Schlumberger

Company: Noble Energy Inc

Well: Larson A23-645

Field: Wattenberg

County: Weld State: Colorado

UltraSonic Summary Print

County: Weld
Field: Wattenberg
Location: SWNW 19-6N-63W
Well: Larson A23-645
Company: Noble Energy Inc

Location:

SWNW 19-6N-63W 2397 FNL & 535 FWL	Elev.:	K.B.	4679.00 ft
		G.L.	4649.00 ft
		D.F.	4679.00 ft

Permanent Datum:	Ground Level	Elev.:	4649.00 f
Log Measured From:	Kelly Bushing	30.00 ft	above Perm.Datum
Drilling Measured From:	Kelly Bushing		

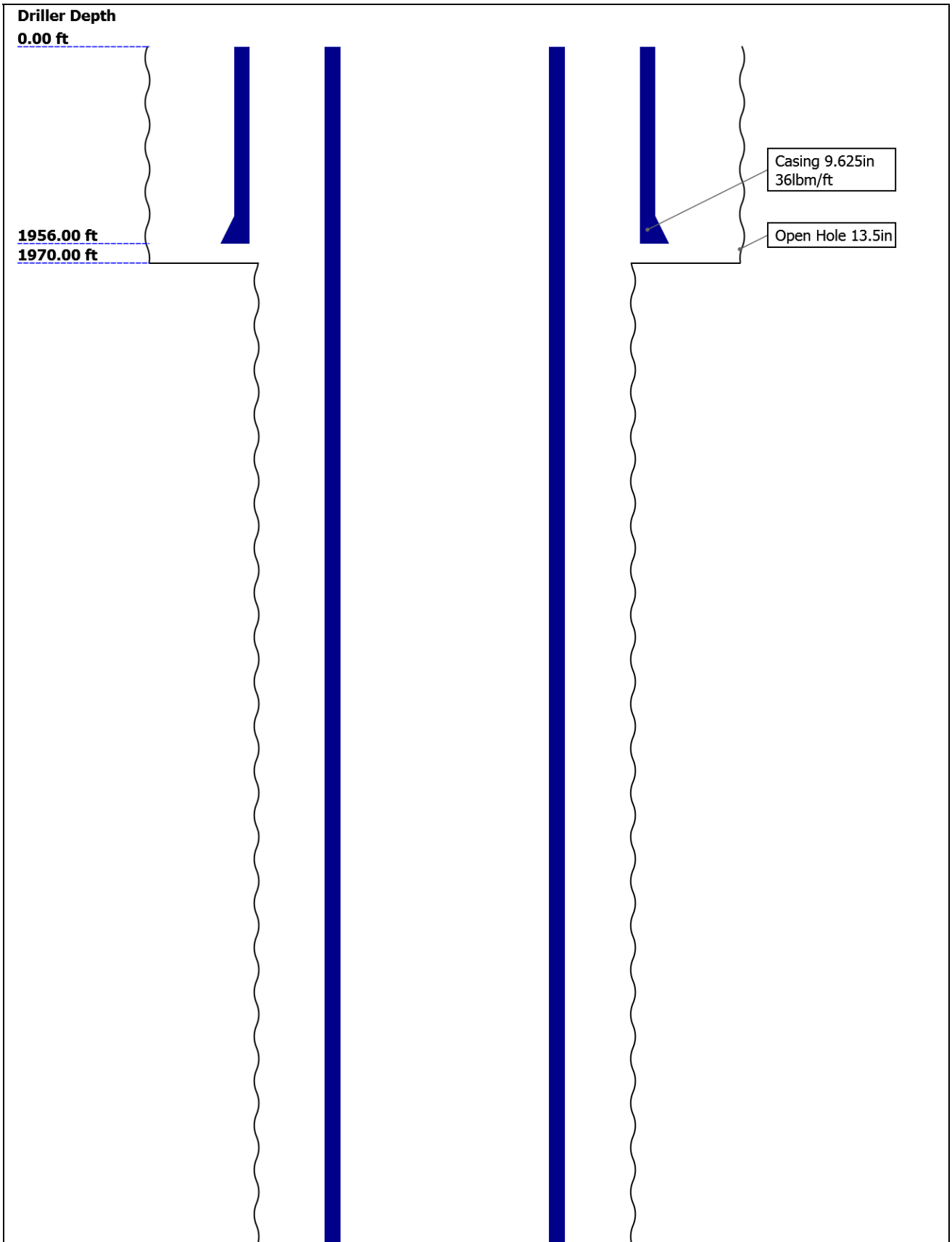
API Serial No.	Section:	Township:	Range:
05-123-45515	19	6N	63W

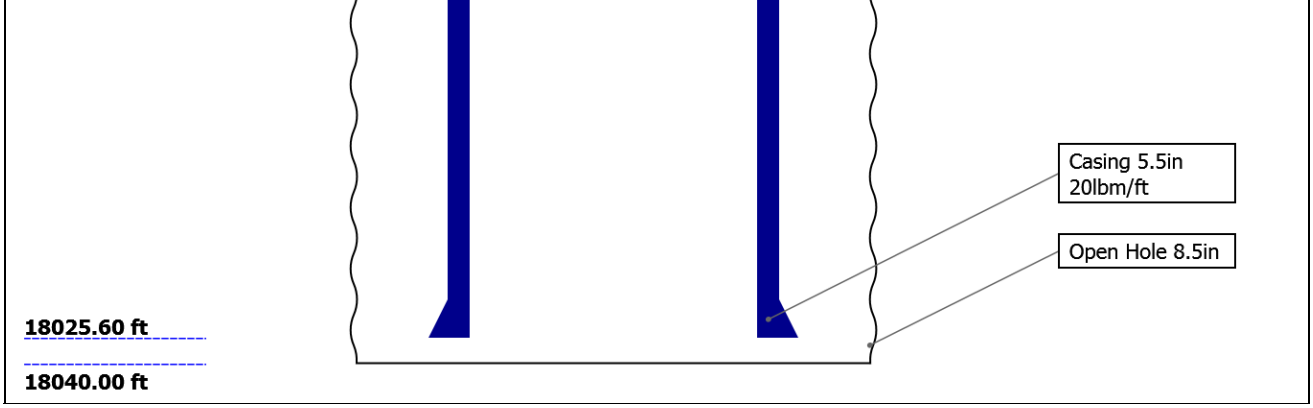
Logging Date	17-Jun-2018		
Run Number	UltraSonic - Nuetron		
Depth Driller	18040.00 ft		
Schlumberger Depth	18040.00 ft		
Bottom Log Interval	5990.00 ft		
Top Log Interval	100.00 ft		
Casing Fluid Type	Water		
Salinity			
Density	8.4 lbm/gal		
Fluid Level	8.00 ft		
BIT/CASING/TUBING STRING			
Bit Size	8.50 in		
From	1970.00 ft		
To	18040.00 ft		
Casing/Tubing Size	5.5 in		
Weight	20 lbm/ft		
Grade	N/A		
From	0.00 ft		
To	18025.60 ft		
Max Recorded Temperatures	185.6 degF		
Logger on Bottom Time	17-Jun-2018	12:02:00	
Unit Number Location:	OSLC-EA 2377	Ft. Morgan	
Recorded By	L. Awalt		
Witnessed By	B. Mansfield		

Disclaimer

Contents

Well Sketch





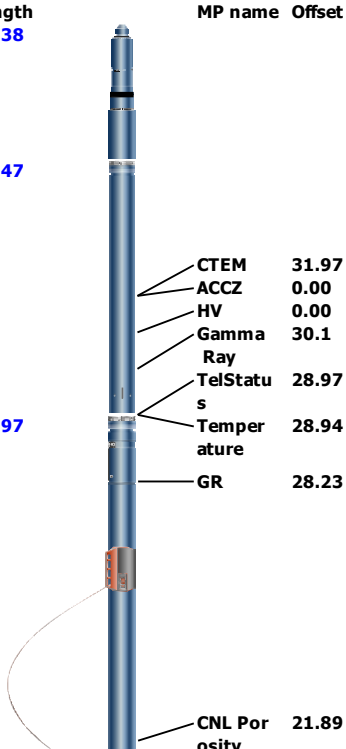
Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	13.5	8.5				
Top Driller (ft)	0	1970				
Top Logger (ft)	0	1970				
Bottom Driller (ft)	1970	18040				
Bottom Logger (ft)	1970	18040				
Casing						
Size (in)	9.625	5.5				
Weight (lbm/ft)	36	20				
Inner Diameter (in)	8.921	4.778				
Grade	N/A	N/A				
Top Driller (ft)	0	0				
Top Logger (ft)	0	0				
Bottom Driller (ft)	1956	18025.6				
Bottom Logger (ft)	1956	18025.6				

Remarks and Equipment Summary

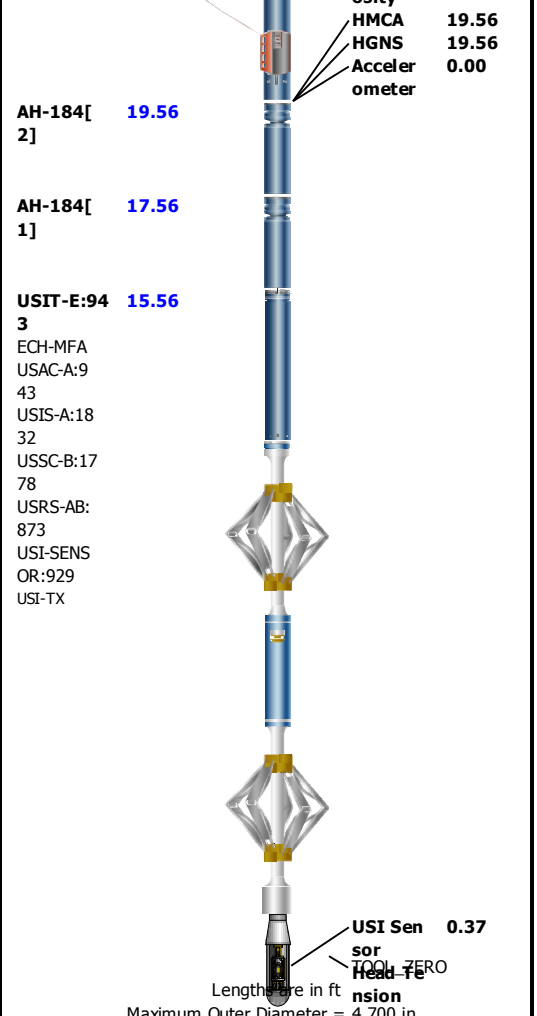
UltraSonic - Nuetron: Toolstring

Equip name	Length
LEH-QT	**38.38**
LEH-QT	
EDTC-B:8478	**35.47**
EDTH-B	
EDTG-A	
EDTC-B:8478	
HGNS-H	**28.97**
HGNH	
NSR-F:5203	
NPV-N	
HACCZ-H:4168	
HMCA-H	
HGNS-H	



MP name	Offset
CTEM	31.97
ACCZ	0.00
HV	0.00
Gamma Ray	30.1
TelStatus	28.97
Temperature	28.94
GR	28.23
CNL Porosity	21.89

UltraSonic - Nuetron: Remarks
Thank you for choosing Schlumberger!
Log run for casing and cement evaluation
Tools run centralized as per tool sketch
Log run in combination with nuetron log
USRS-AB sub run with USI-TX transducer
Crew: Doug Robinson, Gary Lapp



Depth Summary

	UltraSonic - Nuetron		
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			

UltraSonic - Nuetron: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		

USIT - Fluid Properties Measurement

Run Name	Pass Name	Start Depth(ft)	Stop Depth(ft)
Run 1	Log[3]:Up	6034.41	59.89

Fluid Velocity = "Automatic".
CFVL equals DFSL channel

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

Mud Impedance = "Theoretical".
CZMD uses theoretical results.
MUD_N_THE=1.15
DFD=1.01g/cm3(8.40lbm/gal)

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

UltraSonic - Nuetron

2500 PSI Main Pass

Software Version

Acquisition System	Version
Maxwell 2017 SP3	7.3.92069.3100
Application Patch	Wireline_NPD-ICE2-2017SP3_7.3.93033
	Wireline_Hotfix-RTDLIS-2017SP3_7.3.92363
	Wireline_Hotfix-SML-2017SP3_7.3.101161
	Wireline_TestKit-CMR-NG-2017SP3_7.3.96073

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
UltraSonic - Nuetron	Log[3]:Up	Up	59.89 ft	6034.41 ft	17-Jun-2018 12:20:22 PM	17-Jun-2018 1:33:10 PM	ON	3.65 ft	Yes

All depths are referenced to toolstring zero

Log

Company:Noble Energy Inc Well:Larson A23-645

UltraSonic - Nuetron: Log[3]:Up:S003

Description: Format: Log (DJ Basin Ultrasonic Cement Summary Report) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth
Creation Date: 17-Jun-2018 17:21:02

TIME_1900 - Time Marked every 60.00 (s)

Casing Collar Locator Ultrasonic (CCLU) USIT-E
-20 in 1

Amplitude of Eccentering (ECCE) USIT-E
0 in 0.5

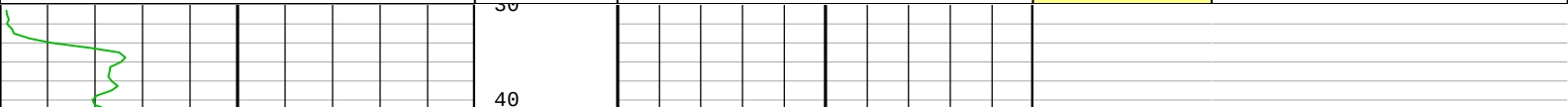
Gamma Ray (ECGR_EDTC) EDTC-B
0 gAPI 150

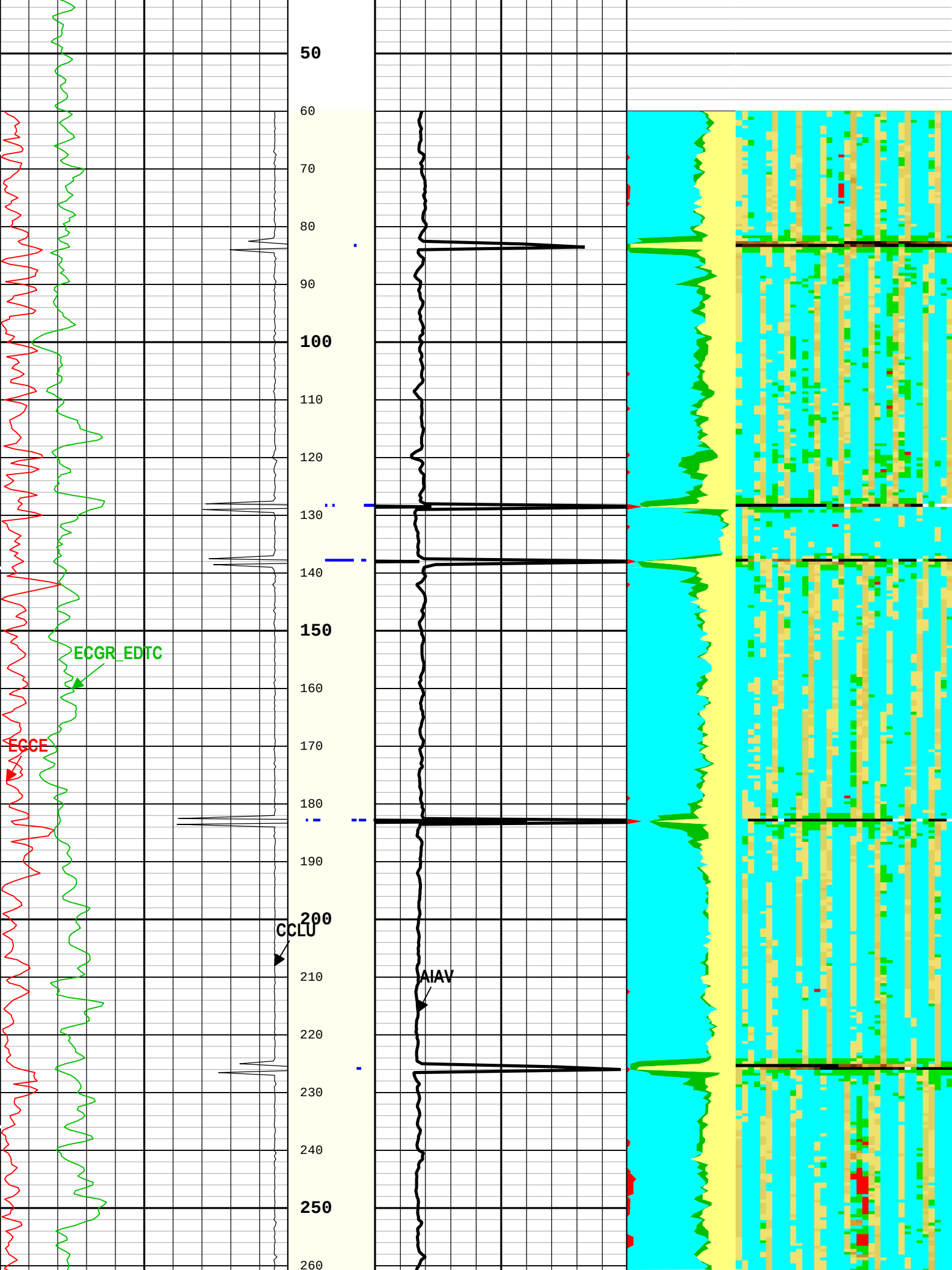
Absent 1.500 2.500 6.500
Explicit Normalization
USIT - USIT Processing Flags (UFLG) USIT-E

Acoustic Impedance Average (AIAV) USIT-E
0 Mrayl 10

Gas
Liquid
Micro-Debonding
Bonded

Absent -500.000 2.200 3.254 4.309 5.363 6.418 7.472
Custom Normalization
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-E (Mrayl)

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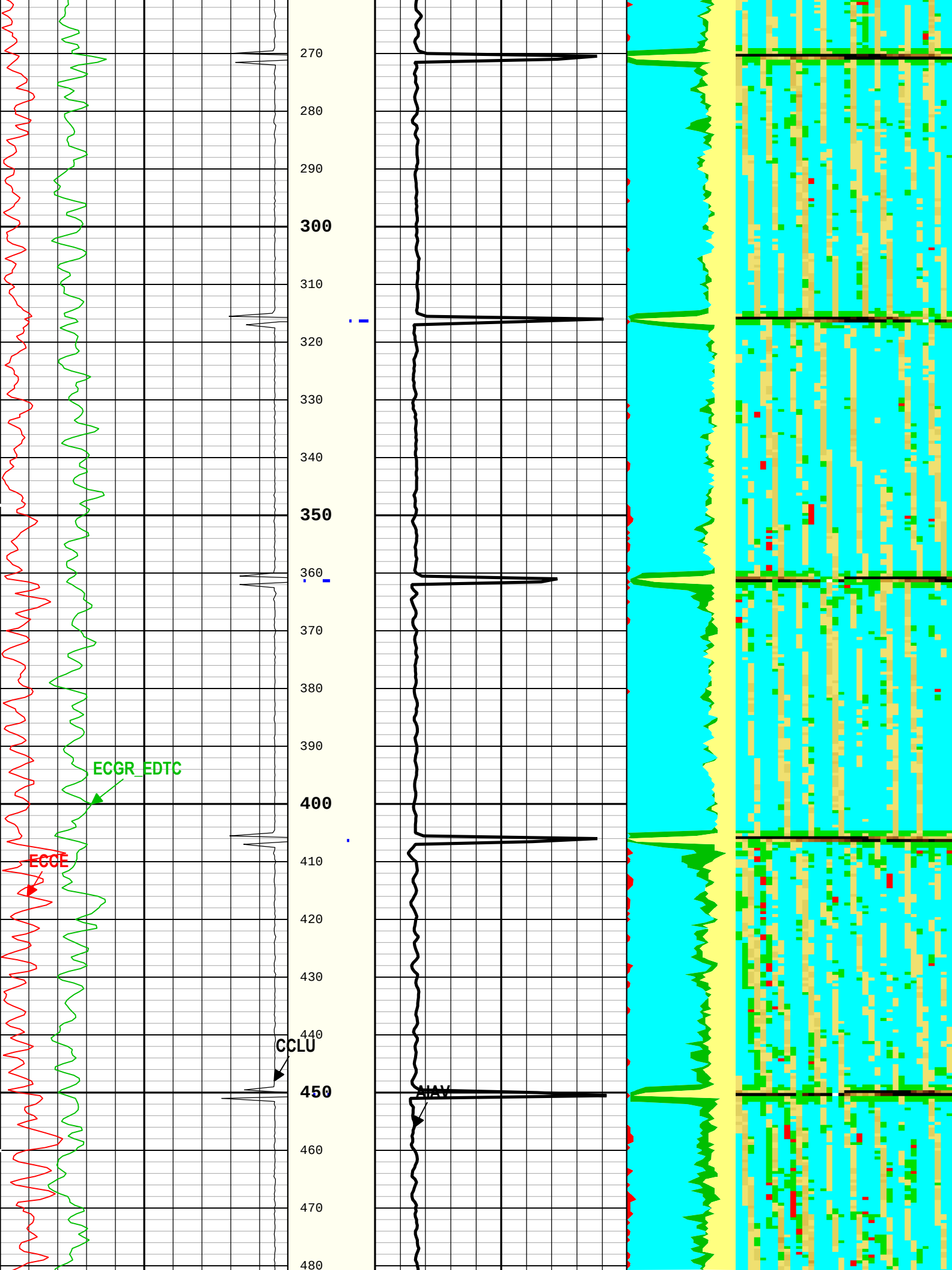
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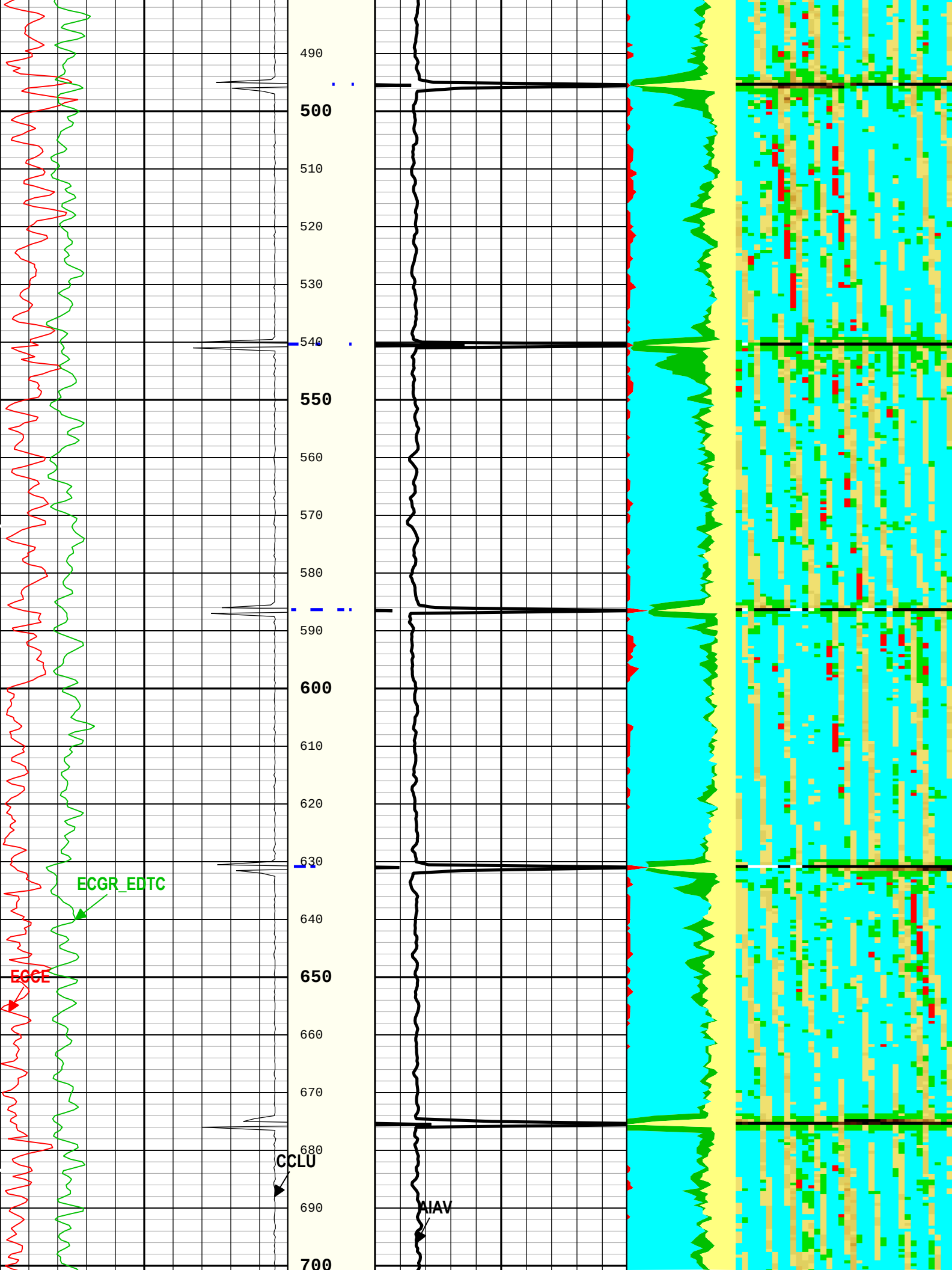
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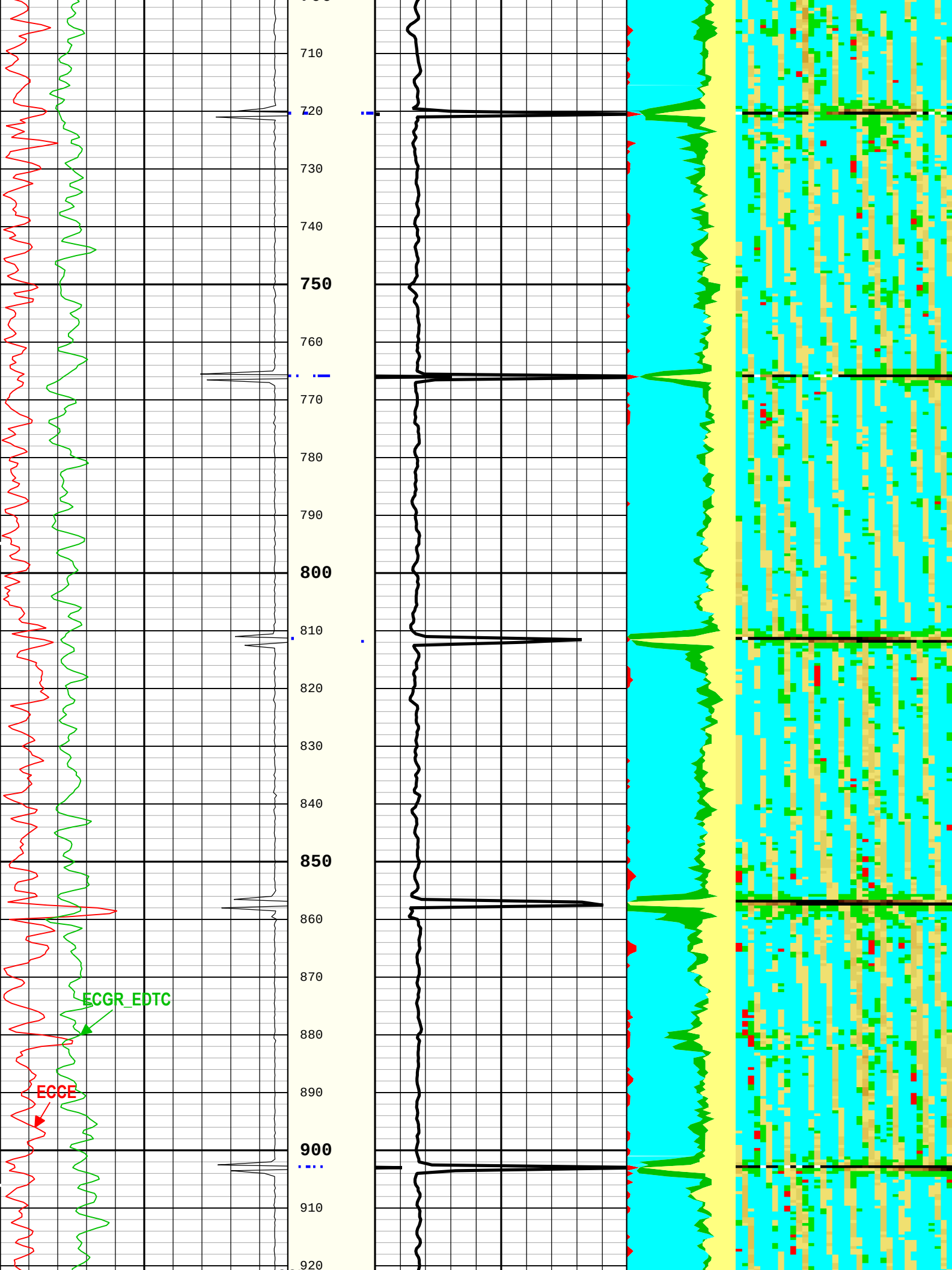
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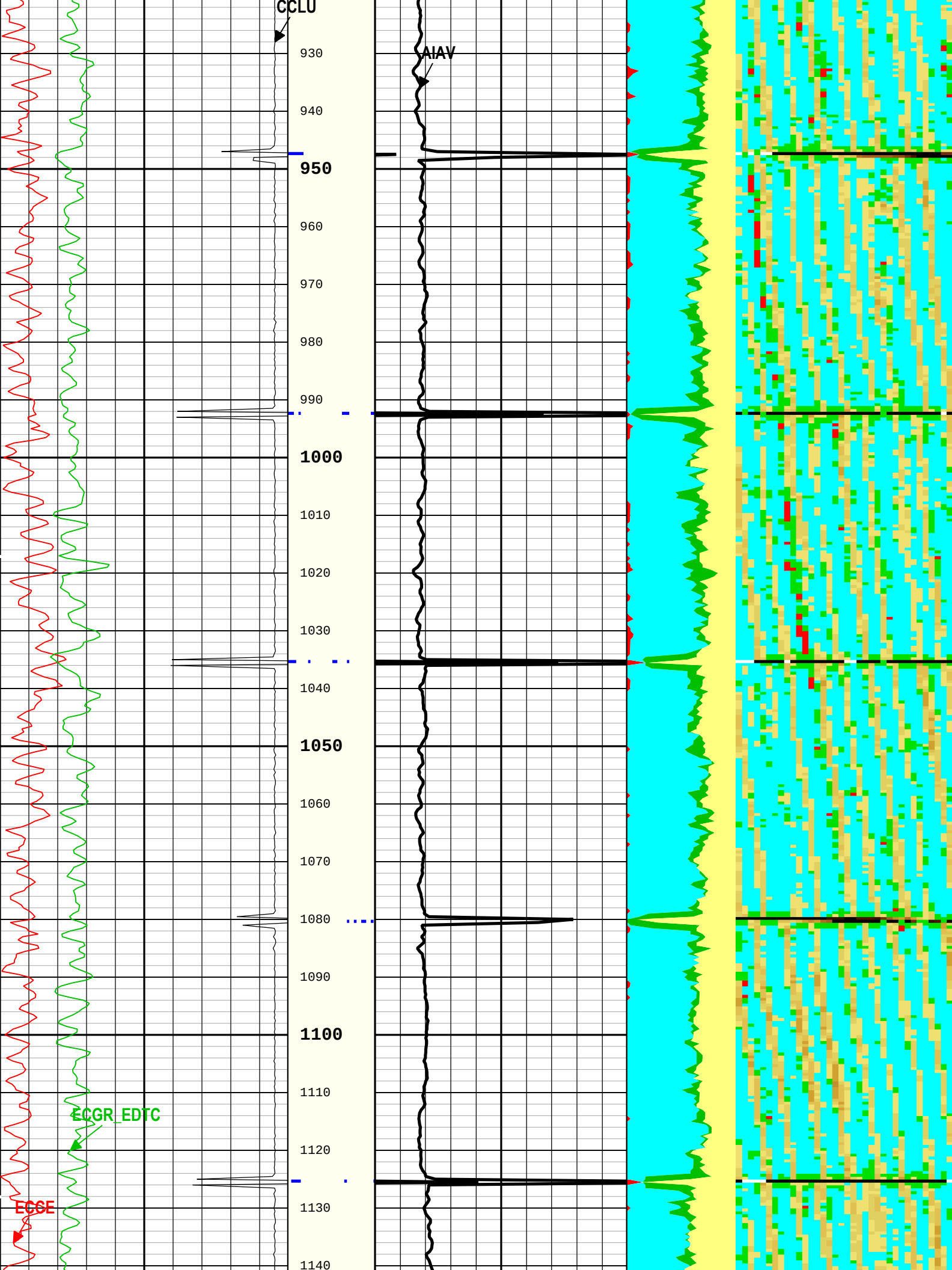
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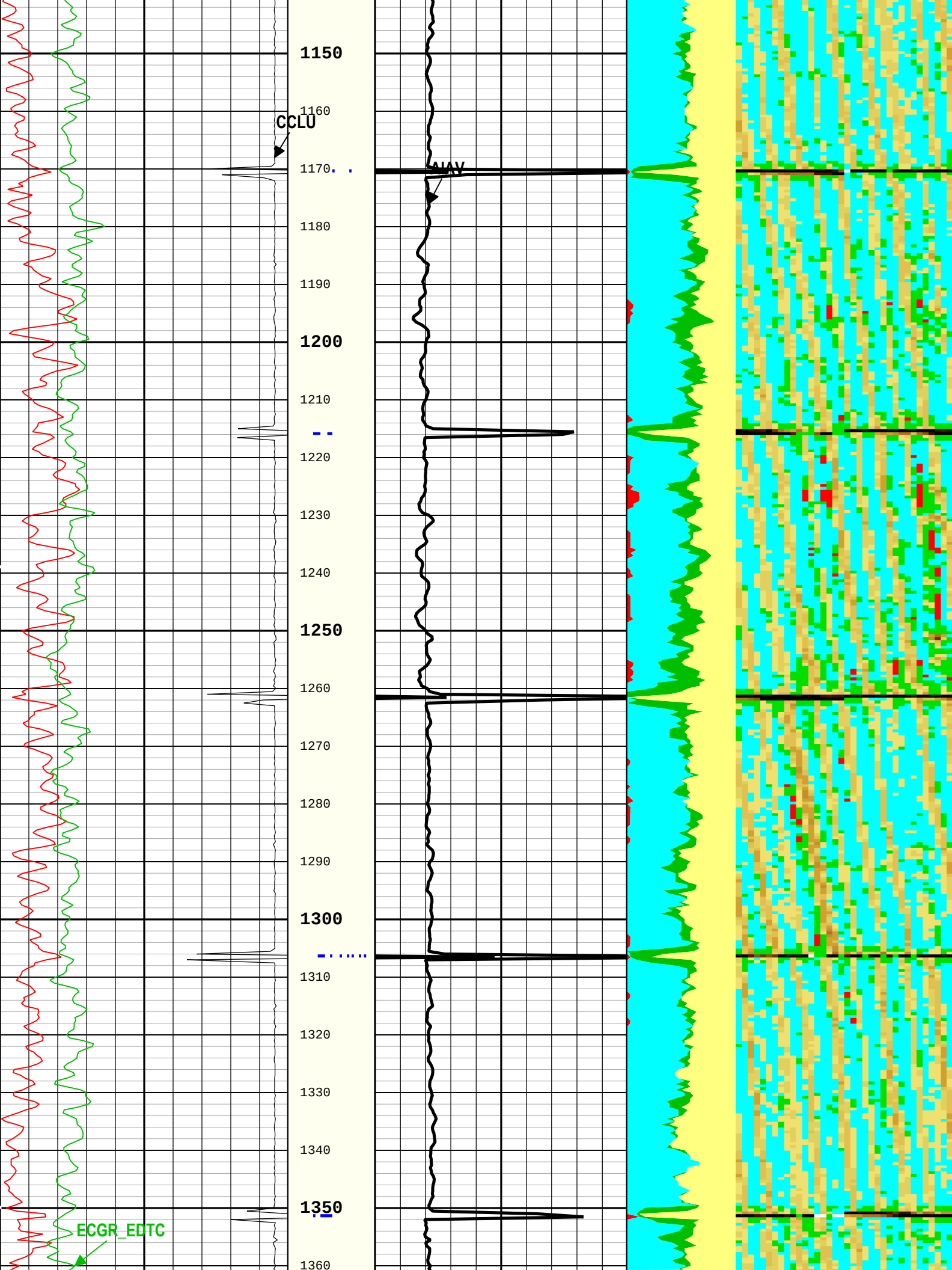
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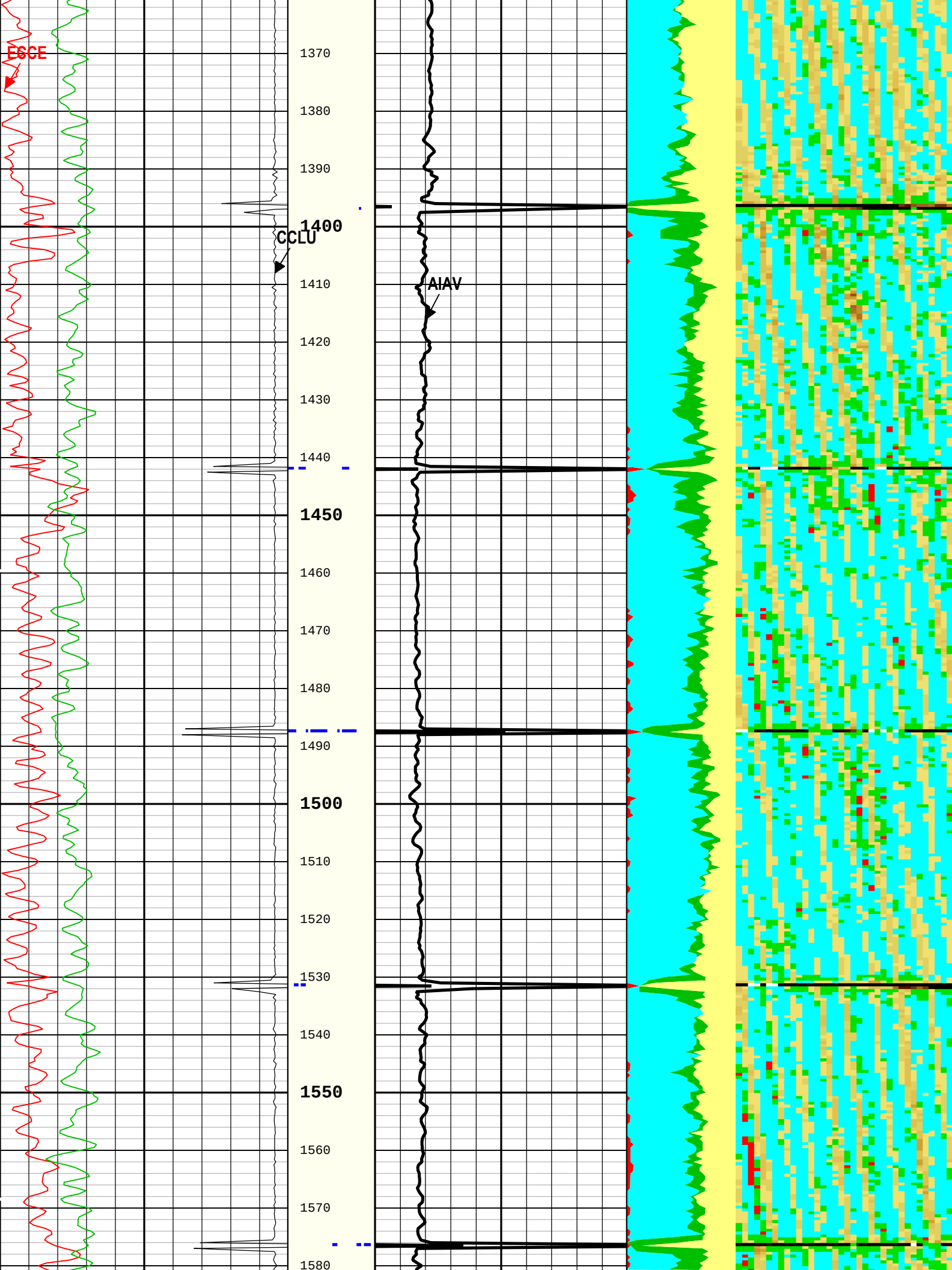
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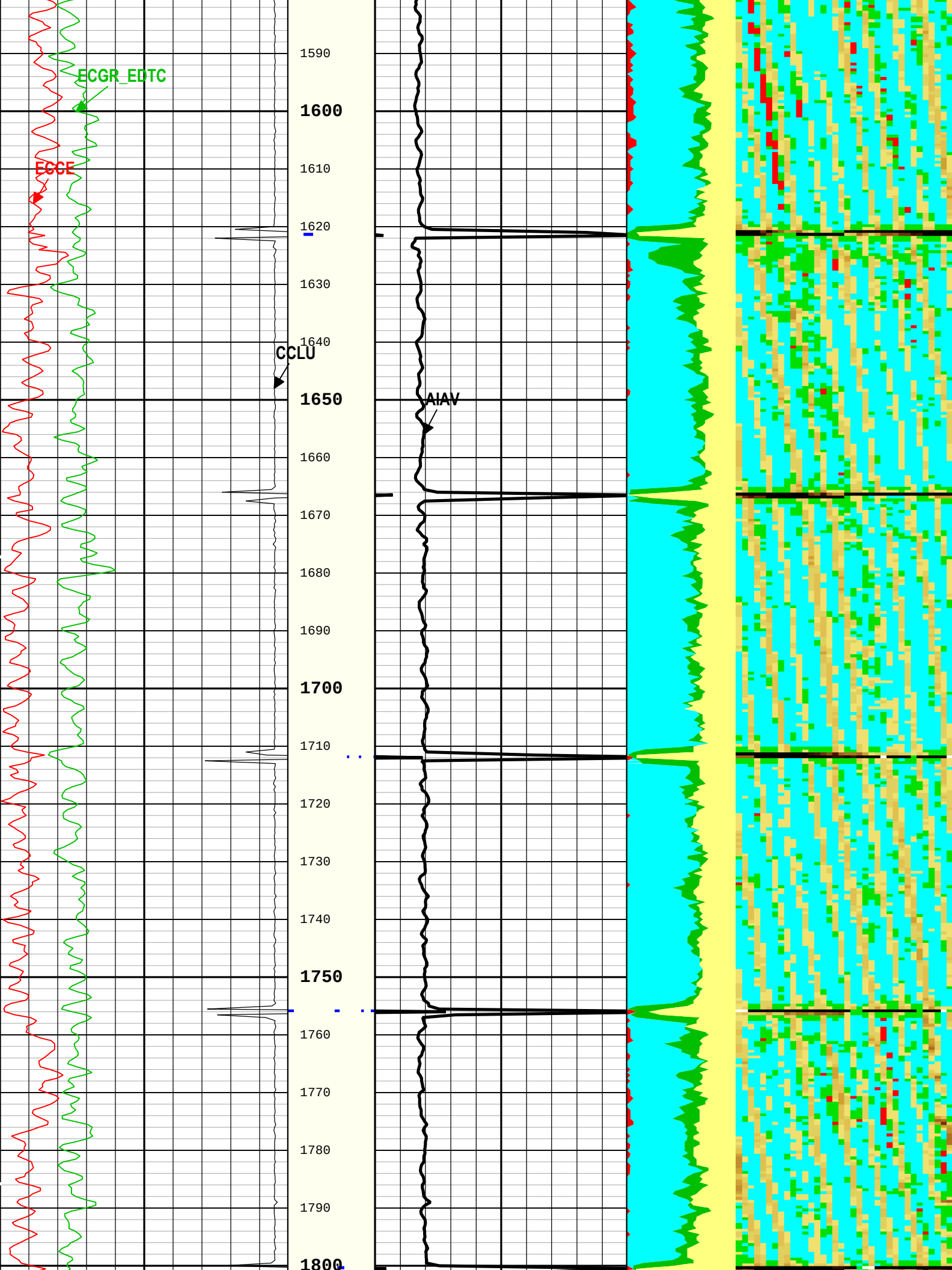
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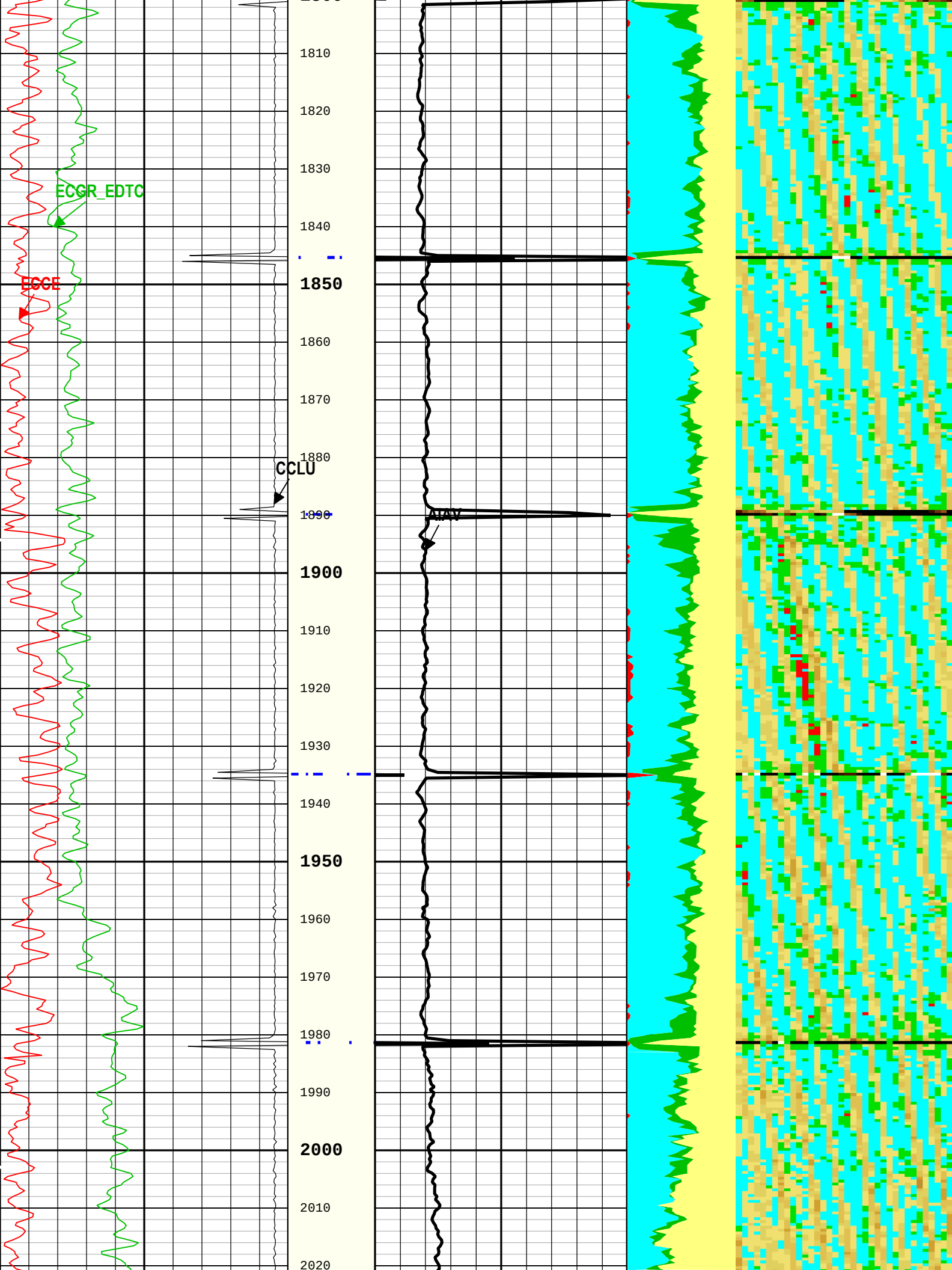
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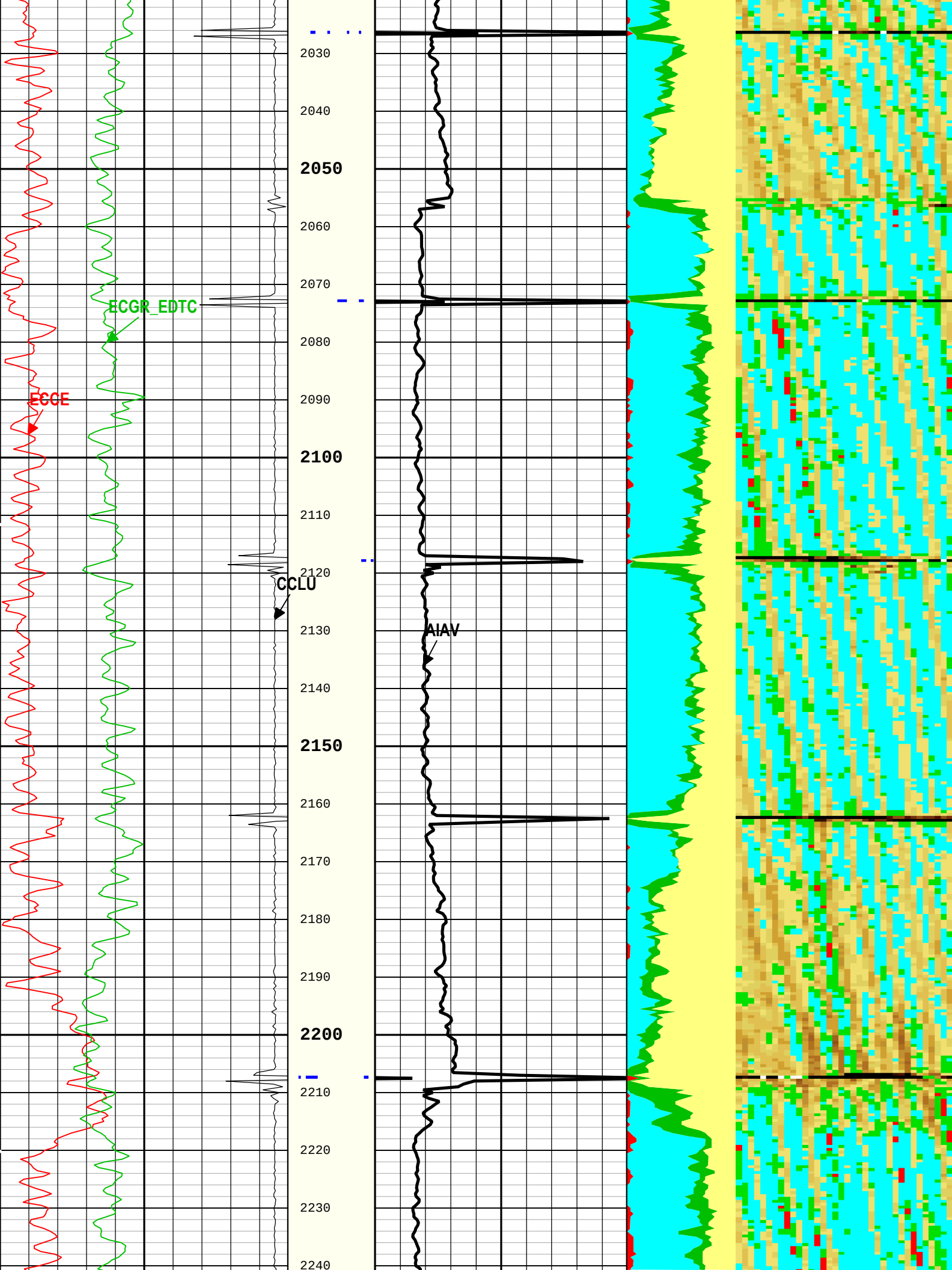
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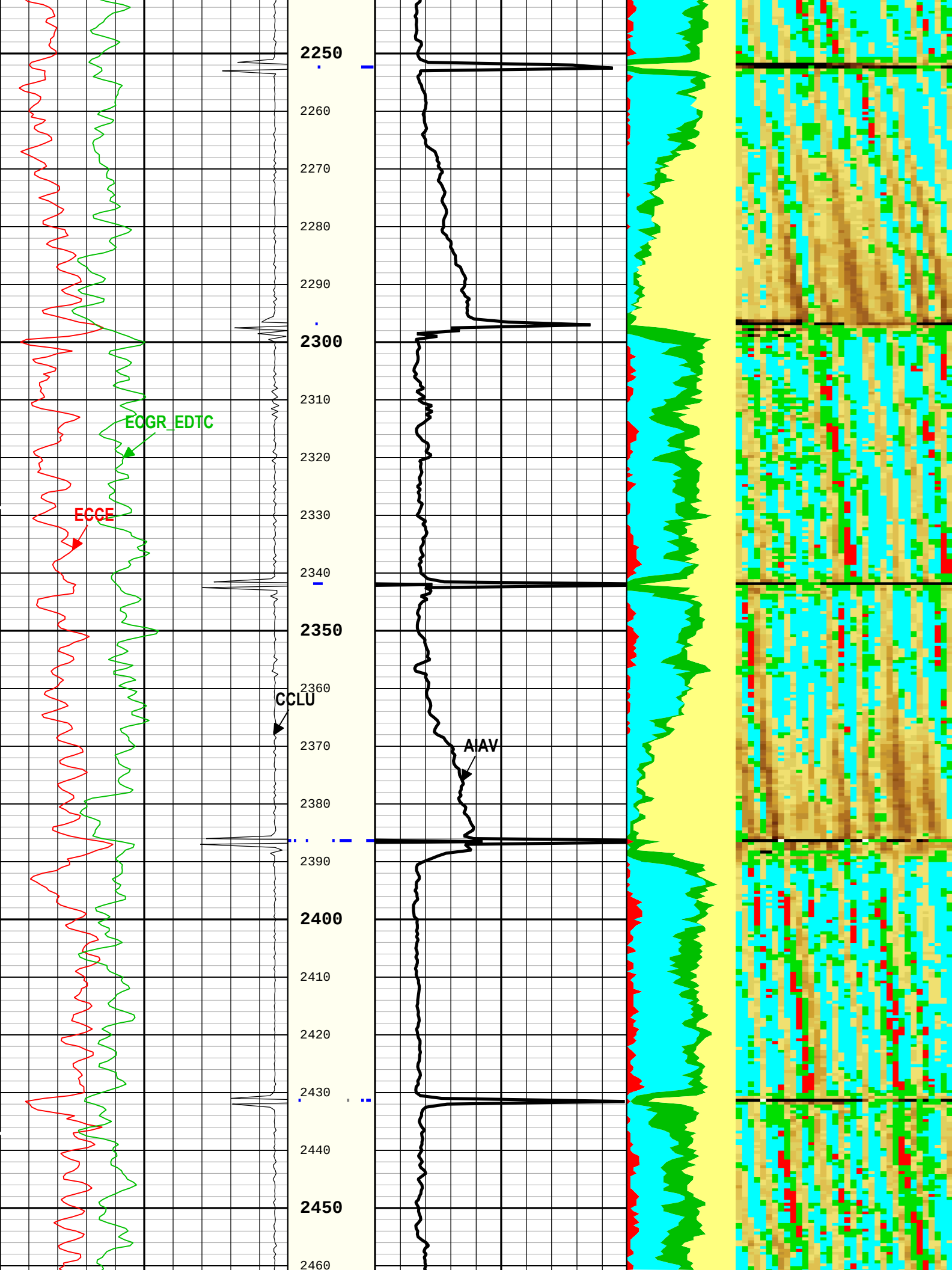
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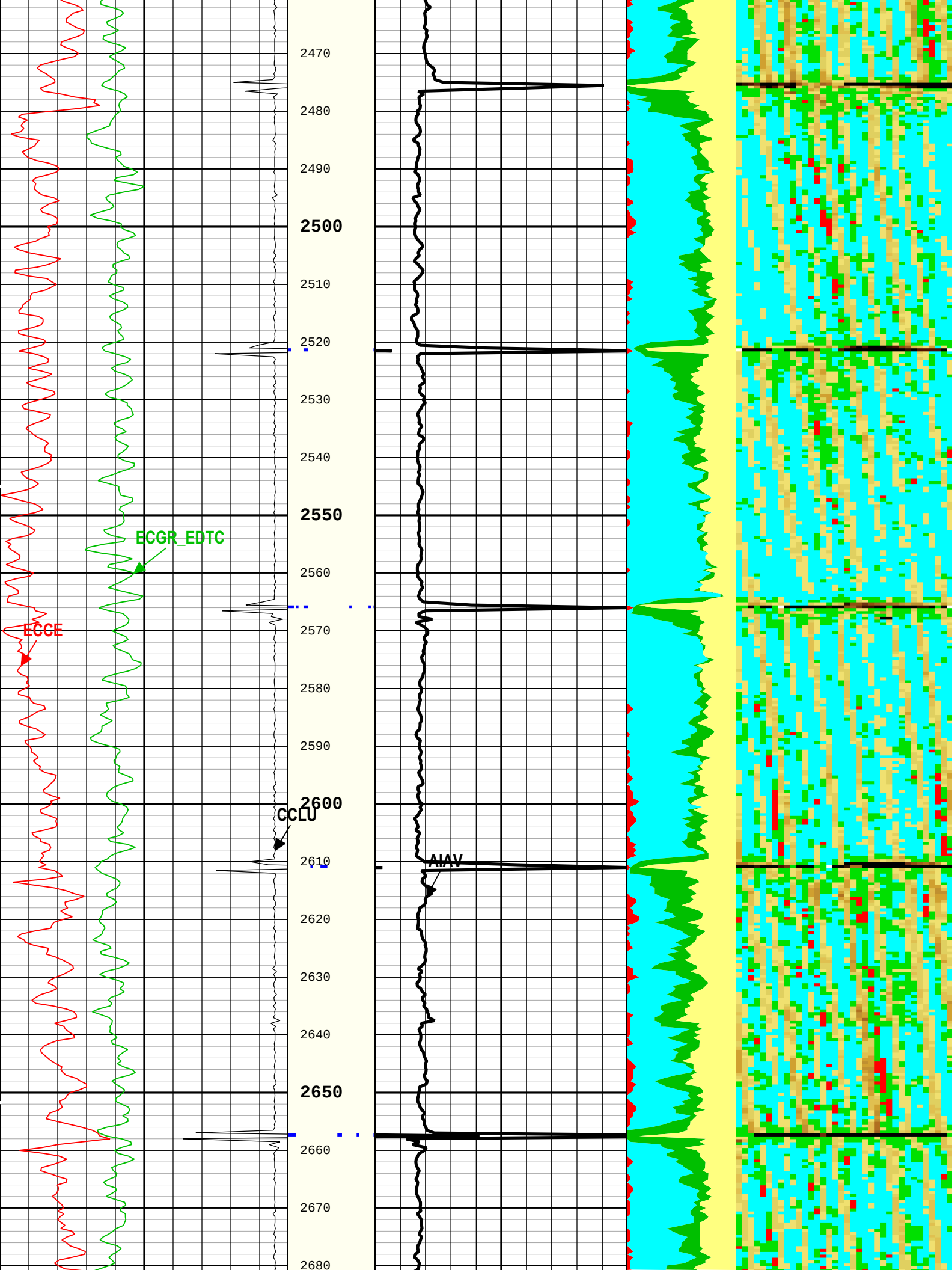
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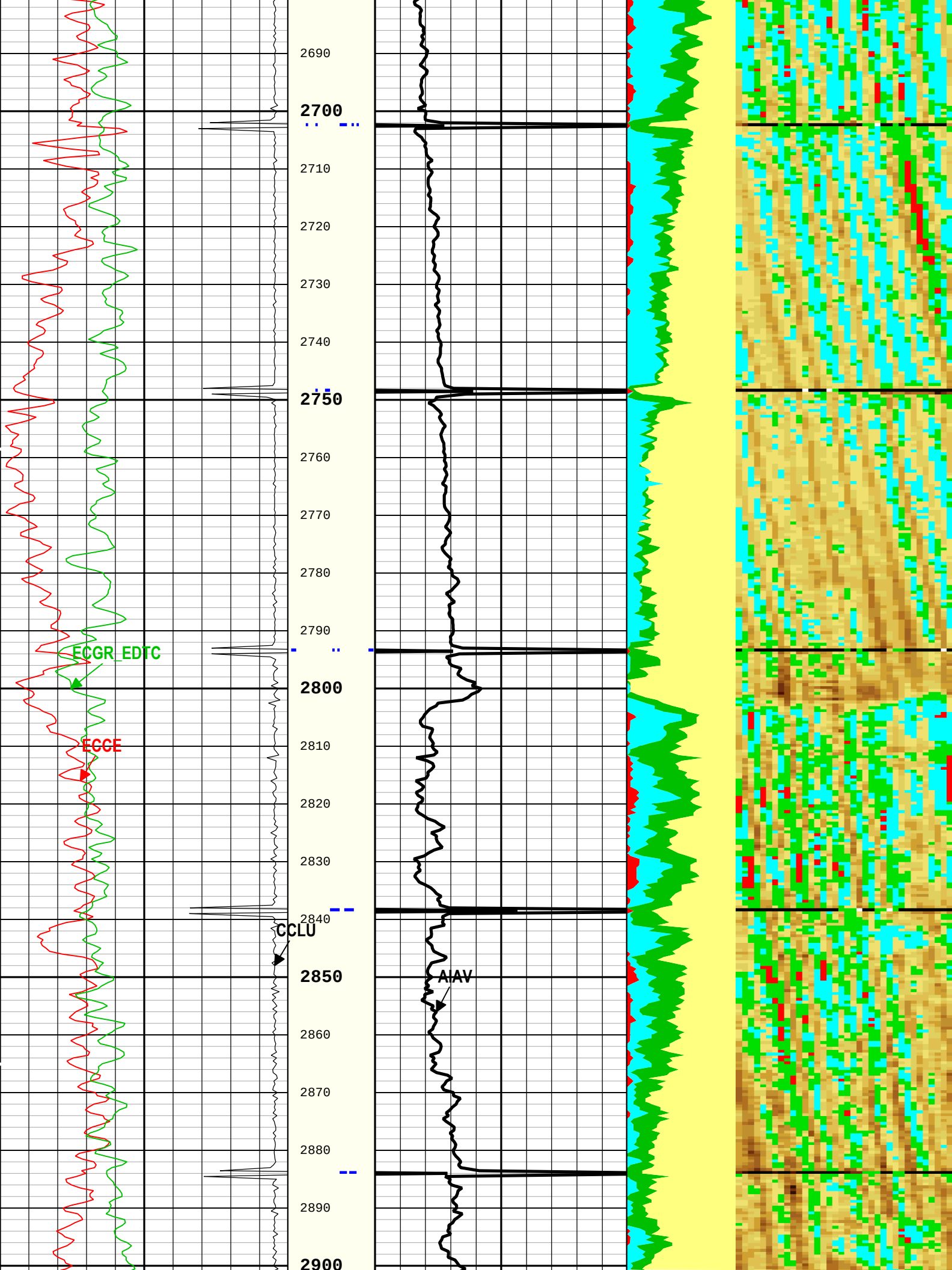
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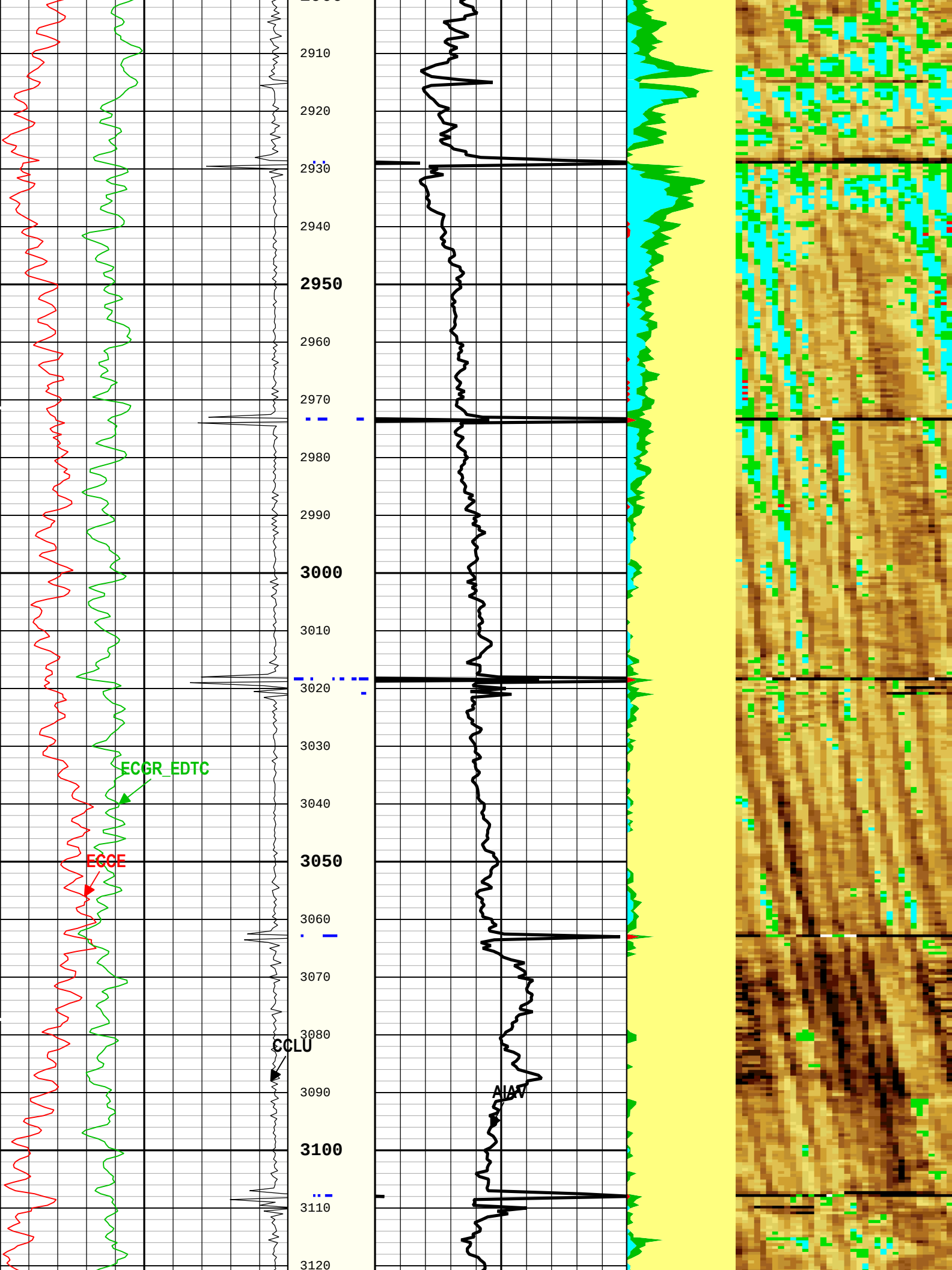
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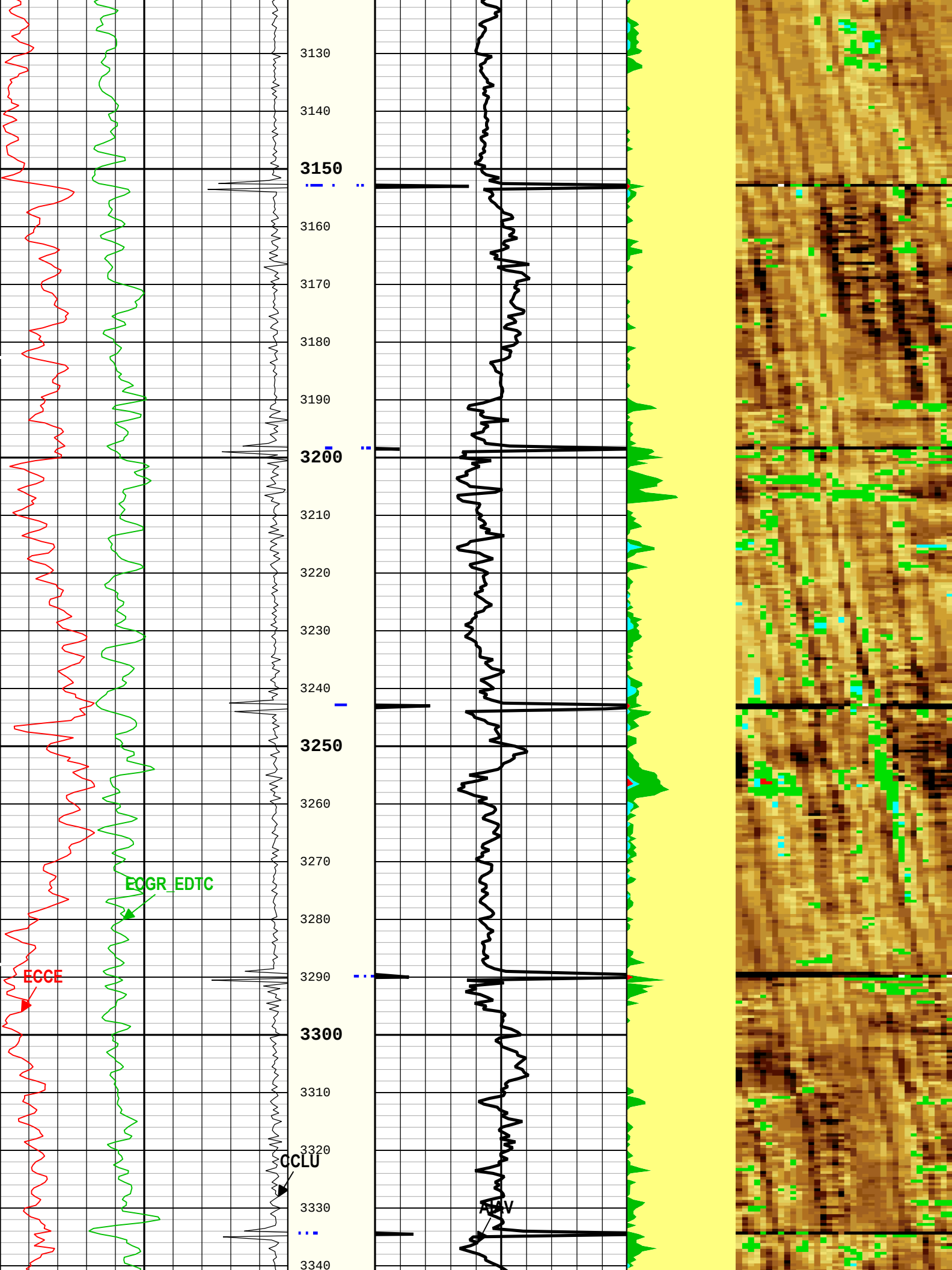
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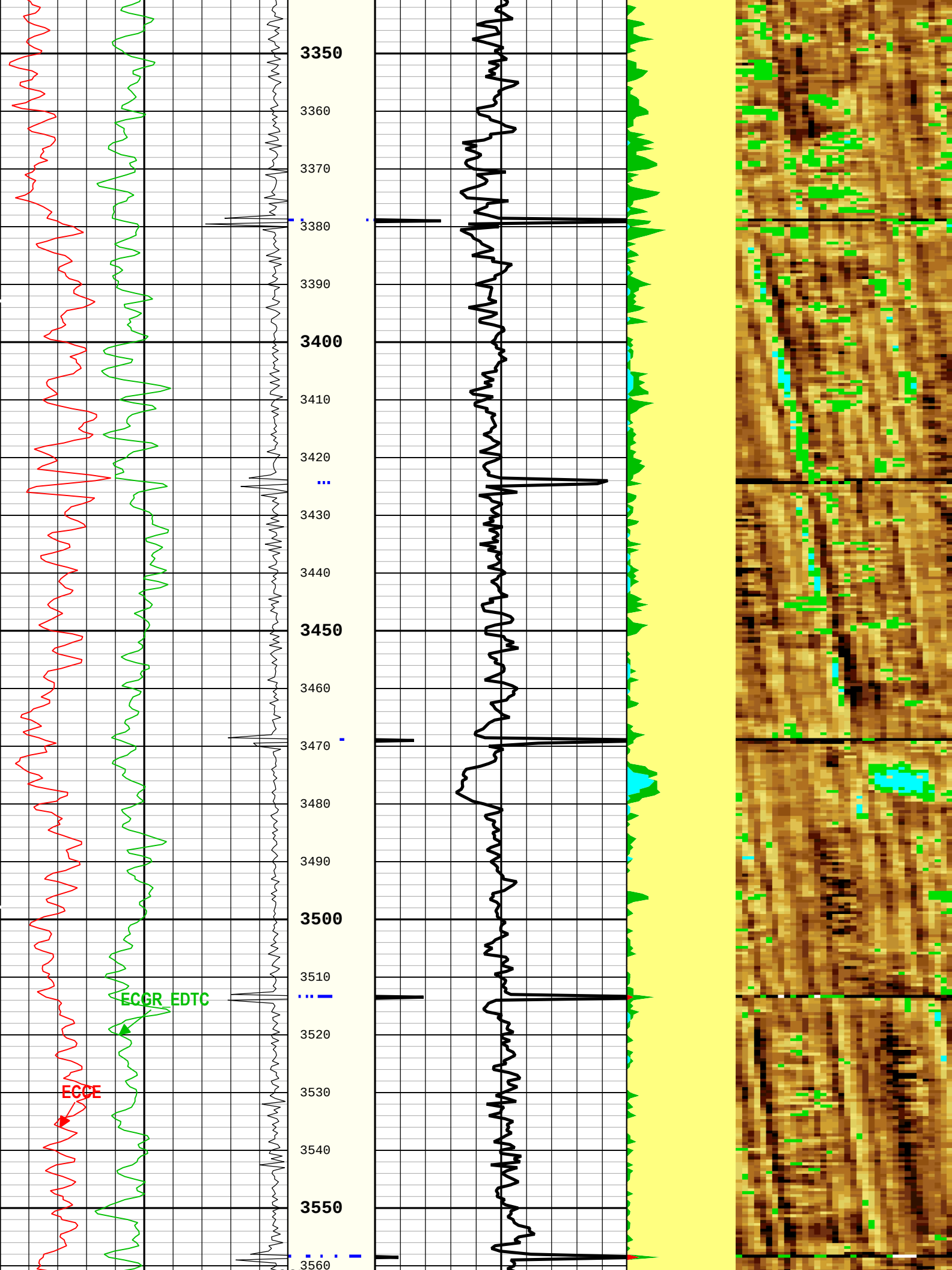
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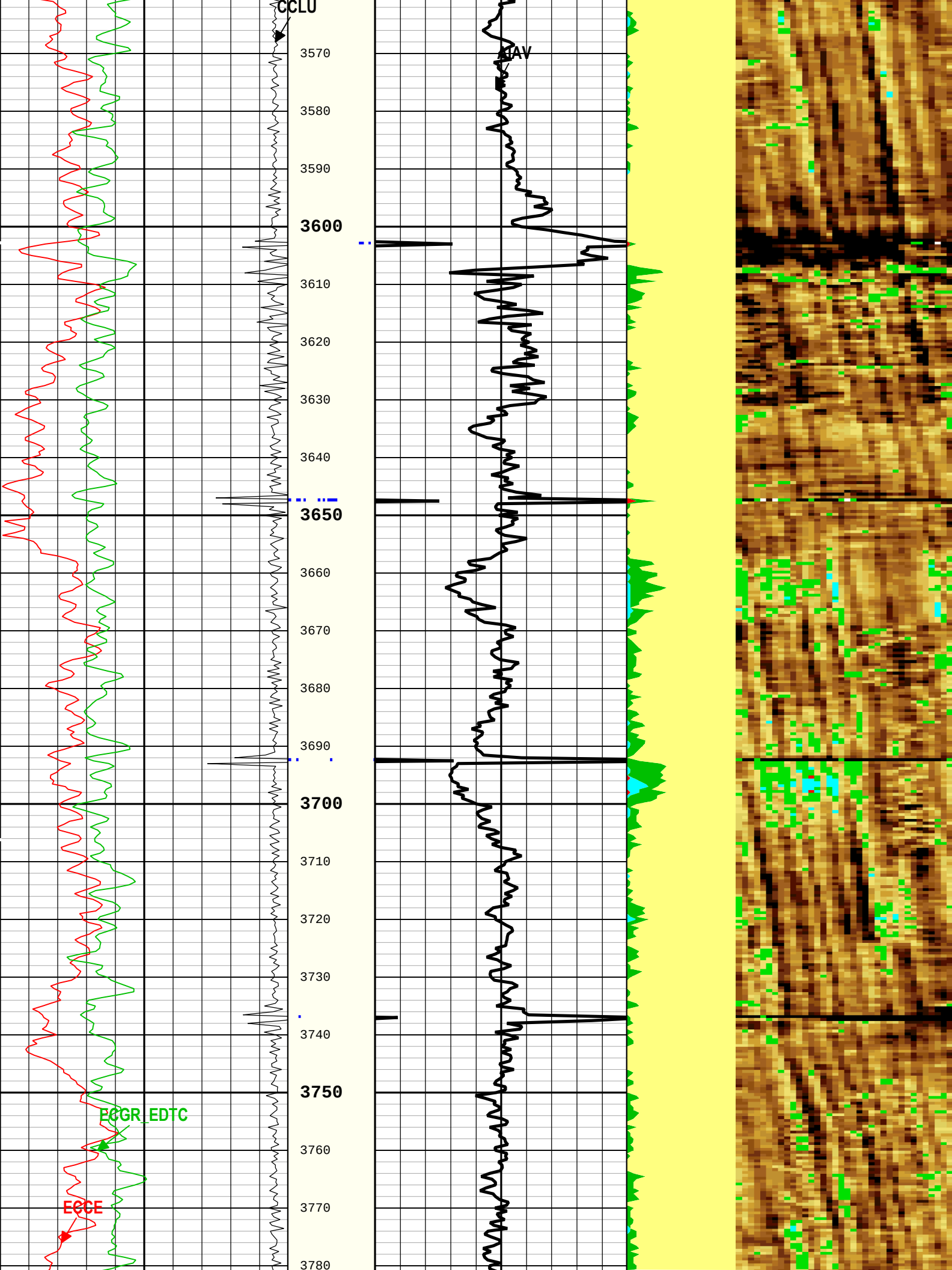
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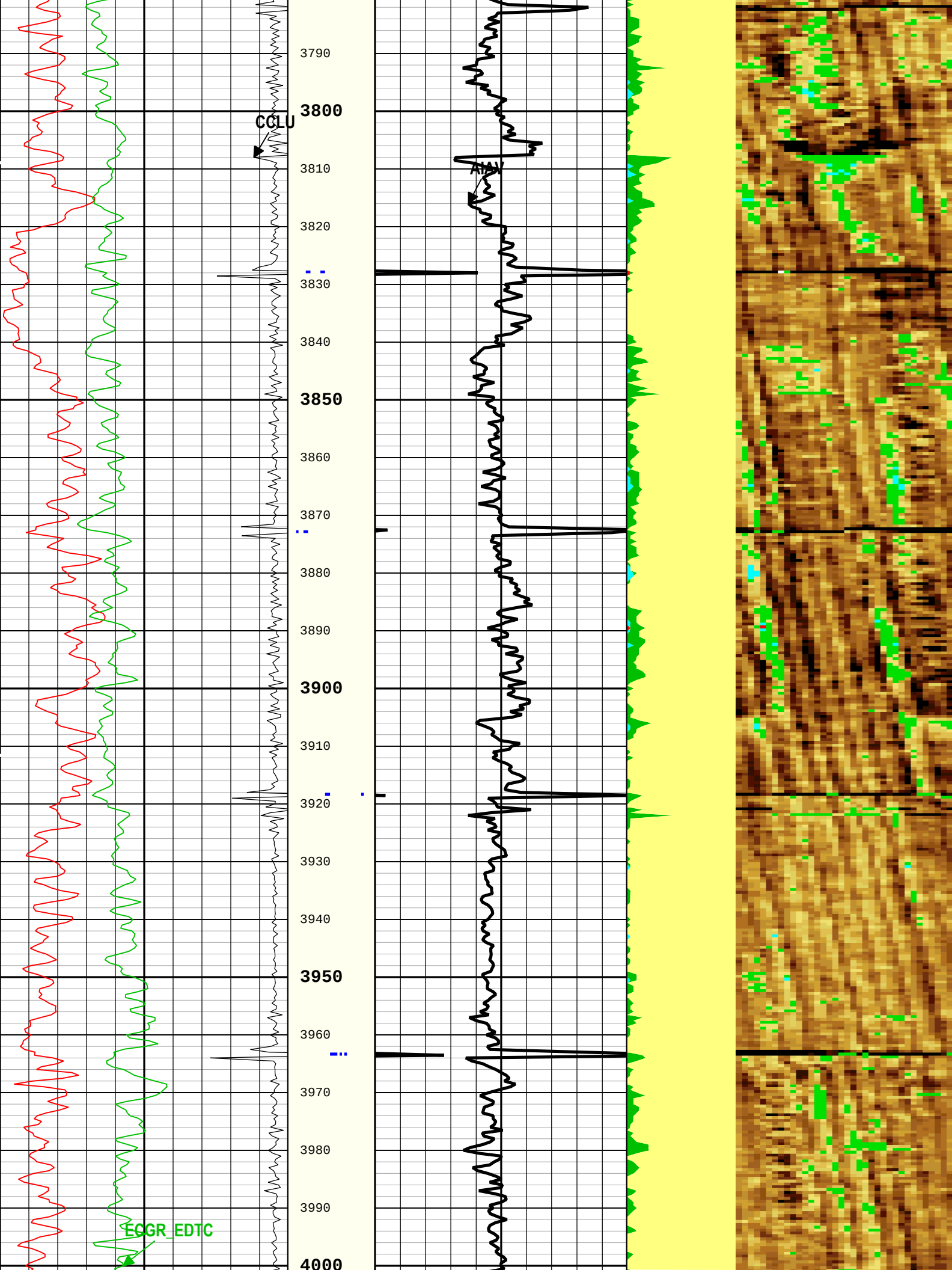
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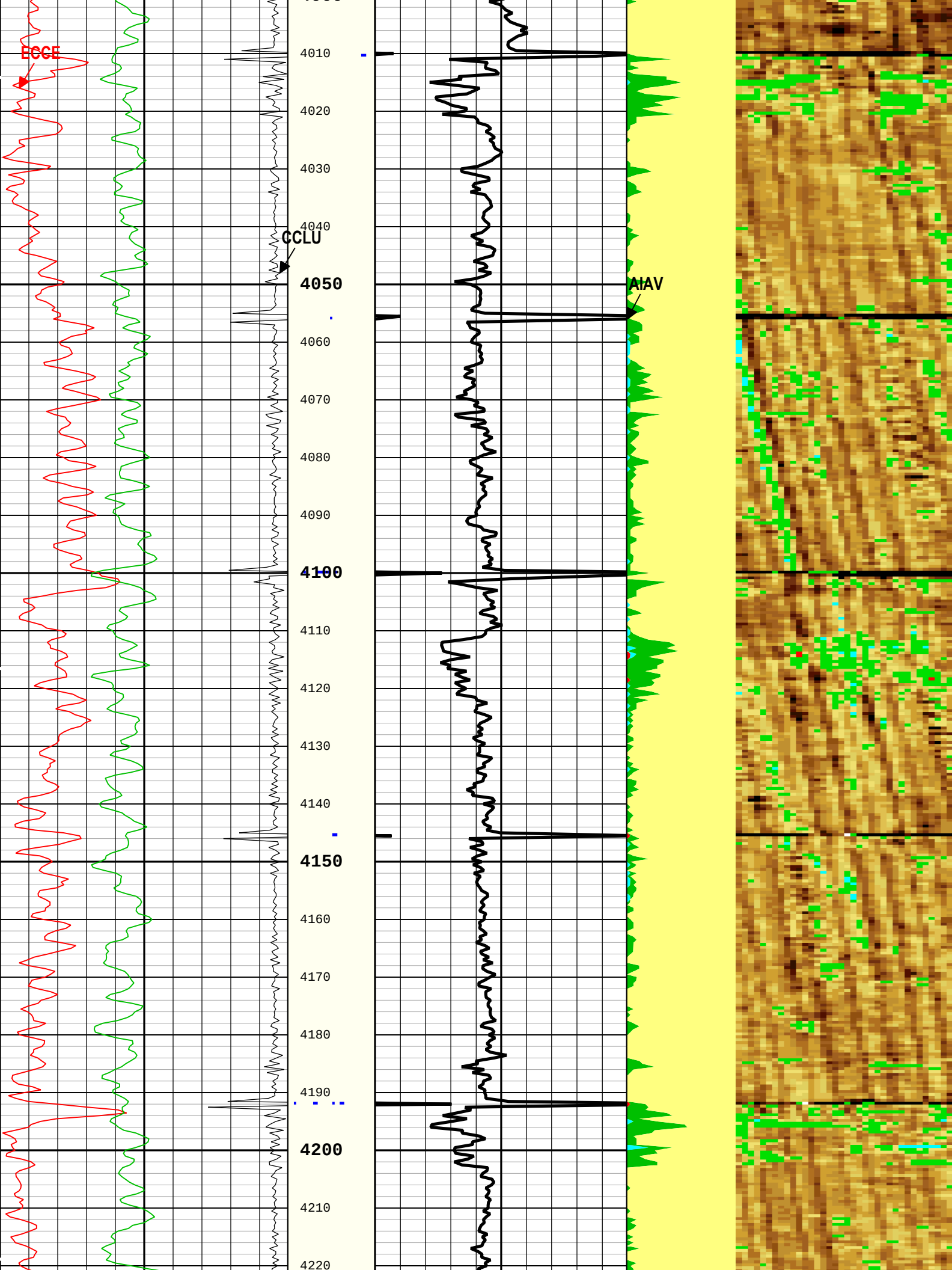
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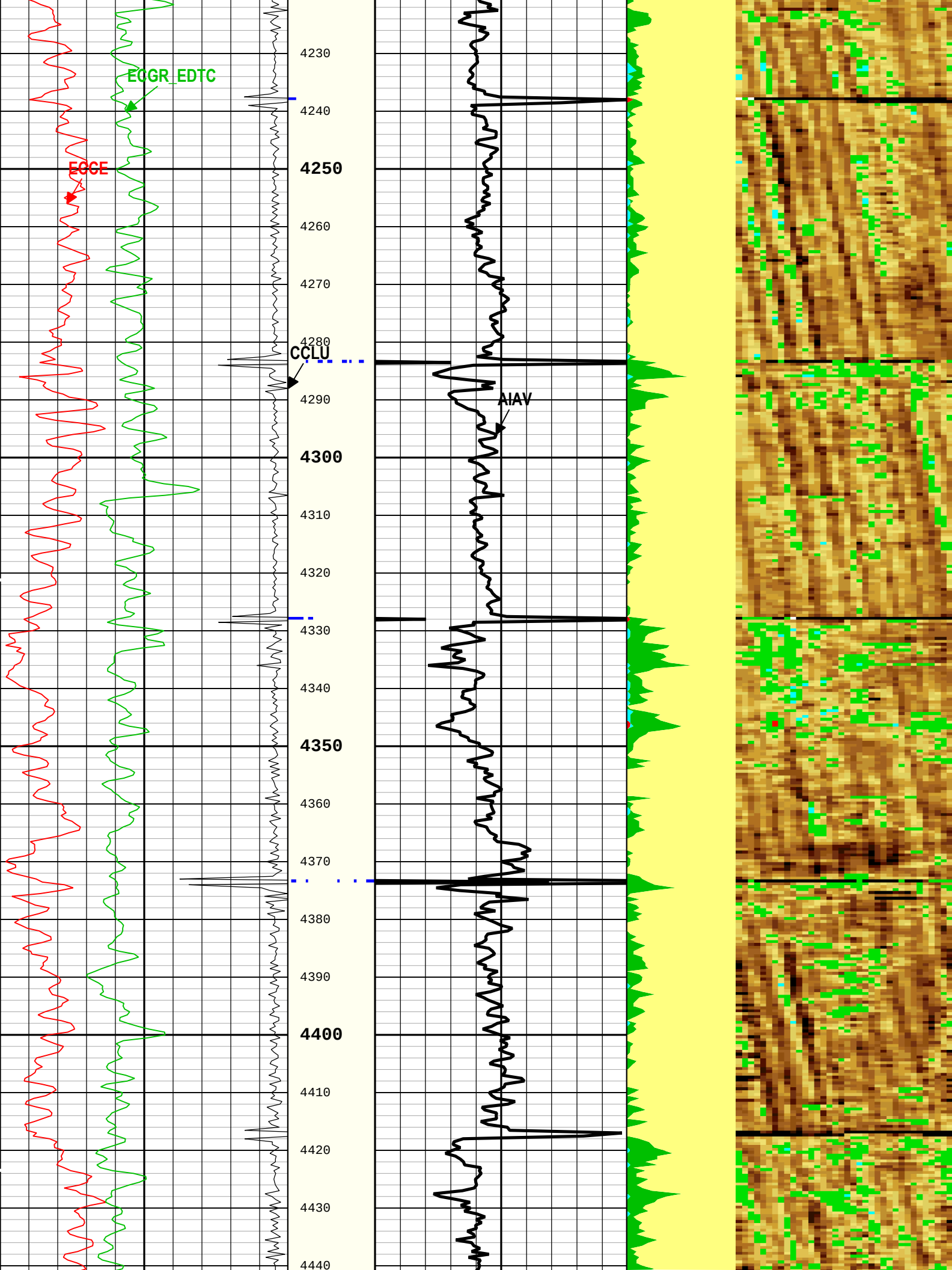
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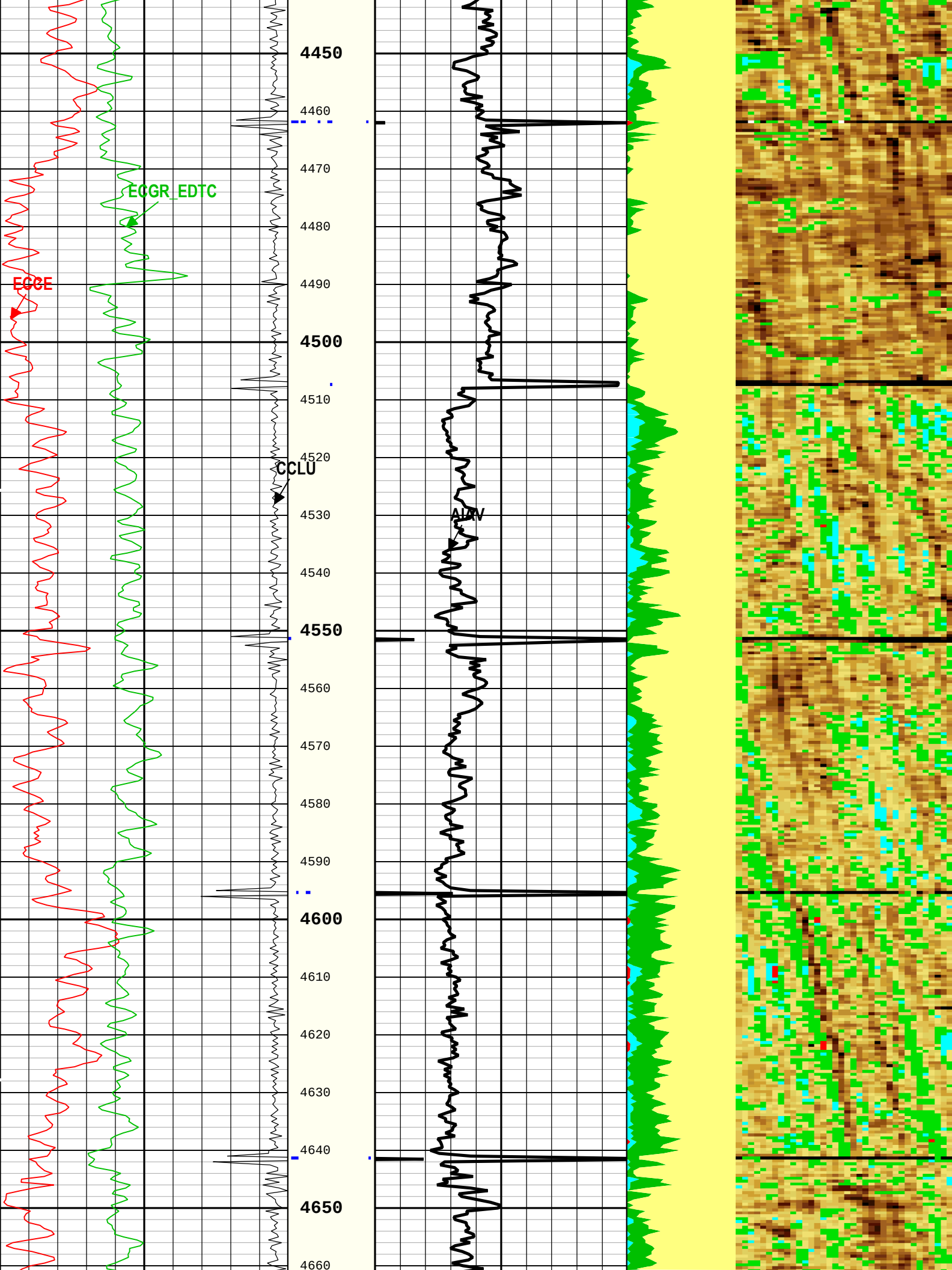
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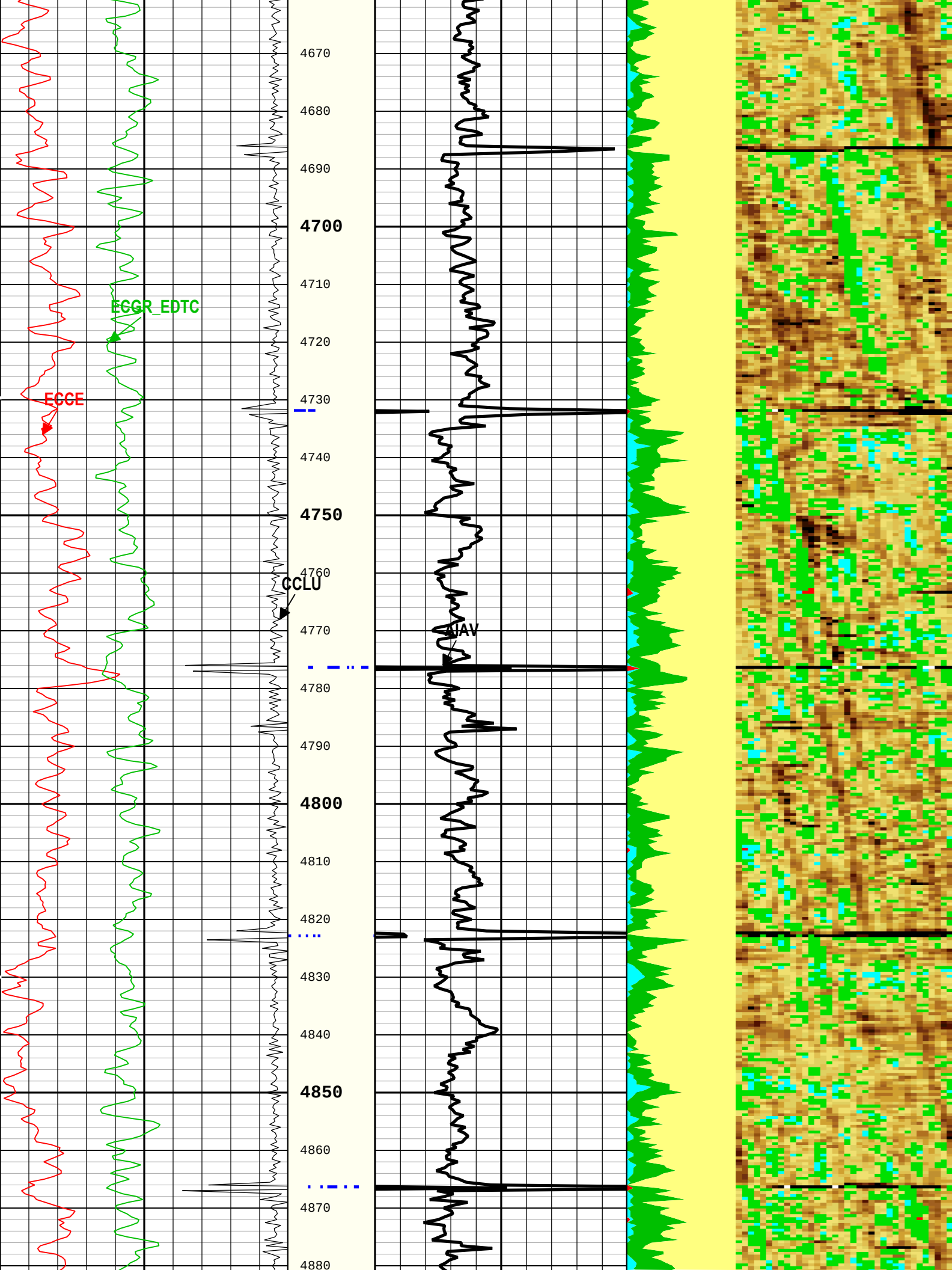
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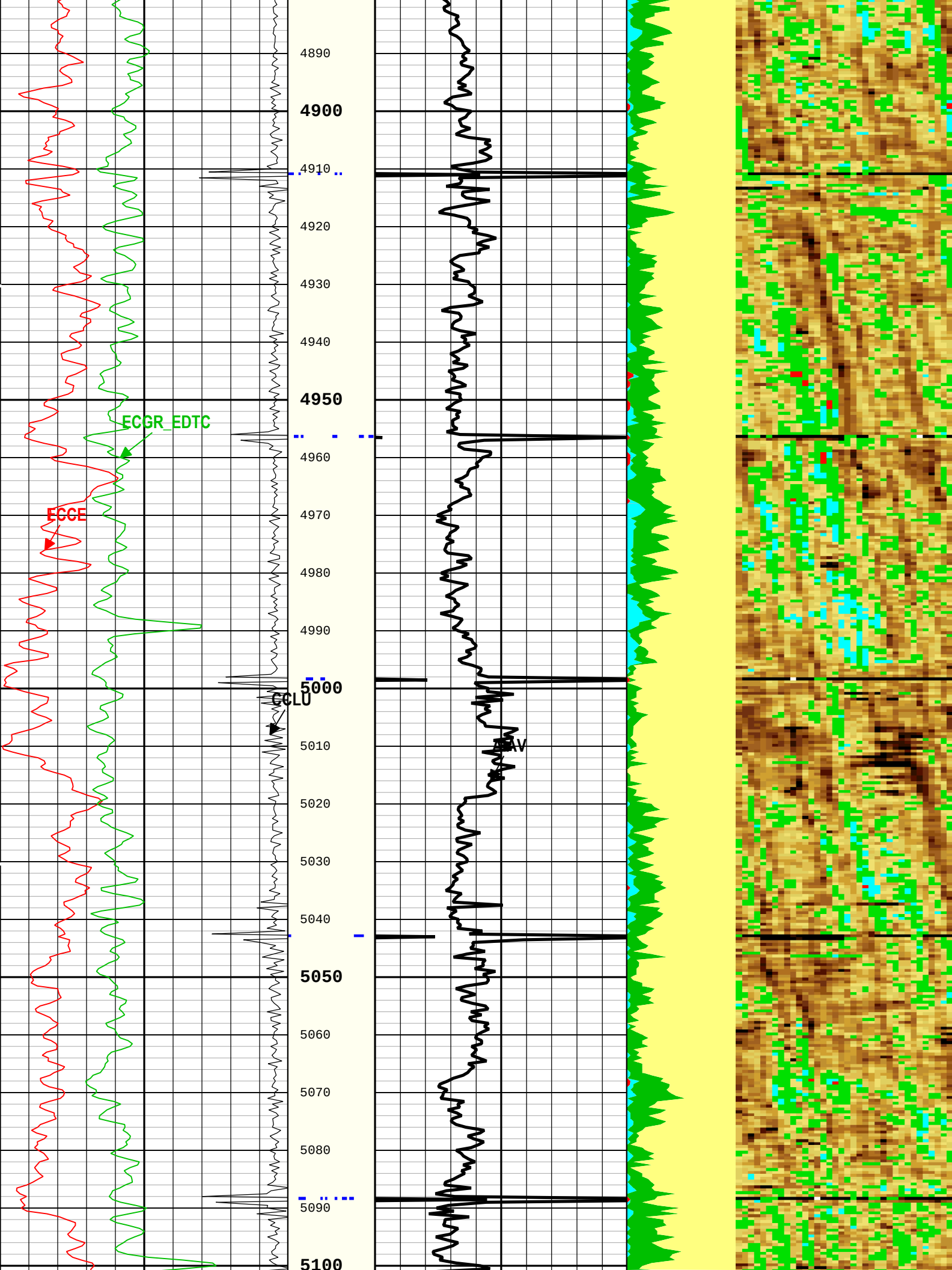
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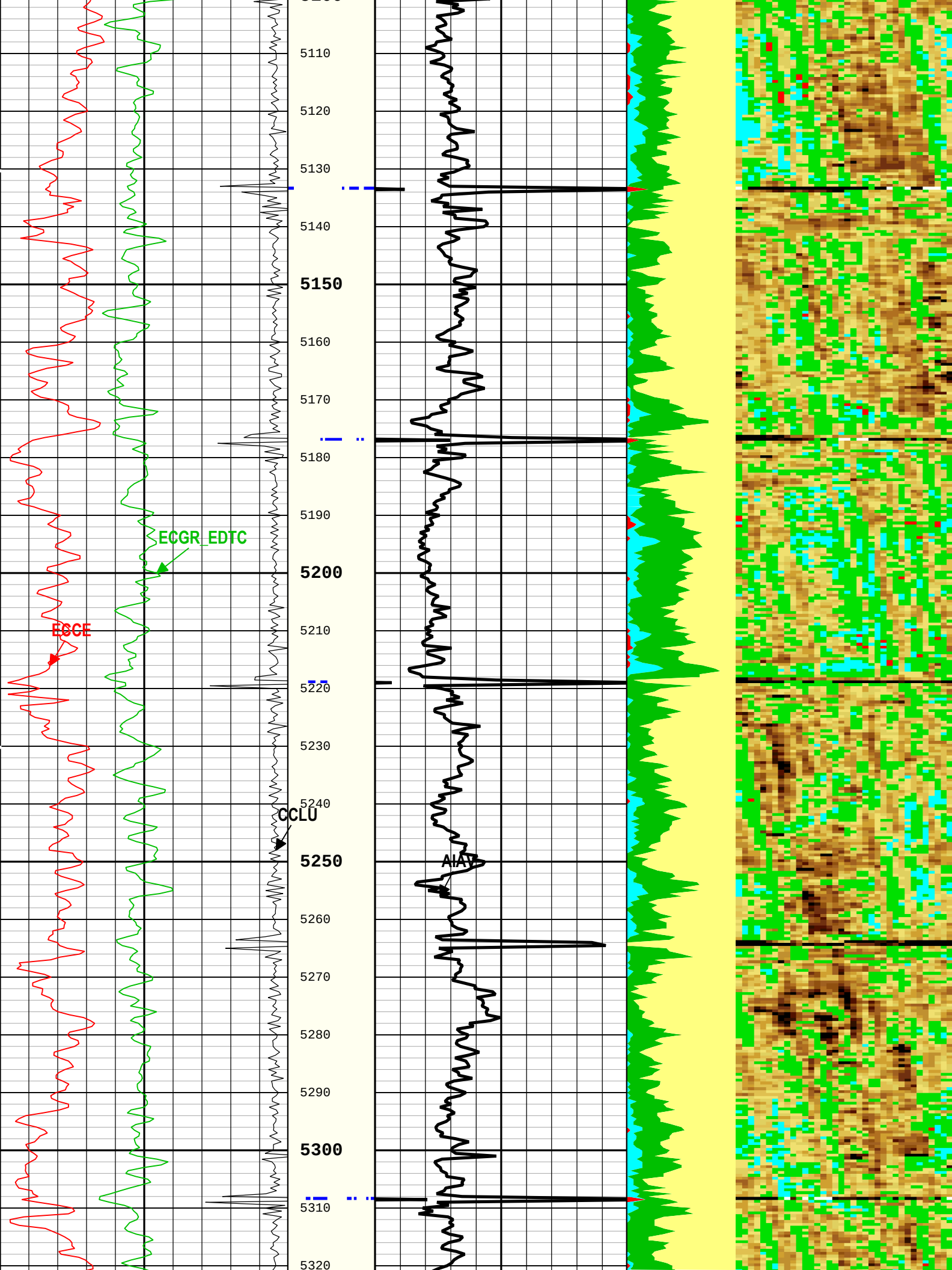
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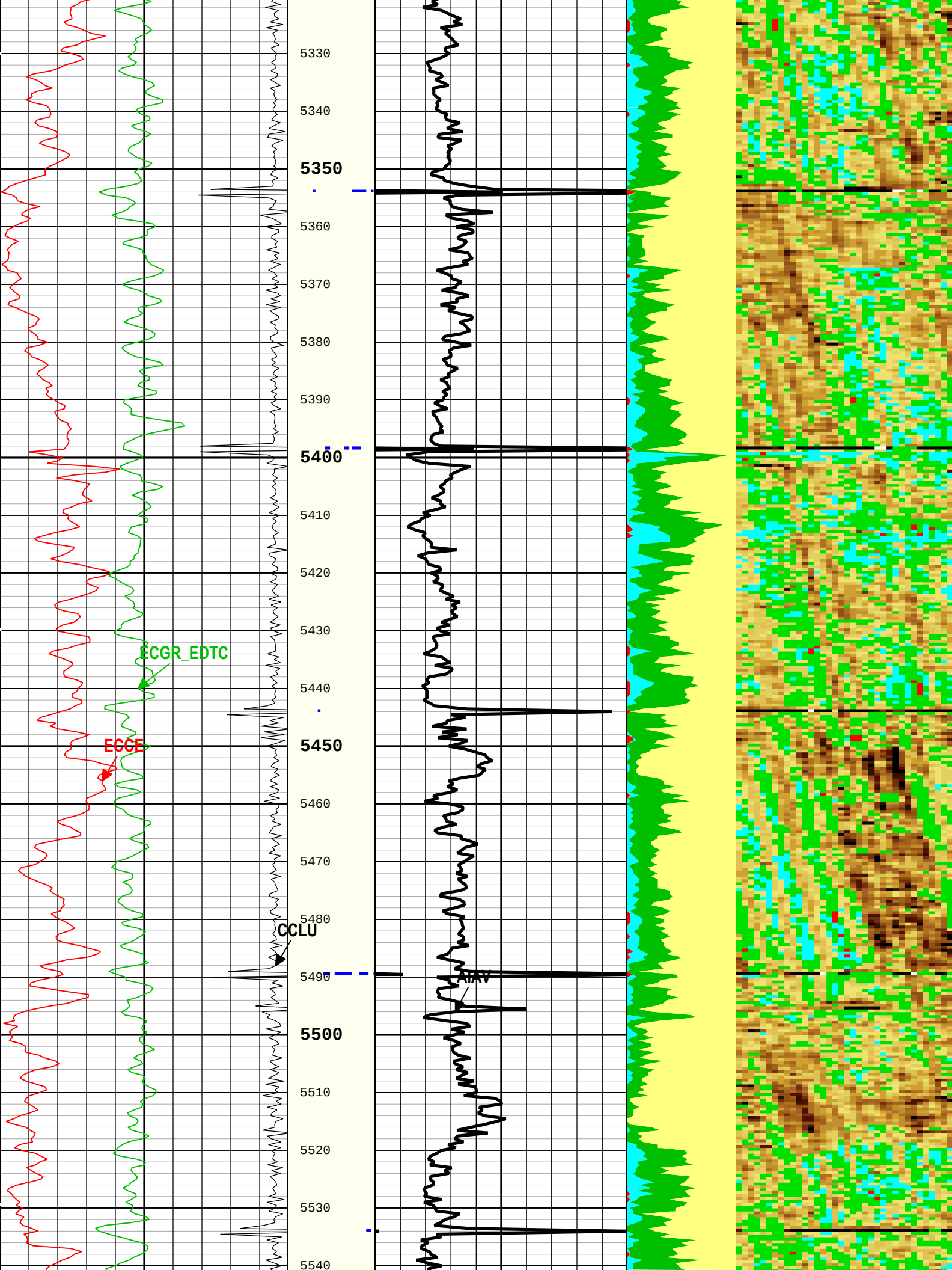
AIAV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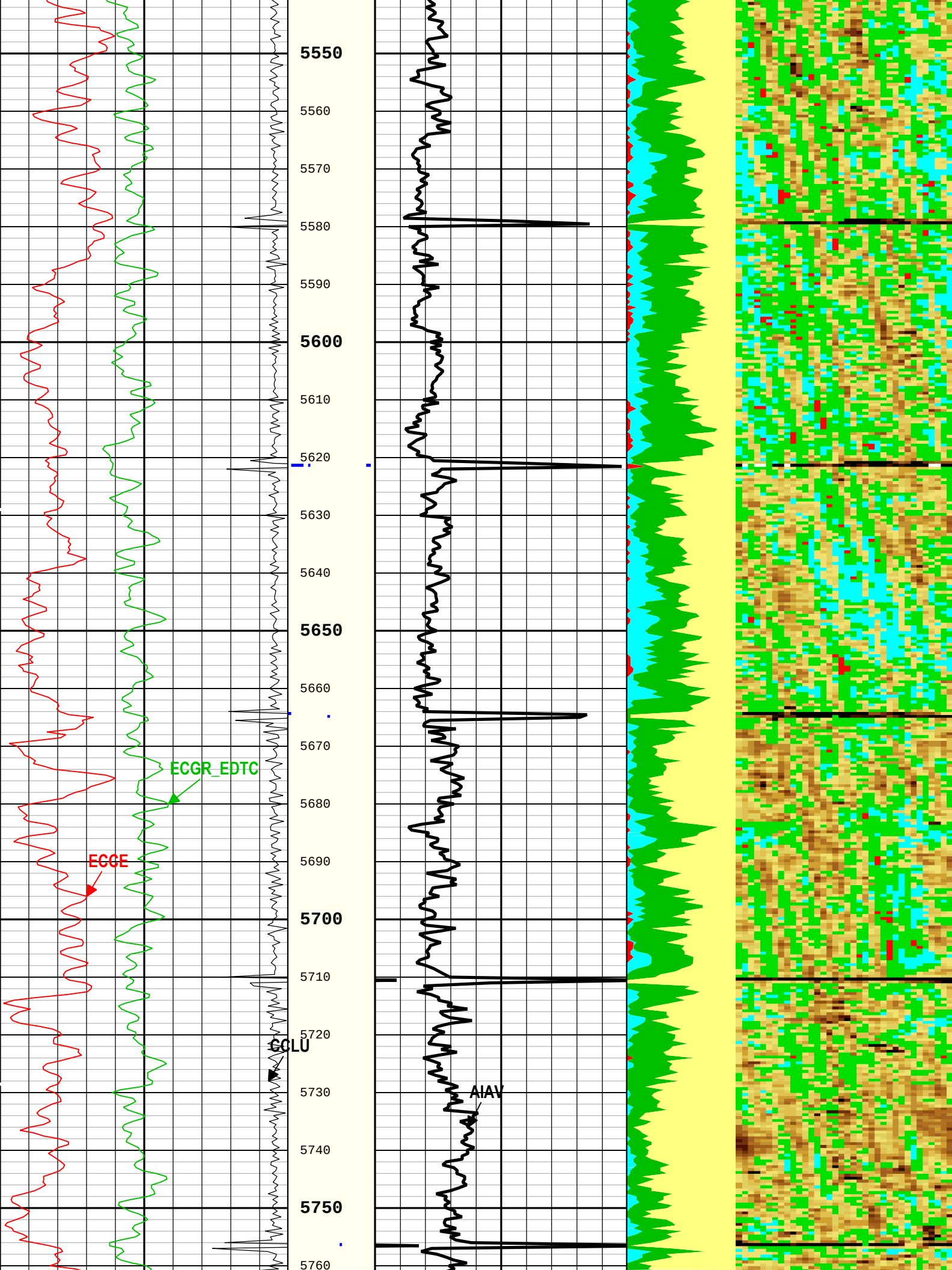
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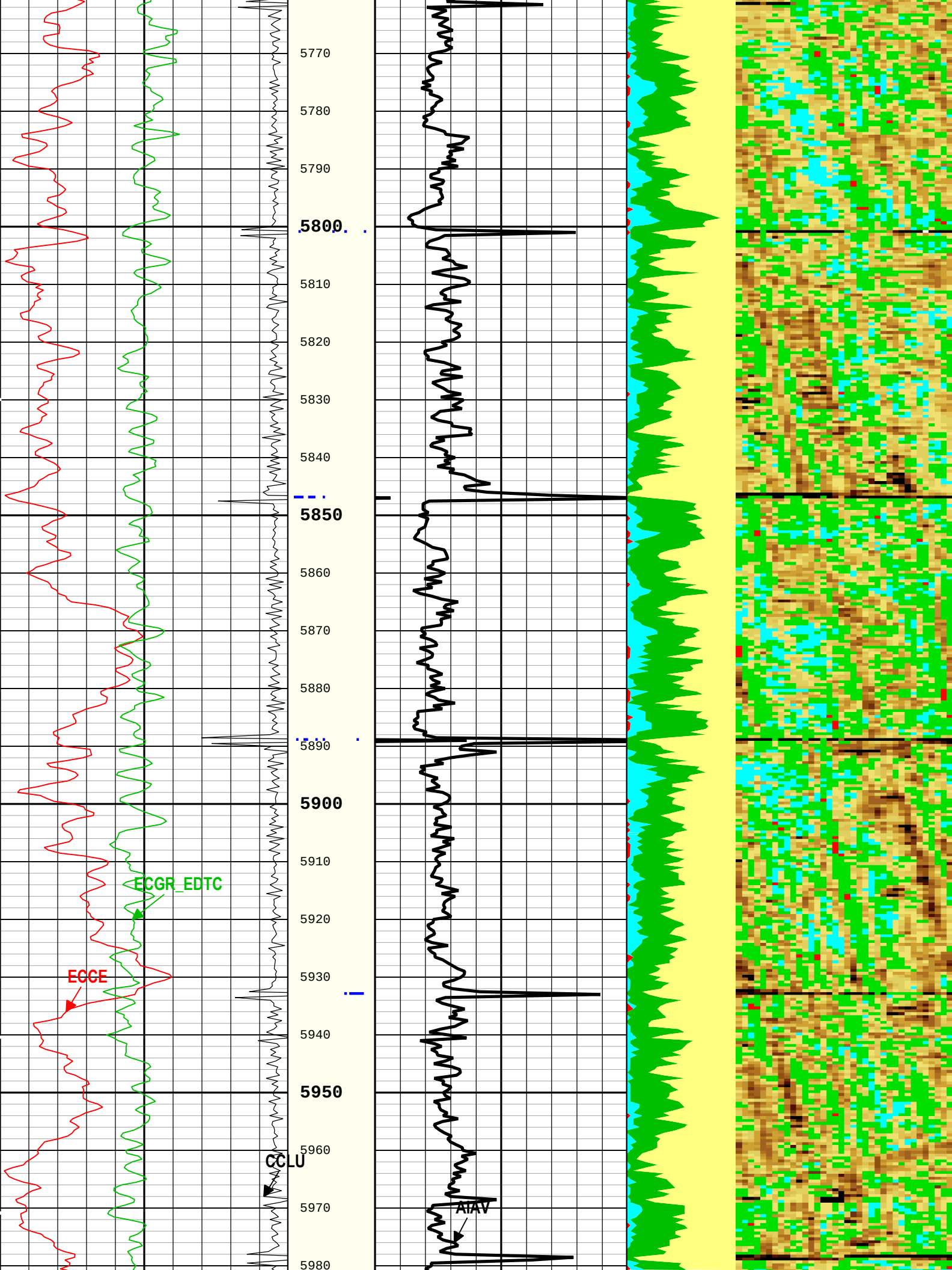
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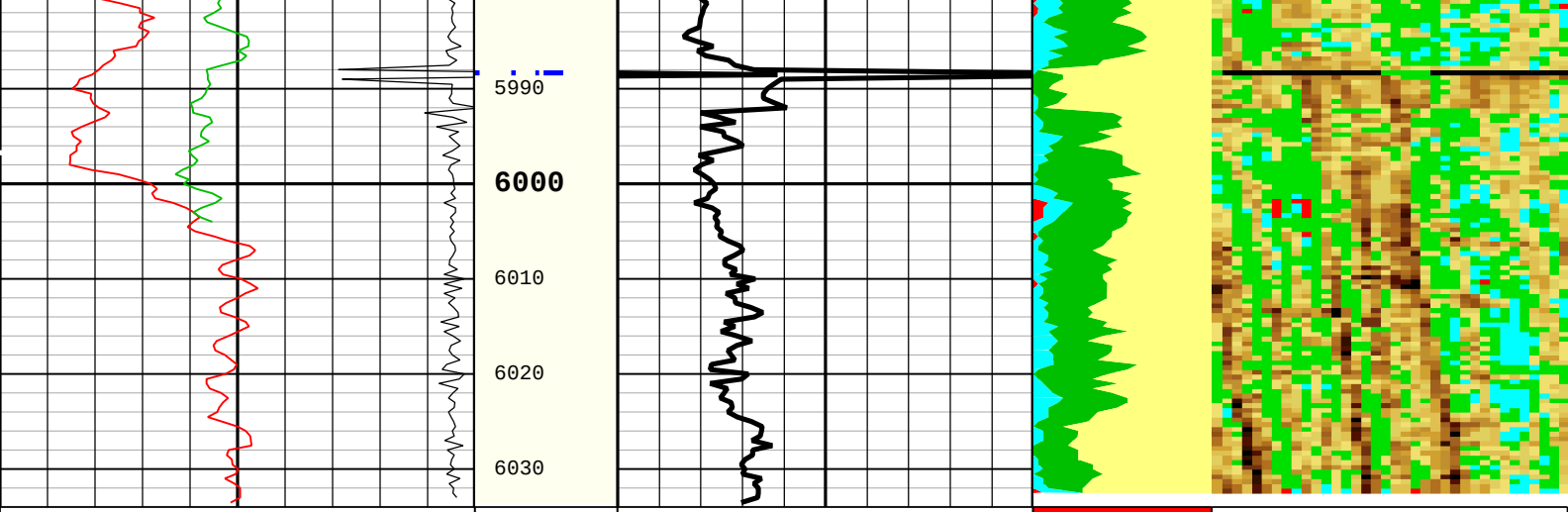


Casing Collar Locator Ultrasonic (CCLU) USIT-E

-20 in 1

Amplitude of Eccentering (ECCE) USIT-E

0 in 0.5

Gamma Ray (ECGR_EDTC) EDTC-B

0 gAPI 150

Absent 1.500 2.500 6.500

Explicit Normalization

USIT - USIT Processing Flags (UFLG) USIT-E

Acoustic Impedance Average (AIAV) USIT-E

0 Mrayl 10

Gas

Liquid

Micro-Debonding

Bonded

Absent -500.000 2.200 3.254 4.309 5.363 6.418 7.472

Custom Normalization

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

TIME_1900 - Time Marked every 60.00 (s)

Description: Format: Log (DJ Basin Ultrasonic Cement Summary Report) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth

Creation Date: 17-Jun-2018 17:21:02

Channel Processing Parameters

UltraSonic - Nuetron: Parameters

Parameter	Description	Tool	Value	Unit
ISSBAR	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Cased	
BS	Bit Size	WLSESSION	Depth Zoned	in
CBLO	Casing Bottom (Logger)	WLSESSION	18025.6	ft
CDEN	Cement Density	EDTC-B	16.69	lbm/gal
CMTY(U-USIT_CEMT)	Cement Type	USIT-E	Regular Cement	
DFD	Drilling Fluid Density	Borehole	8.4	lbm/gal
DFT_CATEGORY	Drilling Fluid Type	Borehole	Water	
DTMD	Borehole Fluid Slowness	Borehole	206	us/ft
FDII	FPM Data Interpolation Interval	USIT-E	0	ft
GCSE_DOWN_PASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	BS(RT)	
GCSE_UP_PASS	Generalized Caliper Selection for WL Log Up Passes	Borehole	BS(RT)	
HEMA	Hematite Presence Flag	Borehole	No	
IMAR	Image Rotation	USIT-E	Off	
MEAS_WLEN	Tcube Processing Window Length in Measurement Mode	USIT-E	22.44	us
MUD_N_THE	Theoretical Mud Normalization Factor	USIT-E	1.15	
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-E	0.1	Mrayl
USI_FVEL_SEL	USI Fluid Velocity Selection	USIT-E	Automatic	
USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-E	Theoretical	
ZMUD	Acoustic Impedance of Mud	Borehole	1.48	Mrayl
ZTCM	Acoustic Impedance Threshold for Cement	USIT-E	2.2	Mrayl
ZTGS	Acoustic Impedance Threshold for Gas	USIT-E	0.3	Mrayl

Depth Zone Parameters

Parameter	Value	Start (ft)	Stop (ft)
BS	13.5	30	1970
BS	8.5	1970	6034

All depth are actual.

Tool Control Parameters

UltraSonic - Nuetron: Parameters

Parameter	Description	Tool	Value	Unit
AGMN	Minimum Gain of Cartridge	USIT-E	-12	dB
AGMX	Maximum Gain of Cartridge	USIT-E	Time Zoned	dB
EMXV	EMEX Voltage	USIT-E	45	V
HRES	Horizontal Resolution	USIT-E	10 deg	
ULOG	Logging Objective	USIT-E	MEASUREMENT	
USFR	Ultrasonic Sampling Frequency	USIT-E	666667	Hz
UPAT	USIT Emission Pattern	USIT-E	Pattern 375 KHz	
UWKM	USIT Working Mode	USIT-E	Uncompressed 10 deg at 6.0 in	
WINB	Window Begin Time	USIT-E	31.88	us
WINE	Window End Time	USIT-E	71.88	us

Time Zone Parameters

Parameter	Value	Start Time	Stop Time	Start Depth (ft)	Stop Depth (ft)
AGMX	18	17-Jun-2018 12:20:22	17-Jun-2018 13:08:02	6034.41	1997.97
AGMX	48	17-Jun-2018 13:08:02	17-Jun-2018 13:33:10	1997.97	59.89

All depth are at tool zero.

UltraSonic - Nuetron

0 PSI Repeat Pass

Software Version

Acquisition System	Version
Maxwell 2017 SP3	7.3.92069.3100
Application Patch	Wireline_NPD-ICE2-2017SP3_7.3.93033
	Wireline_Hotfix-RTDLIS-2017SP3_7.3.92363
	Wireline_Hotfix-SML-2017SP3_7.3.101161
	Wireline_TestKit-CMR-NG-2017SP3_7.3.96073

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
UltraSonic - Nuetron	Log[1]:Up	Up	2001.77 ft	2512.84 ft	17-Jun-2018 12:03:49 PM	17-Jun-2018 12:07:49 PM	ON	1.95 ft	Yes

All depths are referenced to toolstring zero

Log

Company:Noble Energy Inc Well:Larson A23-645

UltraSonic - Nuetron: Log[1]:Up:S003

Description: Format: Log (DJ Basin Ultrasonic Cement Summary Report) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth

Creation Date: 17-Jun-2018 17:21:15

TIME_1900 - Time Marked every 60.00 (s)

Casing Collar Locator Ultrasonic (CCLU) USIT-E

-20 in 1

Amplitude of Eccentering (ECCE) USIT-E

0 in 0.5

Absent 1.500 2.500 6.500

Explicit Normalization

Acoustic Impedance Average (AIAV)

Gas

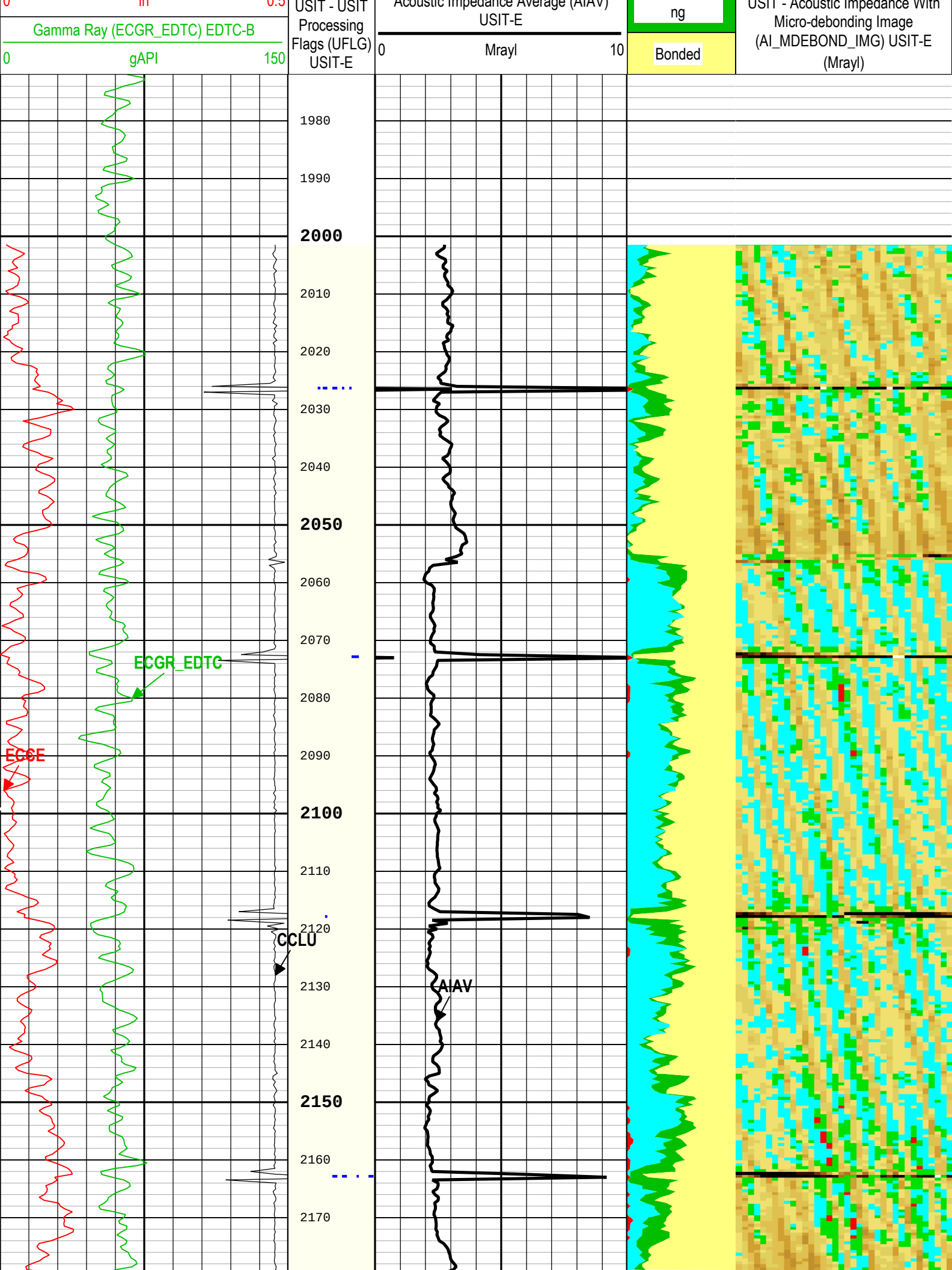
Liquid

Micro-Debondi

Absent -500.000 2.200 3.254 4.309 5.363 6.418 7.472

Custom Normalization

USIT - Acoustic Impedance With


0
in
0.5
Gamma Ray (ECGR_EDTC) EDTC-B
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gAPI
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USIT - USIT Processing Flags (UFLG) USIT-E
Acoustic Impedance Average (AIAV) USIT-E
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Mrayl
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ng
Bonded
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-E (Mrayl)
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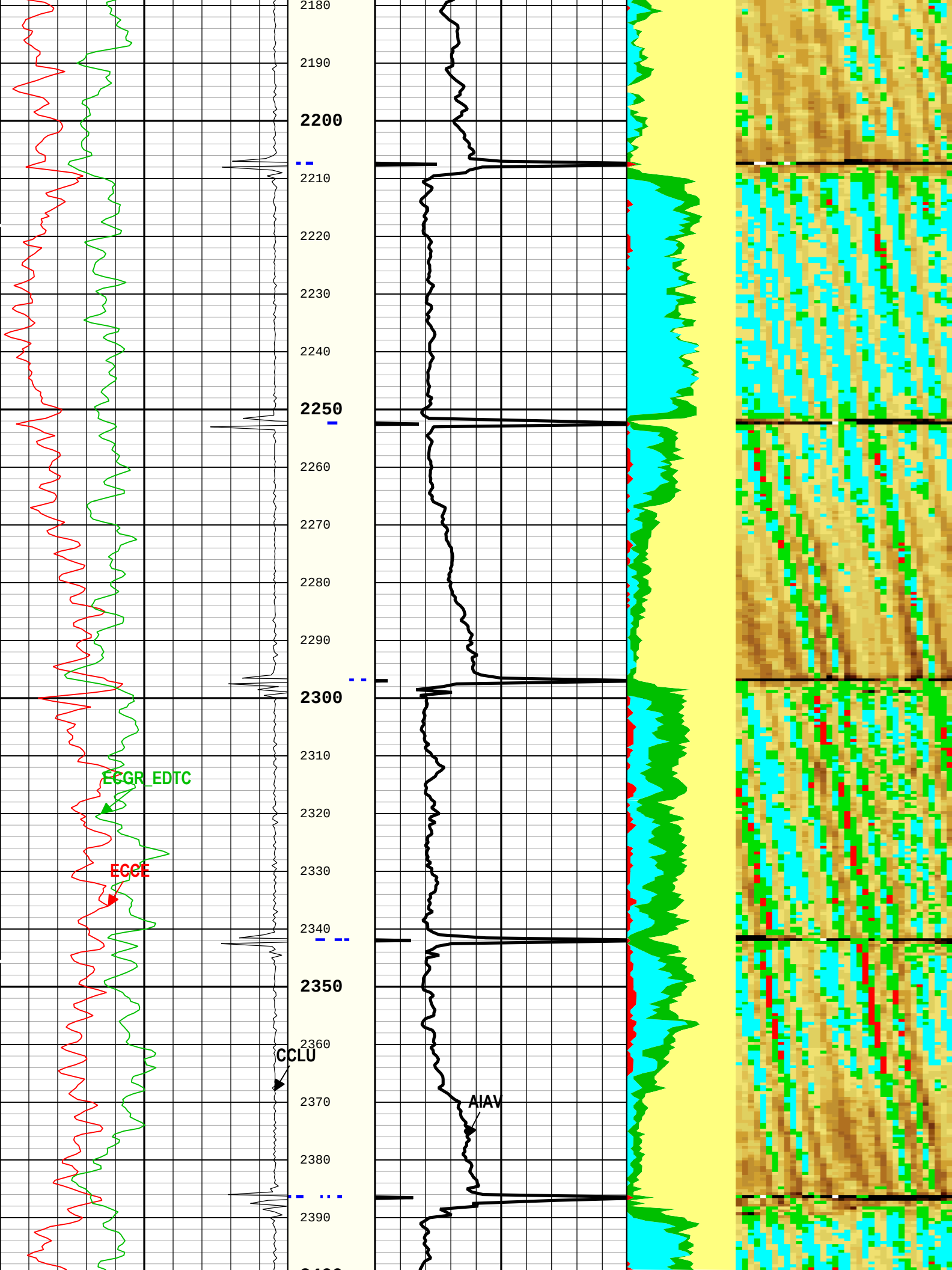
AIAV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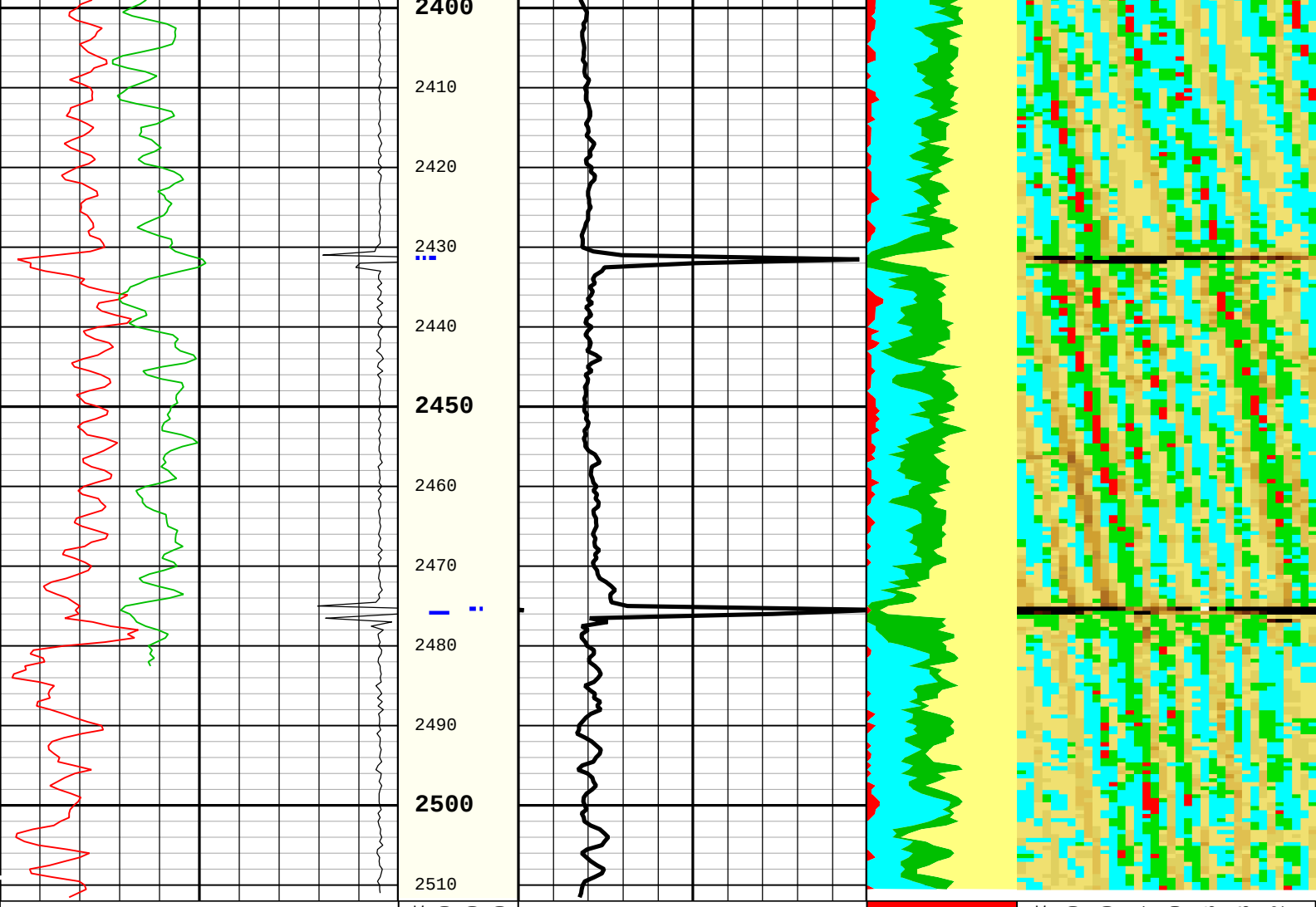


TIME_1900 - Time Marked every 60.00 (s)

Description: Format: Log (DJ Basin Ultrasonic Cement Summary Report) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth
Creation Date: 17-Jun-2018 17:21:15

Channel Processing Parameters

UltraSonic - Nuetron: Parameters

Parameter	Description	Tool	Value	Unit
ISSBAR	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Cased	
BS	Bit Size	WLSESSION	8.5	in
CBLO	Casing Bottom (Logger)	WLSESSION	18025.6	ft
CDEN	Cement Density	EDTC-B	16.69	lbm/gal
CMTY(U-USIT_CEMT)	Cement Type	USIT-E	Regular Cement	
DFD	Drilling Fluid Density	Borehole	8.4	lbm/gal
DFT_CATEGORY	Drilling Fluid Type	Borehole	Water	
DTMD	Borehole Fluid Slowness	Borehole	206	us/ft
FDII	FPM Data Interpolation Interval	USIT-E	0	ft

GCSE_DOWN_PASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	BS(RT)	
GCSE_UP_PASS	Generalized Caliper Selection for WL Log Up Passes	Borehole	BS(RT)	
HEMA	Hematite Presence Flag	Borehole	No	
IMAR	Image Rotation	USIT-E	Off	
MEAS_WLEN	Tcube Processing Window Length in Measurement Mode	USIT-E	22.44	us
MUD_N_THE	Theoretical Mud Normalization Factor	USIT-E	1.15	
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-E	0.1	Mrayl
USI_FVEL_SEL	USI Fluid Velocity Selection	USIT-E	Automatic	
USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-E	Theoretical	
ZMUD	Acoustic Impedance of Mud	Borehole	1.48	Mrayl
ZTCM	Acoustic Impedance Threshold for Cement	USIT-E	2.2	Mrayl
ZTGS	Acoustic Impedance Threshold for Gas	USIT-E	0.3	Mrayl

Tool Control Parameters

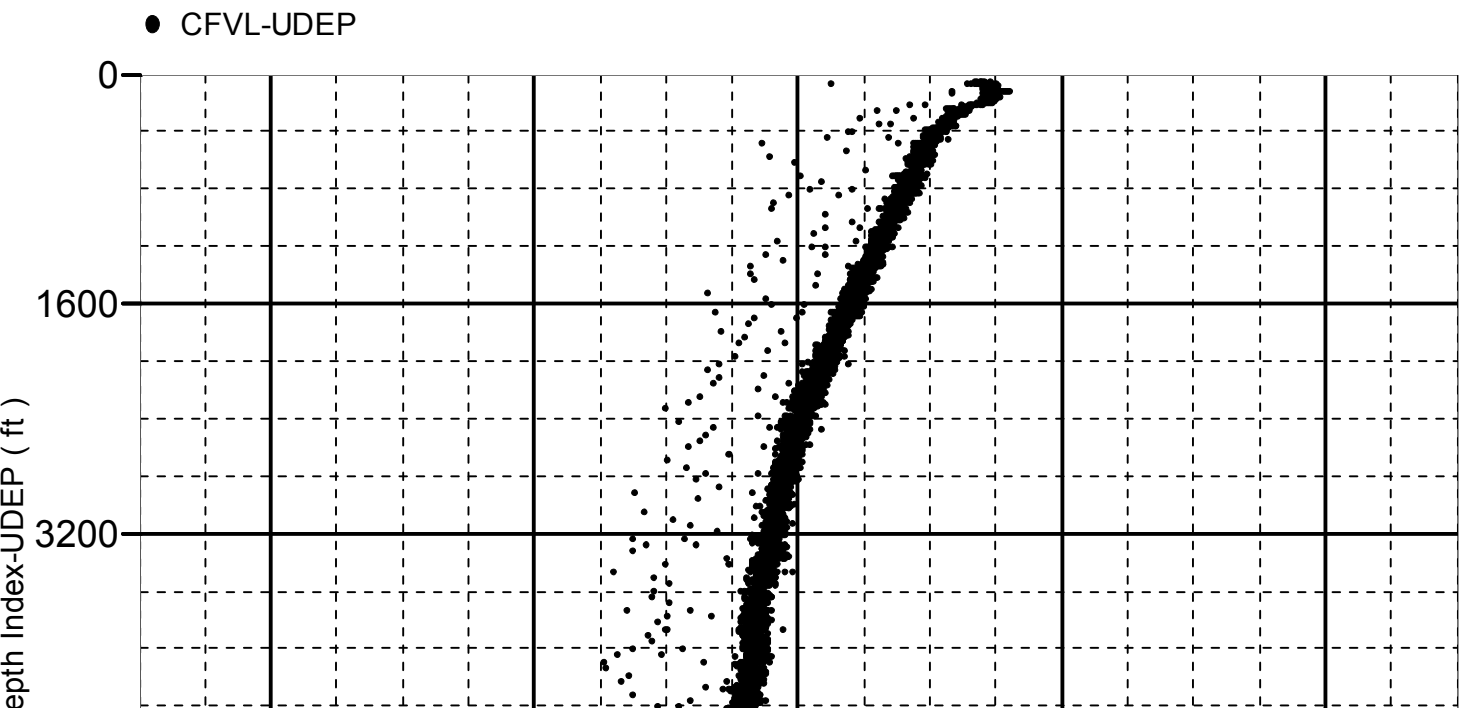
UltraSonic - Nuetron: Parameters

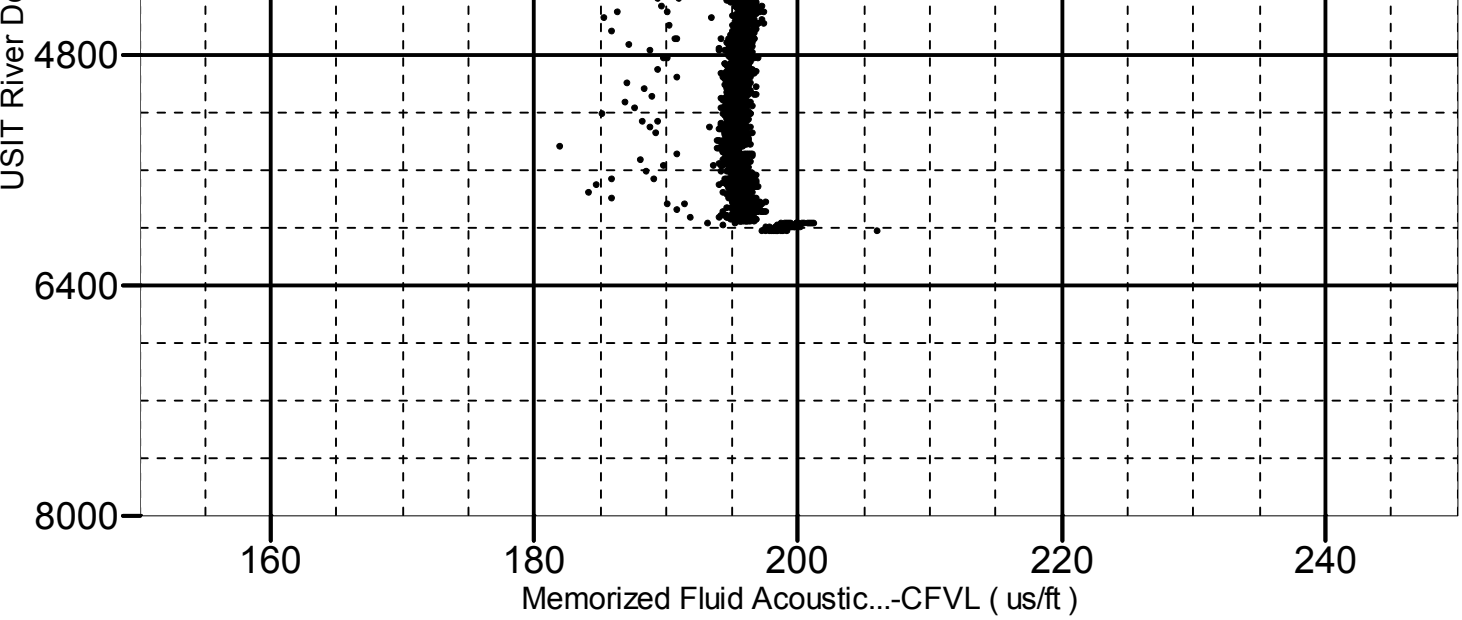
Parameter	Description	Tool	Value	Unit
AGMN	Minimum Gain of Cartridge	USIT-E	-12	dB
AGMX	Maximum Gain of Cartridge	USIT-E	18	dB
EMXV	EMEX Voltage	USIT-E	45	V
HRES	Horizontal Resolution	USIT-E	10 deg	
ULOG	Logging Objective	USIT-E	MEASUREMENT	
USFR	Ultrasonic Sampling Frequency	USIT-E	666667	Hz
UPAT	USIT Emission Pattern	USIT-E	Pattern 375 KHz	
UWKM	USIT Working Mode	USIT-E	Uncompressed 10 deg at 6.0 in	
WINB	Window Begin Time	USIT-E	31.88	us
WINE	Window End Time	USIT-E	71.88	us

Fluid Acoustic Slowness vs Depth

2D Cross Plot

Index Range: From 6034.00 to 60.00 ft





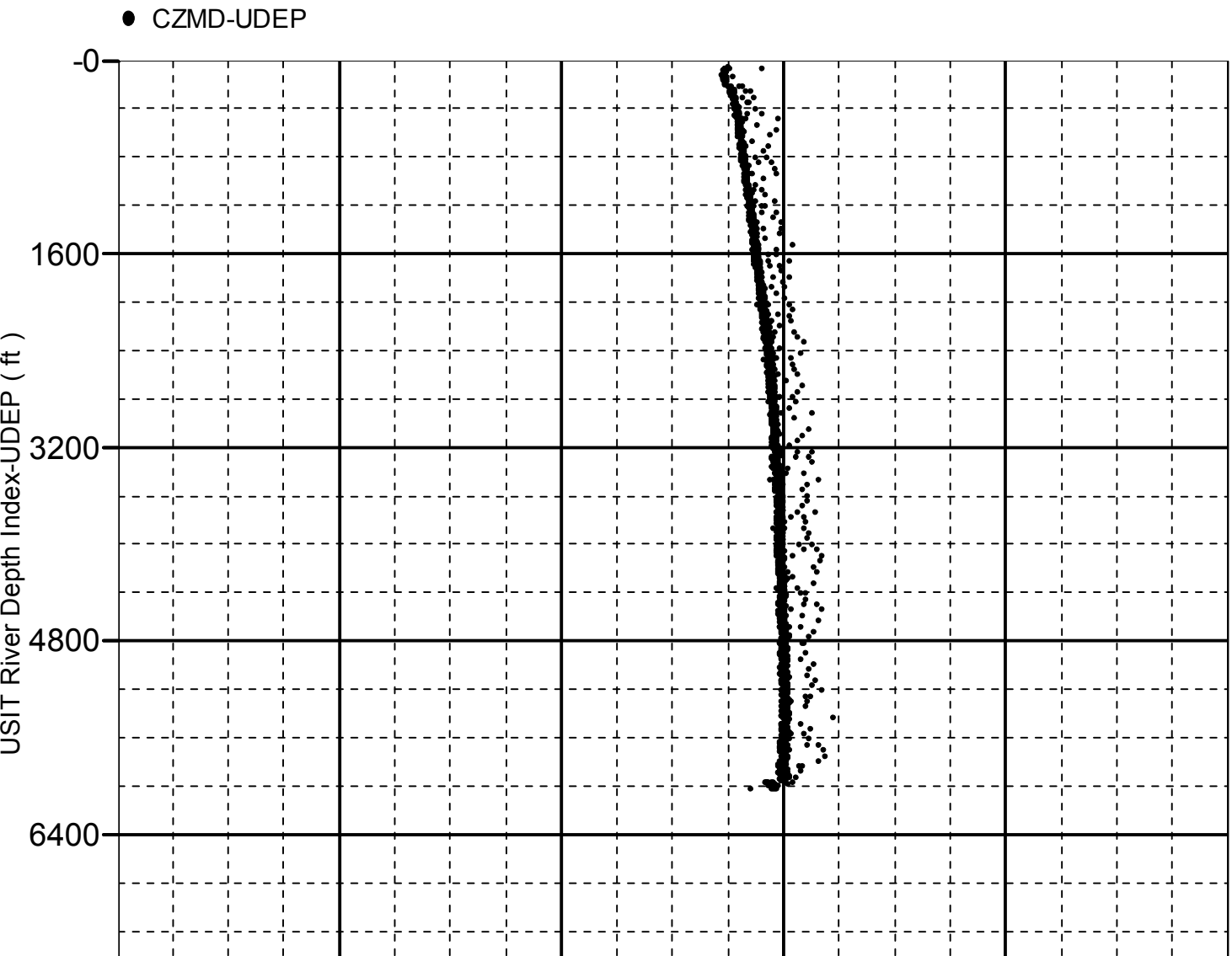
XYZ

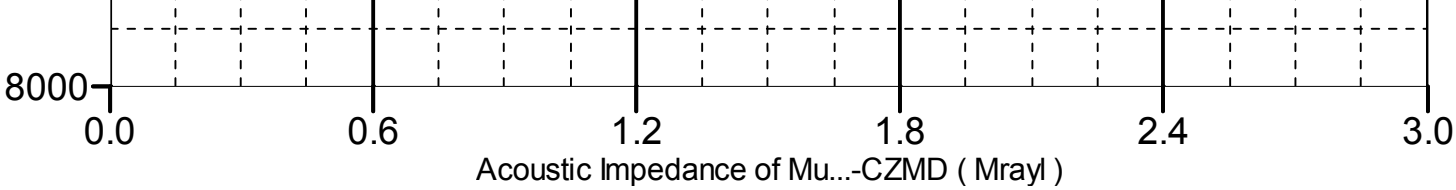
Company:Noble Energy Inc Well:Larson A23-645
UltraSonic - Nuetron: Log[3]:Up:S003

Acoustic Impedance of Mud vs Depth

2D Cross Plot

Index Range: From 6034.00 to 60.00 ft





Company:	Noble Energy Inc
Well:	Larson A23-645
Field:	Wattenberg
County:	Weld
State:	Colorado

Schlumberger

UltraSonic Summary Print