Schlumberger

Company: Noble Energy INC

Well: Wells Ranch BB11-667

Field: Wattenberg

County: WELD State: Colorado

UltraSonic Summary Print

County: WELD
Field: Wattenberg
Location: NWNW Sec. 11, T5N, R63W
Well: Wells Ranch BB11-667
Company: Noble Energy INC

Location:				
NWNW Sec. 11, T5N, R63W		Elev.:	K.B.	4715.00 ft
SHL: 1710' FNL & 300' FWL			G.L.	4685.00 ft
Lat/Long: 40.41898, -104.41268			D.F.	4715.00 ft
Permanent Datum:	Ground Level	Elev.:	4685.00 f	
Log Measured From:	Kelly Bushing	30.00 ft	above Perm.Datum	
Drilling Measured From:	Kelly Bushing			

API Serial No.	Section:	Township:	Range:
05-123-44968	11	5N	63W

Logging Date	21-Sep-2017		
Run Number	One		
Depth Driller	16705.00 ft		
Schlumberger Depth	5900.00 ft		
Bottom Log Interval	5900.00 ft		
Top Log Interval	184.00 ft		
Casing Fluid Type	Brine		
Salinity			
Density	8.4 lbm/gal		
Fluid Level	0.00 ft		
BIT/CASING/TUBING STRING			
Bit Size	8.50 in		
From	1945.00 ft		
To	5900.00 ft		
Casing/Tubing Size	5.5 in		
Weight	20 lbm/ft		
Grade	N/A		
From	30.00 ft		
To	5900.00 ft		
Max Recorded Temperatures	221 degF		
Logger on Bottom Time	22-Sep-2017	11:08:00	
Unit Number Location:	2161	Fort Morgan	
Recorded By	Camila Lang		
Witnessed By	Bill Mansfield		

Disclaimer

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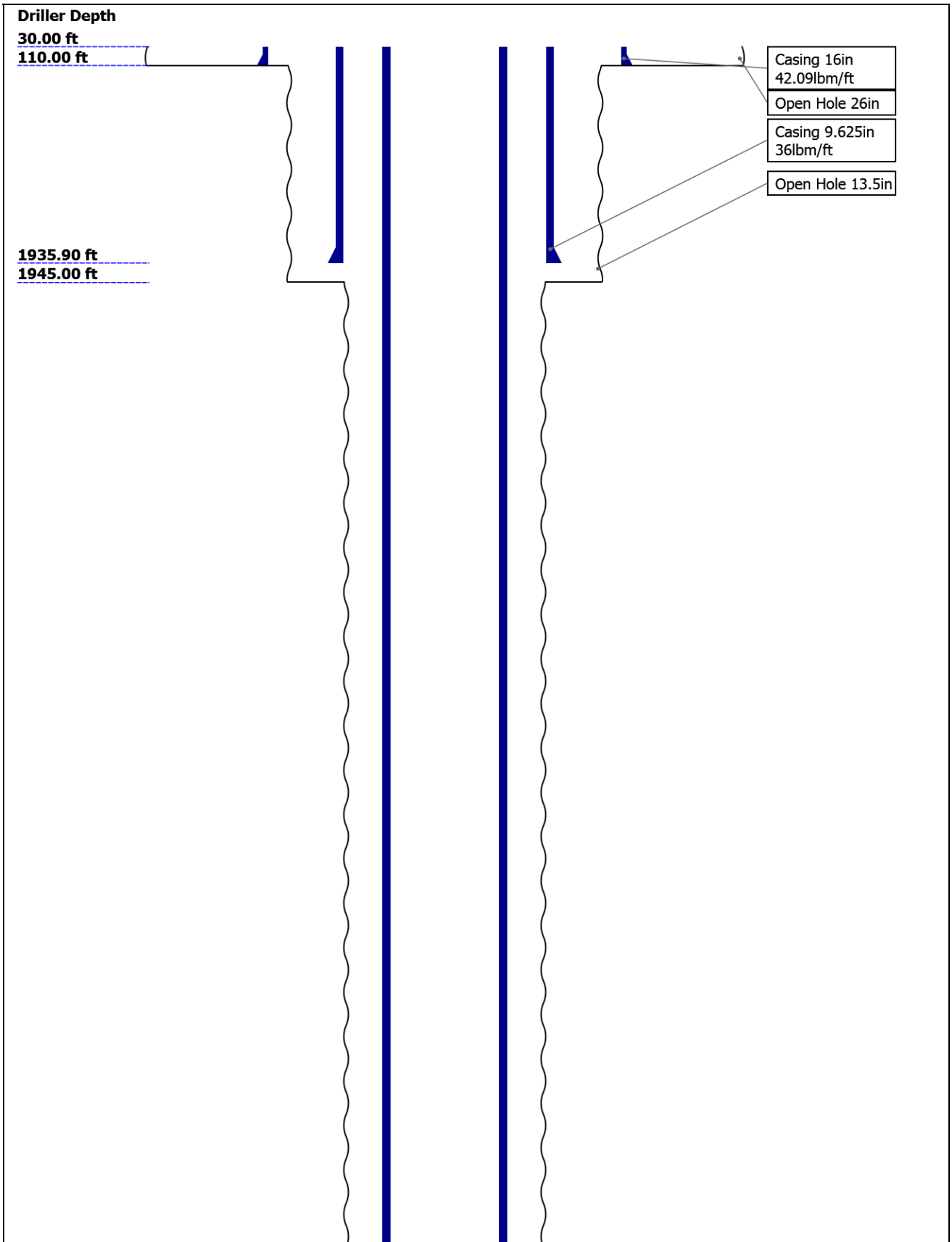
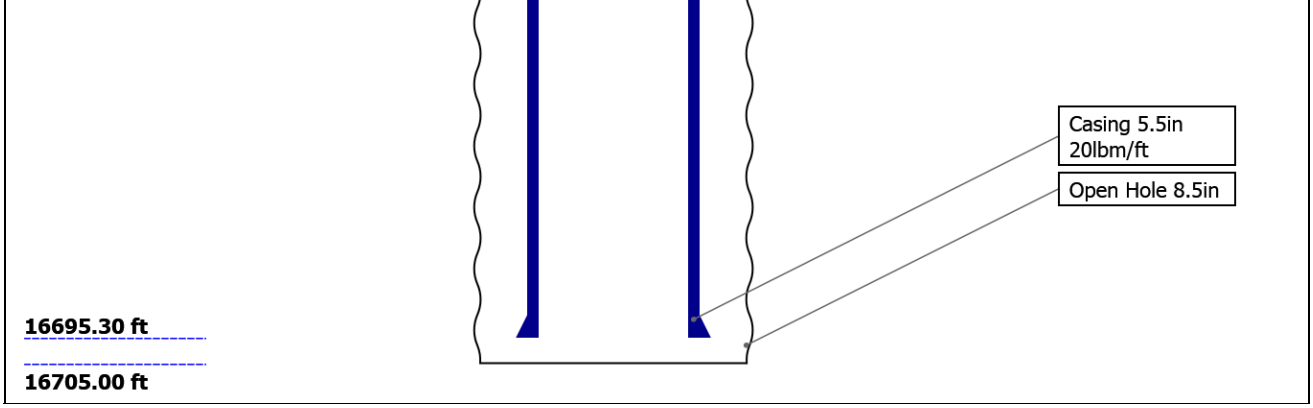
Well Sketch





Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	26	13.5	8.5			
Top Driller (ft)	30	110	1945			
Top Logger (ft)	30	110	1945			
Bottom Driller (ft)	110	1945	16705			
Bottom Logger (ft)	110	1945	5900			
Casing						
Size (in)	16	9.625	5.5			
Weight (lbm/ft)	42.09	36	20			
Inner Diameter (in)	15.511	8.921	4.778			
Grade	N/A	N/A	N/A			
Top Driller (ft)	30	30	30			
Top Logger (ft)	30	30	30			
Bottom Driller (ft)	110	1935.9	16695.3			
Bottom Logger (ft)	110	1935.9	5900			

Operational Run Summary

Parameter (unit)	One					
Date Log Started	21-Sep-2017					
Time Log Started	22:45:31					
Date Log Finished	22-Sep-2017					
Time Log Finished	00:18:20					
Top Log Interval (ft)	184.00					
Bottom Log Interval (ft)	5900.00					
Total Depth (ft)	5900.00					
Max Hole Deviation (deg)	0.00					
Azimuth of Max Deviation (deg)	0.00					
Bit Size (in)	8.500					
Logging Unit Number	2161					
Logging Unit Location	Fort Morgan					
Recorded By	Camila Lang					

Witnessed By	Bill Mansfield					
Service Order Number	DX2C-00003					

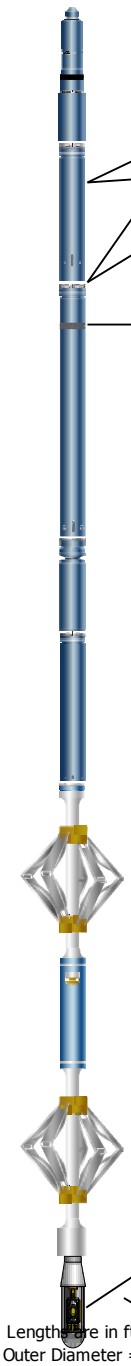
Borehole Fluids

Parameter(unit)	One					
Fluid Type	Water					
Fluid Name	Brine					
Max Recorded Temperatures (degF)	221					
Salinity (ppm)	0					
Density (lbm/gal)	8.4					
Date Logger on Bottom	22-Sep-2017					
Time Logger on Bottom	11:08:00					
Total Solid (%)						
High Gravity Solids (%)						

Remarks and Equipment Summary

One : Toolstring

Equip name	Length	MP name	Offset
LEH-QT:3123 LEH-QT:3123	28.97		
DTC-H:9170 ECH-KC:9579 DTC-H:9170	26.06	**CTEM**	25.16
		HV	0.00
		TelStatus	23.06
		ToolStatus	23.06
SGT-N:10366 SGH-K:3140 SGD-TAA:21869 SGC-TB:10366	23.06	**GR**	22.14
AH-184	17.56	2765	
USIT-E:930 ECH-MFA:1924 USAC-A:930 USIS-A:1826 USSC-B USRS-AB USI-SENSOR:1383	15.56		
		USI Sensor Head Tension	0.37



Length are in ft
Maximum Outer Diameter = 3.410 in
Line: Sensor Location, Value: Gating Offset

One : Remarks

Tool run as per tool sketch.
This is the first log in the well
CSG: 9.625" 36lb/ft @ 1935.9' 5.5" 20lb/ft @ 16695.3'
Fluid: Fresh Water 8.4 lb/gal
Main pass recorded under 2500 PSI, and repeat pass recorded under 0 PSI.
BHT: 221 degF

Line: Sensor Location, Value: Gating Offset
All measurements are relative to TOOL_ZERO

Depth Summary

	One		
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	7-39P-LXS		
Serial Number			
Length	10000.00 ft		
Conveyance Type	Wireline		
Rig Type	Crane USA		

One :Depth Control Parameters		Depth Control Remarks
Log Sequence	First Log In the Well	All Schlumberger depth contol policies were followed
Rig Up Length At Surface		IDW used as a primary depth reference
Rig Up Length At Bottom		Z-chart used as a secondary depth reference
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[5]:Up	6200.84	185.18

Fluid Velocity = "Automatic".
CFVL equals DFSL channel

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

Mud Impedance = "FreePipe Norm.".
Free Pipe normalization zone is : 70.86m(232.48ft) to 72.77m(238.73ft)
MUD_N_FRP = 1.16
DFD = 1.01g/cm3(8.40lbm/gal)
CZMD median computed in free pipe normalization interval = 1.70 MRayl

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

One

2500 PSI Main Pass

Software Version

Acquisition System	Version

Acquisition System	Version
Maxwell 2017 SP2	7.2.87778.3100

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
One	Log[5]:Up	Up	185.18 ft	6200.84 ft	21-Sep-2017 11:29:34 PM	22-Sep-2017 12:17:45 AM	ON	4.03 ft	Yes

All depths are referenced to toolstring zero

Log

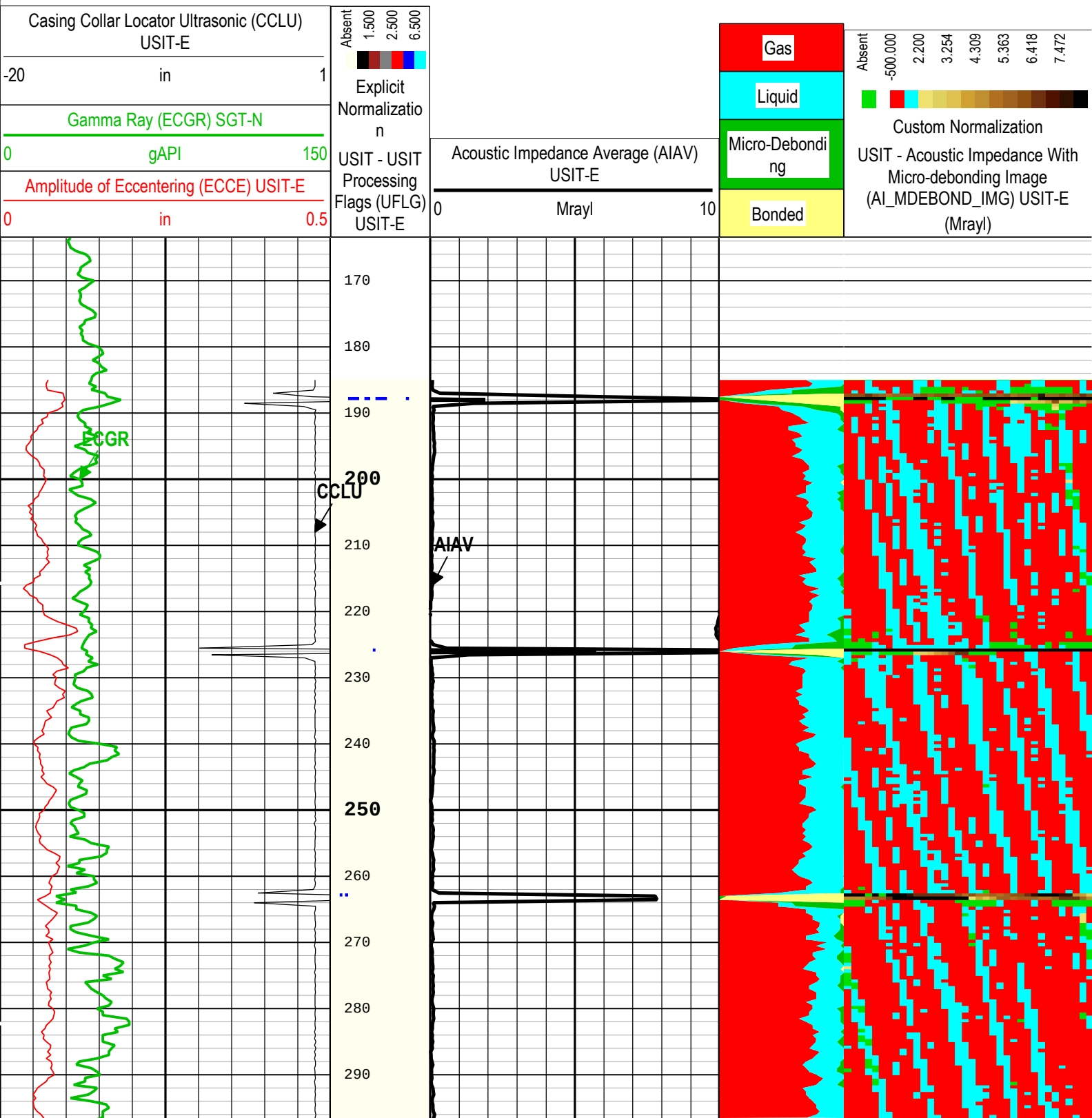
Company:Noble Energy INC Well:Wells Ranch BB11-667

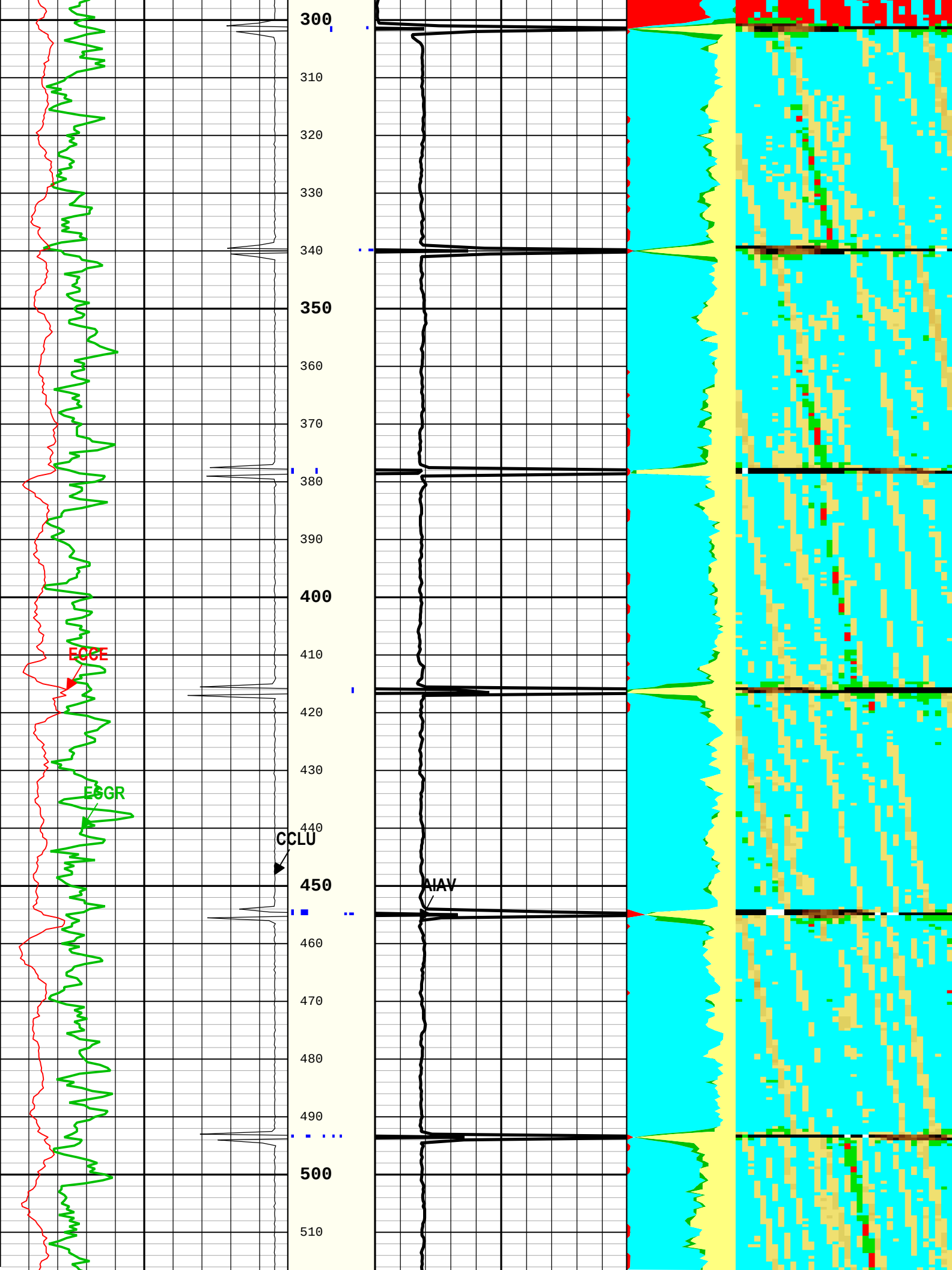
One : Log[5]:Up:S007

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: 22-Sep-2017 01:17:27

TIME_1900 - Time Marked every 60.00 (s)

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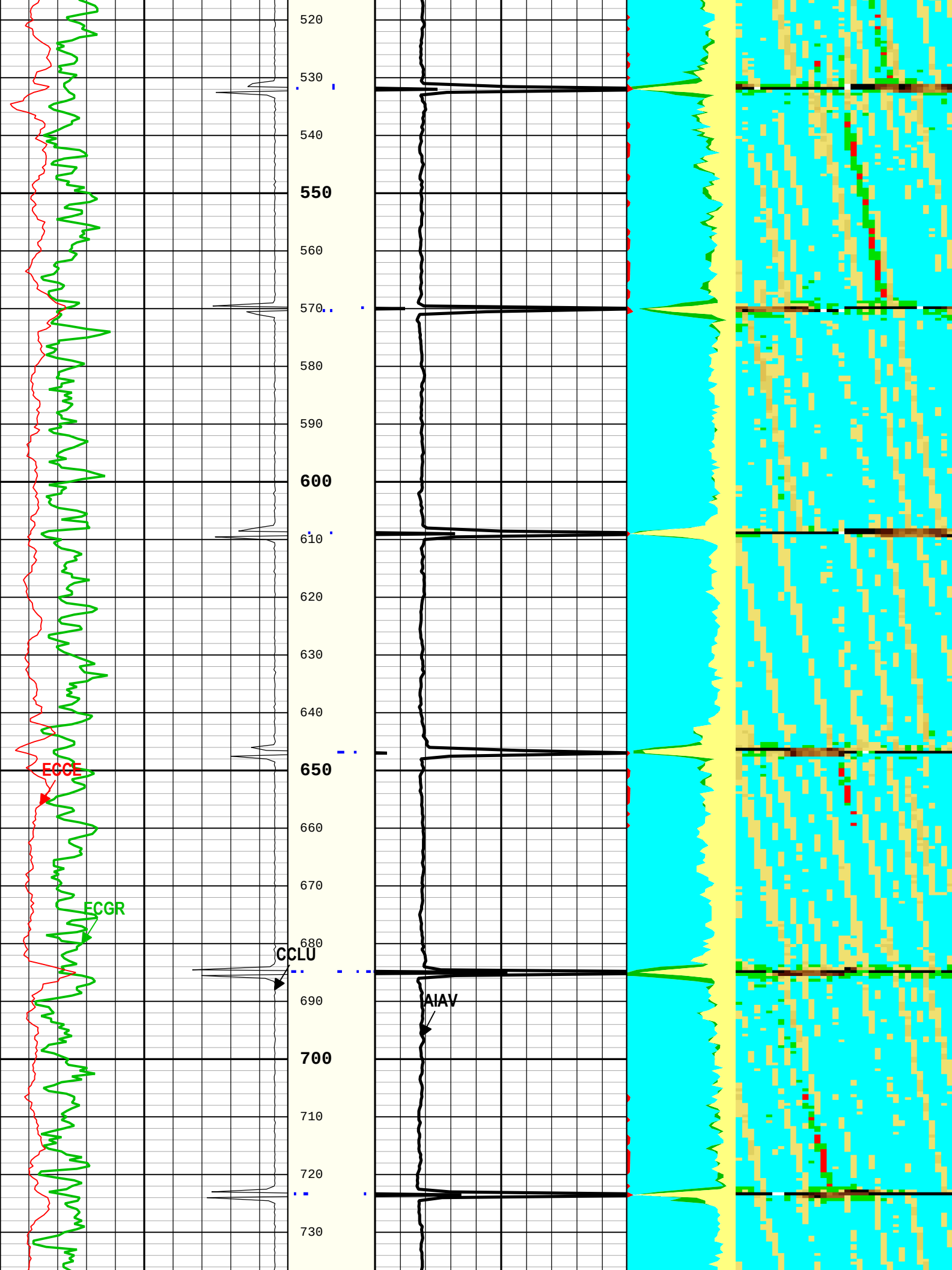
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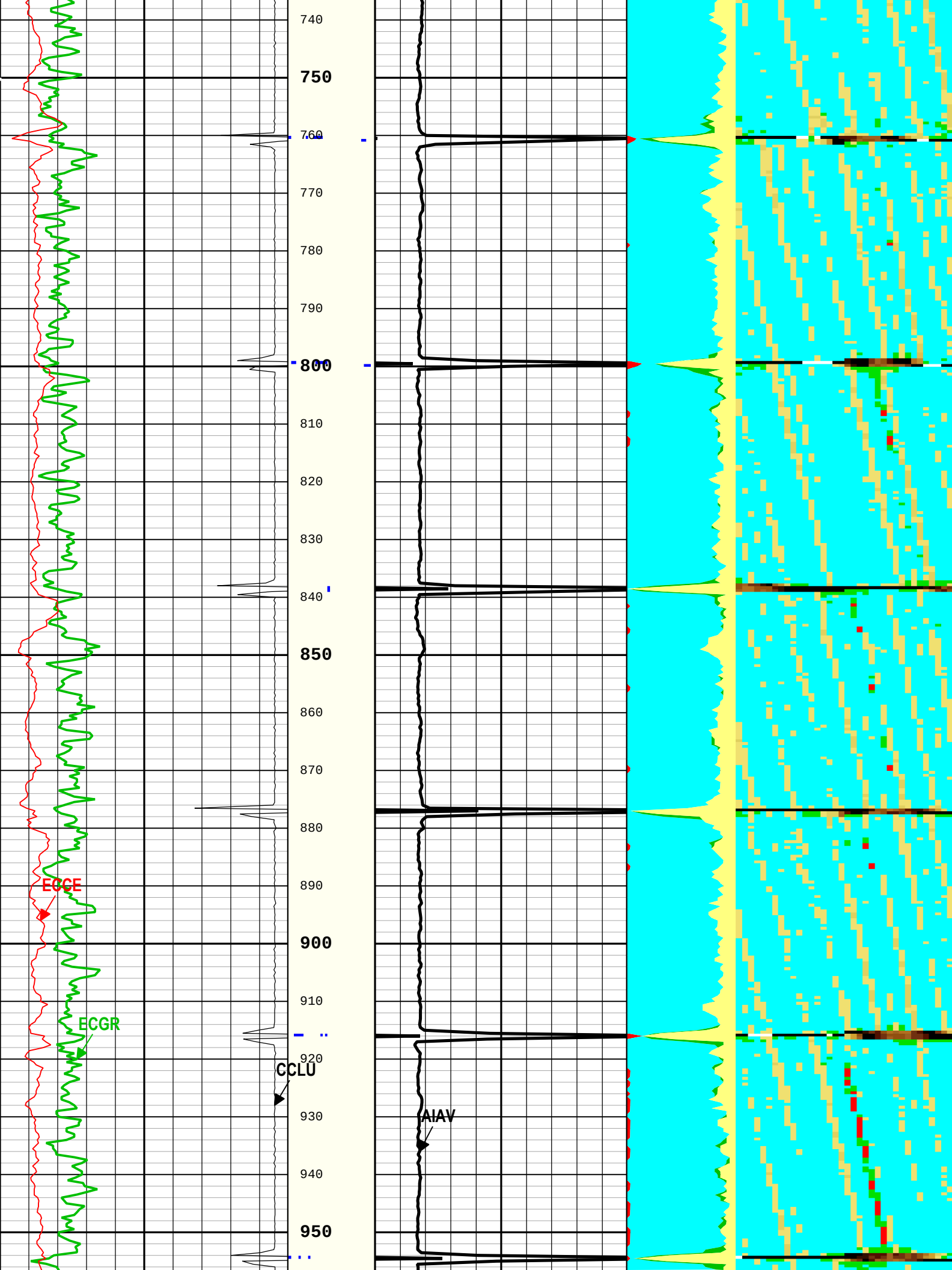
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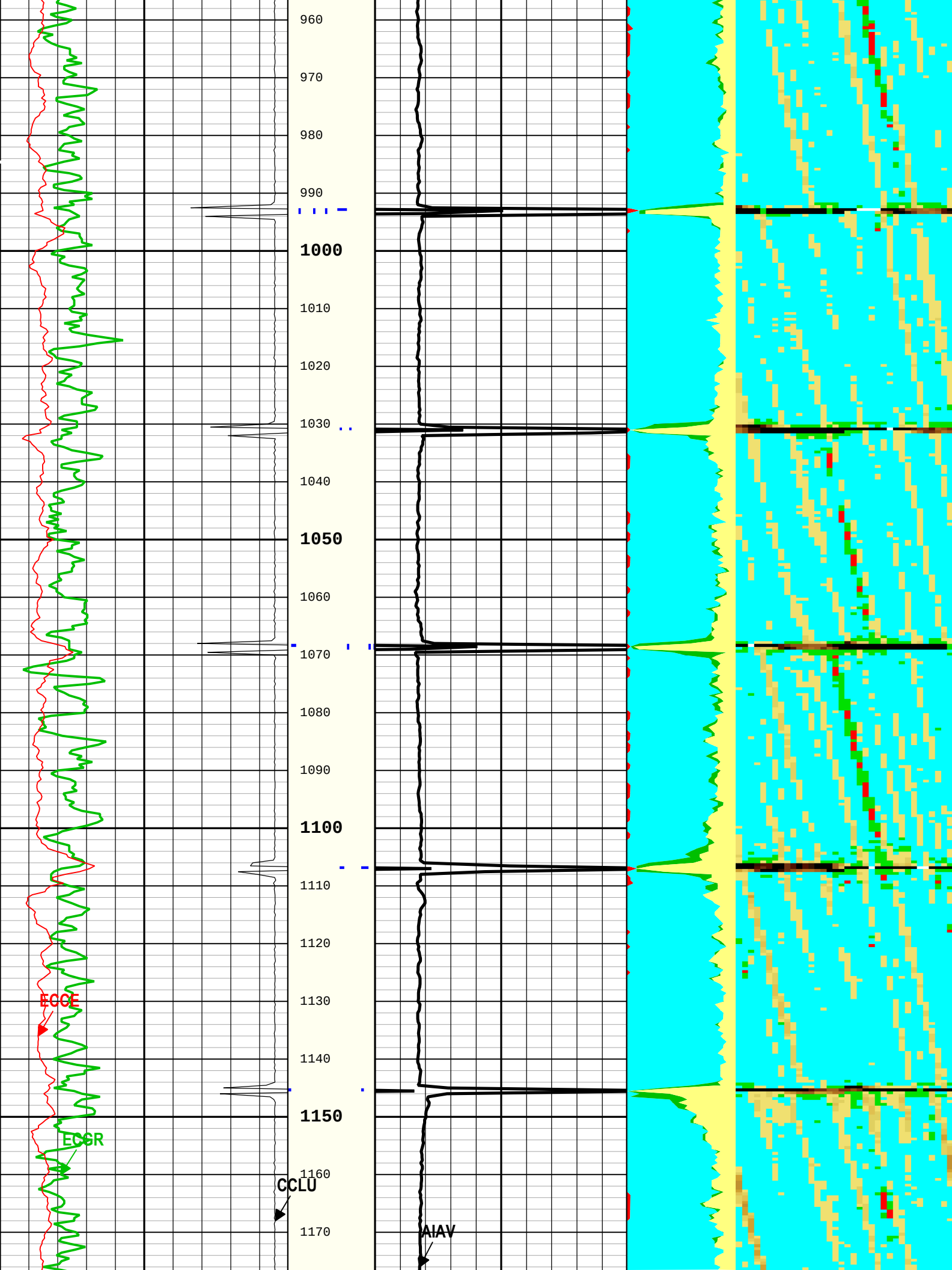
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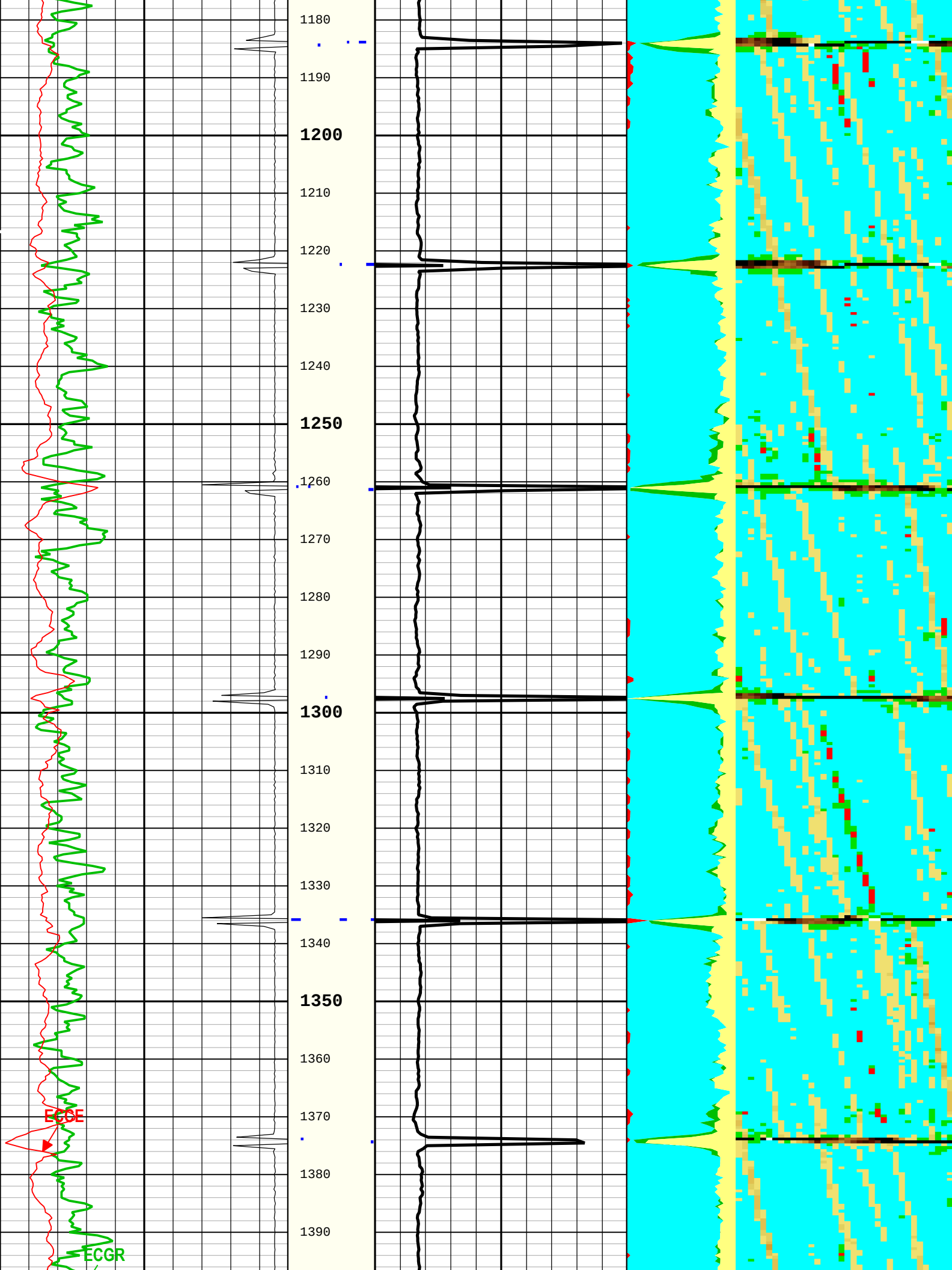
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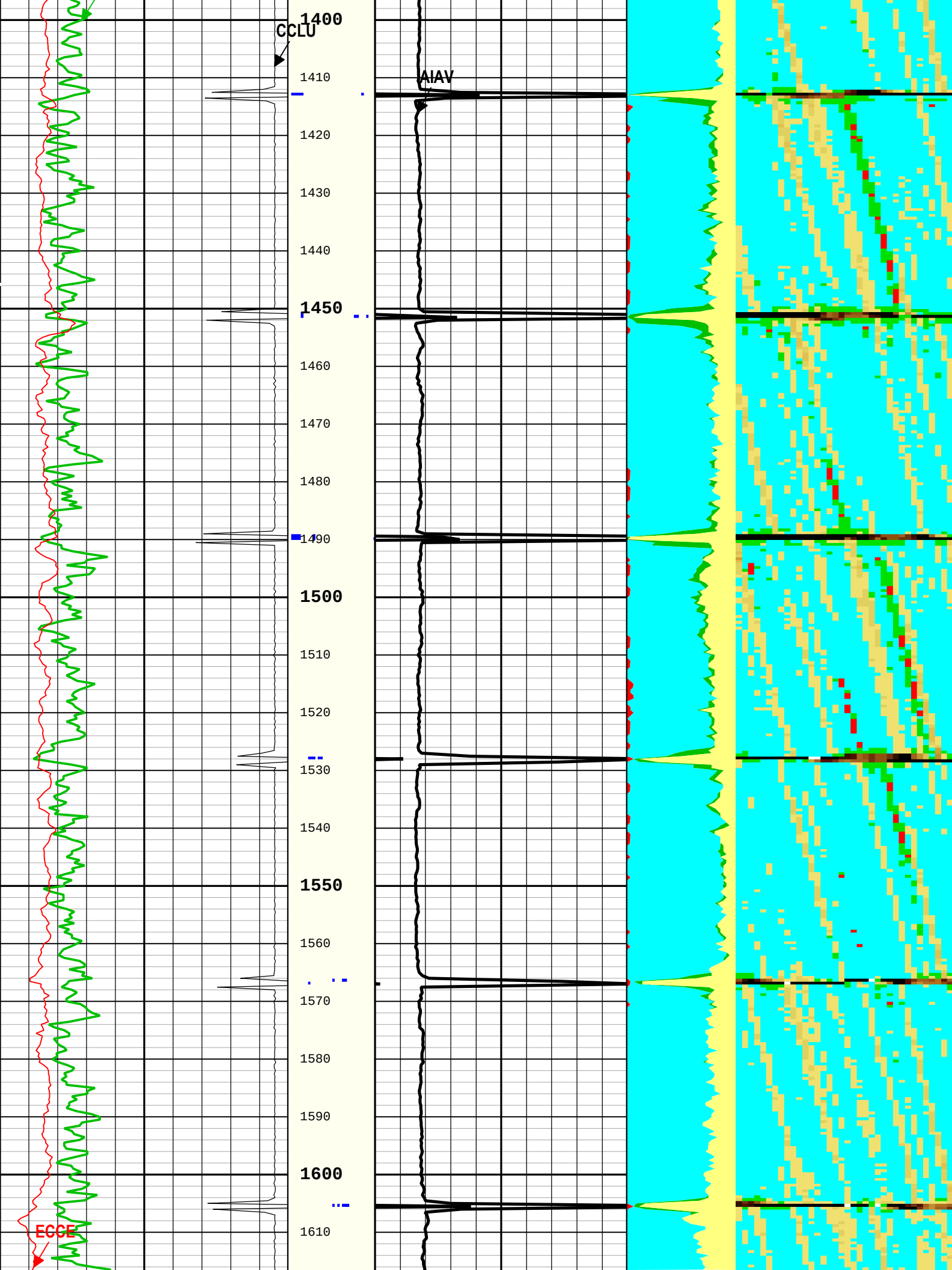
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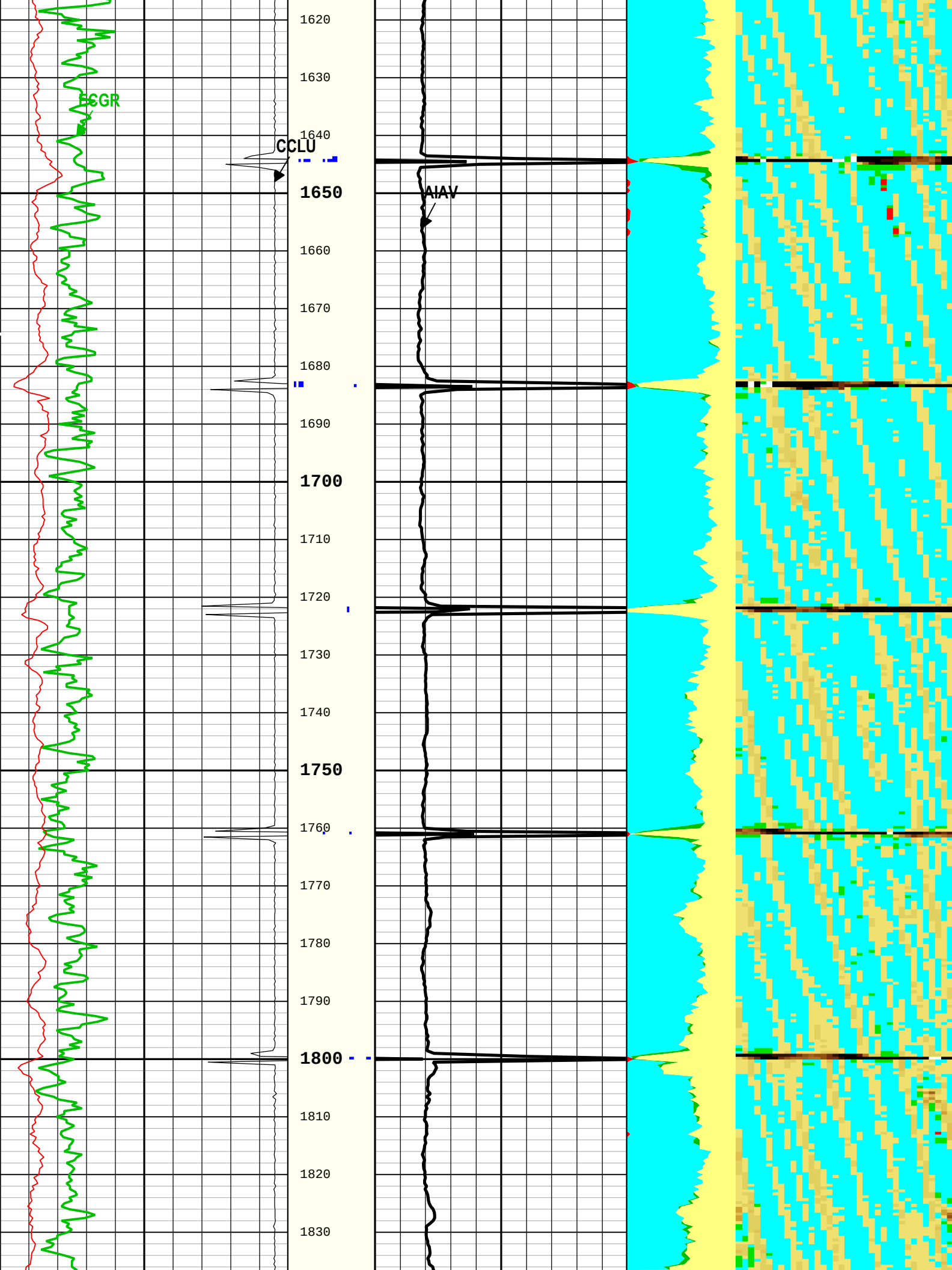
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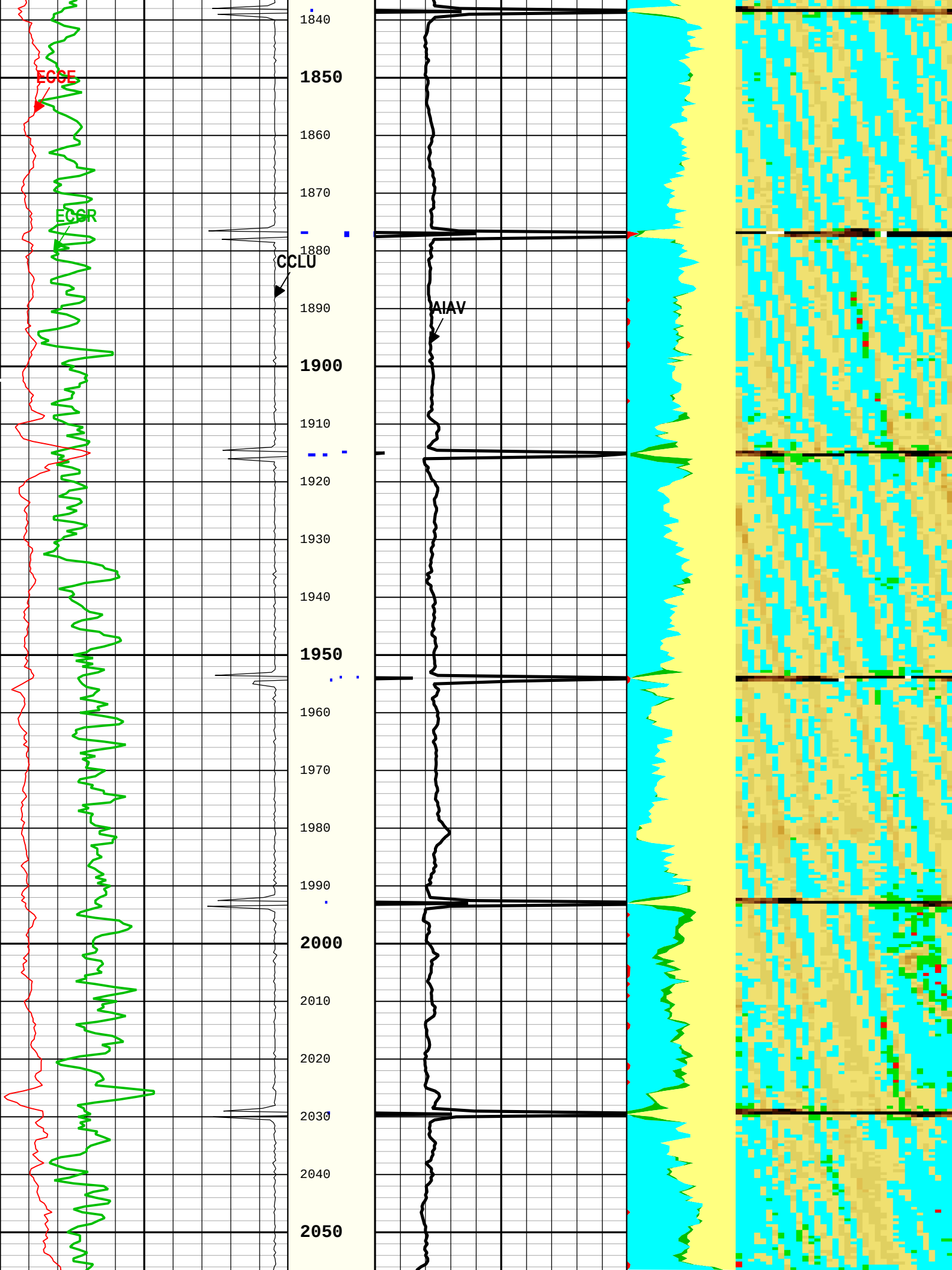
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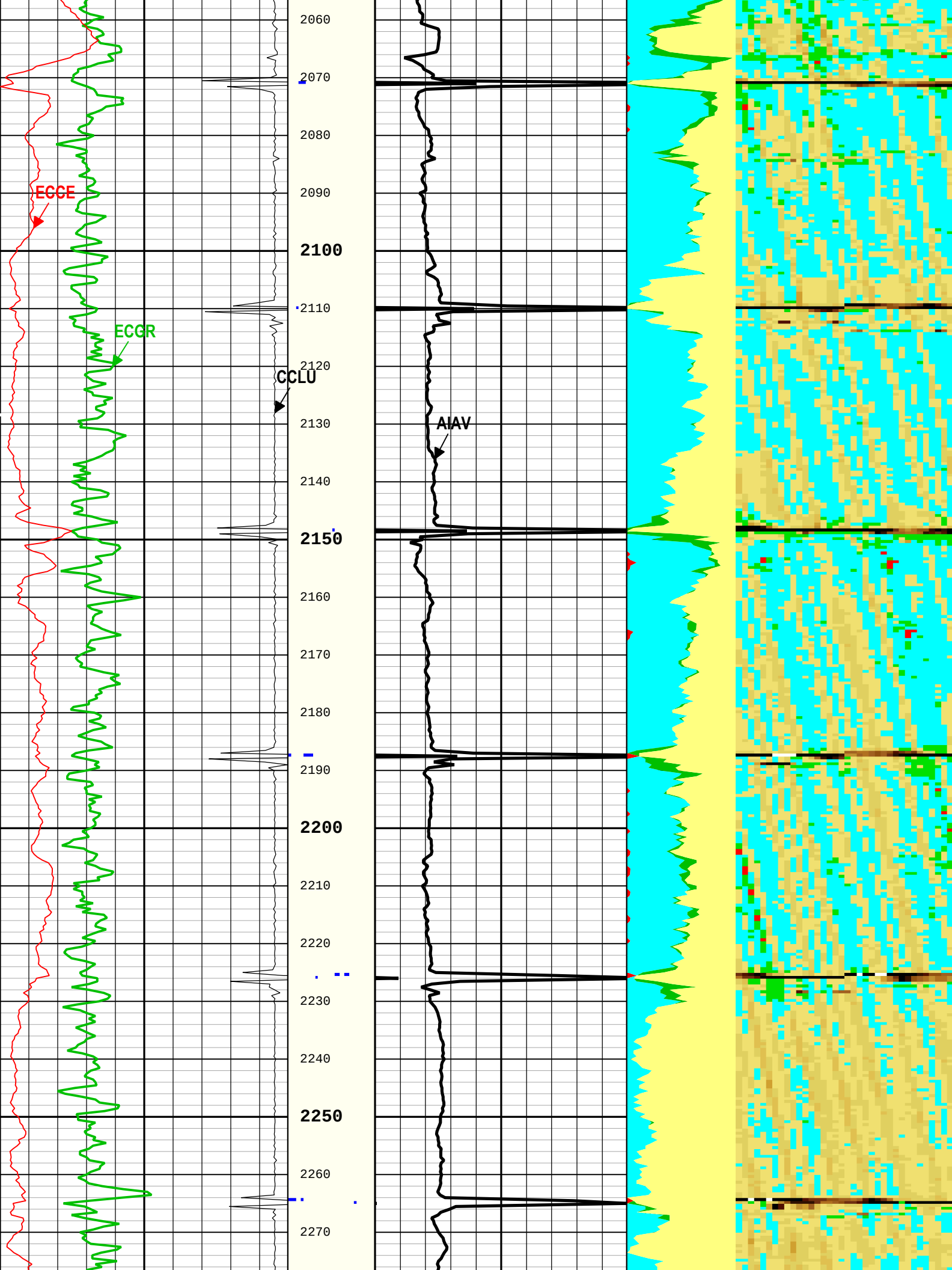
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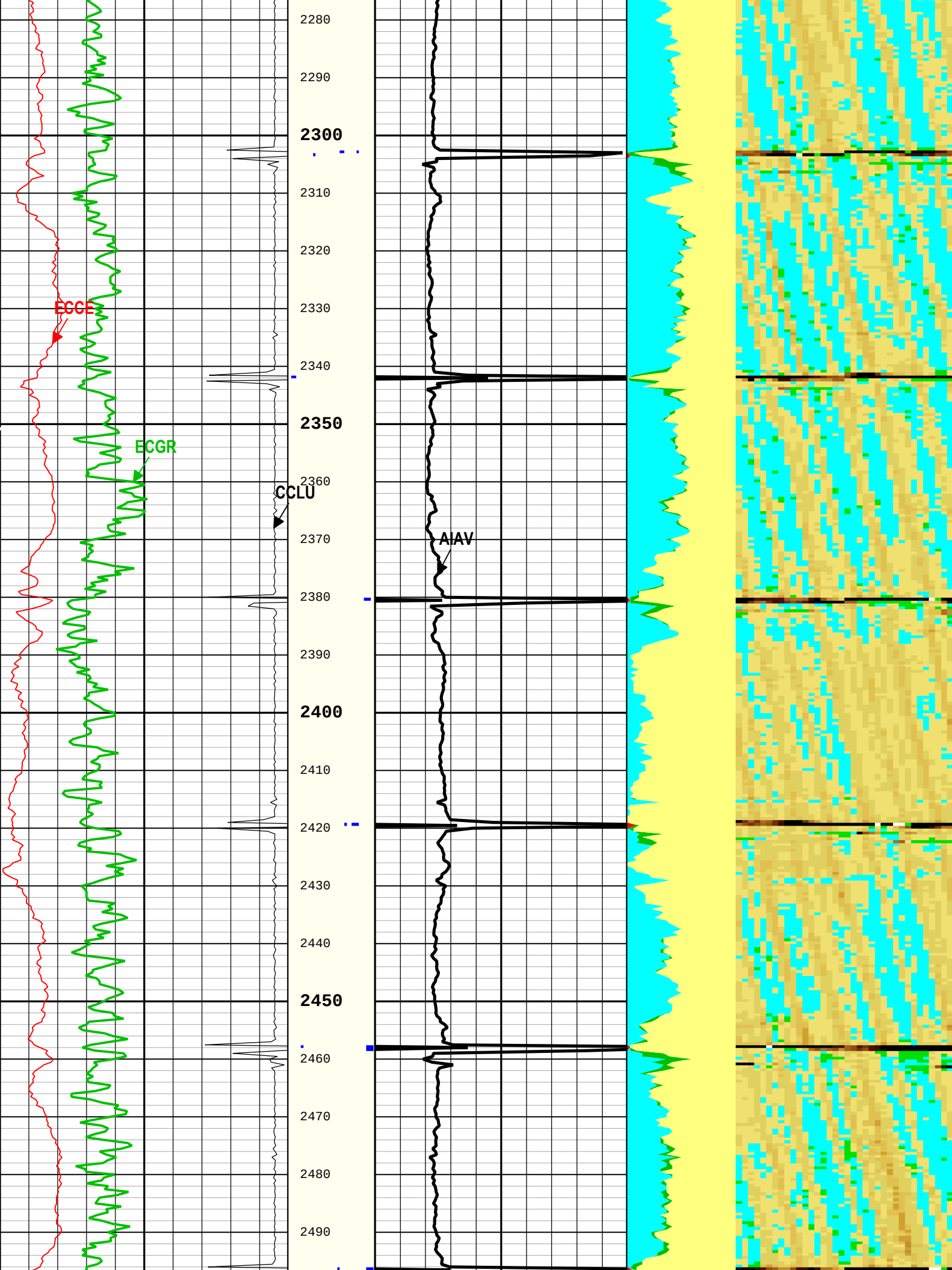
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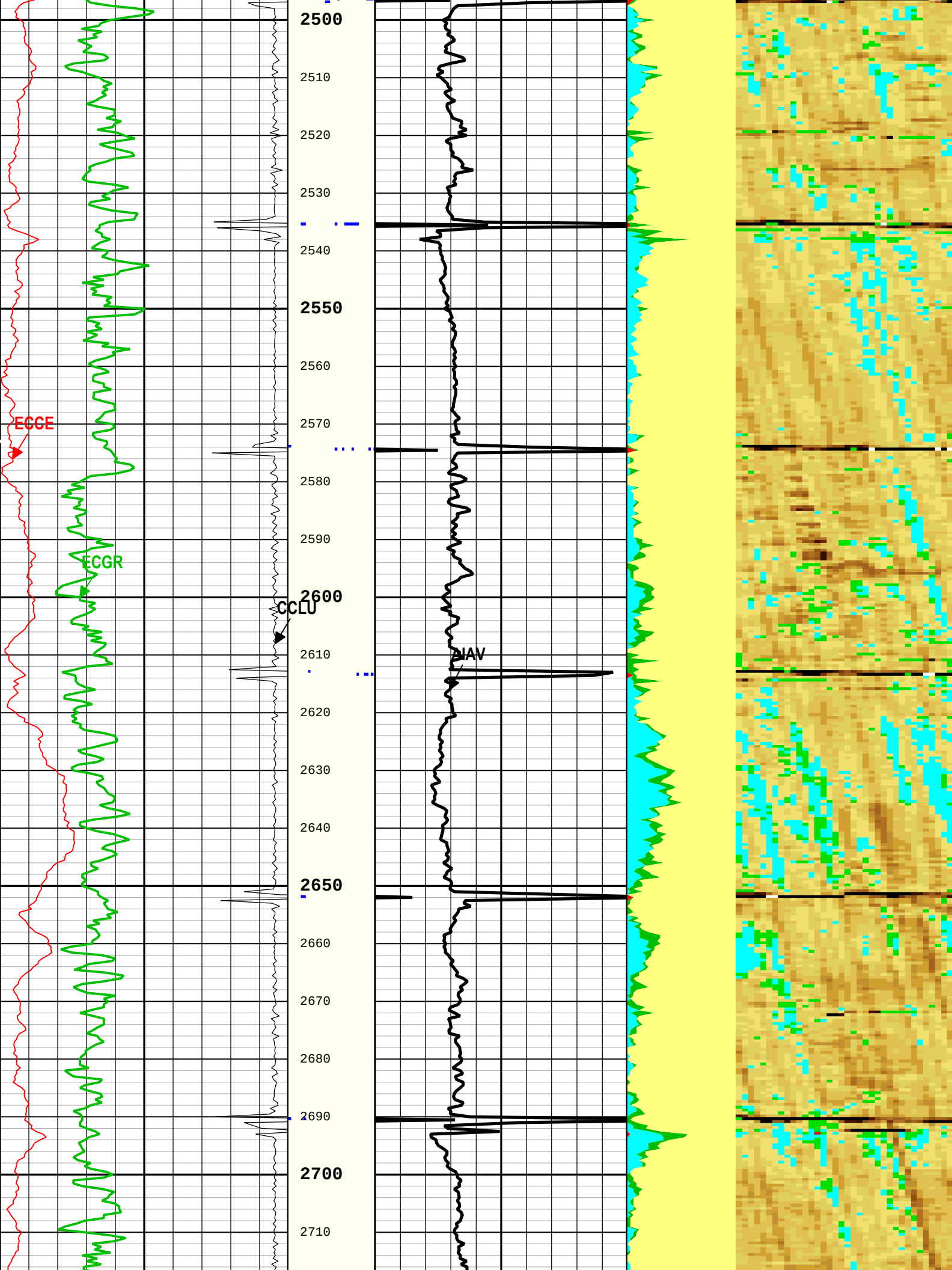
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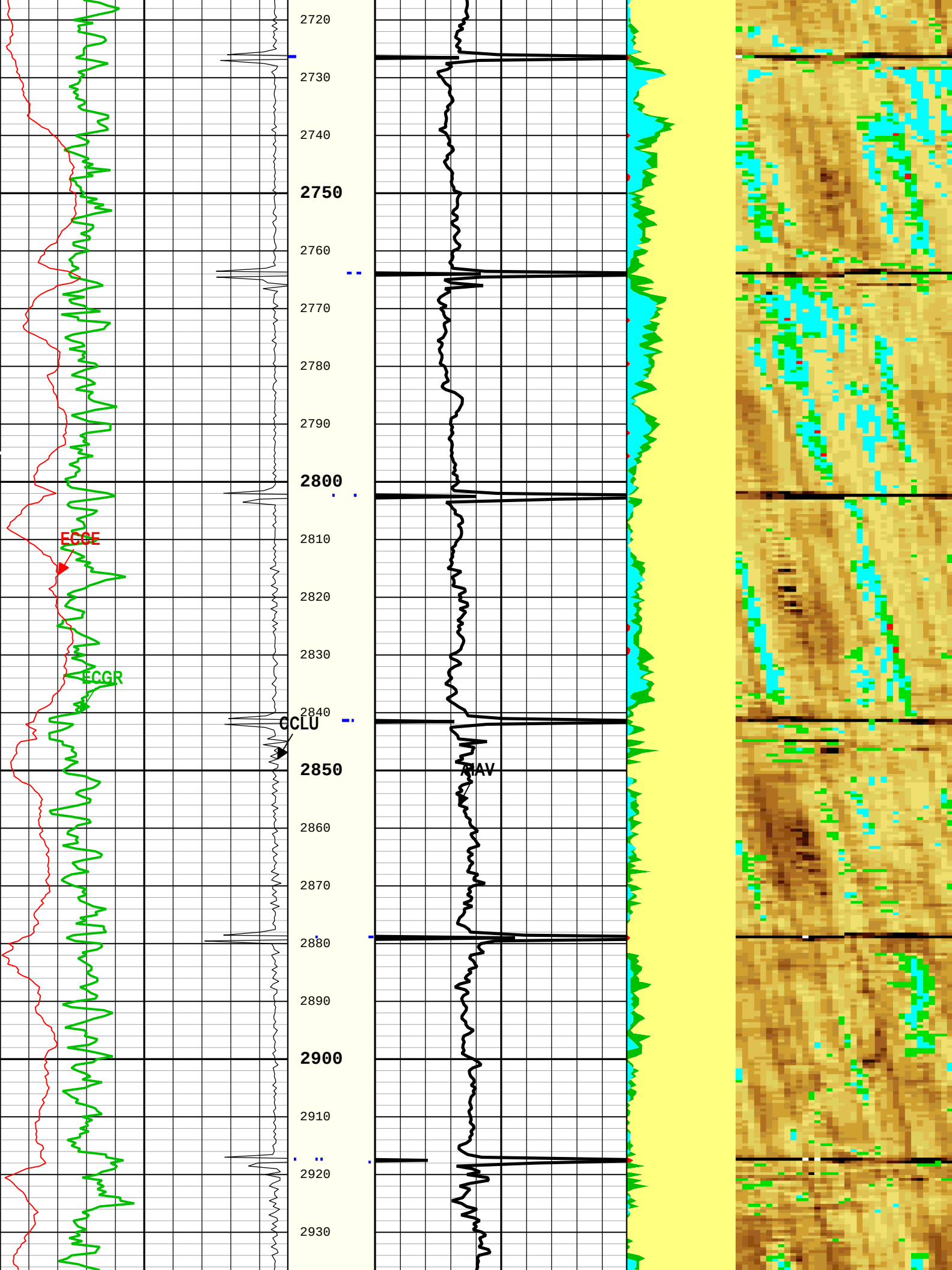
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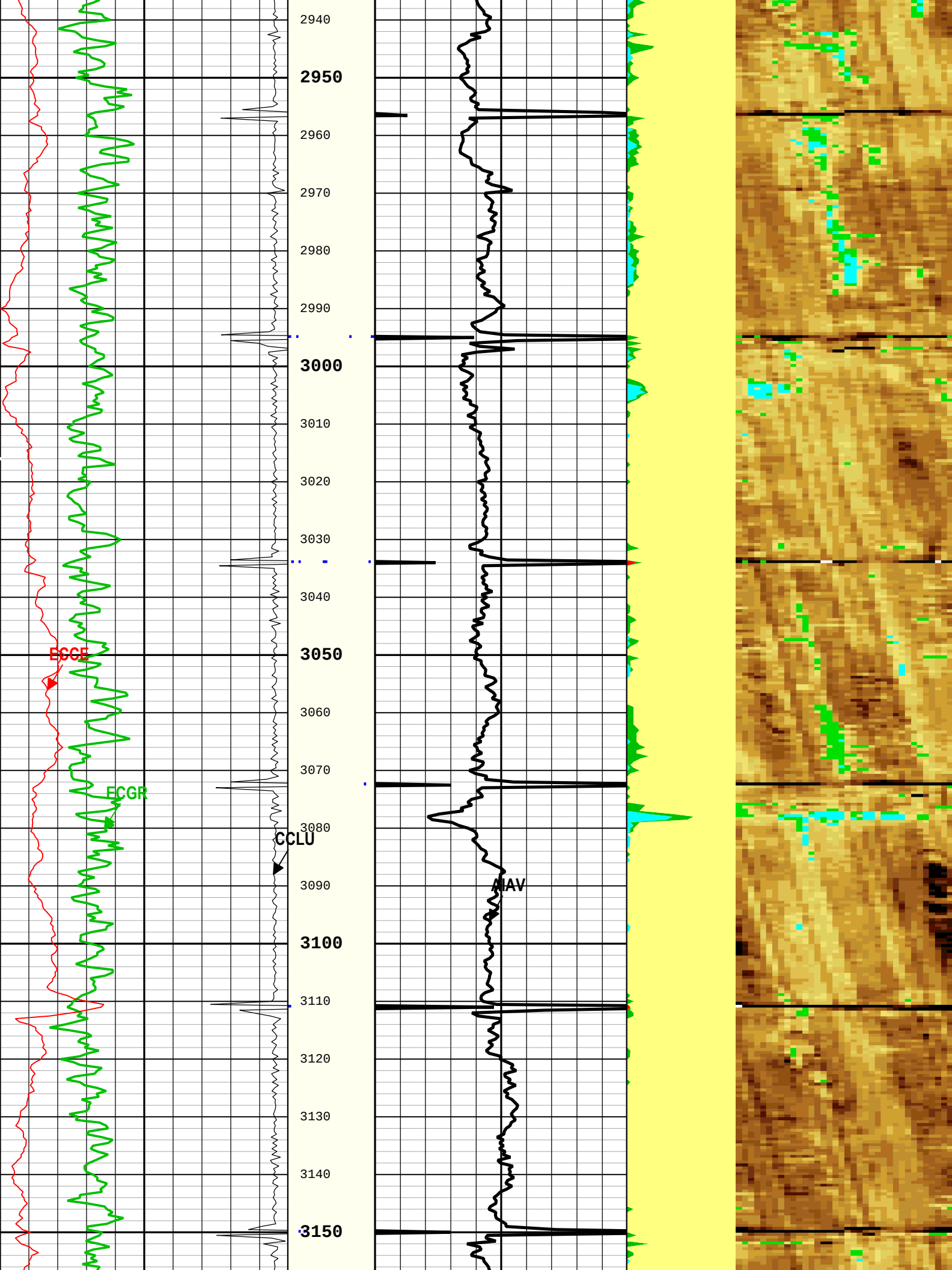
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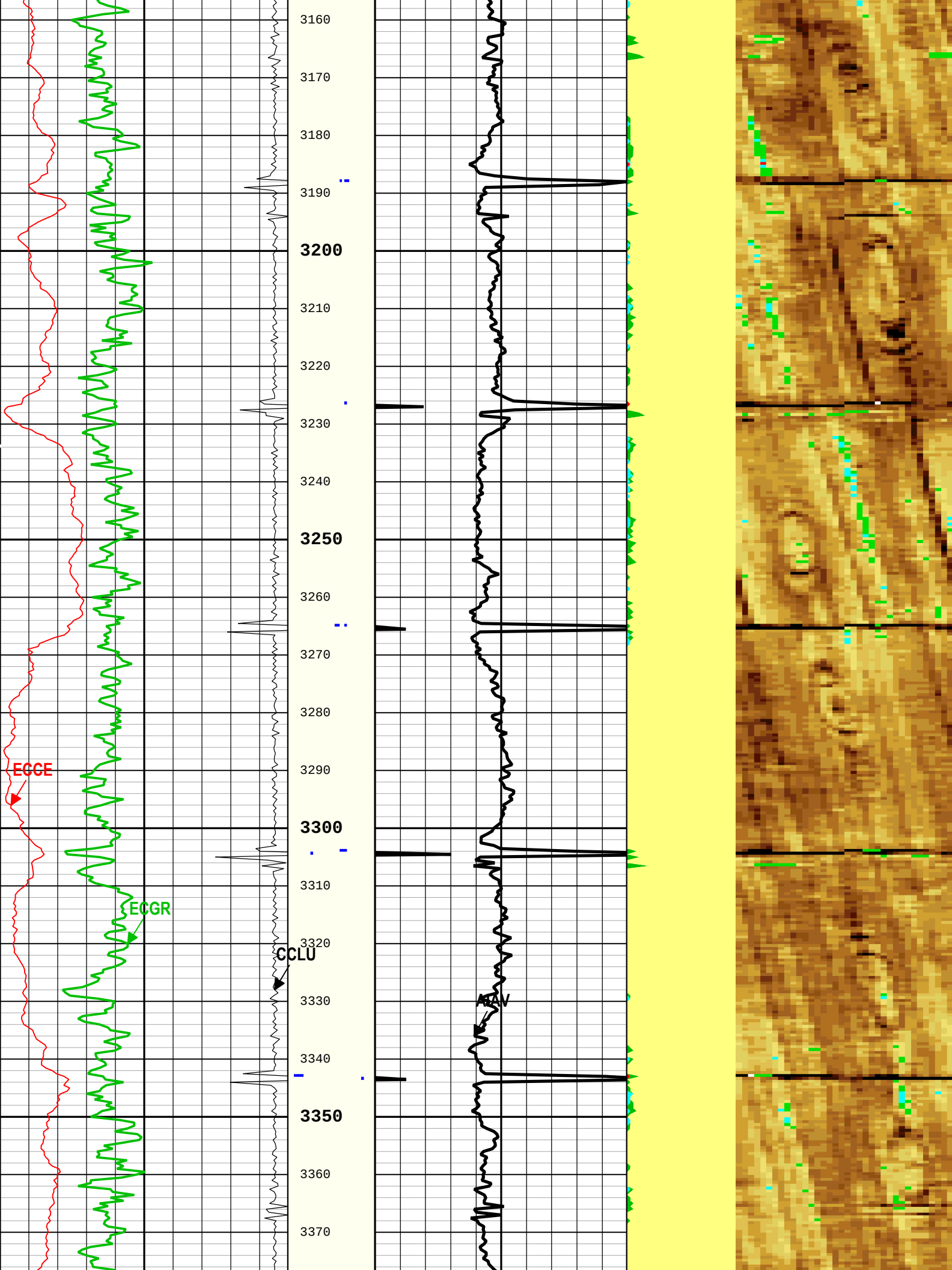
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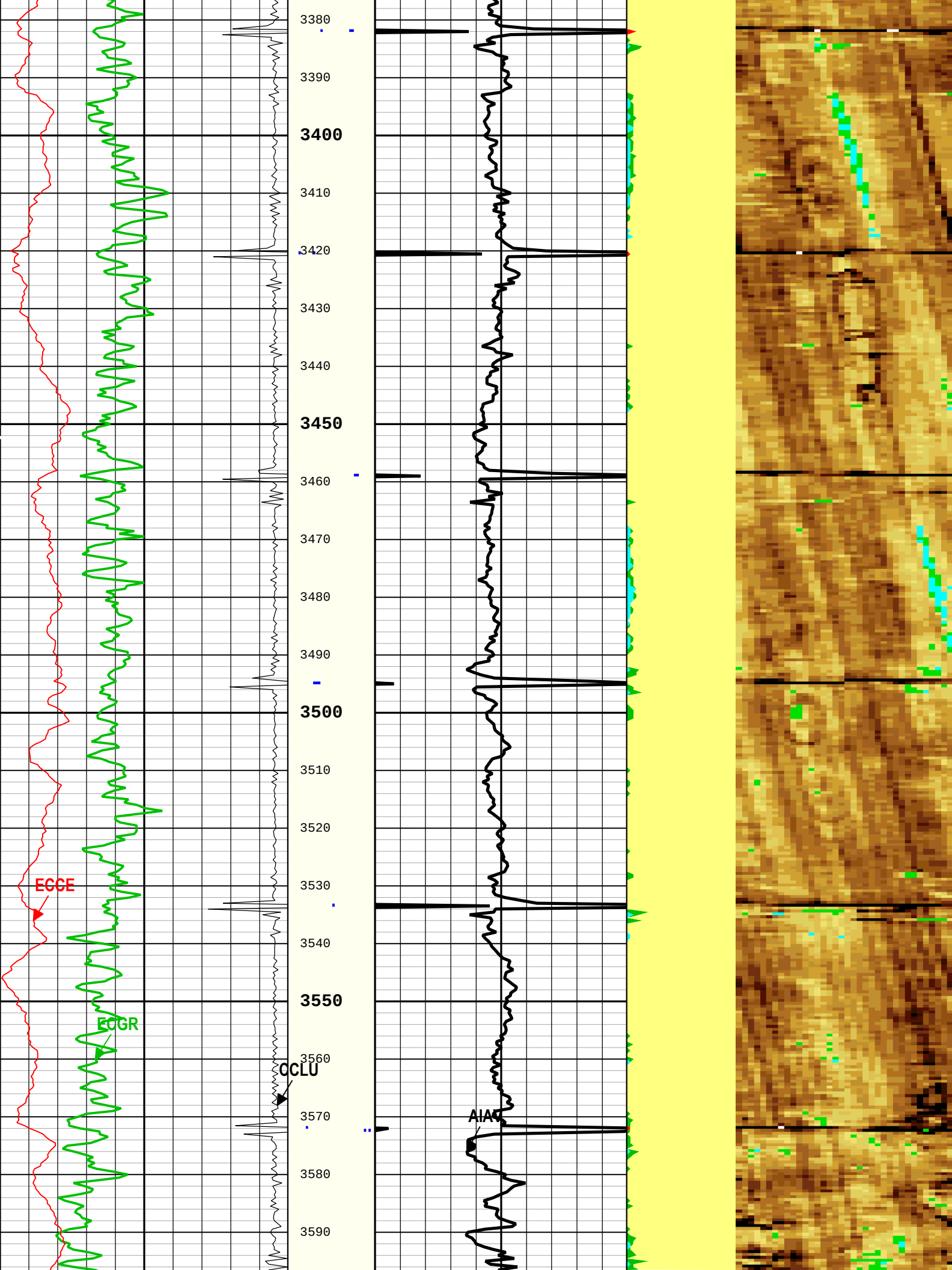
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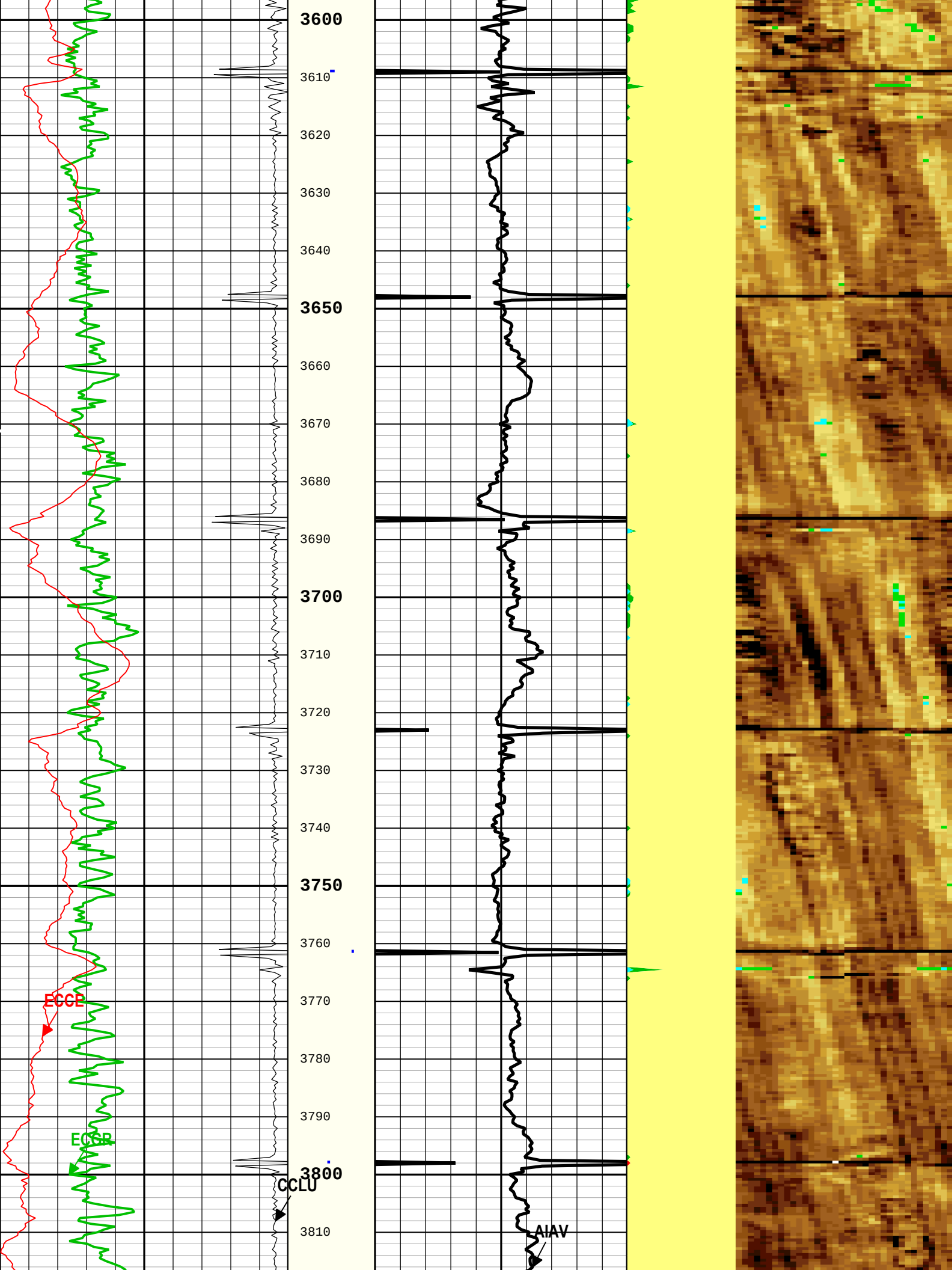
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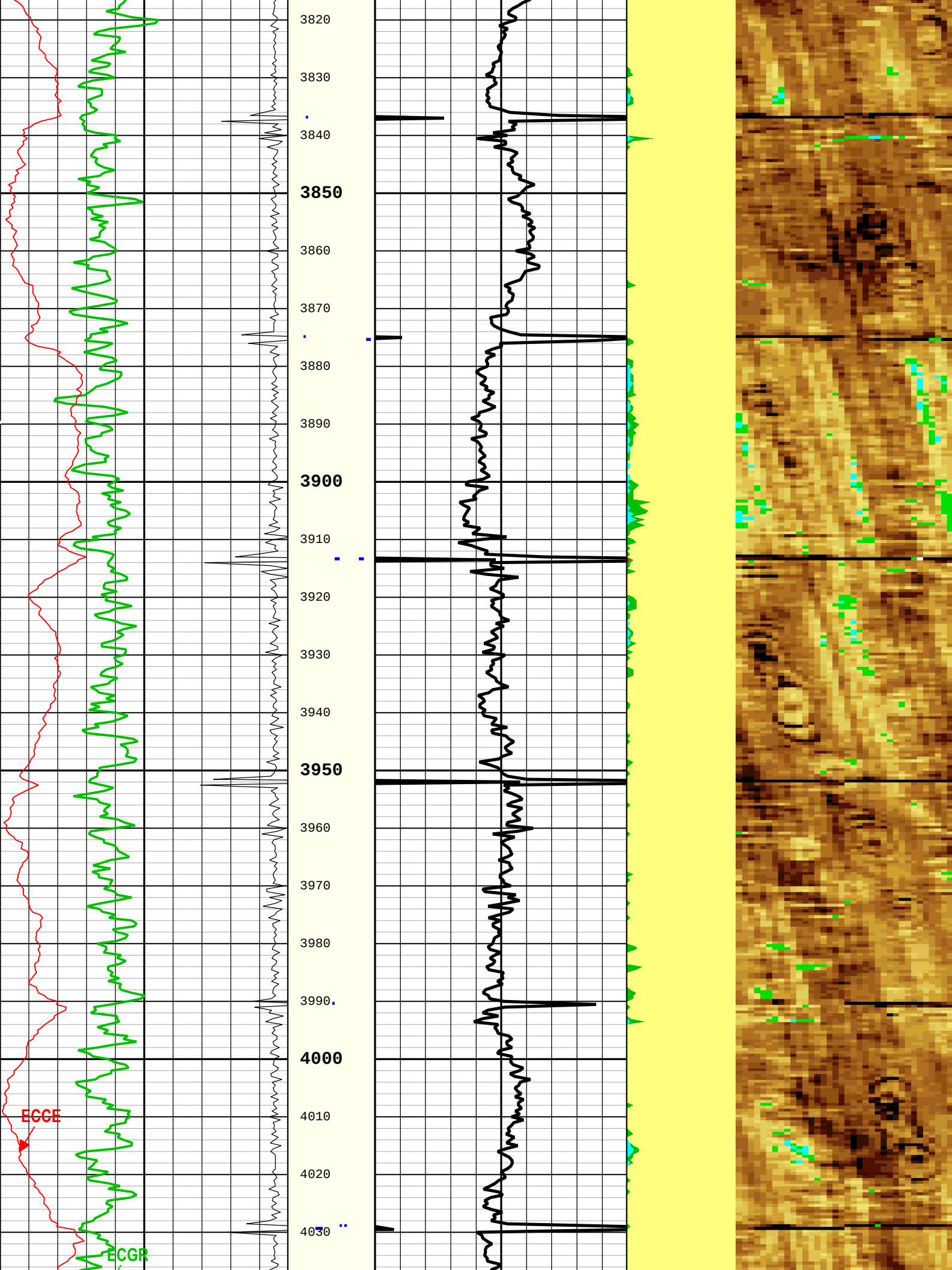
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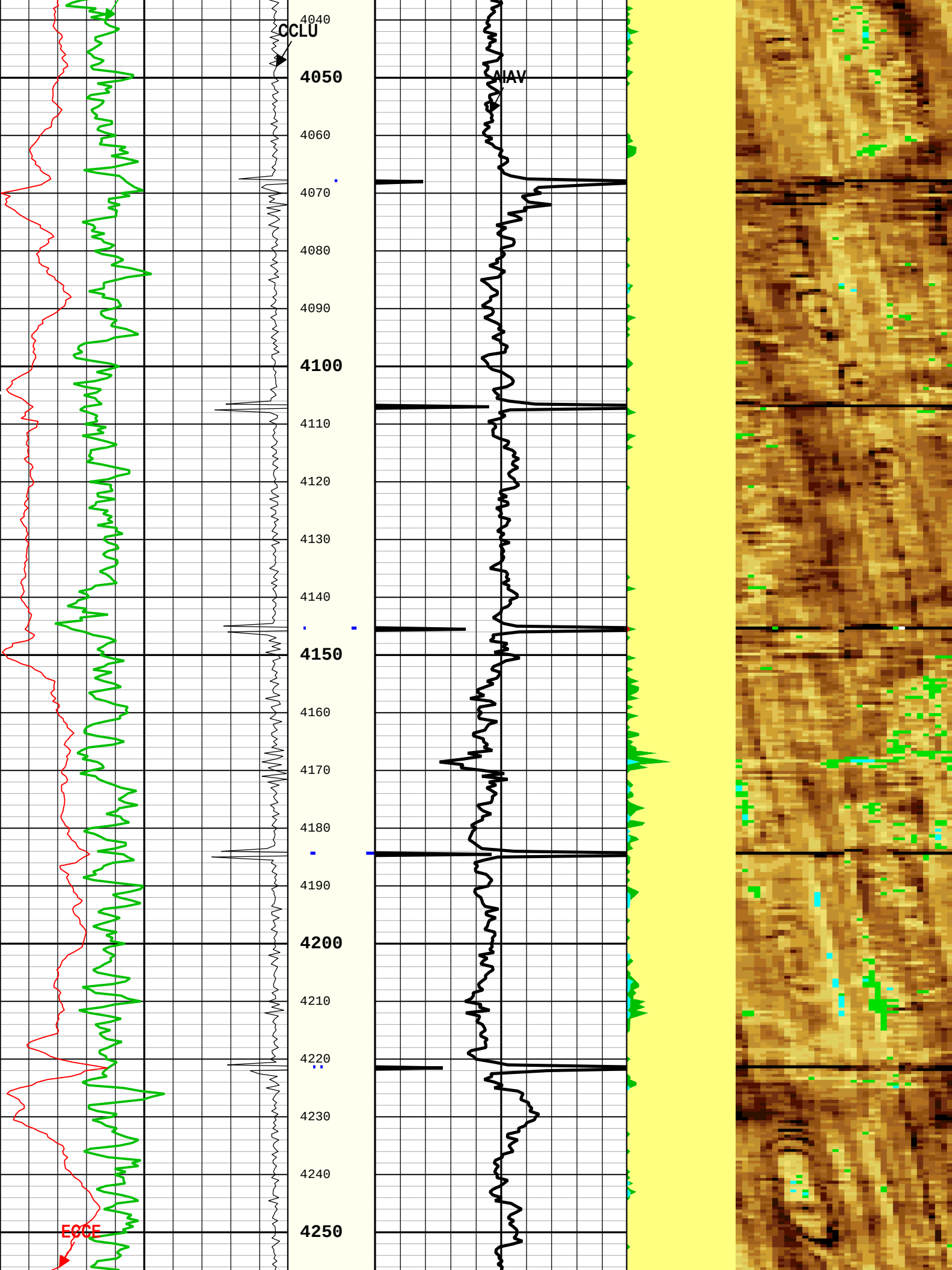
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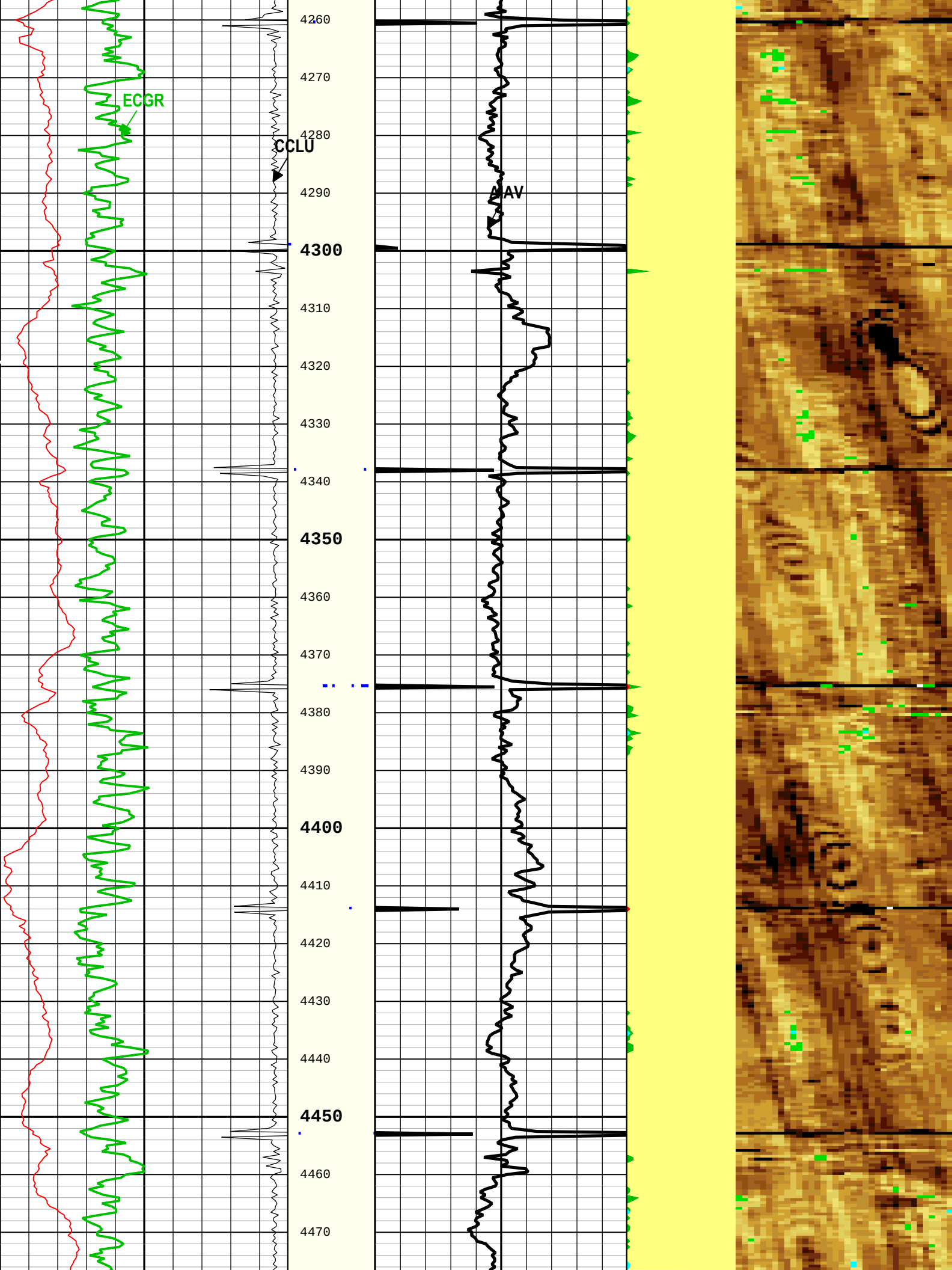
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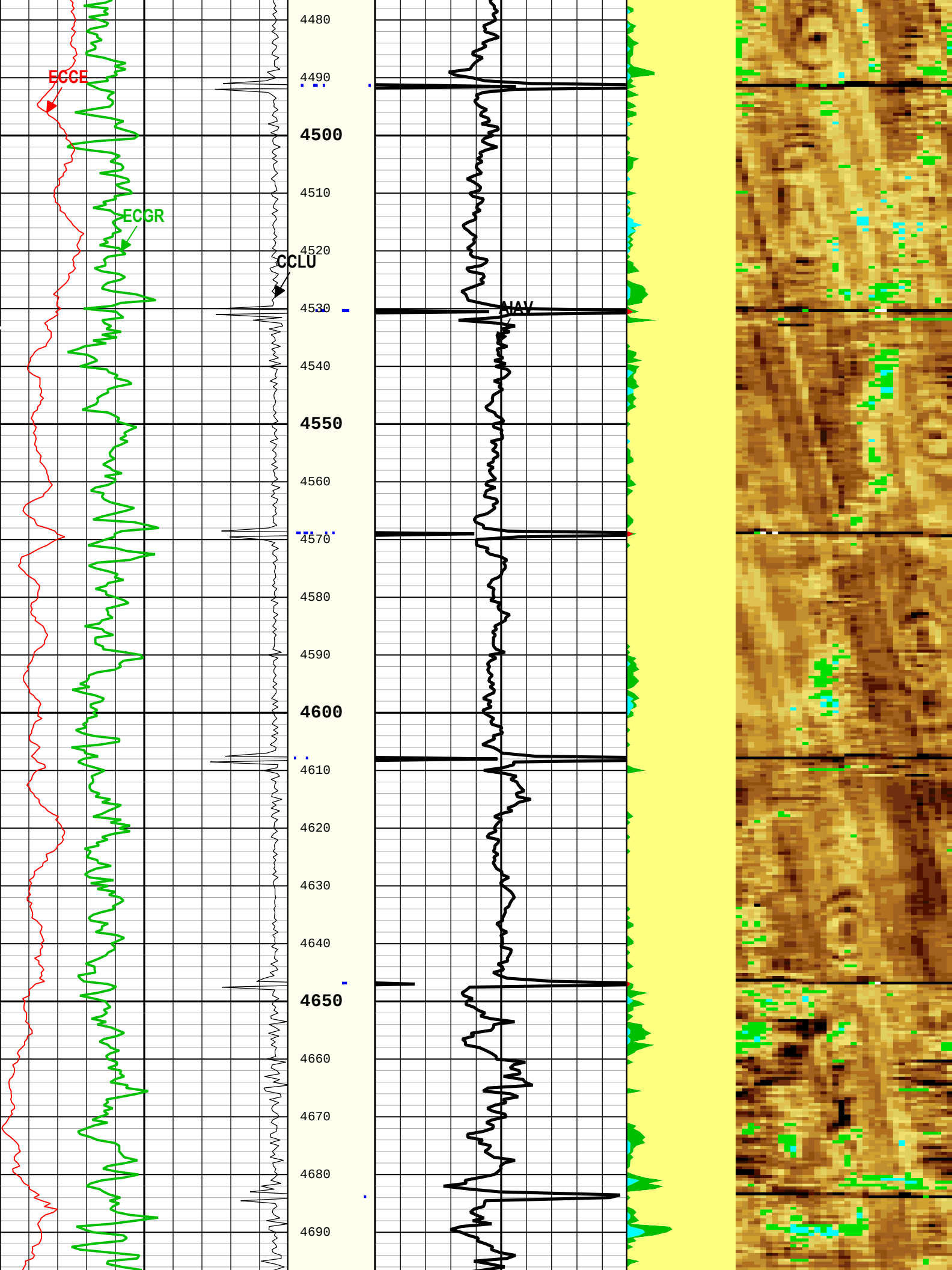
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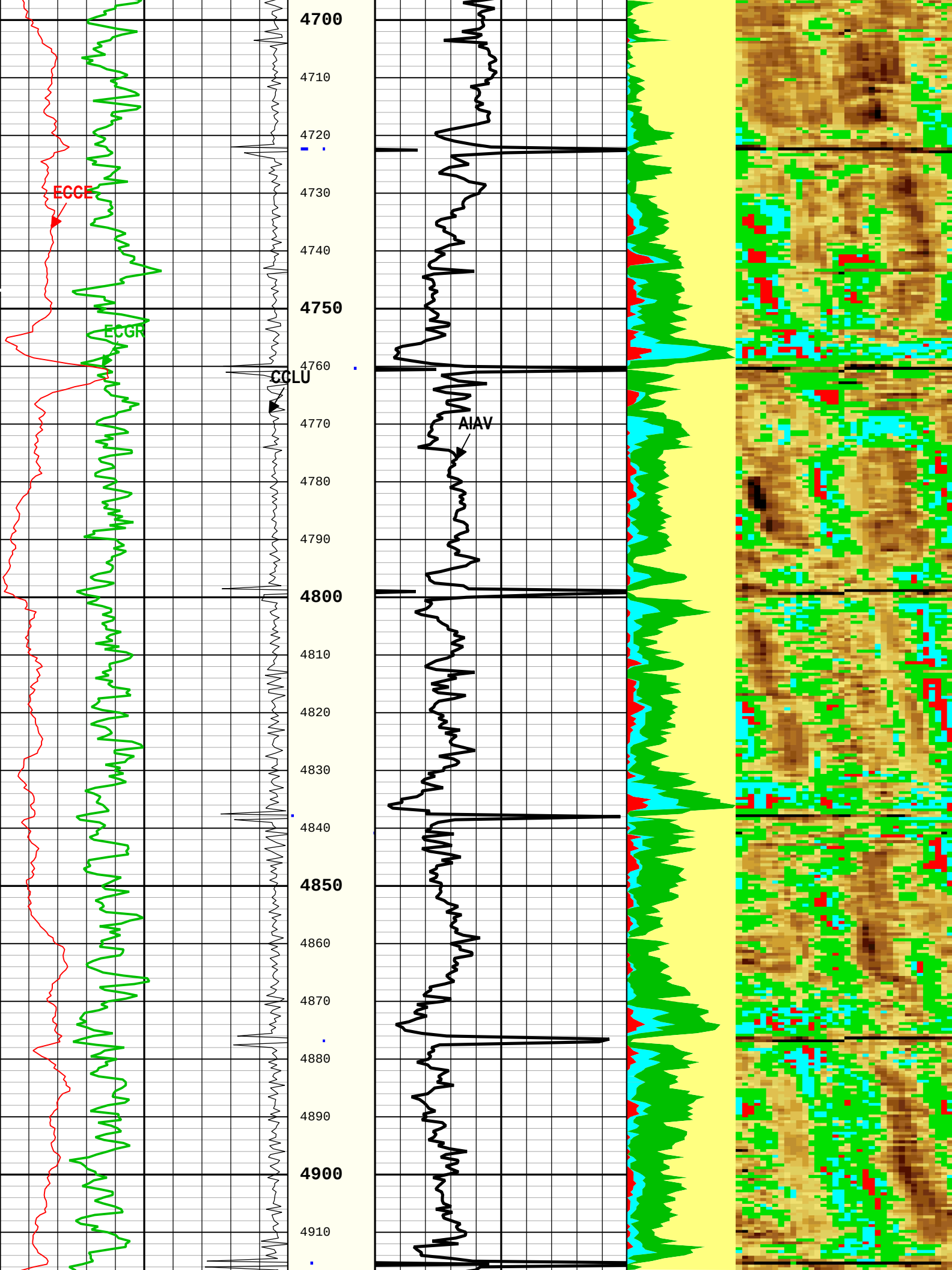
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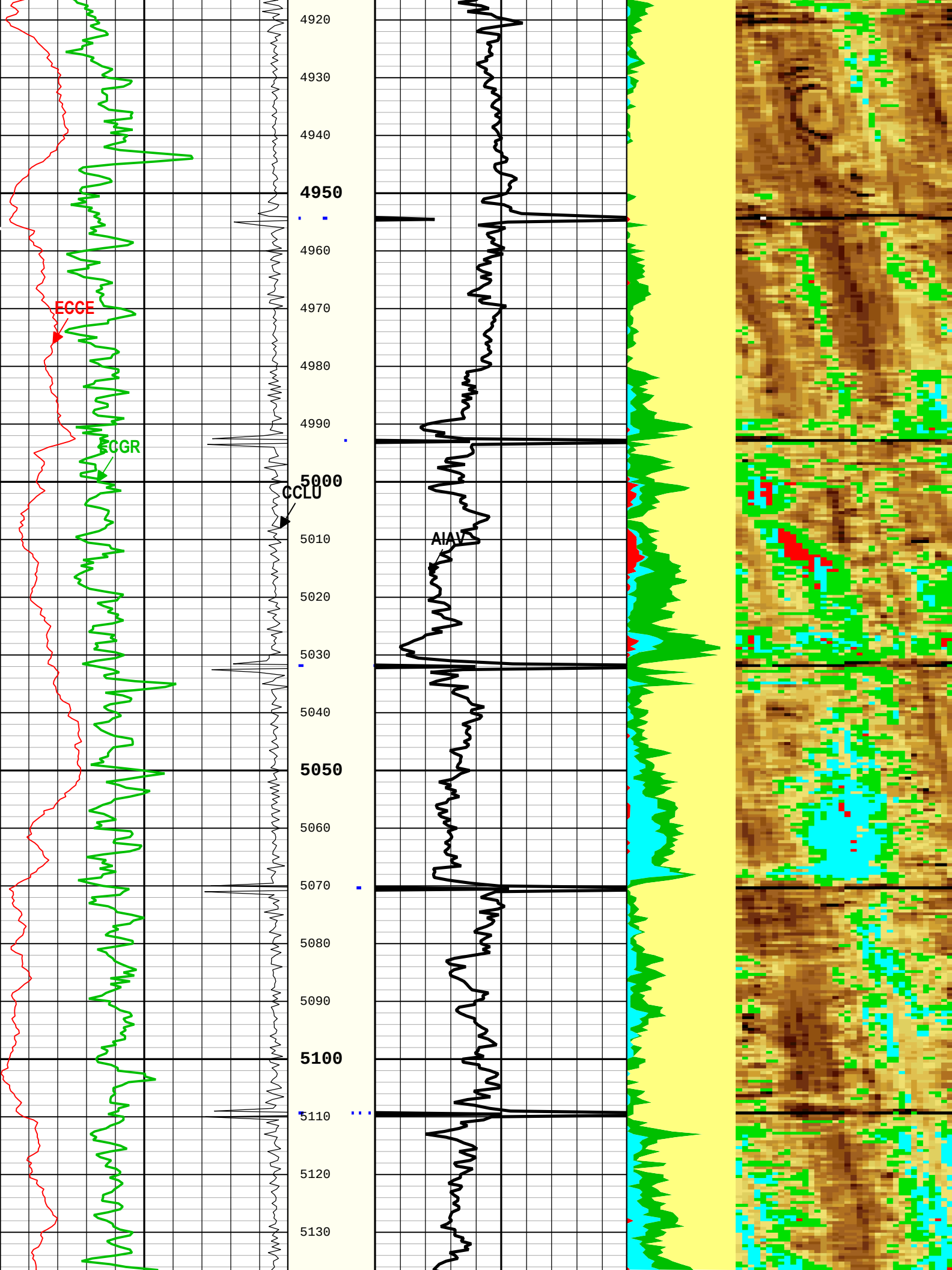
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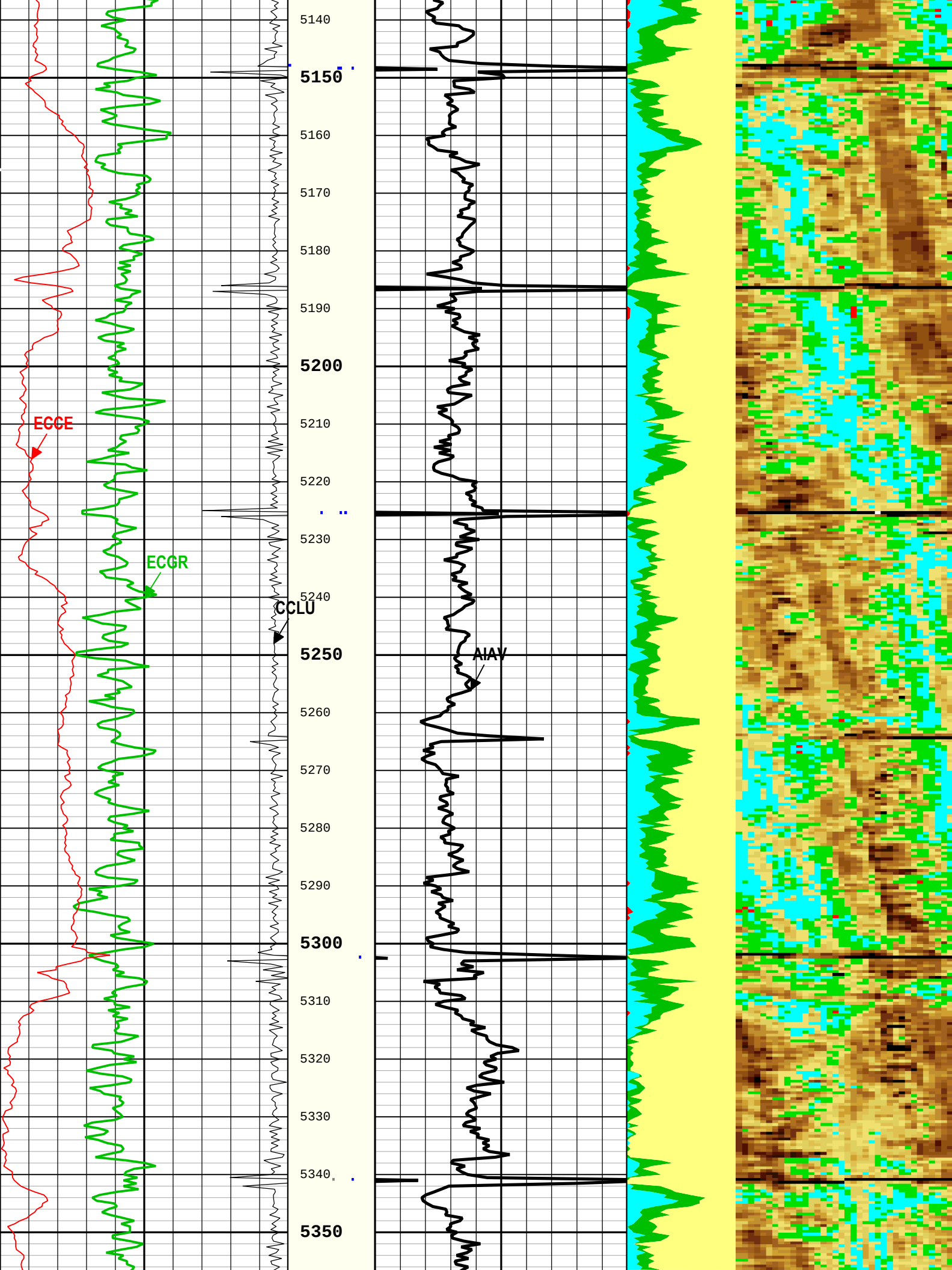
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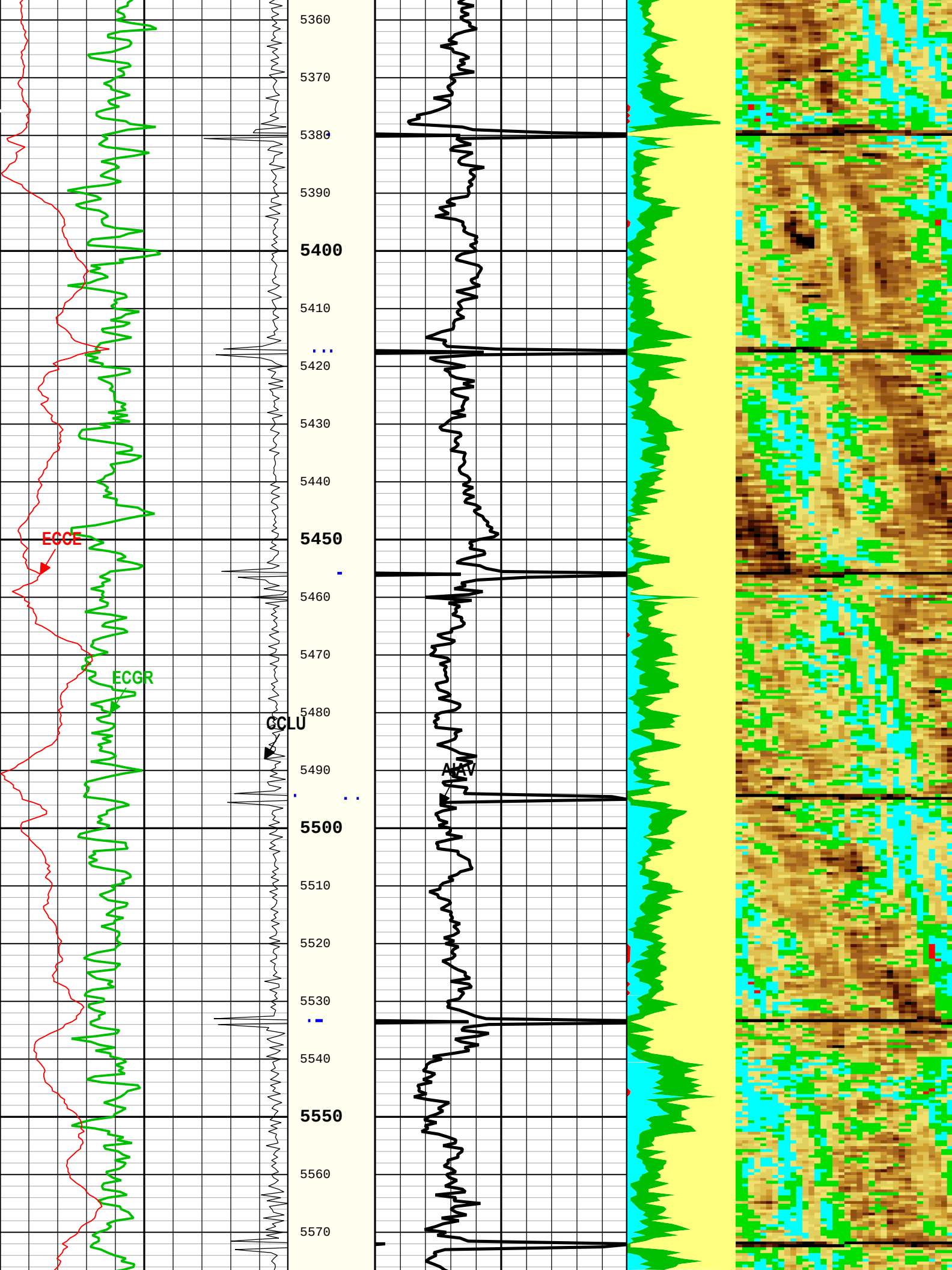
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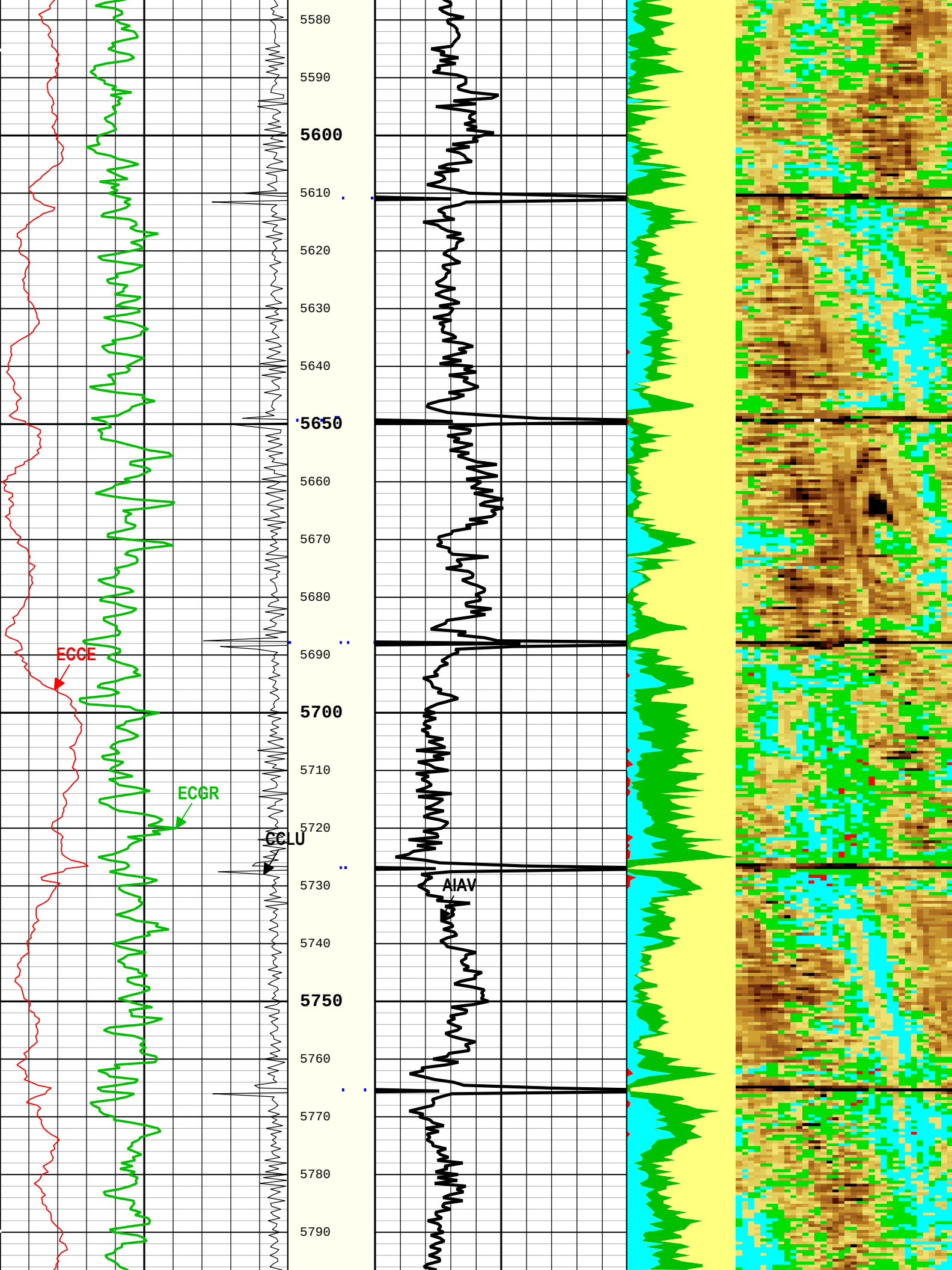
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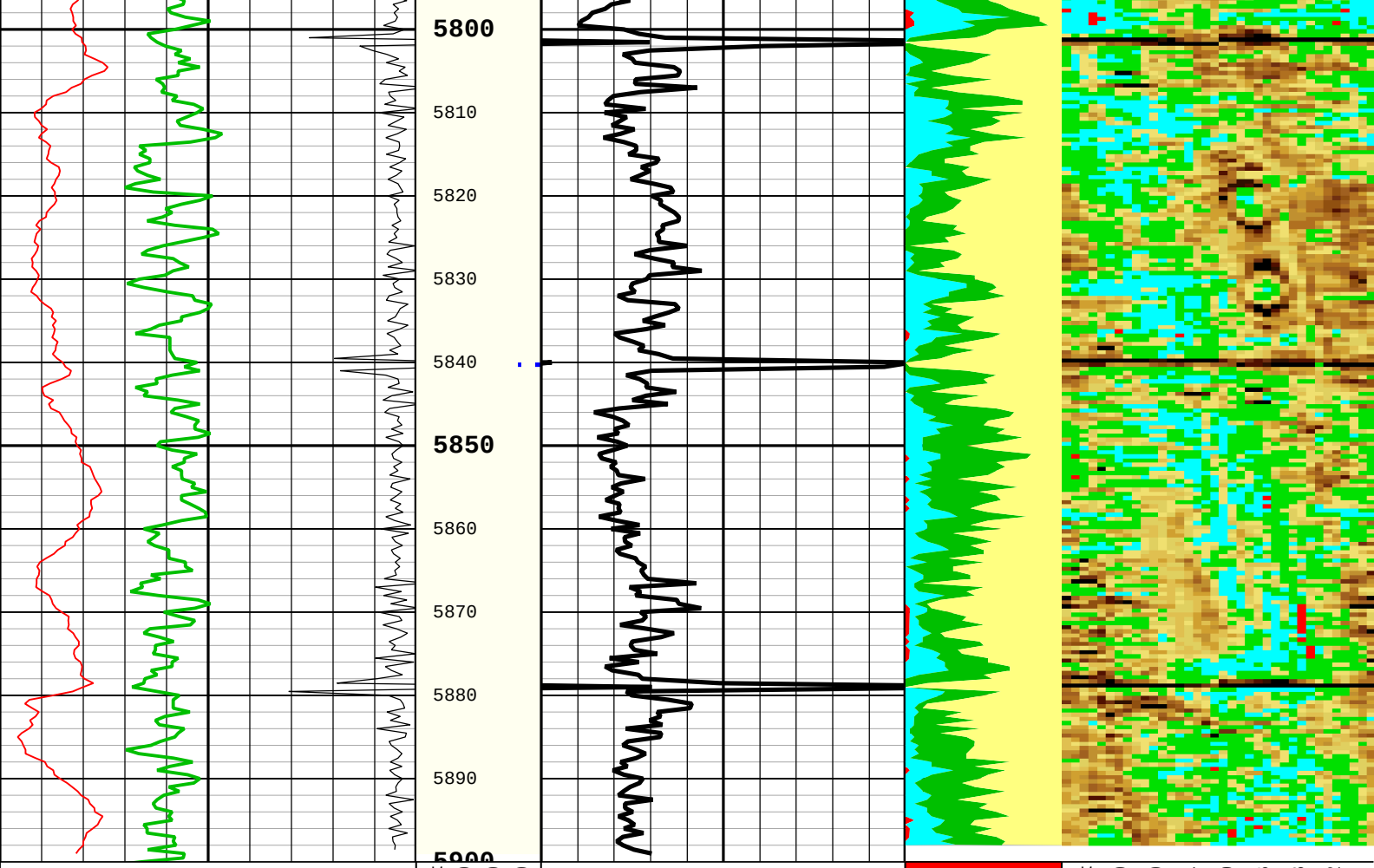


TIME_1900 - Time Marked every 60.00 (s)

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: 22-Sep-2017 01:17:27

Channel Processing Parameters

One : 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	5900	ft
CDEN	Cement Density	SGT-N	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	
ICE_PROCESS	ICE Processing	USIT-E	Yes	
IMAR	Image Rotation	USIT-E	Off	
MEAS_WLEN	Tcube Processing Window Length in Measurement Mode	USIT-E	22.44	us
MUD_N_FRP	Free Pipe Mud Normalization Factor	USIT-E	1.16	
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-E	0.1	Mrayl
UFGDE	Fiberglass Density	USIT-E	16.27	lbm/gal
UFGPS	Fiberglass Processing Selection	USIT-E	No	
UFGVL	Fiberglass Velocity	USIT-E	9678.48	ft/s
USI_FSOD	USIT USI Fluid Slowness Fits Casing Outer Diameter	USIT-E	0_OFF	
USI_FVEL_SEL	USI Fluid Velocity Selection	USIT-E	Automatic	
USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-E	FreePipe Norm.	
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	163.5	1945
BS	8.5	1945	5900

All depth are actual.

Tool Control Parameters

One : Parameters

Parameter	Description	Tool	Value	Unit
AGMN	Minimum Gain of Cartridge	USIT-E	-12	dB
AGMX	Maximum Gain of Cartridge	USIT-E	18	dB
U-USIT_DDT5	USIC Downhole Decimation for T5 only	USIT-E	0_NONE	
EMXV	EMEX Voltage	USIT-E	Time Zoned	V
HRES	Horizontal Resolution	USIT-E	10 deg	
TMUC	Type of Mud	USIT-E	BRI	
ULOG	Logging Objective	USIT-E	MEASUREMENT	
UMFR	Modulation Frequency	USIT-E	333333	Hz
USFR	Ultrasonic Sampling Frequency	USIT-E	500000	Hz
UPAT	USIT Emission Pattern	USIT-E	Pattern 375 KHz	
UWKM	USIT Working Mode	USIT-E	Uncompressed 10 deg at 6.0 in LF	
USIT_DEPTHLOG	Starting Depth Log for Ultrasonics	USIT-E	6200	ft
WINB	Window Begin Time	USIT-E	Time Zoned	us
WINE	Window End Time	USIT-E	Time Zoned	us

Time Zone Parameters

Parameter	Value	Start Time	Stop Time	Start Depth (ft)	Stop Depth (ft)
EMXV	80	21-Sep-2017 23:29:34	21-Sep-2017 23:30:58	6200.84	6192.73
EMXV	90	21-Sep-2017 23:30:58	22-Sep-2017 00:17:45	6192.73	185.18
WINB	31.88	21-Sep-2017 23:29:34	21-Sep-2017 23:30:17	6200.84	6196.77
WINB	28.23	21-Sep-2017 23:30:17	22-Sep-2017 00:17:45	6196.77	185.18
WINE	71.88	21-Sep-2017 23:29:34	21-Sep-2017 23:30:14	6200.84	6196.77
WINE	65.97	21-Sep-2017 23:30:14	22-Sep-2017 00:17:45	6196.77	185.18

All depth are at tool zero.

0 PSI Repeat Pass

Software Version

Acquisition System	Version
Maxwell 2017 SP2	7.2.87778.3100

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
One	Log[2]:Up	Up	1903.68 ft	2519.28 ft	21-Sep-2017 11:00:41 PM	21-Sep-2017 11:05:27 PM	ON	2.20 ft	Yes

All depths are referenced to toolstring zero

Log

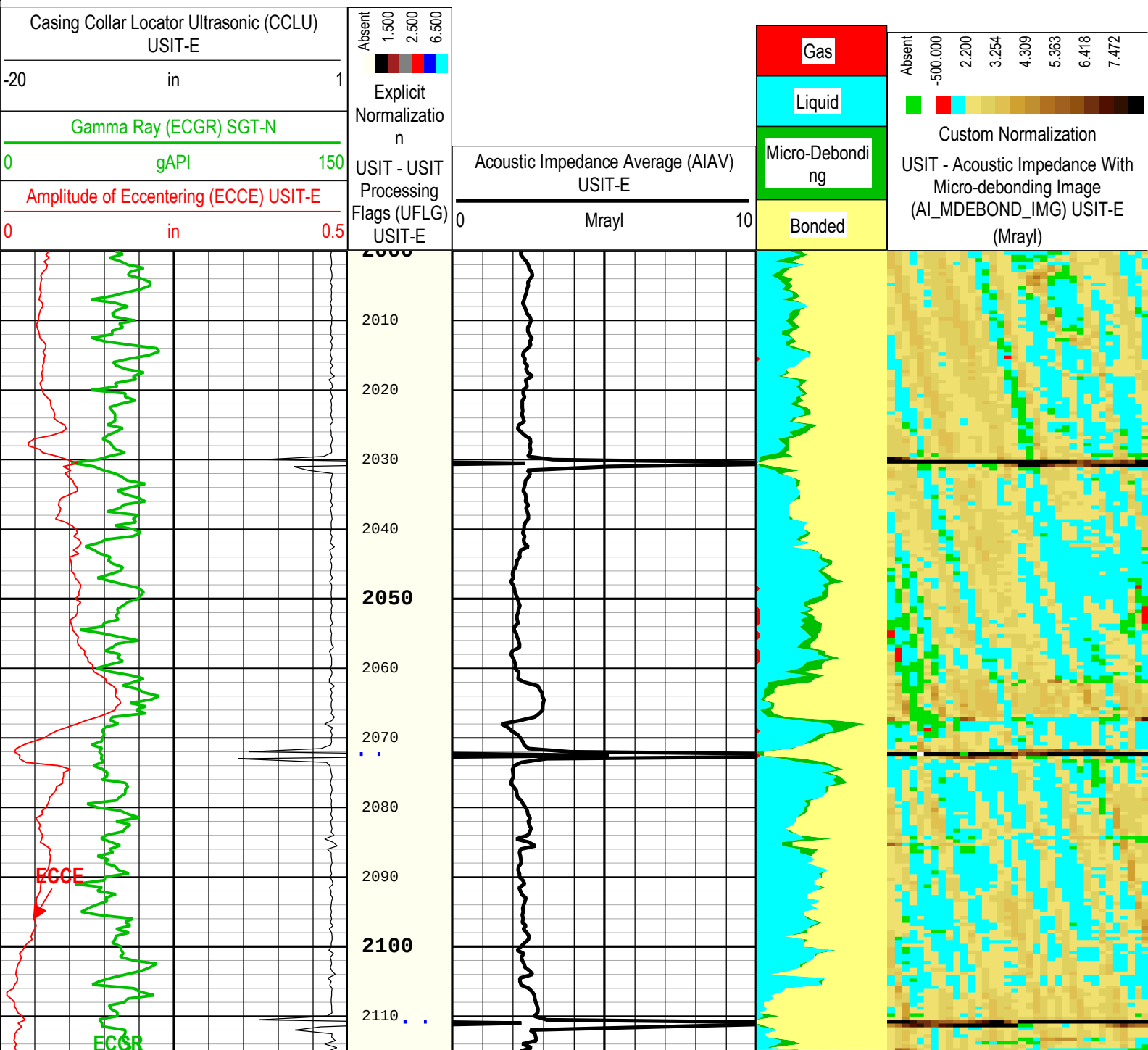
Company:Noble Energy INC Well:Wells Ranch BB11-667

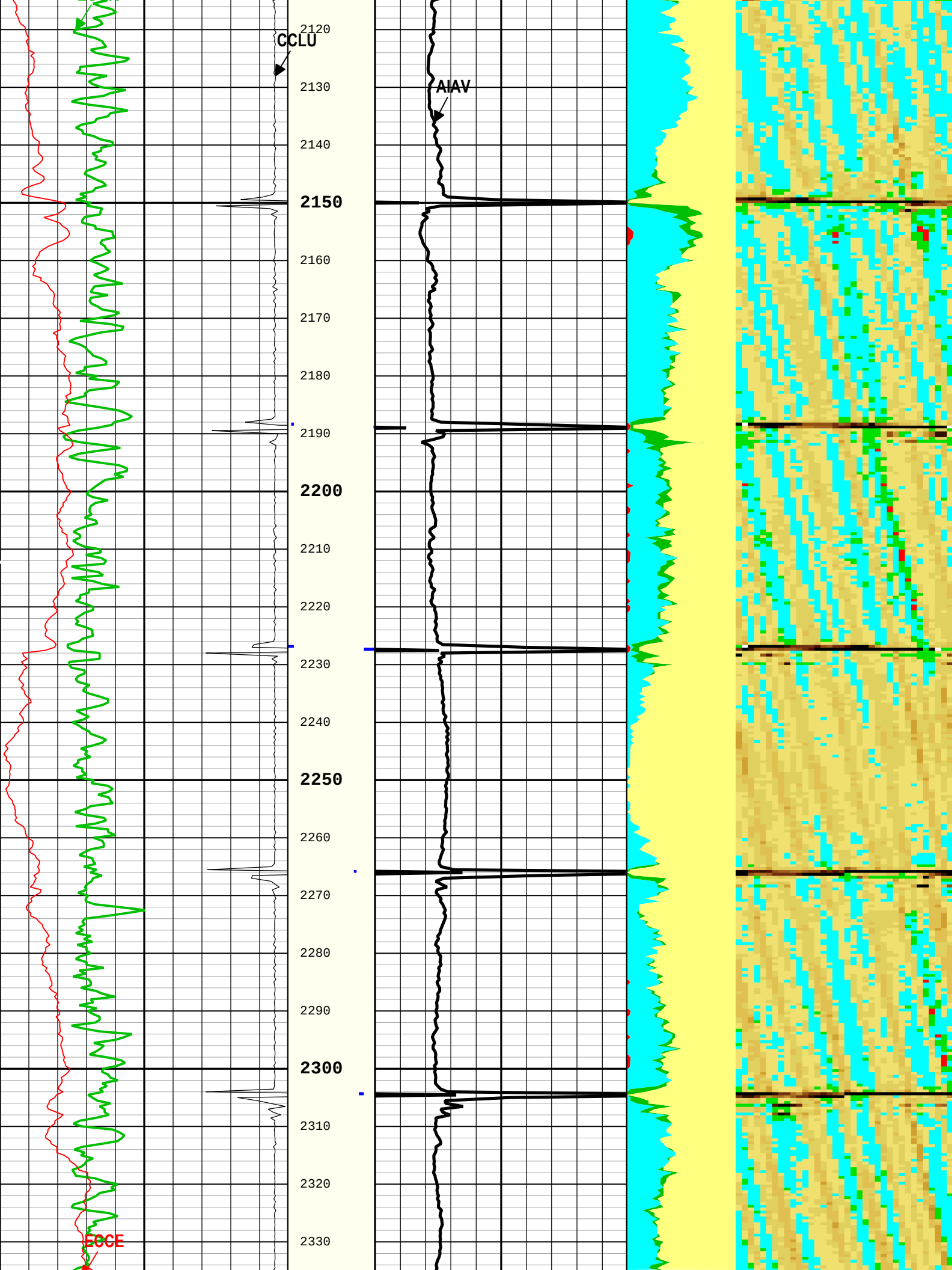
One : Log[2]:Up:S007

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: 22-Sep-2017 01:17:34

TIME_1900 - Time Marked every 60.00 (s)

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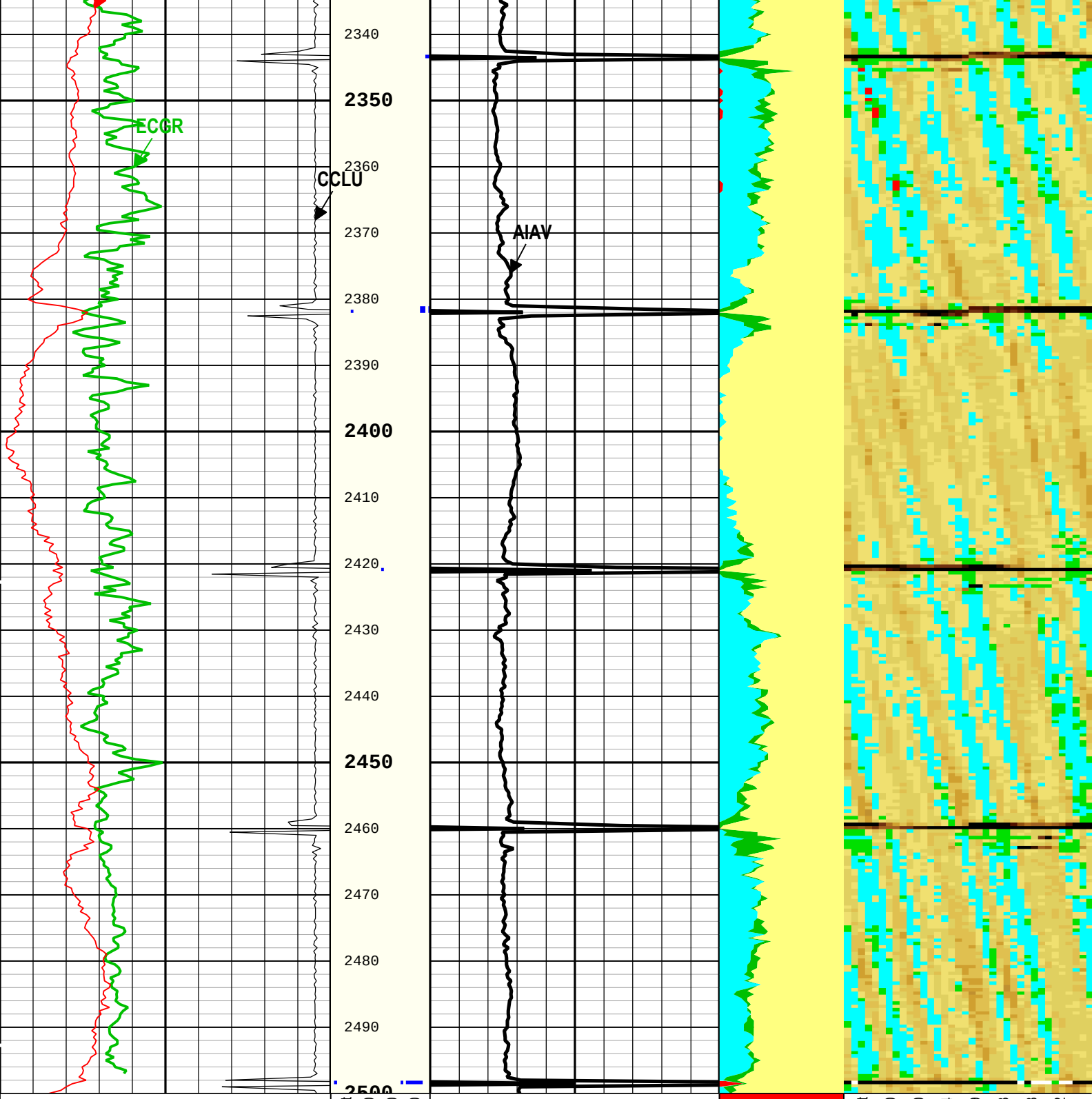


Casing Collar Locator Ultrasonic (CCLU) USIT-E

-20 in 1

Gamma Ray (ECGR) SGT-N

0 gAPI 150

Amplitude of Eccentering (ECCE) USIT-E

0 in 0.5

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: 22-Sep-2017 01:17:34

Channel Processing Parameters

One : 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	5900	ft
CDEN	Cement Density	SGT-N	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	
ICE_PROCESS	ICE Processing	USIT-E	Yes	
IMAR	Image Rotation	USIT-E	Off	
MEAS_WLEN	Tcube Processing Window Length in Measurement Mode	USIT-E	22.44	us
MUD_N_FRP	Free Pipe Mud Normalization Factor	USIT-E	1.16	
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-E	0.1	Mrayl
UFGDE	Fiberglass Density	USIT-E	16.27	lbm/gal
UFGPS	Fiberglass Processing Selection	USIT-E	No	
UFGVL	Fiberglass Velocity	USIT-E	9678.48	ft/s
USI_FSOD	USIT USI Fluid Slowness Fits Casing Outer Diameter	USIT-E	0_OFF	
USI_FVEL_SEL	USI Fluid Velocity Selection	USIT-E	Automatic	
USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-E	FreePipe Norm.	
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

One : Parameters

Parameter	Description	Tool	Value	Unit
AGMN	Minimum Gain of Cartridge	USIT-E	-12	dB
AGMX	Maximum Gain of Cartridge	USIT-E	18	dB
U-USIT_DDT5	USIC Downhole Decimation for T5 only	USIT-E	0_NONE	
EMXV	EMEX Voltage	USIT-E	80	V
HRES	Horizontal Resolution	USIT-E	10 deg	
TMUC	Type of Mud	USIT-E	BRI	
ULOG	Logging Objective	USIT-E	MEASUREMENT	
UMFR	Modulation Frequency	USIT-E	333333	Hz
USFR	Ultrasonic Sampling Frequency	USIT-E	500000	Hz
UPAT	USIT Emission Pattern	USIT-E	Pattern 375 KHz	
UWKM	USIT Working Mode	USIT-E	Uncompressed 10 deg at 6.0 in LF	
USIT_DEPTHLOG	Starting Depth Log for Ultrasonics	USIT-E	2600	ft
WINB	Window Begin Time	USIT-E	Time Zoned	us
WINE	Window End Time	USIT-E	Time Zoned	us

Time Zone Parameters

Parameter	Value	Start Time	Stop Time	Start Depth (ft)	Stop Depth (ft)
WINB	21.88	21-Sep-2017 22:09:41	21-Sep-2017 22:09:53	2518.28	2514.57

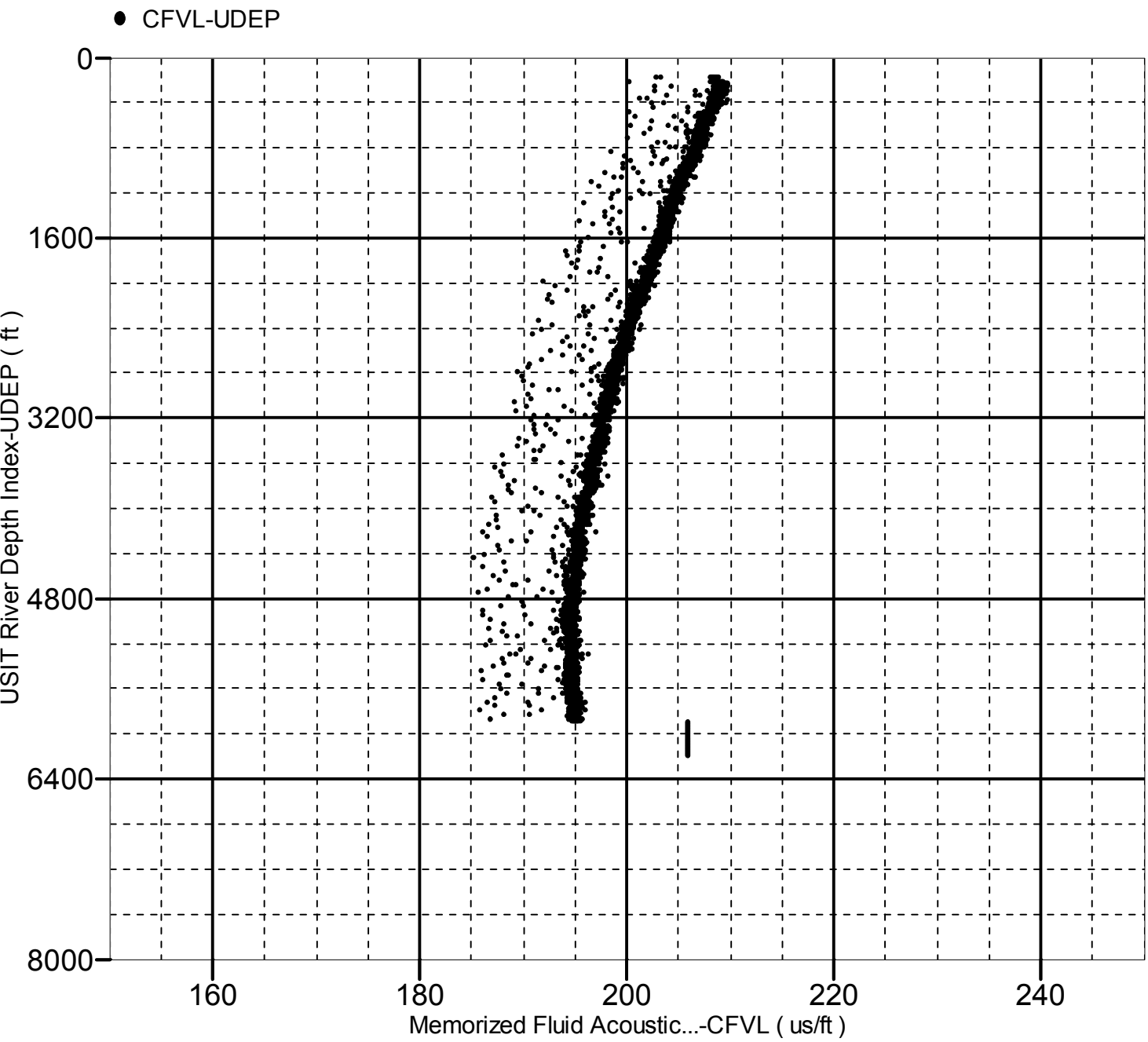
WINB	31.88	21-Sep-2017 23:00:41	21-Sep-2017 23:00:58	2519.28	2514.57
WINB	43.63	21-Sep-2017 23:00:58	21-Sep-2017 23:01:35	2514.57	2501.31
WINB	42.09	21-Sep-2017 23:01:35	21-Sep-2017 23:01:51	2501.31	2495.8
WINB	36.7	21-Sep-2017 23:01:51	21-Sep-2017 23:05:27	2495.8	1903.68
WINE	71.88	21-Sep-2017 23:00:41	21-Sep-2017 23:00:54	2519.28	2515.91
WINE	75.98	21-Sep-2017 23:00:54	21-Sep-2017 23:02:03	2515.91	2491.48
WINE	78.29	21-Sep-2017 23:02:03	21-Sep-2017 23:05:27	2491.48	1903.68

All depth are at tool zero.

Fluid Acoustic Slowness vs Depth

2D Cross Plot

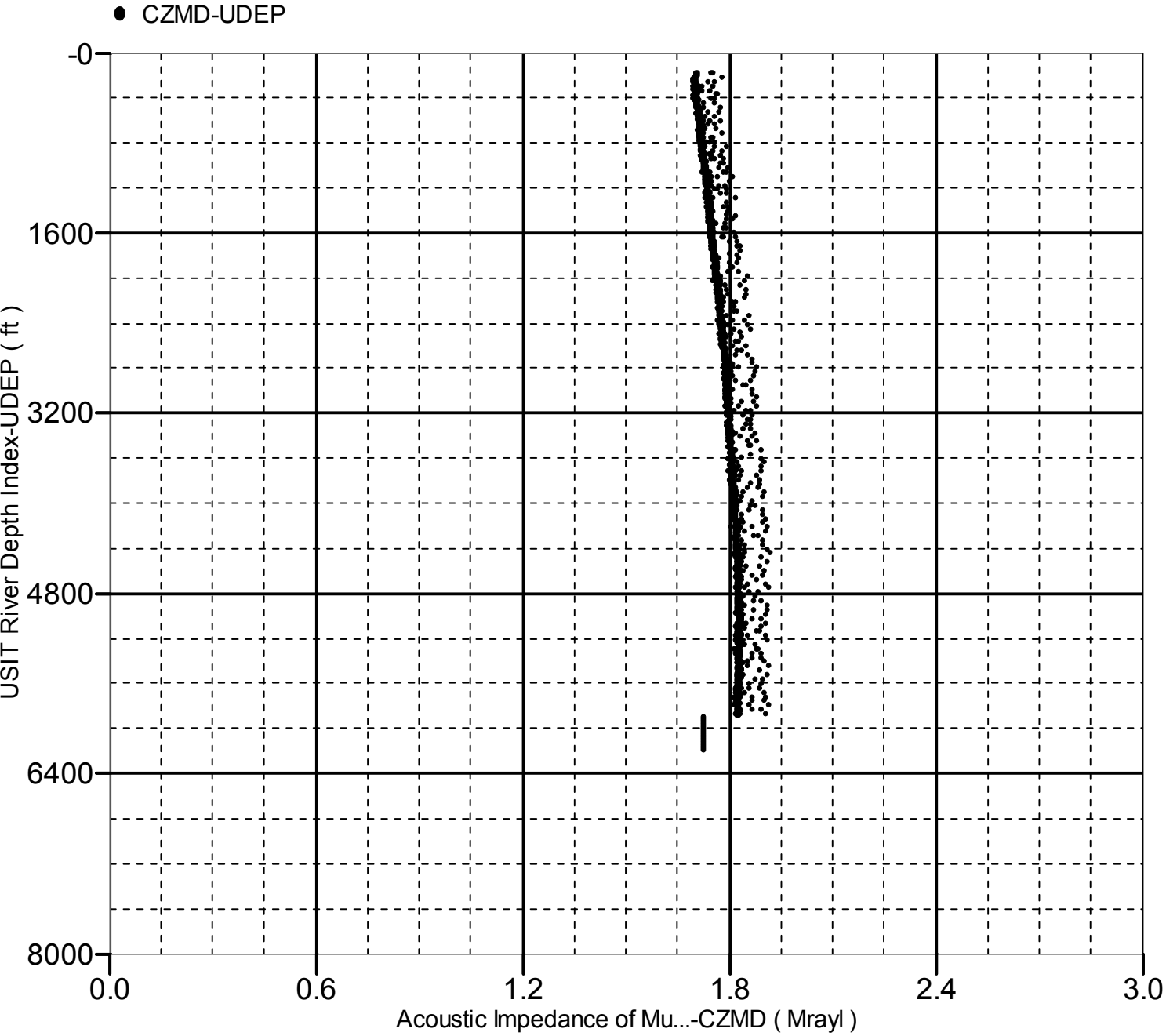
Index Range: From 5900.00 to 185.00 ft



Acoustic Impedance of Mud vs Depth

2D Cross Plot

Index Range: From 5900.00 to 185.00 ft



Company:	Noble Energy INC
Well:	Wells Ranch BB11-667
Field:	Wattenberg
County:	WELD
State:	Colorado

Schlumberger

UltraSonic Summary Print