PRATIO	Casing Poisson Ratio	USIT-D	Standard Poisson Ratio	
CMTY(U-USIT_CEMT)	Cement Type	USIT-D	Regular Cement	
THNO	Nominal Casing Thickness - Zoned along logger depths	WLSESSION	0.472	in
CYSTLGR	Casing Yield Strength - Zoned along logger depths	WLSESSION	80000	psi
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	8.5	lbm/gal
DFT	Drilling Fluid Type	Borehole	Water	
DTMD	Borehole Fluid Slowness	Borehole	188	us/ft
ETIP	Elevation of the TIP above MSL	WLSESSION	2021.5	ft
FD	Fluid Density	USIT-D	1.2	g/cm3
FDII	FPM Data Interpolation Interval	USIT-D	0	ft
HEMA	Hematite Presence Flag	Borehole	No	
ICE_BINPROC	ICE Bin Processing Depth Interval	USIT-D	0	ft
ICE_PROCESS	ICE Processing	USIT-D	Yes	
IMAR	Image Rotation	USIT-D	Off	
MEAS_WLEN	Tcube Processing Window Length in Measurement Mode	USIT-D	Depth Zoned	us
MUD_N_FRP	Free Pipe Mud Normalization Factor	USIT-D	1.2	
MUD_N_THE	Theoretical Mud Normalization Factor	USIT-D	1	
OPLEV	USIT Remove Flagged Data Level	USIT-D	OPT2	
RAPID_OPTION	Rapid Access Computation Option	USIT-D	Off	
RCOD	Reference Calibrator Outer Diameter	USIT-D	7	in
RCSO	Reference Calibrator Standoff	USIT-D	1.378	in
RCTH	Reference Calibrator Thickness	USIT-D	0.295	in
SDNV	Number of Vertical Samples used for Micro-debonding Computation	USIT-D	5	
SDTHOR	Acoustic Impedance STD Horizontal Threshold for Micro-debonding	USIT-D	0.5	Mrayl
SDTVER	Acoustic Impedance STD Vertical Threshold for Micro-debonding	USIT-D	0.3	Mrayl
TCUB	T^3 Processing Level	USIT-D	Loop	
THDH	Maximum Search Thickness (percentage of nominal)	USIT-D	130	%
THDL	Minimum Search Thickness (percentage of nominal)	USIT-D	70	%
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-D	1.6	Mrayl
UFGDE	Fiberglass Density	USIT-D	1.95	g/cm3
UFGPS	Fiberglass Processing Selection	USIT-D	No	
UFGVL	Fiberglass Velocity	USIT-D	9678.48	ft/s

UFGVL	Fiberglass Velocity	USIT-D	3078.48	ft/s
USI_FSOD	USIT USI Fluid Slowness Fits Casing Outer Diameter	USIT-D	0_OFF	
USI_FVEL_SEL	USI Fluid Velocity Selection	USIT-D	Automatic	
USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-D	FreePipe Norm.	
THDP	Thickness Detection Policy	USIT-D	Fundamental	
VCAS	Ultrasonic Transversal Velocity in Casing	USIT-D	51.4	us/ft
ZCAS	Acoustic Impedance of Casing	USIT-D	46.25	Mrayl
ZINI	Initial Estimate of Cement Impedance	USIT-D	-1	Mrayl
ZMUD	Acoustic Impedance of Mud	Borehole	1.48	Mrayl
ZTCM	Acoustic Impedance Threshold for Cement	USIT-D	2.6	Mrayl
ZTGS	Acoustic Impedance Threshold for Gas	USIT-D	0.3	Mrayl

Depth Zone Parameters

Parameter	Value	Start (ft)	Stop (ft)
BS	17	35	1100
BS	14	1100	7505
BS	8.5	7505	7517
MEAS_WLEN	29.67	35	7507
MEAS_WLEN	20	7507	7517

All depth are actual.

Tool Control Parameters

2.B: Parameters

Parameter	Description	Tool	Value	Unit
AGMN	Minimum Gain of Cartridge	USIT-D	-4	dB
AGMX	Maximum Gain of Cartridge	USIT-D	20	dB
U-USIT_DDT5	USIC Downhole Decimation for T5 only	USIT-D	0_NONE	
DOT(DOS)	Distance between Opposite Transducer Faces	USIT-D	4.874	in
EMXV	EMEX Voltage	USIT-D	70	V
HRES	Horizontal Resolution	USIT-D	5 deg	
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h
MOTOR_PROTECT	Motor Protection	USIT-D	On	
TMUC	Type of Mud	USIT-D	BRI	
UACLV_PERM	Ultrasonic ACLV Permanent	USIT-D	No	
ULOG	Logging Objective	USIT-D	MEASUREMENT	
UMFR	Modulation Frequency	USIT-D	333333	Hz
USFR	Ultrasonic Sampling Frequency	USIT-D	500000	Hz
UPAT	USIT Emission Pattern	USIT-D	Pattern 300 KHz	
UWKM	USIT Working Mode	USIT-D	Uncompressed 5 deg at 6.0 in LF	
USIT_DEPTHLOG	Starting Depth Log for Ultrasonics	USIT-D	7505	ft
USSP	Ultrasonic Service	USIT-D	USI	
VRES	Vertical Resolution	USIT-D	6.0 in	
WINB	Window Begin Time	USIT-D	40	us
WINE	Window End Time	USIT-D	85.35	us

2.B

Repeat Pass 5 IN = 100 FT

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
2.B	Log[2]:Up	Up	7100.38 ft	7511.26 ft	03-Aug-2015	03-Aug-2015	ON	6.05 ft	Yes

					5:11:14 PM	5:24:29 PM			

All depths are referenced to toolstring zero

Log

Company:Southern California Gas Company Well:Fernando Fee 32H

2.B: Log[2]:Up:S037

Description: USI Composite Format: Log (UCRC_USI Composite 9.625inch) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth

Creation Date: 03-Aug-2015 21:34:54

TIME_1900 - Time Marked every 60.00 (s)

USIT Processing Flags (UFLG[0]) USIT-D

1 - UFLG 1 Value within [0.0 - 1.5] - :

2 - UFLG 2 Value within [1.5 - 2.5] - :

3 - UFLG 3 Value within [2.5 - 3.5] - :

4 - UFLG 4 UFLG 5 UFLG 6 Value within [3.5 - 6.5] - :

5 - UFLG 7 UFLG 8 UFLG 9 Value within [6.5 - 10] - :

- UTIM Error
- Pulse Origin Not Detected
- WINLEN Error
- Casing Thickness Error
- Loop Processing Error

Azimuth of Eccentering (AZEC) USIT-D
0 deg 360

Casing Collar Locator Ultrasonic (CCLU) USIT-D
-30 in 10

Amplitude of Eccentering for Unflagged Waves (ECCE_RF) USIT-D
0 in 0.5

Motor Revolution Speed (RSAV) USIT-D
6 c/s 8

Absent 1.500 3.500
Explicit Normalization
USIT - USIT Processing Flags (UFLG) USIT-D

USIT Processing Flags (UFLG[0]) USIT-D
1 5

Dog Leg Severity (DLS)
0 10 deg/100ft

Absent -4.799 -2.799 -0.800
Explicit Normalization
USIT - Amplitude of Unflagged Wave (AWBK_RF) USIT-D (dB)

Minimum of Unflagged Wave Amplitude (AWMN_RF) USIT-D
0 dB 75

Average of Unflagged Wave Amplitude (AWAV_RF) USIT-D
0 dB 75

Maximum of Unflagged Wave Amplitude (AWMX_RF) USIT-D
0 dB 75

ERAV | IRAV | ERAV-IRAV | IRAV

Median of Unflagged External Radii (ERAV_RF) USIT-D
5 in 4

Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-D
5 in 4

Maximum of Unflagged Internal Radii (IRMX_RF) USIT-D
5 in 4

Minimum of Unflagged Internal Radii (IRMN_RF) USIT-D
5 in 4

ERAV | IRAV | ERAV | IRAV-ERAV

Median of Unflagged External Radii (ERAV_RF) USIT-D
4 in 5

Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-D
4 in 5

Maximum of Unflagged Internal Radii (IRMX_RF) USIT-D
4 in 5

Minimum of Unflagged Internal Radii (IRMN_RF) USIT-D
4 in 5

Absent -0.051 -0.012 0.028 0.068
Explicit Normalization
USIT - Unflagged Internal Radii minus Median Internal Radius (IRBKM_RF) USIT-D (in)

Minimum of Unflagged Casing Thickness (THMN_RF) USIT-D
0.1 in 0.6

Nominal Casing Thickness (THNO) USIT-D
0.1 in 0.6

Median of Unflagged Casing Thickness (THAV_RF) USIT-D
0.1 in 0.6

Maximum of Unflagged Casing Thickness (THMX_RF) USIT-D
0.1 in 0.6

Absent -0.051 -0.012 0.028 0.068
Explicit Normalization
USIT - Unflagged Casing Thickness minus Median of Unflagged Casing Thickness (THBKM_RF) USIT-D (in)

Absent 1.500 3.500 5.500 7.500
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D (Mrayl)

Ratio of Cement Measurements to Total (CEMR) USIT-D
1 0

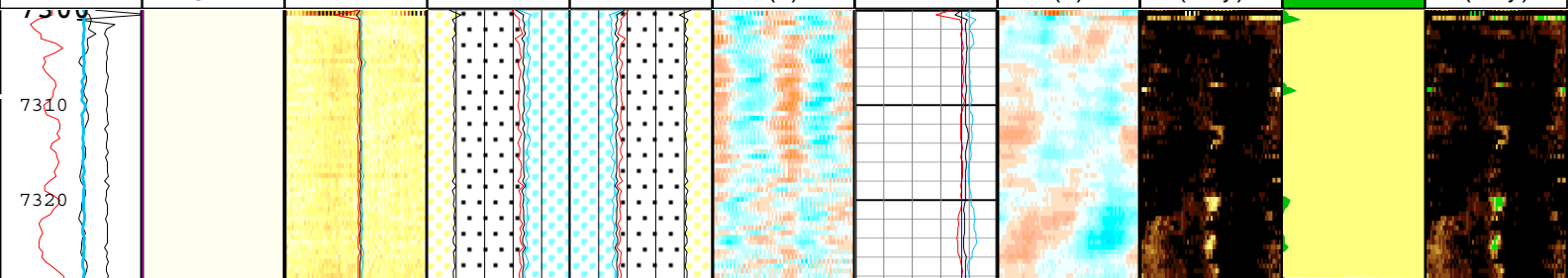
Micro-debonding Ratio (MDR) USIT-D
1 0

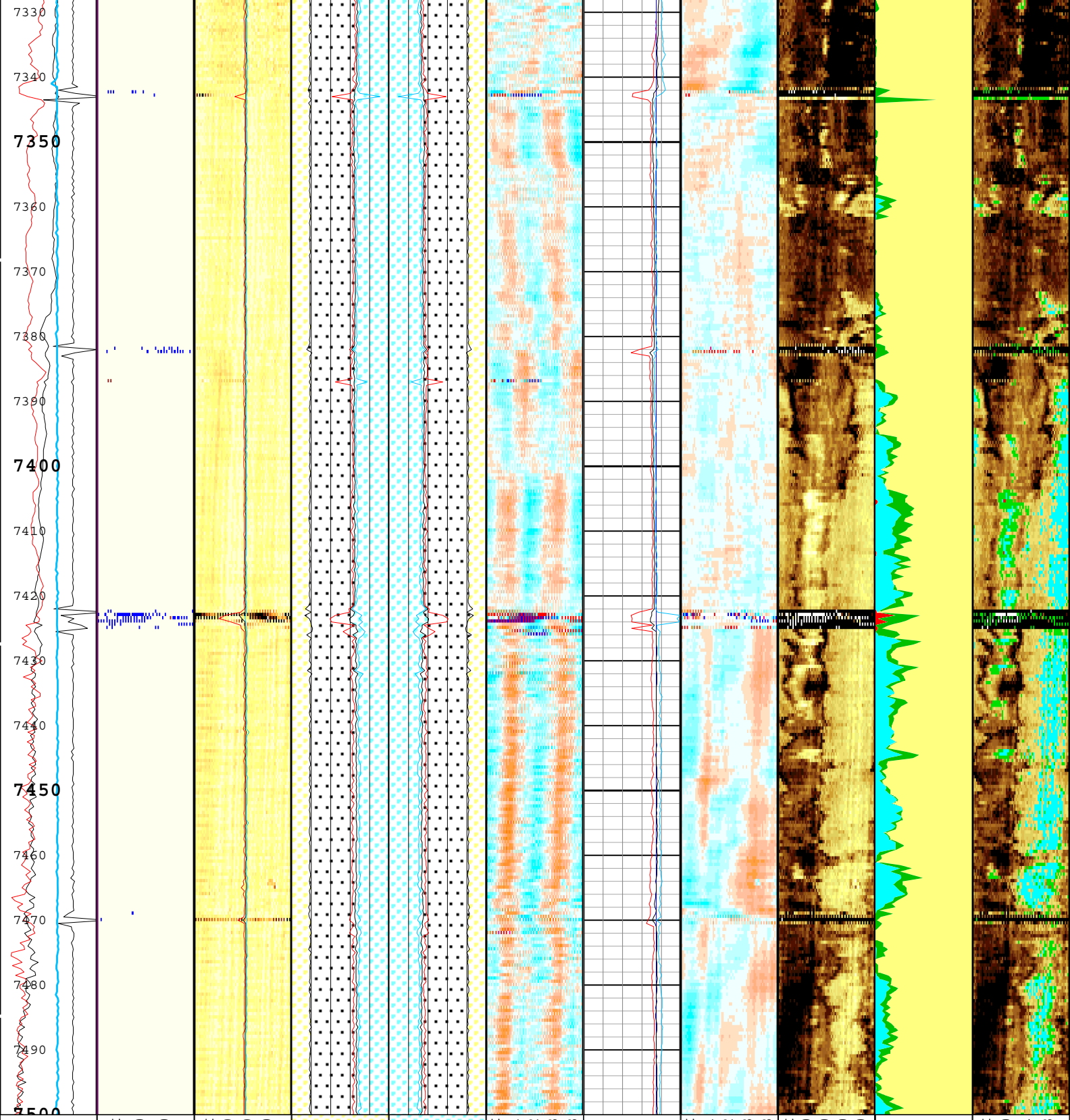
Ratio of Gas Measurements to Total (GASR) USIT-D
1 0

Bonded
Gas
Liquid
Micro-debonding

Absent 3.090 5.054 7.018
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D (Mrayl)

Absent 2.599 4.563 6.527
Custom Normalization
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-D (Mrayl)




7330
7340
7350
7360
7370
7380
7390
7400
7410
7420
7430
7440
7450
7460
7470
7480
7490
7500
Azimuth of Eccentering (AZEC) USIT-D
0 deg 360
Casing Collar Locator Ultrasonic (CCLU) USIT-D
-30 in 10
Amplitude of
Absent 1.500 3.500
Explicit Normalization
USIT - USIT Processing Flags (UFLG) USIT-D
USIT Processing Flags (UFLG[0]) USIT-D
Absent -4.799 -2.799 -0.800
Explicit Normalization
USIT - Amplitude of Unflagged Wave (AWBK_RF) USIT-D
(dB)
Minimum of
ERAV
ERAV-IRAV
IRAV
Median of Unflagged External Radii (ERAV_RF) USIT-D
5 in 4
IRAV
ERAV
IRAV-ERAV
Median of Unflagged External Radii (ERAV_RF) USIT-D
4 in 5
Absent -0.051 -0.012 0.028 0.068
Explicit Normalization
USIT - Unflagged Internal Radii minus Median Internal Radius (IRBKM_RF) USIT-D
Minimum of Unflagged Casing Thickness (THMN_RF) USIT-D
0.1 in 0.6
Nominal Casing Thickness (THNO) USIT-D
0.1 in 0.6
Absent -0.051 -0.012 0.028 0.068
Explicit Normalization
USIT - Unflagged Casing Thickness minus Median of Unflagged Casing
Absent 1.500 3.500 5.500 7.500
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D
(Mrayl)
Ratio of Cement Measurements to Total (CEMR) USIT-D
1 0
Micro-debonding Ratio (MDR) USIT-D
1 0
Absent 3.090 5.054 7.018
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D
(Mrayl)
Absent 2.599 4.563 6.527

Eccentering for Unflagged Waves (ECCE_RF) USIT-D
0 in 0.5

USIT-D
1 5

Dog Leg Severity (DLS)
0 10 deg/100ft

Unflagged Wave Amplitude (AWMN_RF) USIT-D
0 dB 75

Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-D
5 in 4

Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-D
4 in 5

USIT-D (in)

0.1 in 0.6

Thickness (THBKM_RF) USIT-D (in)

Ratio of Gas Measurements to Total (GASR) USIT-D
1 0

Custom Normalization USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-D (Mrayl)

Motor Revolution Speed (RSAV) USIT-D
6 c/s 8

Average of Unflagged Wave Amplitude (AWAV_RF) USIT-D
0 dB 75

Maximum of Unflagged Wave Amplitude (AWMX_RF) USIT-D
0 dB 75

Maximum of Unflagged Internal Radii (IRMX_RF) USIT-D
5 in 4

Maximum of Unflagged Internal Radii (IRMX_RF) USIT-D
4 in 5

Minimum of Unflagged Internal Radii (IRMN_RF) USIT-D
5 in 4

Minimum of Unflagged Internal Radii (IRMN_RF) USIT-D
4 in 5

Median of Unflagged Casing Thickness (THAV_RF) USIT-D
0.1 in 0.6

Maximum of Unflagged Casing Thickness (THMX_RF) USIT-D
0.1 in 0.6

Bonded

Gas

Liquid

Micro-debonding

USIT Processing Flags (UFLG[0]) USIT-D

1 - UFLG 1 Value within [0.0 - 1.5] - :
2 - UFLG 2 Value within [1.5 - 2.5] - :
3 - UFLG 3 Value within [2.5 - 3.5] - :
4 - UFLG 4 UFLG 5 UFLG 6 Value within [3.5 - 6.5] - :
5 - UFLG 7 UFLG 8 UFLG 9 Value within [6.5 - 10] - :

UTIM Error
Pulse Origin Not Detected
WINLEN Error
Casing Thickness Error
Loop Processing Error

TIME_1900 - Time Marked every 60.00 (s)

Description: USI Composite Format: Log (UCRC_USI Composite 9.625inch) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth
Creation Date: 03-Aug-2015 21:34:54

2.B

Cement Log 2 IN = 100 FT

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
2.B	Log[4]:Up	Up	22.62 ft	7516.79 ft	03-Aug-2015 5:35:50 PM	03-Aug-2015 7:56:54 PM	ON	6.58 ft	Yes

All depths are referenced to toolstring zero

Log

Company:Southern California Gas Company Well:Fernando Fee 32H
2.B: Log[4]:Up:S037

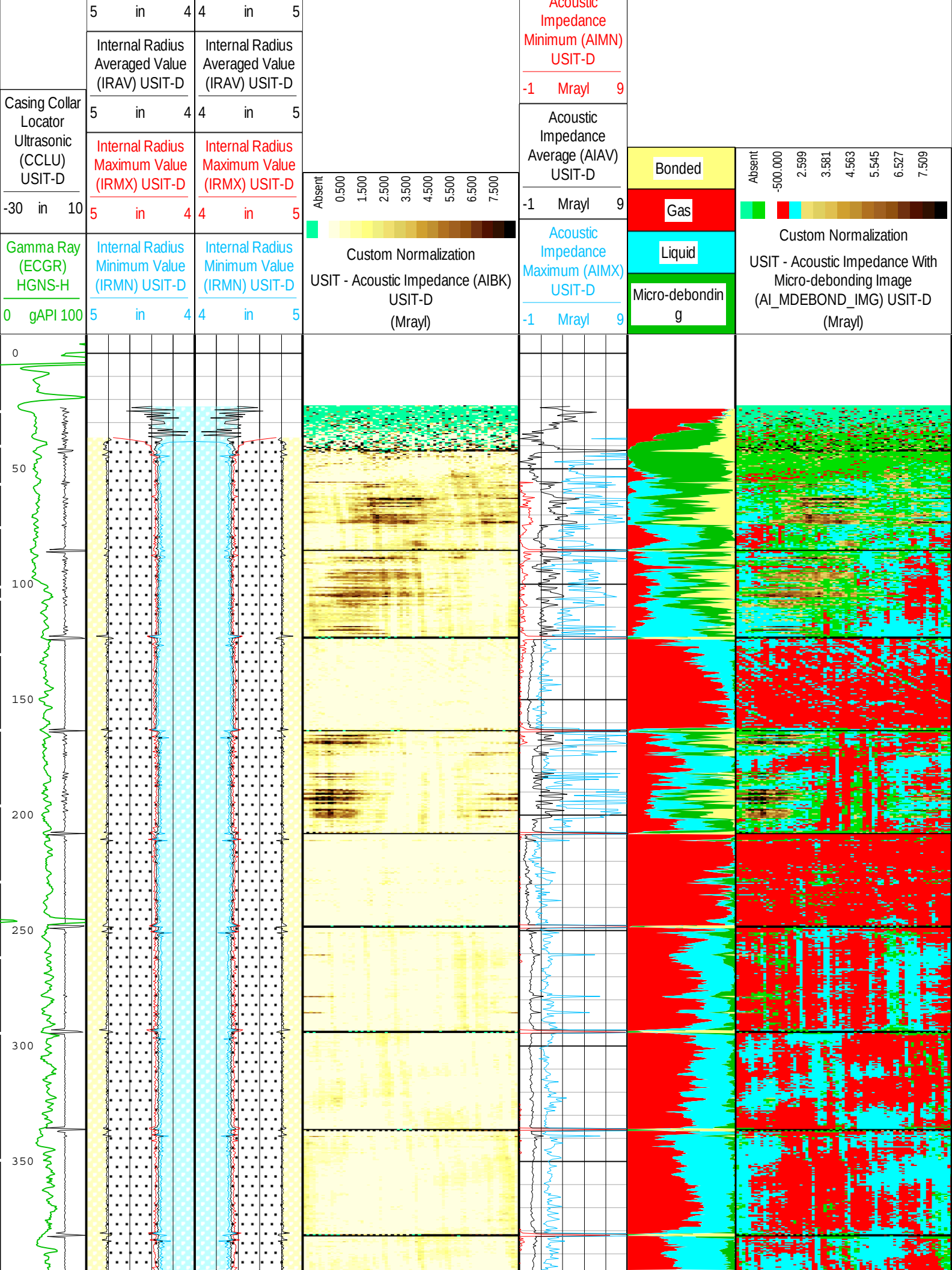
Description: USI Cement Format: Log (UCRC_USI Cement 9.625inch) Index Scale: 2 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 03-Aug-2015 21:34:55

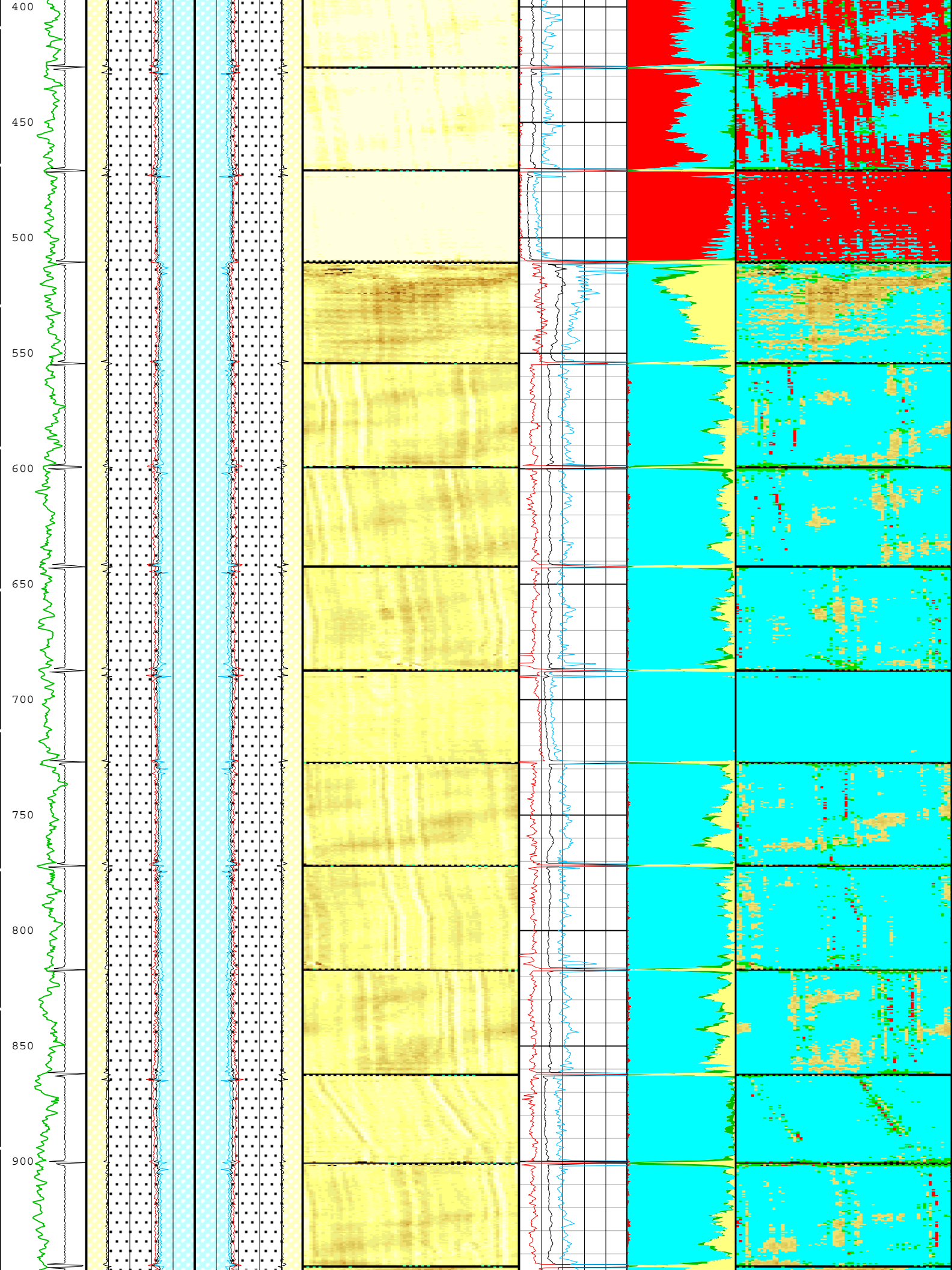
TIME_1900 - Time Marked every 60.00 (s)

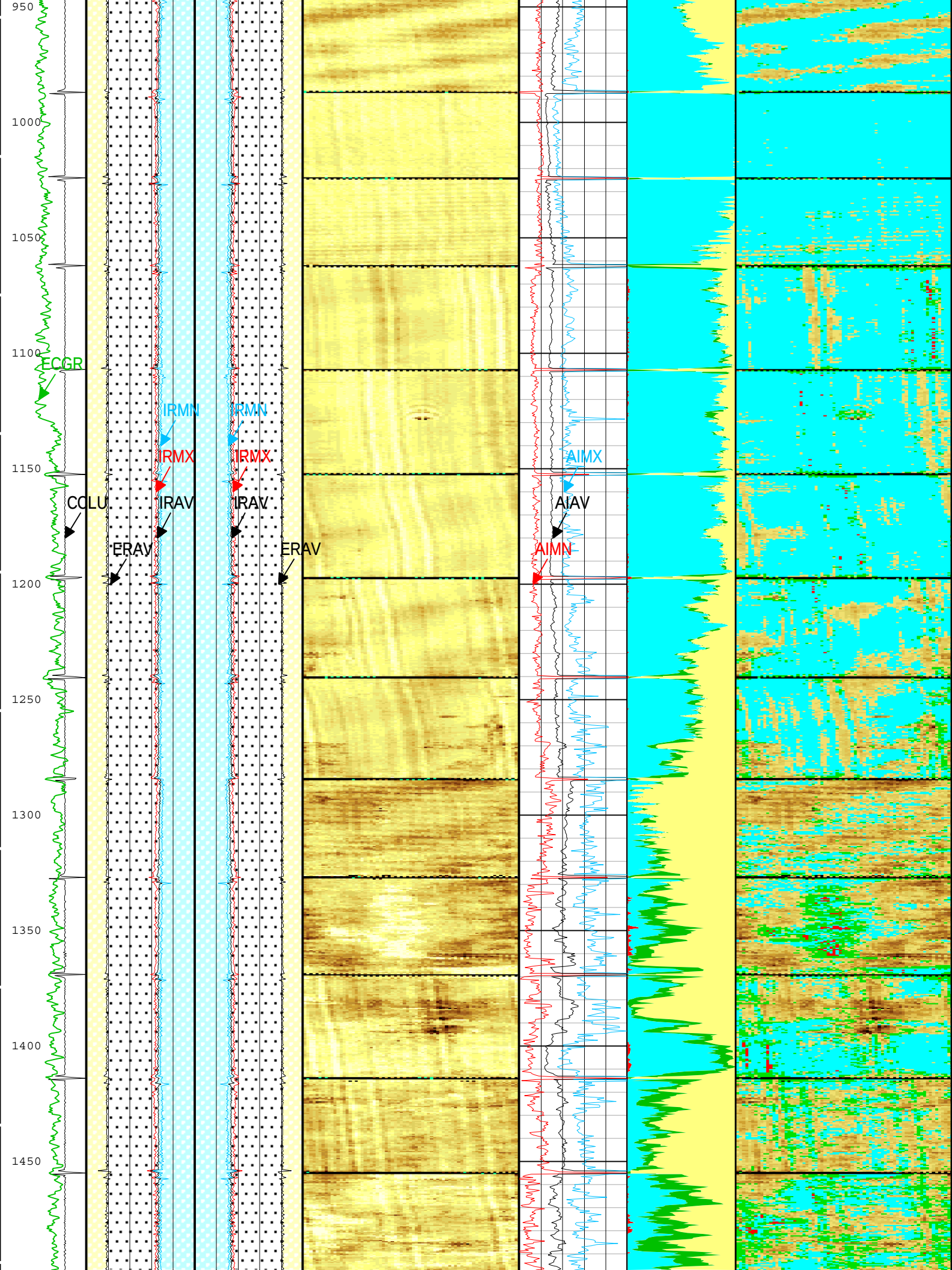
ERAV_IRAV
ERAV_RHF1
IRAV_LHF1
IRAV_IRAV
LHF1_ERAV
RHF1_IRAV

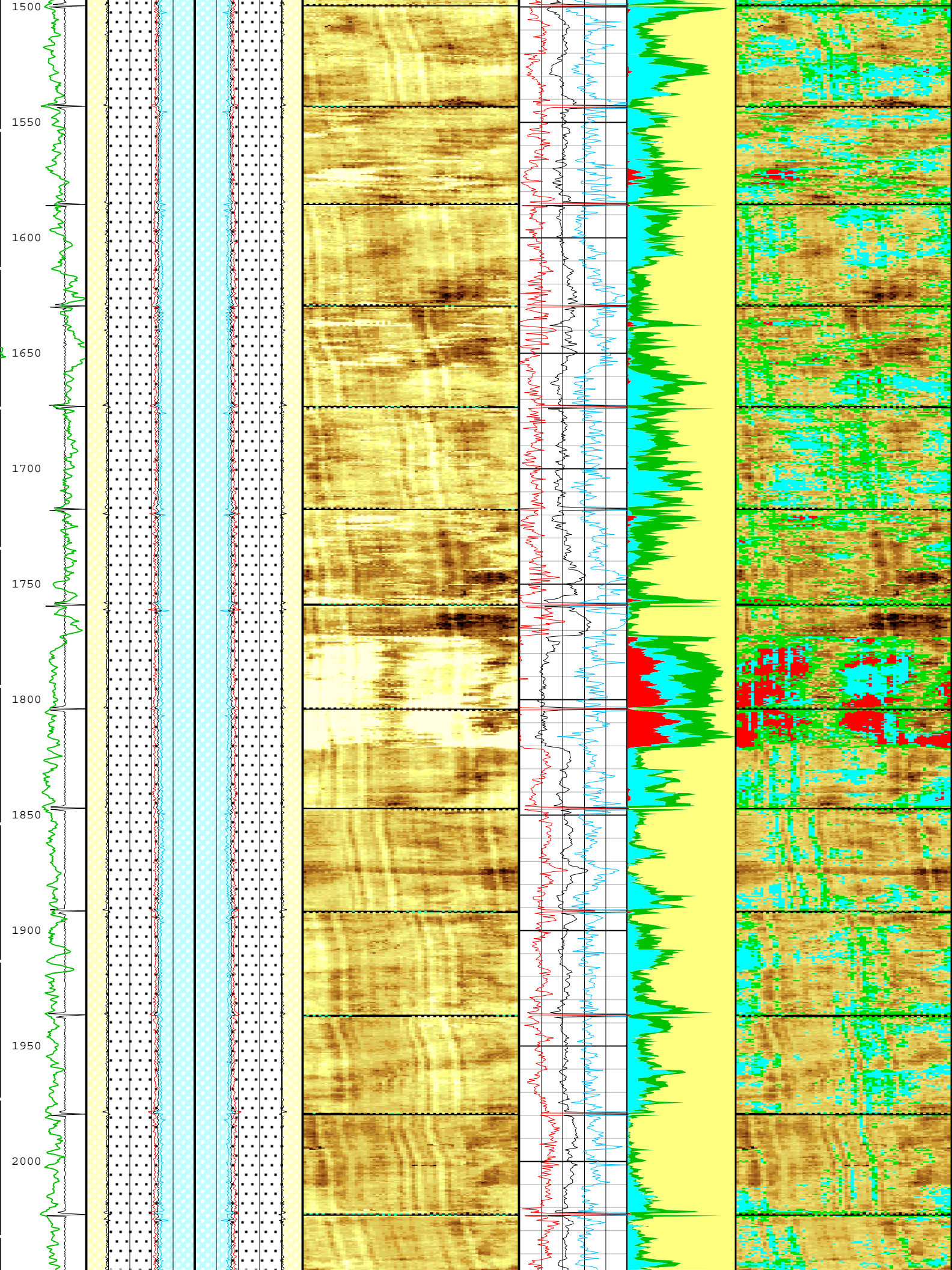
External Radii Average (ERAV) USIT-D

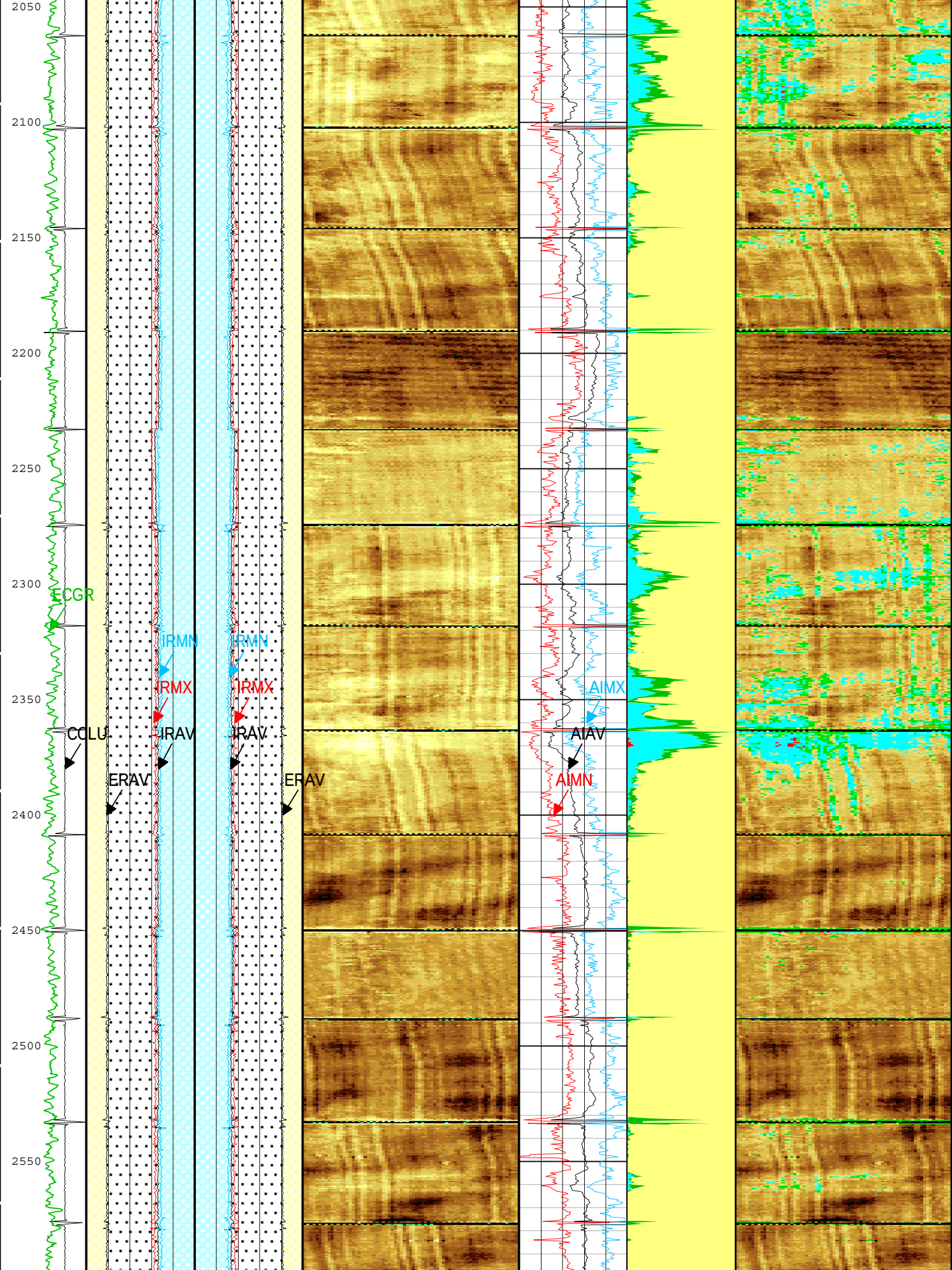
External Radii Average (ERAV) USIT-D

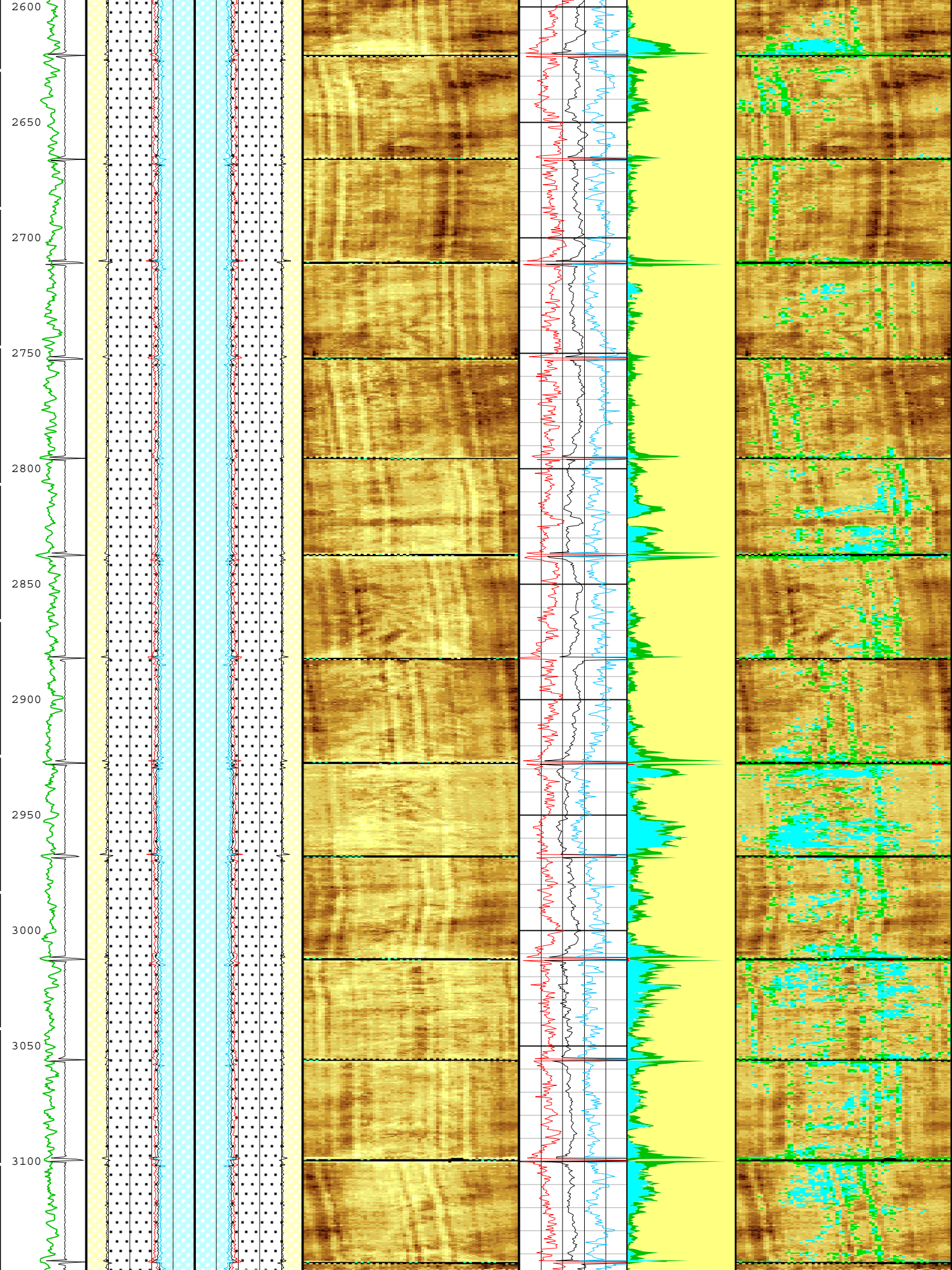

Casing Collar Locator Ultrasonic (CCLU) USIT-D
-30 in 10
Gamma Ray (ECGR) HGNS-H
0 gAPI 100
5 in 4
Internal Radius Averaged Value (IRAV) USIT-D
5 in 4
Internal Radius Maximum Value (IRMX) USIT-D
5 in 4
Internal Radius Minimum Value (IRMN) USIT-D
5 in 4
4 in 5
Internal Radius Averaged Value (IRAV) USIT-D
4 in 5
Internal Radius Maximum Value (IRMX) USIT-D
4 in 5
Internal Radius Minimum Value (IRMN) USIT-D
4 in 5
Absent 0.500 1.500 2.500 3.500 4.500 5.500 6.500 7.500
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D
(Mrayl)
Acoustic Impedance Minimum (AIMN) USIT-D
-1 Mrayl 9
Acoustic Impedance Average (AIAV) USIT-D
-1 Mrayl 9
Acoustic Impedance Maximum (AIMX) USIT-D
-1 Mrayl 9
Bonded
Gas
Liquid
Micro-debonding
Absent -500.000 2.599 3.581 4.563 5.545 6.527 7.509
Custom Normalization
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-D
(Mrayl)
0
50
100
150
200
250
300
350

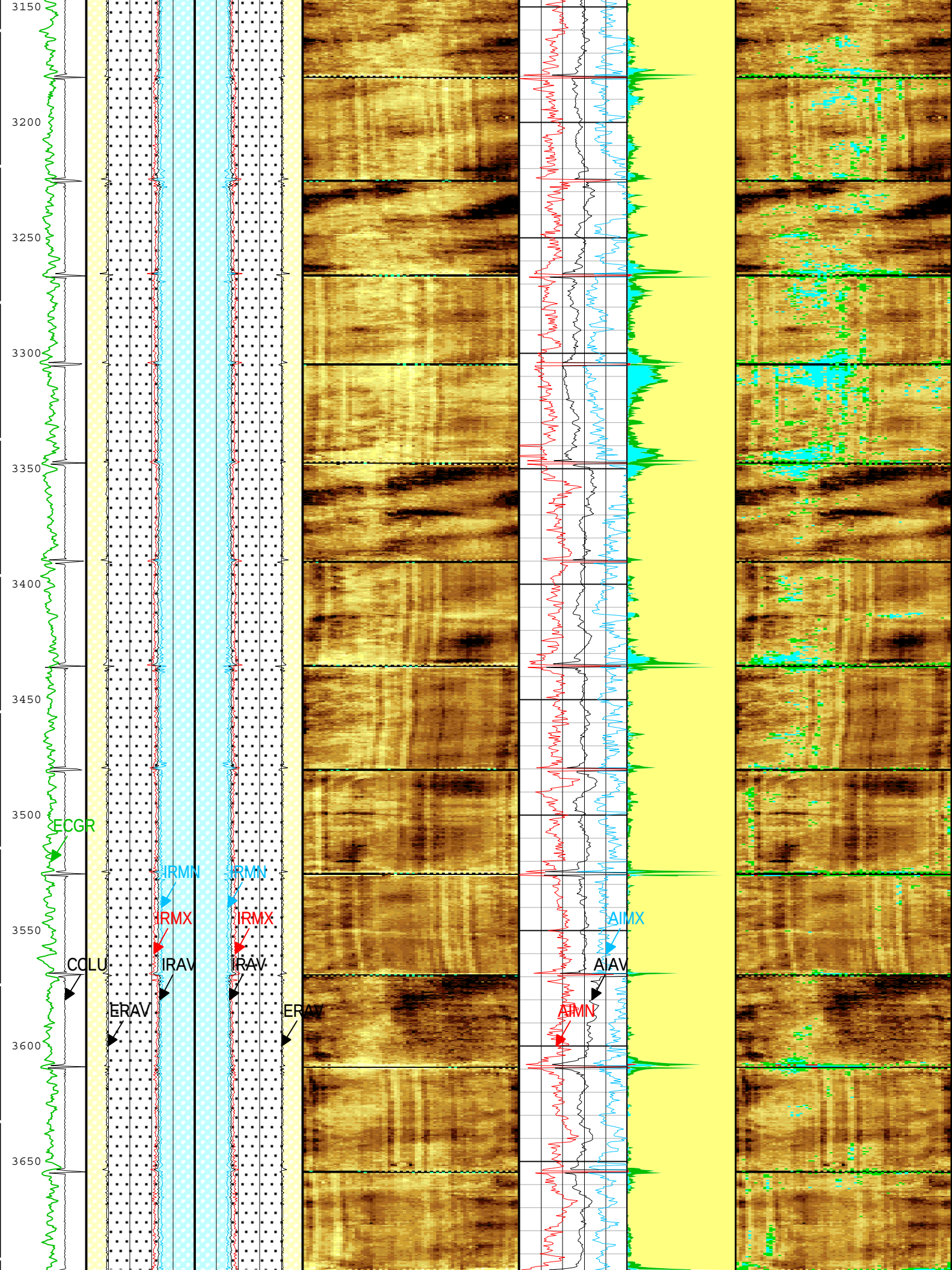

400
450
500
550
600
650
700
750
800
850
900

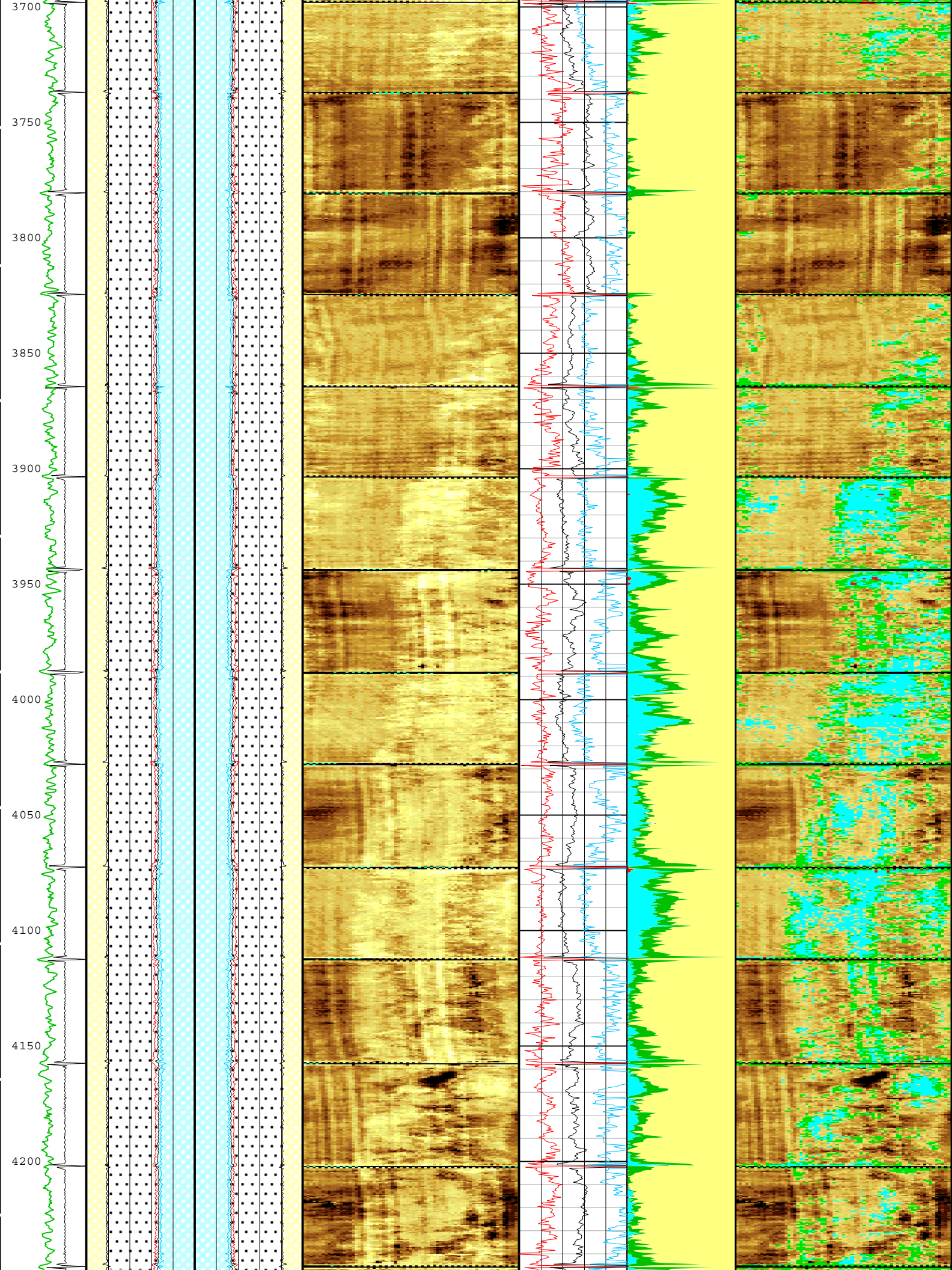

950
1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
ECGR
IRMN
IRMX
IRAV
ERAV
COLU
IRMN
IRMX
IRAV
ERAV
AIMX
AIAV
AIMN

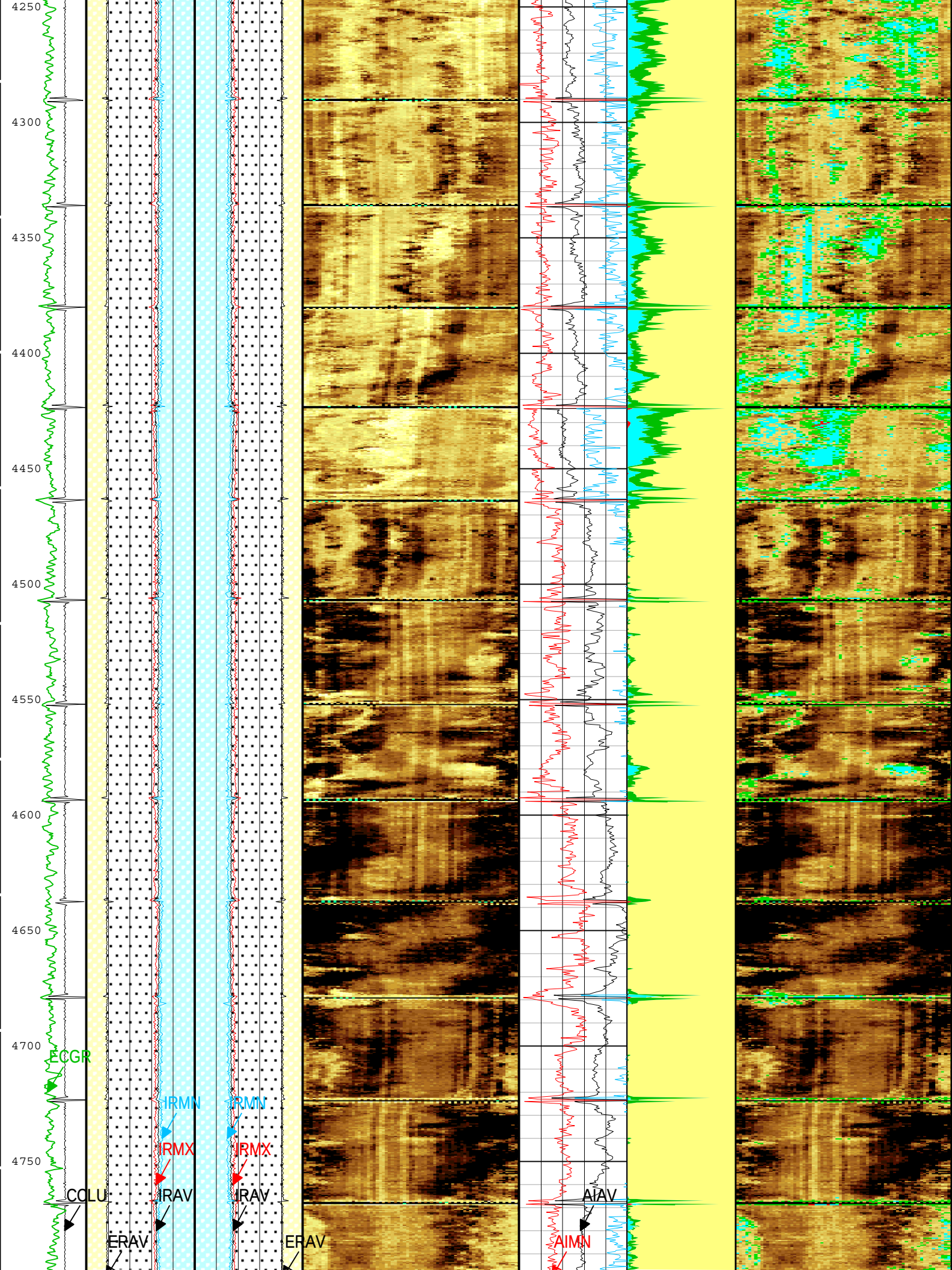

1500
1550
1600
1650
1700
1750
1800
1850
1900
1950
2000

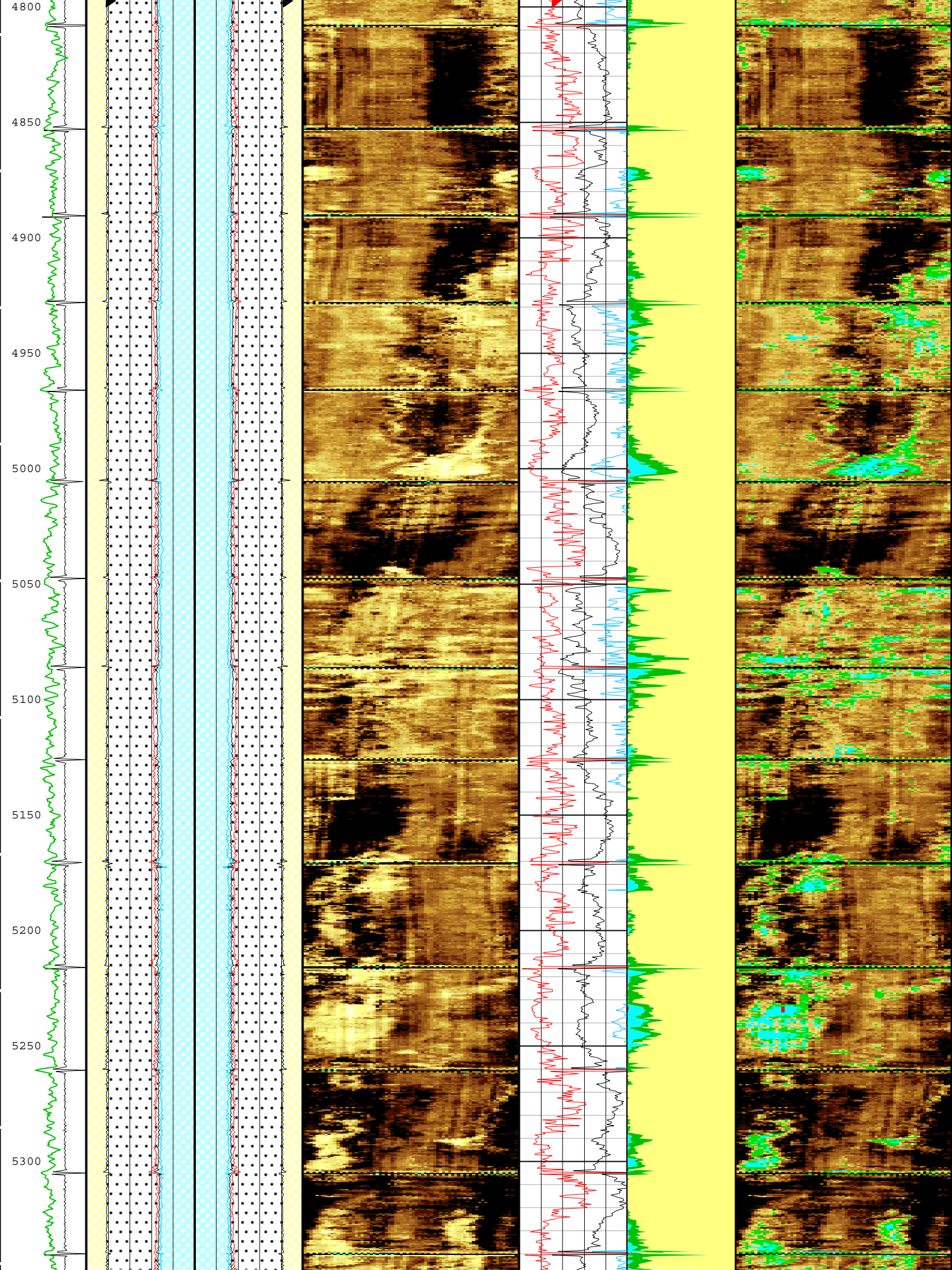

2050
2100
2150
2200
2250
2300
2350
2400
2450
2500
2550
GCGR
IRMN
IRMN
IRMX
IRMX
COLU
IRAV
IRAV
ERAV
ERAV
AIMX
AIAV
AIMN

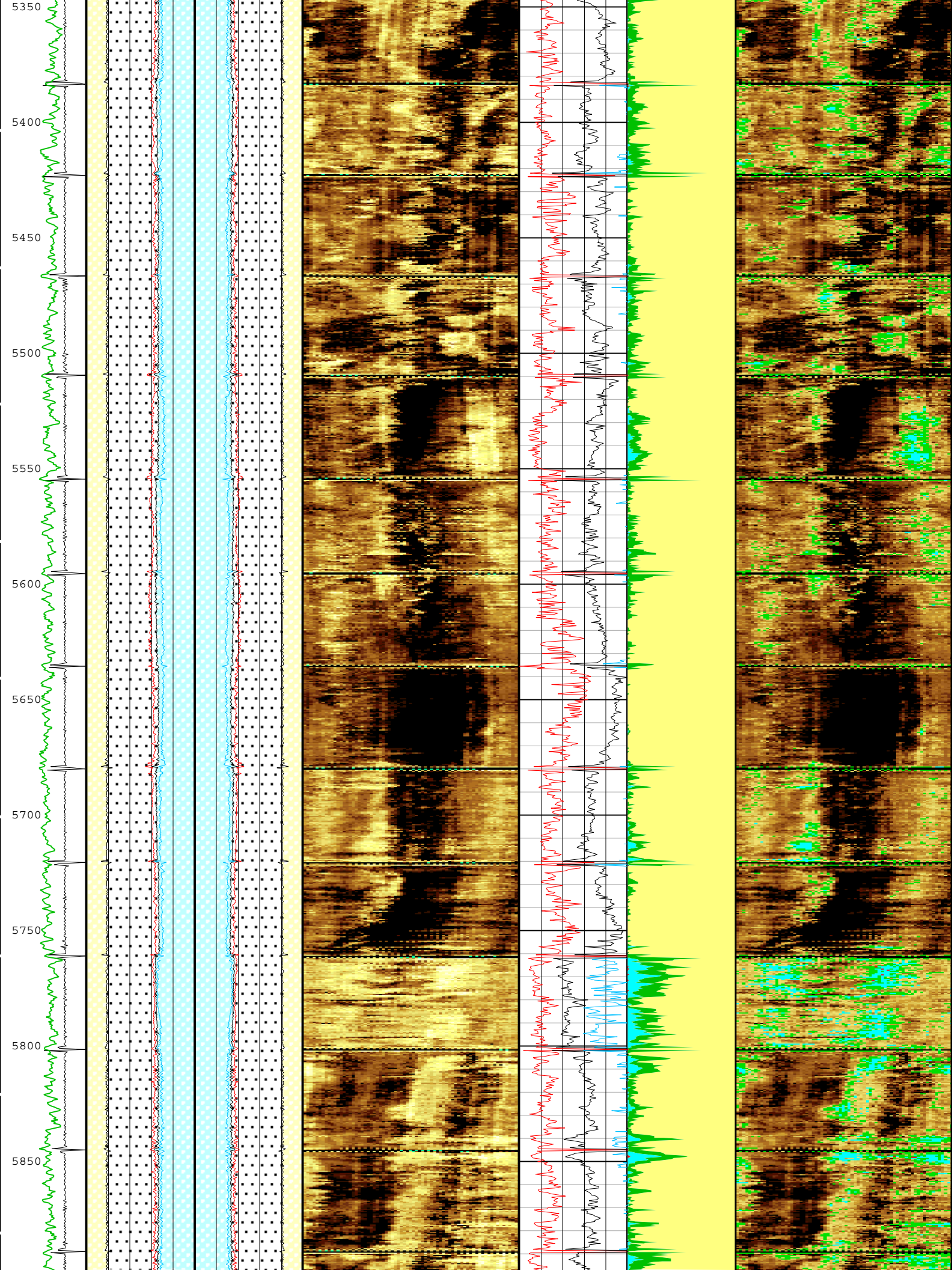

2600
2650
2700
2750
2800
2850
2900
2950
3000
3050
3100

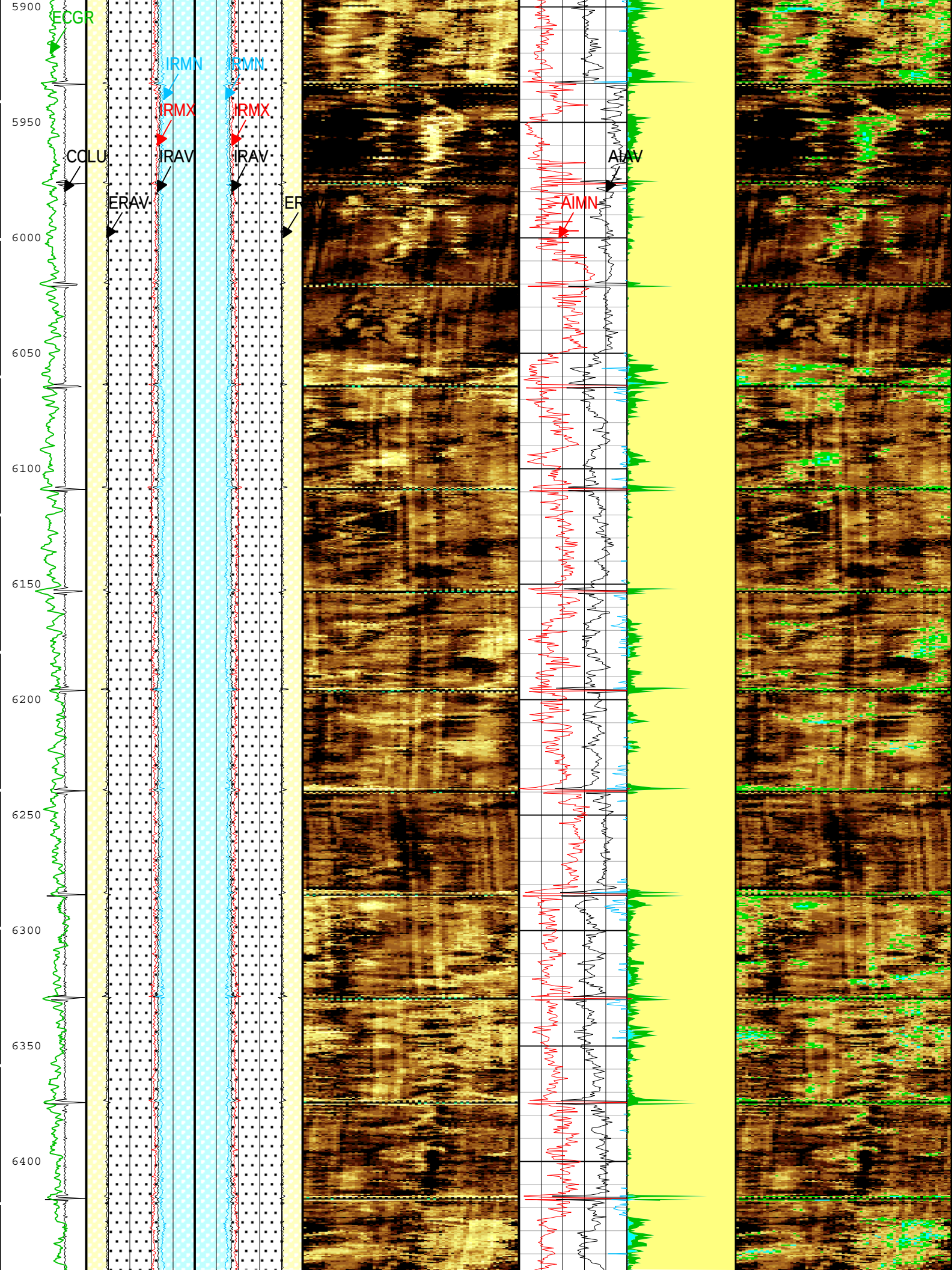

3150
3200
3250
3300
3350
3400
3450
3500
3550
3600
3650
ECGR
IRMN
IRMN
IRMX
IRMX
COLU
IRAV
IRAV
ERAV
ERAV
AIMX
AIAV
AIMN

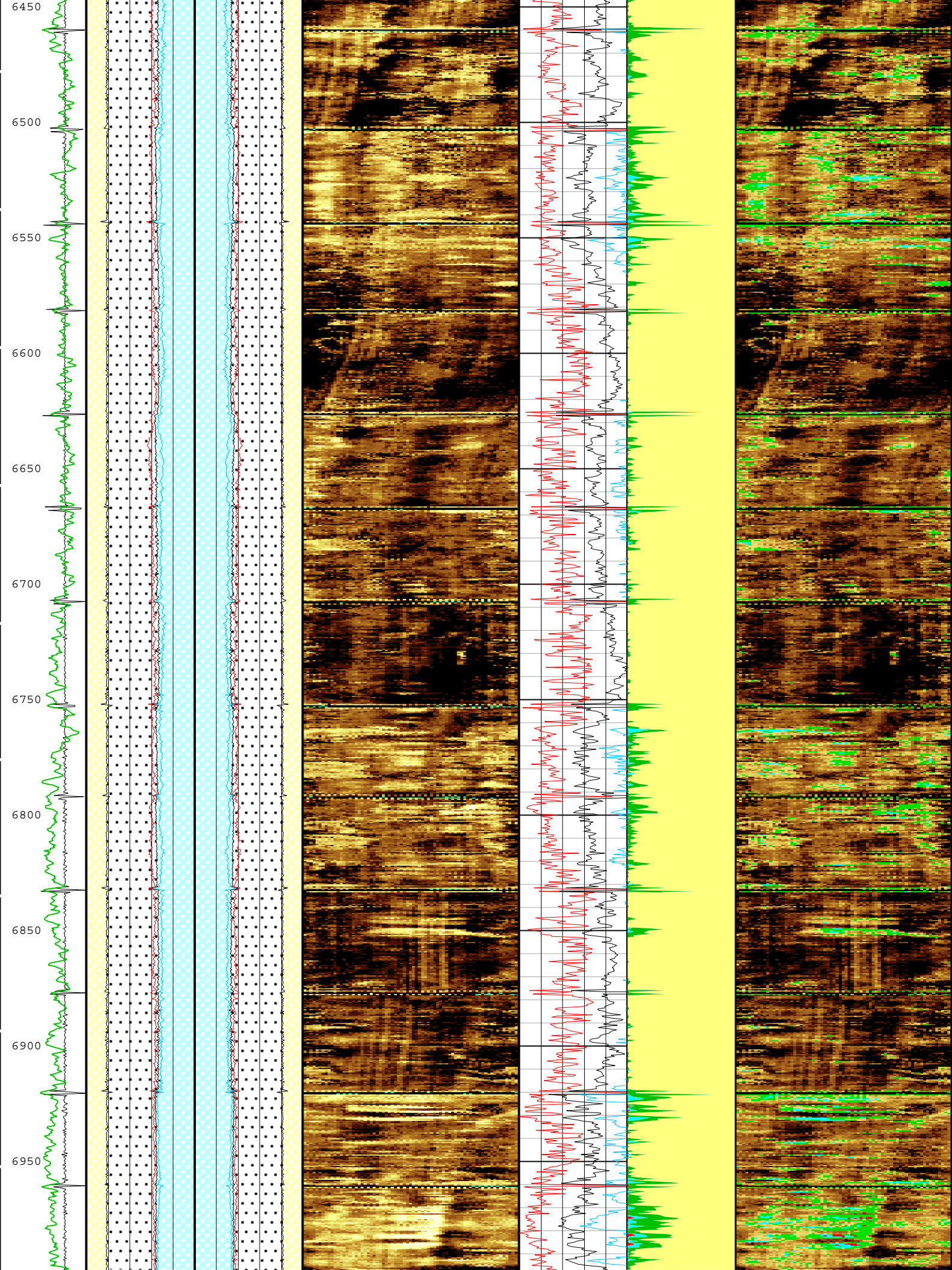

3700
3750
3800
3850
3900
3950
4000
4050
4100
4150
4200


4250
4300
4350
4400
4450
4500
4550
4600
4650
4700
4750
ECGR
IRMN
IRMX
COLU
IRAV
ERAV
IRMN
IRMX
IRAV
ERAV
AIAV
AIMN


4800
4850
4900
4950
5000
5050
5100
5150
5200
5250
5300


5350
5400
5450
5500
5550
5600
5650
5700
5750
5800
5850


5900
5950
6000
6050
6100
6150
6200
6250
6300
6350
6400
ECGR
IRMN
IRMN
IRMX
IRMX
COLU
IRAV
IRAV
AIAV
ERAV
AIMN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6500
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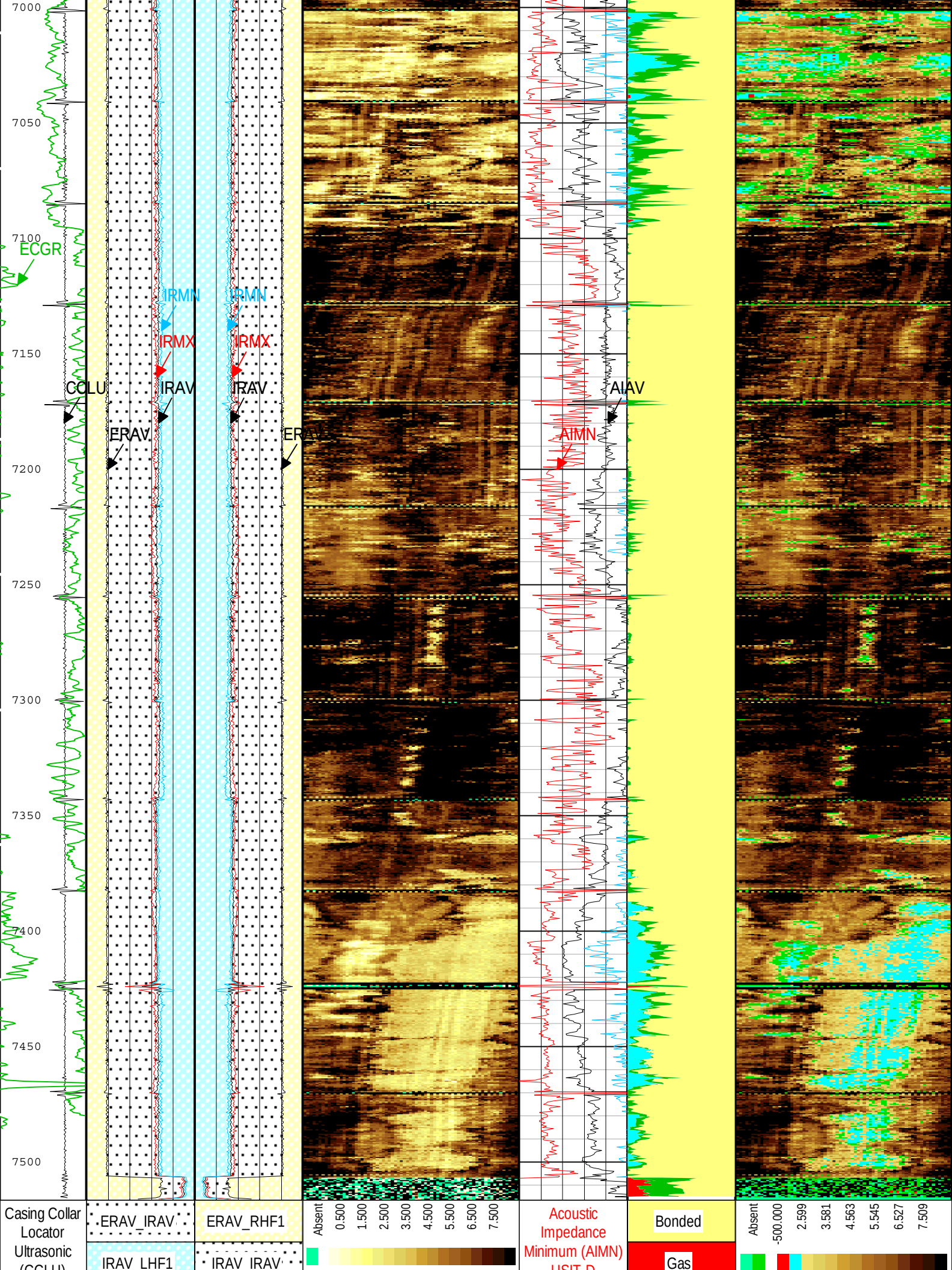
6750
6800
6850
6900
6950


7000
7050
7100
7150
7200
7250
7300
7350
7400
7450
7500
ECGR
IRMN
IRMX
IRAV
COLU
ERAV
AIAV
AIMN
Casing Collar Locator
Ultrasonic (CCLU)
ERAV_IRAV
IRAV_LHF1
ERAV_RHF1
IRAV_IRAV
Absent
0.500
1.500
2.500
3.500
4.500
5.500
6.500
7.500
Acoustic Impedance Minimum (AIMN)
Bonded
Gas
Absent
-500.000
2.599
3.581
4.563
5.545
6.527
7.509

(CCLU) USIT-D
-30 in 10

Gamma Ray (ECGR) HGNS-H
0 gAPI 100

LHF1_ERAV | RHF1_IRAV

External Radii Average (ERAV) USIT-D
5 in 4 | 4 in 5

Internal Radius Averaged Value (IRAV) USIT-D
5 in 4 | 4 in 5

Internal Radius Maximum Value (IRMX) USIT-D
5 in 4 | 4 in 5

Internal Radius Minimum Value (IRMN) USIT-D
5 in 4 | 4 in 5

Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D (Mrayl)

USIT-D
-1 Mrayl 9

Acoustic Impedance Average (AIAV) USIT-D
-1 Mrayl 9

Acoustic Impedance Maximum (AIMX) USIT-D
-1 Mrayl 9

Liquid

Micro-debonding

Custom Normalization
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-D (Mrayl)

TIME_1900 - Time Marked every 60.00 (s)

Description: USI Cement Format: Log (UCRC_USI Cement 9.625inch) Index Scale: 2 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 03-Aug-2015 21:34:55

2.B

USIT Goodwin Compressed

Software Version

Acquisition System	Version
Maxwell	5.2.40401.3100

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
2.B	Log[4]:Up	Up	22.62 ft	7516.79 ft	03-Aug-2015 5:35:50 PM	03-Aug-2015 7:56:54 PM	ON	6.58 ft	Yes

All depths are referenced to toolstring zero

Log

Company:Southern California Gas Company Well:Fernando Fee 32H

2.B: Log[4]:Up:S037

Description: USI Goodwin Format: Log (UCRC_Long Beach Custom Goodwin) Index Scale: 0.1 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 03-Aug-2015 21:35:03

TIME_1900 - Time Marked every 60.00 (s)

Motor Revolution Speed (RSAV) USIT-D
6 c/s 8

Amplitude of Eccentering

Average Acoustic Impedance 1 (AV_AI1) USIT-D
0 10 Mrayl

Average Acoustic Impedance 2 (AV_AI2) USIT-D
0 10 Mrayl

Average Acoustic Impedance 3 (AV_AI3) USIT-D
0 10 Mrayl

Average Acoustic Impedance 4 (AV_AI4) USIT-D
0 10 Mrayl

Average Acoustic Impedance 5 (AV_AI5) USIT-D
0 10 Mrayl

Average Acoustic Impedance 6 (AV_AI6) USIT-D
0 10 Mrayl

Average Acoustic Impedance 7 (AV_AI7) USIT-D
0 10 Mrayl

Average Acoustic Impedance 8 (AV_AI8) USIT-D
0 10 Mrayl

Average Acoustic Impedance 9 (AV_AI9) USIT-D
0 10 Mrayl

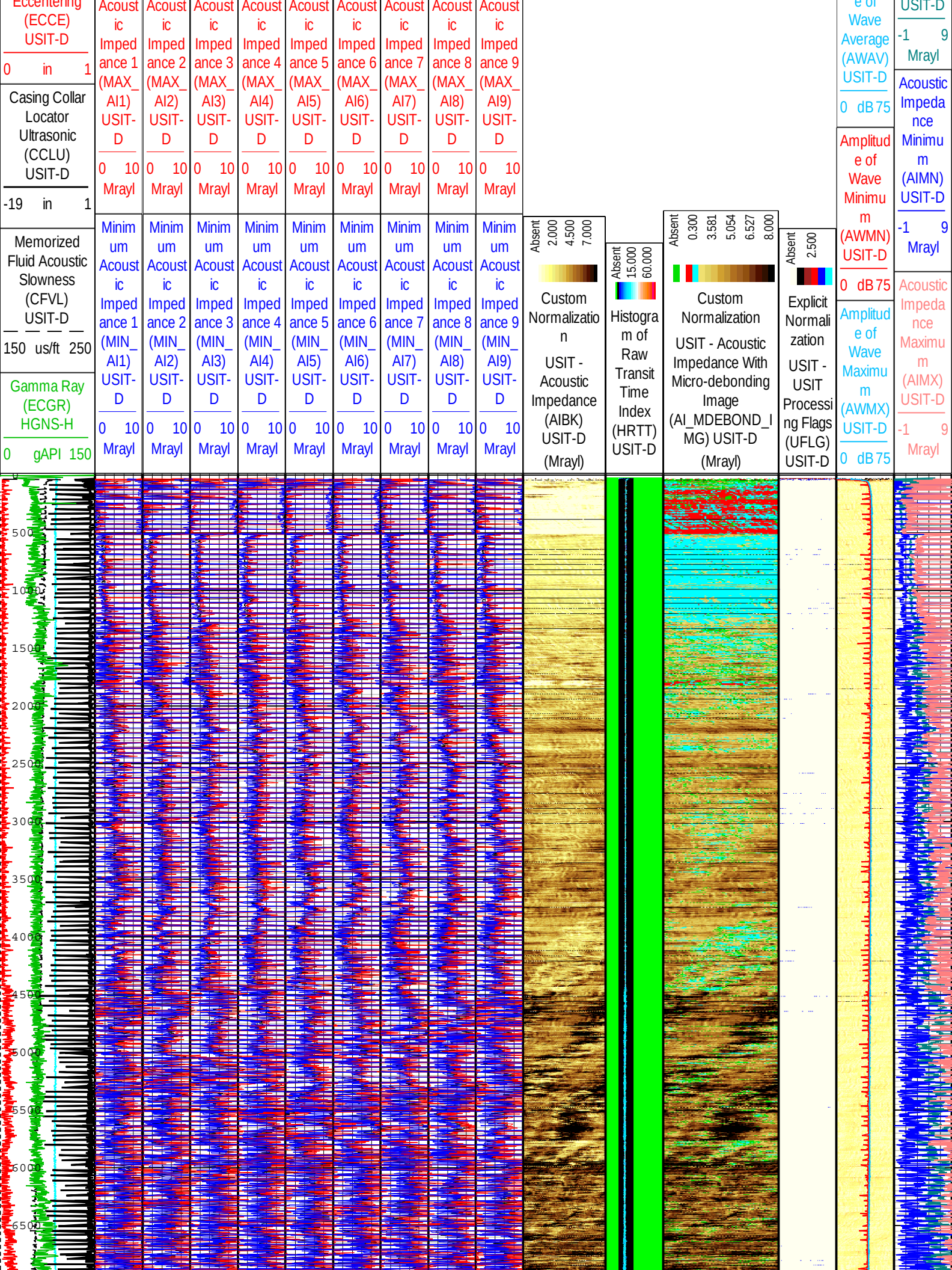
Maximum

Absent -4.000 -1.200

Explicit Normalization
USIT - Amplitude of Wave (AWBK) USIT-D (dB)

Acoustic Impedance Average (AIAV)

Amplitud


Eccentering (ECCE) USIT-D
0 in 1
Casing Collar Locator Ultrasonic (CCLU) USIT-D
-19 in 1
Memorized Fluid Acoustic Slowness (CFVL) USIT-D
150 us/ft 250
Gamma Ray (ECGR) HGNS-H
0 gAPI 150
Acoustic Impedance 1 (MAX_AI1) USIT-D
Acoustic Impedance 2 (MAX_AI2) USIT-D
Acoustic Impedance 3 (MAX_AI3) USIT-D
Acoustic Impedance 4 (MAX_AI4) USIT-D
Acoustic Impedance 5 (MAX_AI5) USIT-D
Acoustic Impedance 6 (MAX_AI6) USIT-D
Acoustic Impedance 7 (MAX_AI7) USIT-D
Acoustic Impedance 8 (MAX_AI8) USIT-D
Acoustic Impedance 9 (MAX_AI9) USIT-D
0 10 Mrayl
Minimum Acoustic Impedance 1 (MIN_AI1) USIT-D
Minimum Acoustic Impedance 2 (MIN_AI2) USIT-D
Minimum Acoustic Impedance 3 (MIN_AI3) USIT-D
Minimum Acoustic Impedance 4 (MIN_AI4) USIT-D
Minimum Acoustic Impedance 5 (MIN_AI5) USIT-D
Minimum Acoustic Impedance 6 (MIN_AI6) USIT-D
Minimum Acoustic Impedance 7 (MIN_AI7) USIT-D
Minimum Acoustic Impedance 8 (MIN_AI8) USIT-D
Minimum Acoustic Impedance 9 (MIN_AI9) USIT-D
Absent 2.000 4.500 7.000
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D
(Mrayl)
Absent 15.000 60.000
Histogram of Raw Transit Time Index (HRTT) USIT-D
Absent 0.300 3.581 5.054 6.527 8.000
Custom Normalization
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-D
(Mrayl)
Absent 2.500
Explicit Normalization
USIT - USIT Processing Flags (UFLG) USIT-D
Wave Average (AWAV) USIT-D
0 dB 75
Amplitude of Wave Minimum (AWMN) USIT-D
0 dB 75
Amplitude of Wave Maximum (AWMX) USIT-D
0 dB 75
USIT-D
-1 9 Mrayl
Acoustic Impedance Minimum (AIMN) USIT-D
-1 9 Mrayl
Acoustic Impedance Maximum (AIMX) USIT-D
-1 9 Mrayl
500
1000
1500
2000
2500
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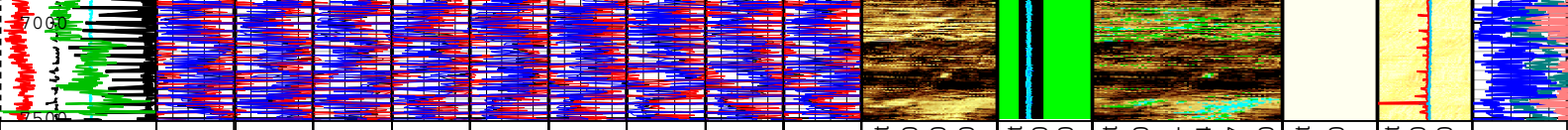
4000
4500
5000
5500
6000
6500



Motor Revolution Speed (RSAV) USIT-D
6 c/s 8

Amplitude of Eccentering (ECCE) USIT-D
0 in 1

Casing Collar Locator Ultrasonic (CCLU) USIT-D
-19 in 1

Memorized Fluid Acoustic Slowness (CFVL) USIT-D
150 us/ft 250

Gamma Ray (ECGR) HGNS-H
0 gAPI 150

Average Acoustic Impedance 1 (AV_AI1) USIT-D
0 10 Mrayl

Average Acoustic Impedance 2 (AV_AI2) USIT-D
0 10 Mrayl

Average Acoustic Impedance 3 (AV_AI3) USIT-D
0 10 Mrayl

Average Acoustic Impedance 4 (AV_AI4) USIT-D
0 10 Mrayl

Average Acoustic Impedance 5 (AV_AI5) USIT-D
0 10 Mrayl

Average Acoustic Impedance 6 (AV_AI6) USIT-D
0 10 Mrayl

Average Acoustic Impedance 7 (AV_AI7) USIT-D
0 10 Mrayl

Average Acoustic Impedance 8 (AV_AI8) USIT-D
0 10 Mrayl

Average Acoustic Impedance 9 (AV_AI9) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 1 (MAX_AI1) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 2 (MAX_AI2) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 3 (MAX_AI3) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 4 (MAX_AI4) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 5 (MAX_AI5) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 6 (MAX_AI6) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 7 (MAX_AI7) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 8 (MAX_AI8) USIT-D
0 10 Mrayl

Maximum Acoustic Impedance 9 (MAX_AI9) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 1 (MIN_AI1) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 2 (MIN_AI2) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 3 (MIN_AI3) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 4 (MIN_AI4) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 5 (MIN_AI5) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 6 (MIN_AI6) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 7 (MIN_AI7) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 8 (MIN_AI8) USIT-D
0 10 Mrayl

Minimum Acoustic Impedance 9 (MIN_AI9) USIT-D
0 10 Mrayl

Absent 2.000 4.500 7.000
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-D (Mrayl)

Absent 15.000 60.000
Histogram of Raw Transit Time Index (HRTT) USIT-D

Absent 0.300 3.581 5.054 6.527 8.000
Custom Normalization
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-D (Mrayl)

Absent 2.500
Explicit Normalization
USIT - USIT Processing Flags (UFLG) USIT-D

Absent -4.000 -1.200
Explicit Normalization
USIT - Amplitude of Wave (AWBK) USIT-D (dB)

Amplitude of Wave Average (AWAV) USIT-D
0 dB 75

Amplitude of Wave Minimum (AWMN) USIT-D
0 dB 75

Amplitude of Wave Maximum (AWMX) USIT-D
0 dB 75

Acoustic Impedance Average (AIAV) USIT-D
-1 9 Mrayl

Acoustic Impedance Minimum (AIMN) USIT-D
-1 9 Mrayl

Acoustic Impedance Maximum (AIMX) USIT-D
-1 9 Mrayl

TIME_1900 - Time Marked every 60.00 (s)

Description: USI Goodwin Format: Log (UCRC_Long Beach Custom Goodwin) Index Scale: 0.1 in per 100 ft Index Unit: ft Index Type: Measured Depth
Creation Date: 03-Aug-2015 21:35:03

Channel Processing Parameters

2.B: Parameters

Parameter	Description	Tool	Value	Unit
ISSBAR	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Open	
BS	Bit Size	WLSESSION	Depth Zoned	in
CBLO	Casing Bottom (Logger)	WLSESSION	7507	ft
CDEN	Cement Density	HGNS-H	2	g/cm3
CMTY(U-USIT_CEMT)	Cement Type	USIT-D	Regular Cement	
THNO	Nominal Casing Thickness - Zoned along logger depths	WLSESSION	0.472	in
DFD	Drilling Fluid Density	Borehole	8.5	lbm/gal
DFT	Drilling Fluid Type	Borehole	Water	
DTMD	Borehole Fluid Slowness	Borehole	188	us/ft

FD	Fluid Density	USIT-D	1.2	g/cm3
FDII	FPM Data Interpolation Interval	USIT-D	0	ft
GCSE_DOWN_PASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	BS	
GCSE_UP_PASS	Generalized Caliper Selection for WL Log Up Passes	Borehole	BS	
HEMA	Hematite Presence Flag	Borehole	No	
ICE_PROCESS	ICE Processing	USIT-D	Yes	
IMAR	Image Rotation	USIT-D	Off	
MEAS_WLEN	Tcube Processing Window Length in Measurement Mode	USIT-D	Depth Zoned	us
MUD_N_FRP	Free Pipe Mud Normalization Factor	USIT-D	1.2	
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-D	1.6	Mrayl
UFGDE	Fiberglass Density	USIT-D	1.95	g/cm3
UFGPS	Fiberglass Processing Selection	USIT-D	No	
UFGVL	Fiberglass Velocity	USIT-D	9678.48	ft/s
USI_FSOD	USIT USI Fluid Slowness Fits Casing Outer Diameter	USIT-D	0_OFF	
USI_FVEL_SEL	USI Fluid Velocity Selection	USIT-D	Automatic	
USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-D	FreePipe Norm.	
ZMUD	Acoustic Impedance of Mud	Borehole	1.48	Mrayl

Depth Zone Parameters

Parameter	Value	Start (ft)	Stop (ft)
BS	17	0	1100
BS	14	1100	7505
BS	8.5	7505	7516.5
MEAS_WLEN	29.67	0	7507
MEAS_WLEN	20	7507	7516.5

All depth are actual.

Tool Control Parameters

2.B: Parameters

Parameter	Description	Tool	Value	Unit
AGMN	Minimum Gain of Cartridge	USIT-D	-4	dB
AGMX	Maximum Gain of Cartridge	USIT-D	20	dB
U-USIT_DDT5	USIC Downhole Decimation for T5 only	USIT-D	0_NONE	
EMXV	EMEX Voltage	USIT-D	70	V
HRES	Horizontal Resolution	USIT-D	5 deg	
TMUC	Type of Mud	USIT-D	BRI	
ULOG	Logging Objective	USIT-D	MEASUREMENT	
UMFR	Modulation Frequency	USIT-D	333333	Hz
USFR	Ultrasonic Sampling Frequency	USIT-D	500000	Hz
UPAT	USIT Emission Pattern	USIT-D	Pattern 300 KHz	
UWKM	USIT Working Mode	USIT-D	Uncompressed 5 deg at 6.0 in LF	
USIT_DEPTHLOG	Starting Depth Log for Ultrasonics	USIT-D	7505	ft
WINB	Window Begin Time	USIT-D	40	us
WINE	Window End Time	USIT-D	85.35	us

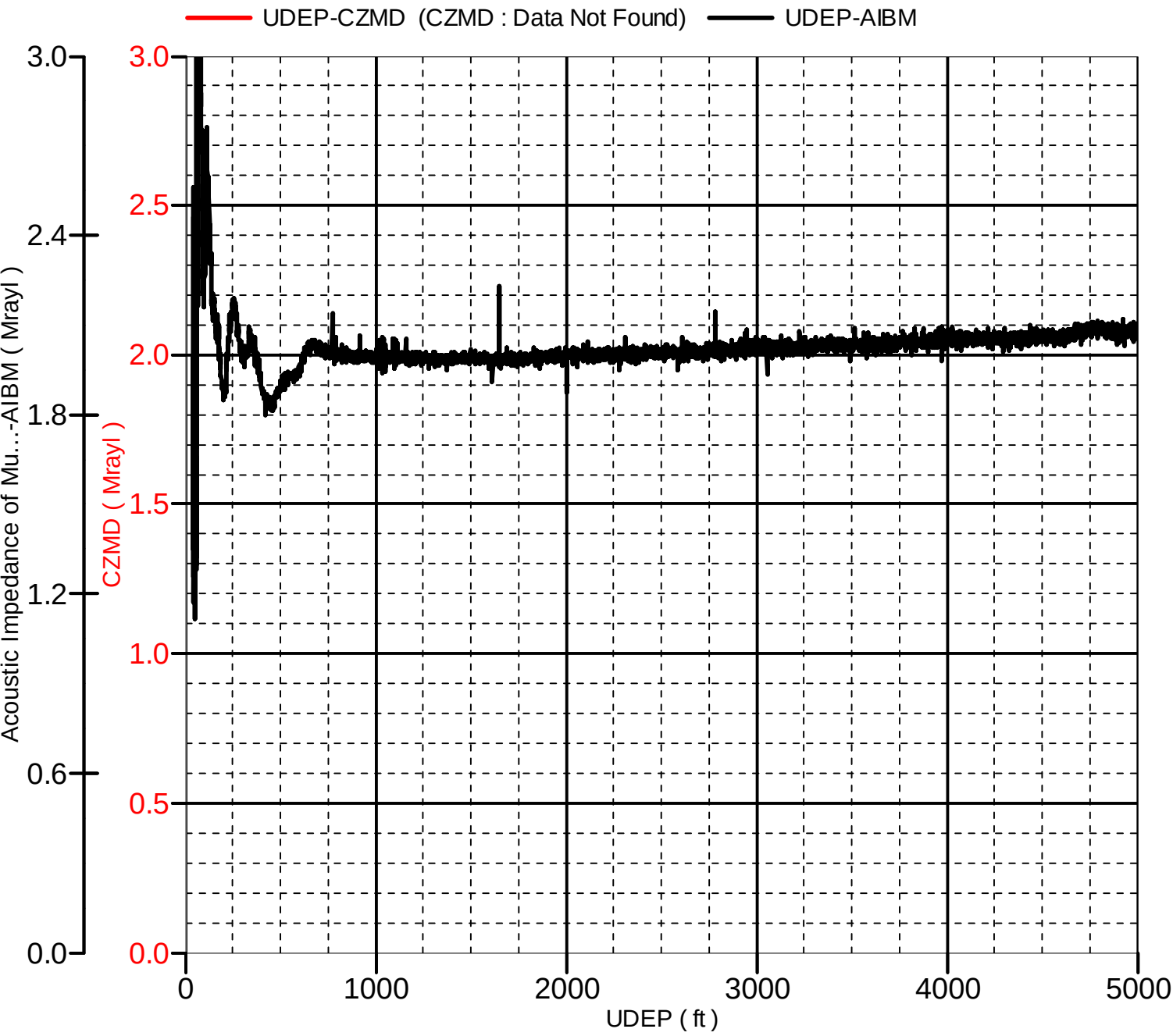
Well Diagram - Status Before

Well Diagram - Proposed Drilling

Acoustic Impedance of Mud vs Depth

2D Cross Plot

Index Range: From 34.50 to 7504.50 ft



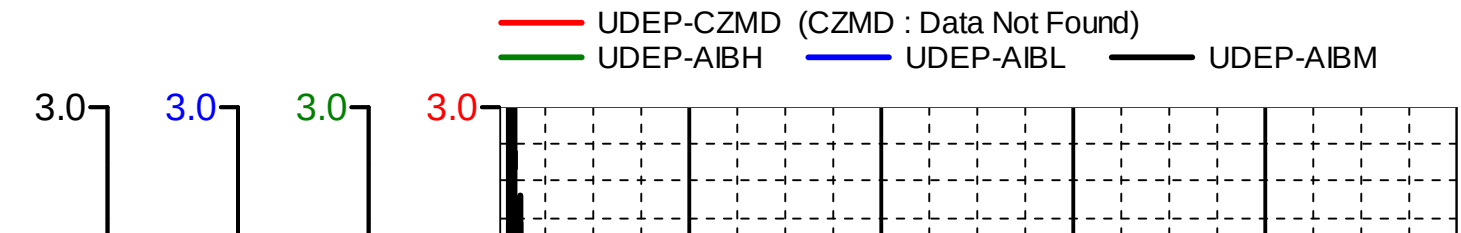
XYZ

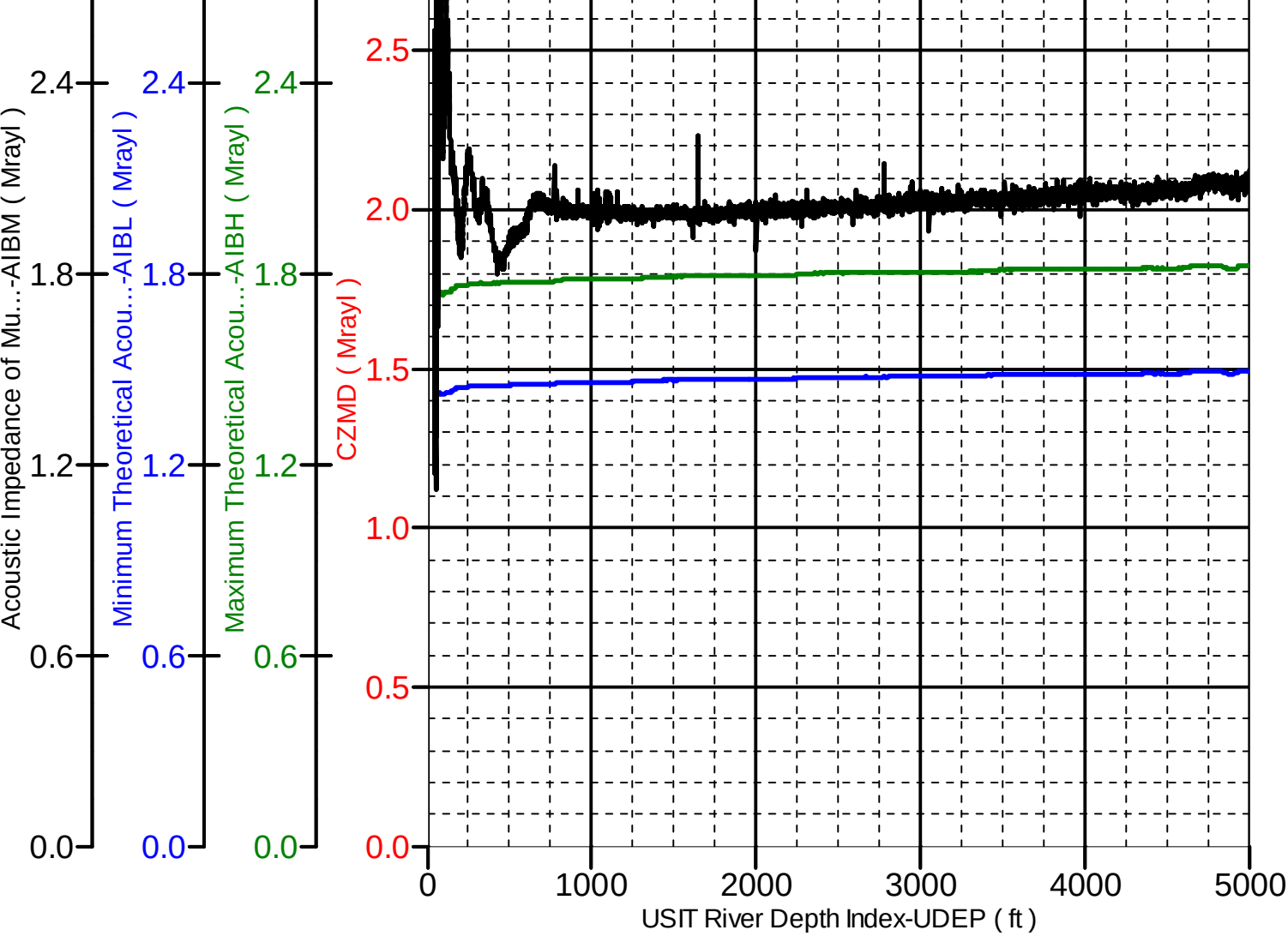
Company:Southern California Gas Company Well:Fernando Fee 32H
2.B: Log[1]:Down:S037

Theoretical Acoustic Impedance of Mud vs Depth

2D Cross Plot

Index Range: From 34.50 to 7504.50 ft





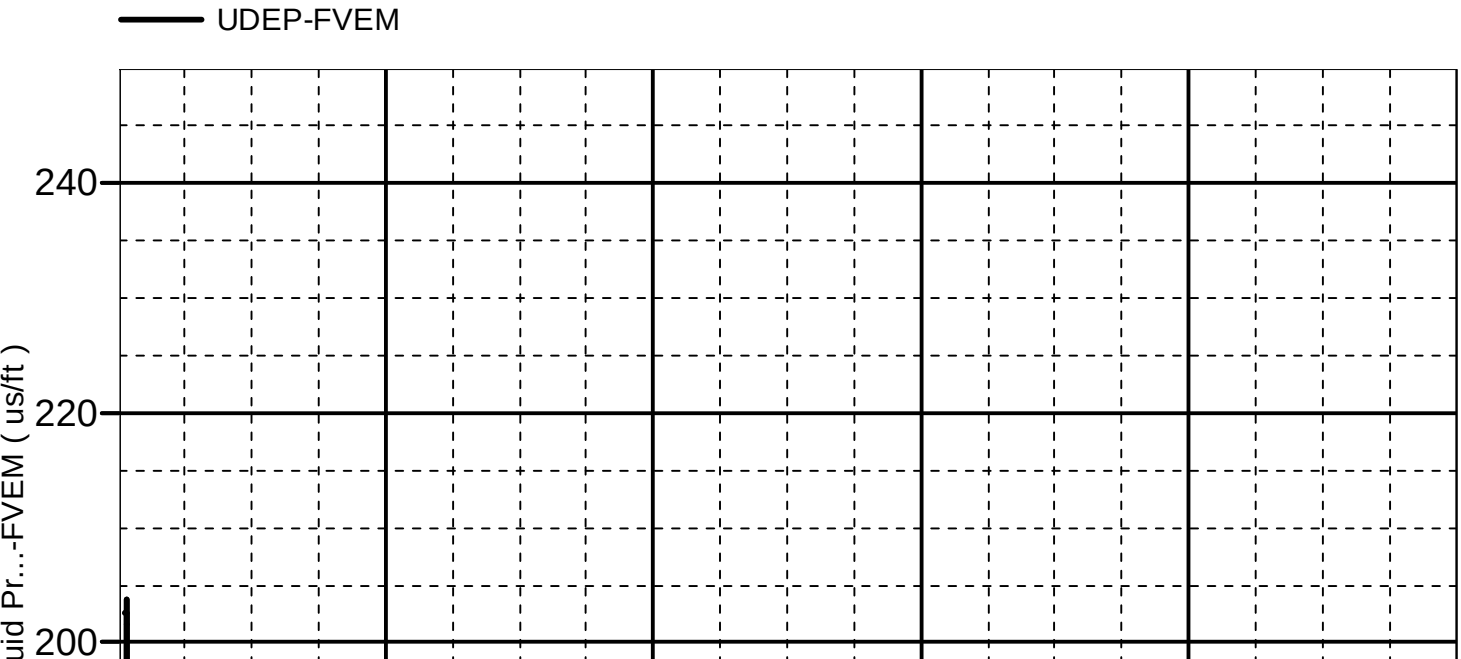
XYZ

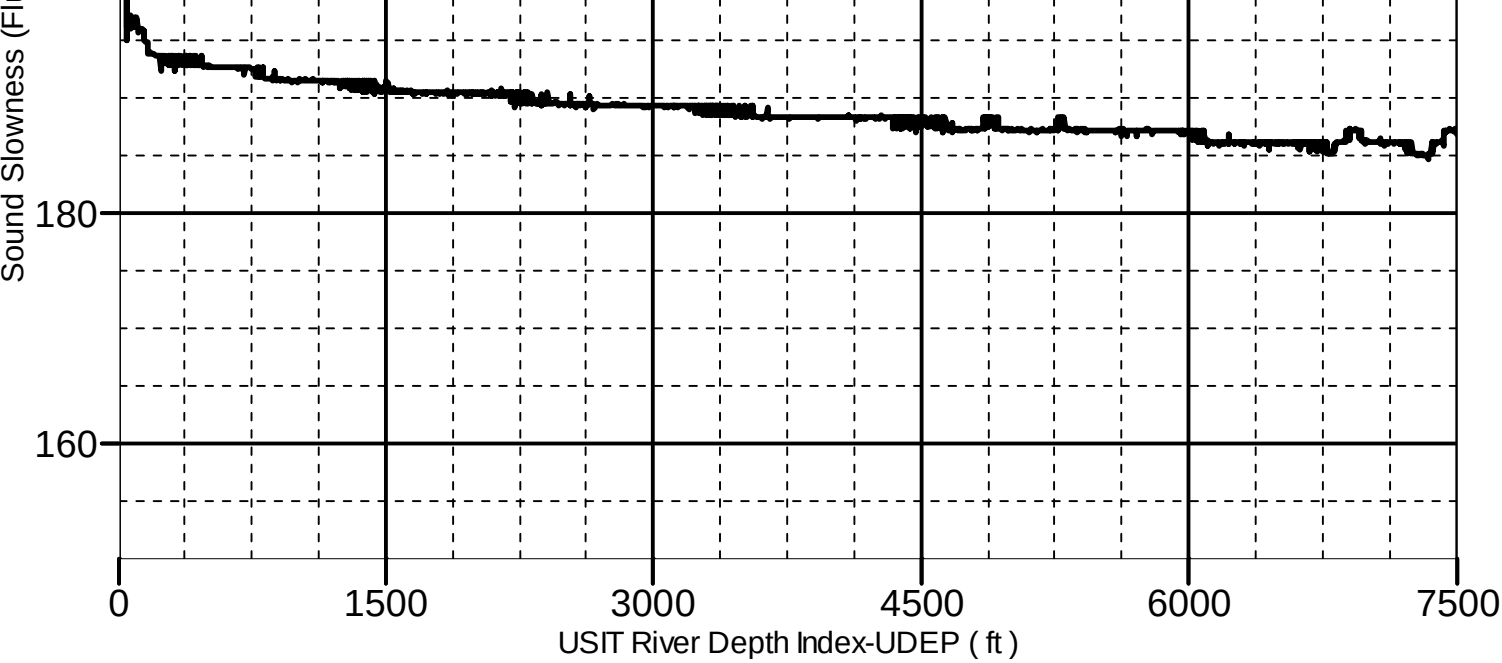
Company:Southern California Gas Company Well:Fernando Fee 32H
2.B: Log[1]:Down:S037

Fluid Acoustic Slowness vs Depth

2D Cross Plot

Index Range: From 34.50 to 7504.50 ft





Company:	Southern California Gas Company
Well:	Fernando Fee 32H
Field:	Aliso Canyon
County:	Los Angeles

Schlumberger

State: California

Ultrasonic Imager

Gamma Ray - CCL