Schlumberger

Company: Southern California Gas Company

Well: Fernando Fee 35A

Field: Aliso Canyon

County: Los Angeles State: California

County: Los Angeles
Field: Aliso Canyon
Location:
Well: Fernando Fee 35A
Company: Southern California Gas Company

Cement Bond Log

Variable Density Log

Gamma Ray - CCL

Location:		Elev.: K.B.	1689.00 ft
		G.L.	1674.00 ft
		D.F.	
Permanent Datum:	Ground Level	Elev.:	1674.00 f
Log Measured From:	Kelly Bushing	15.00 ft	above Perm.Datum
Drilling Measured From:	Kelly Bushing		

API Serial No.	Section:	Township:	Range:
04-037-21457-00	34	3N	16W

Logging Date		18-Aug-2016	
Run Number		One	
Depth Driller		6971.00 ft	
Schlumberger Depth		6983.00 ft	
Bottom Log Interval		6980.00 ft	
Top Log Interval		28.00 ft	
Casing Fluid Type		Brine with Polymer	
Salinity			
Density		9 lbm/gal	
Fluid Level		8.00 ft	
BIT/CASING/TUBING STRING			
Bit Size		11.00 in	
From		812.00 ft	
To		7026.00 ft	
Casing/Tubing Size		8.625 in	
Weight		36 lbm/ft	
Grade		N/A	
From		0.00 ft	
To		7026.00 ft	
Max Recorded Temperatures			
Logger on Bottom	Time	18-Aug-2016 10:32:00	
Unit Number	Location:	3079 Ventura	
Recorded By		I. Kartawidjaja	
Witnessed By		Mr. Tom McMahon	

Disclaimer

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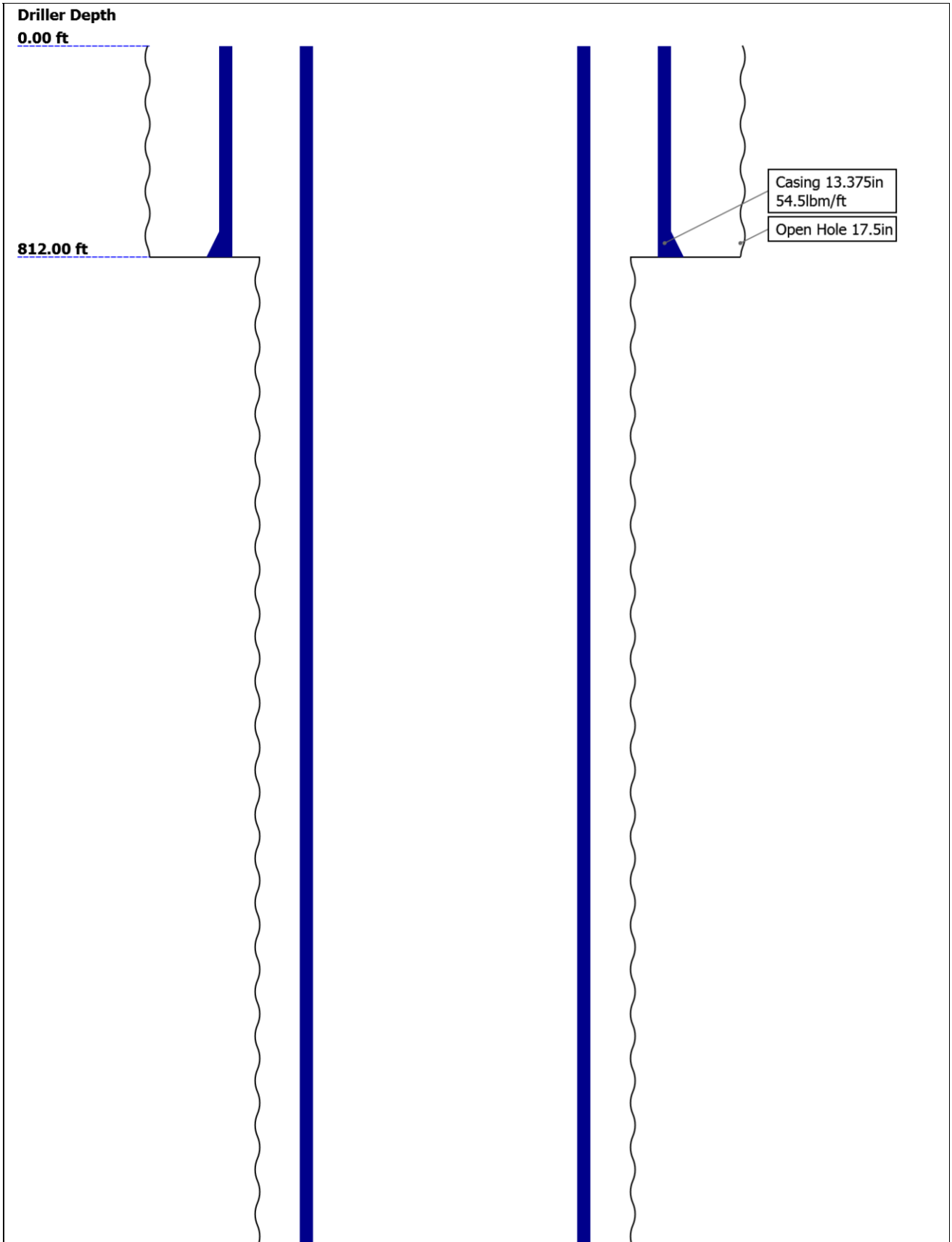
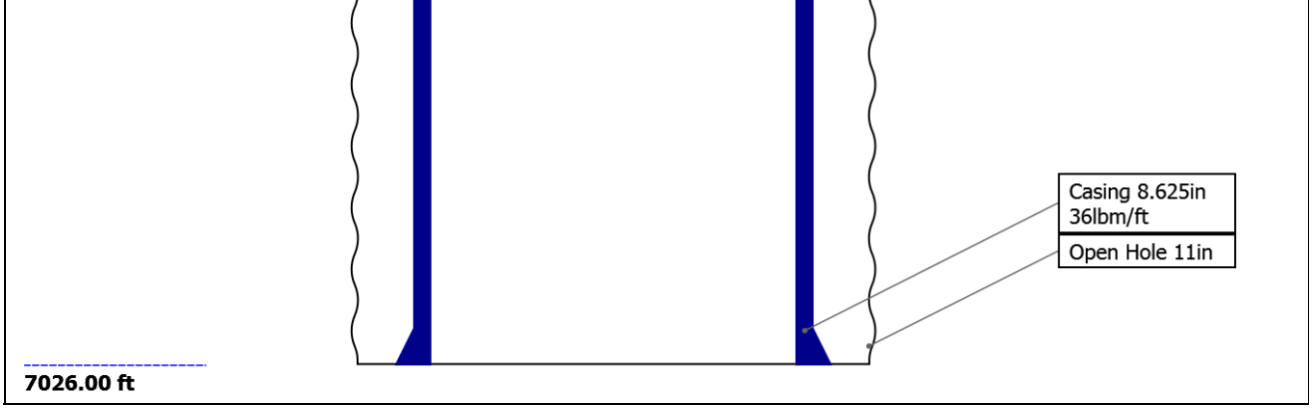
Well Sketch





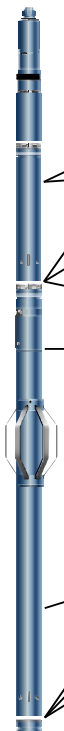
Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	17.5	11				
Top Driller (ft)	0	812				
Top Logger (ft)	0	812				
Bottom Driller (ft)	812	7026				
Bottom Logger (ft)	812	7026				
Casing						
Size (in)	13.375	8.625				
Weight (lbm/ft)	54.5	36				
Inner Diameter (in)	12.615	7.825				
Grade	N/A	N/A				
Top Driller (ft)	0	0				
Top Logger (ft)	0	0				
Bottom Driller (ft)	812	7026				
Bottom Logger (ft)	812	7026				

Remarks and Equipment Summary

One: Toolstring

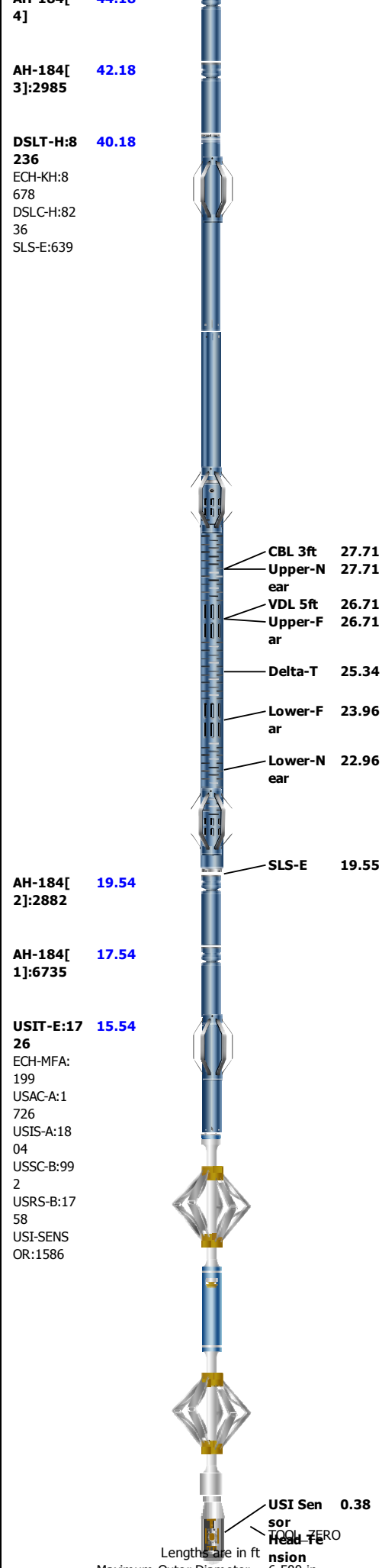
Equip name	Length
LEH-QT:2867	**59.51**
LEH-QT:2867	
DTC-H	**56.59**
ECH-KC	
DTC-H	
HGNS-H:3923	**53.59**
HGNH:4819	
NSR-F:1303	
NPV-N	
HACCZ-H:4177	
HMCA-H	
HGNS-H:3923	
AH-184[	**44.18**



MP name	Offset
Red	
CTEM	**55.69**
HV	**0.00**
TelStatus	**53.59**
ToolStatus	**53.59**
Temperature	**53.57**
GR	**52.85**
CNL Porosity	**46.52**
HMCA	**44.18**
HGNS	**44.18**
Accelerometer	**0.00**

One: Remarks

- Depth correlated to Welex Induction Electrical log dated 8-6-74
- Correlated neutron from current logging to resistivity between 6650 and 6750 ft
- USIT logged at 10 deg 1.5 inch, speed 3000 fph. Repeat at 10 deg 0.6 inch at 1200 fph
- Anomalies repeated at very hi-res
- All passes recorded with 0 psi surface pressure
- Top of sand at 6971 ft (tubing depth). Logged from above top of sand to surface.
- Speed correction applied to data to correct for tool stick and slipping



Lengths are in ft
Maximum Outer Diameter = 6.500 in
Line: Sensor Location, Value: Gating Offset
All measurements are relative to TOOL_ZERO

Job Event Summary

Event	Time	Duration	Interval	Remark
Log[1]:Down	Aug-18-2016 09:34	00:09:08	89.8 - 561.27 ft	Fluid Properties Measurement
Log[3]:Down	Aug-18-2016 09:50	00:15:42	1786.83 - 6968.49 ft	Fluid Properties Measurement
Log[5]:Up	Aug-18-2016 10:17	00:04:24	6976.47 - 6894.42 ft	Hi-Res Repeat
Log[6]:Up	Aug-18-2016 10:24	00:05:44	6983.35 - 6724.32 ft	Repeat Pass
Log[7]:Up	Aug-18-2016 10:32	01:34:53	6987.04 - 5184.38 ft	Main Pass #1
Log[9]:Up	Aug-18-2016 11:10	00:05:26	5728.44 - 5622.66 ft	Hi-Res Repeat
Log[11]:Up	Aug-18-2016 11:29	01:29:07	5434.88 - 1280.64 ft	Main Pass #2
Log[12]:Up	Aug-18-2016 13:08	01:30:19	1429.75 - 45.18 ft	Main Pass #3
Log[13]:Up	Aug-18-2016 13:59	00:07:03	4732.42 - 4601.74 ft	Hi-Res Repeat
Log[14]:Up	Aug-18-2016 14:07	00:06:13	4475.49 - 4362.17 ft	Hi-Res Repeat
Log[15]:Up	Aug-18-2016 14:16	00:08:30	3489.84 - 3324.54 ft	Hi-Res Repeat
Log[16]:Up	Aug-18-2016 14:27	00:10:21	2688.75 - 2500.52 ft	Hi-Res Repeat
Log[17]:Up	Aug-18-2016 14:40	00:05:41	1427.89 - 1325.2 ft	Hi-Res Repeat
Log[18]:Up	Aug-18-2016 14:53	00:05:15	172.29 - 22.17 ft	Main Pass #4, Surface
Log[19]:Up	Aug-18-2016 14:59	00:03:05	63.76 - 25.64 ft	Hi-Res Repeat

Composite 1

Main Pass 5 in = 100 ft

Software Version

Acquisition System	Version
Maxwell 2016 SP1	6.1.58882.3100
Application Patch	Wireline_Hotfix-Perfo-2016SP1_6.1.63773

Computation	Description	Version
CEVAL	Sonic Cement Evaluation Computation Ensemble provides common Parameters and Channels	6.1.58882.3100

SoftwareVersion_Tool	SoftwareVersion_Run Version	SoftwareVersion_Build Version
WAFE-SEC	Synergy SV451EC version 8.10	Synergy SV451EC version 9.10
WAFE-FEC	Synergy SV451EC version 8.10	Synergy SV451EC version 9.10
WAFE-TMDI	Synergy SV451EC version 46.19	Synergy SV451EC version 46.19

Tool Elements	Description	Software Version	Firmware Version
HGNS-H	HILT Gamma-Ray and Neutron Sonde, 150 degC	6.1.58882.3100	2.0
SLS-E	Sonic Logging Sonde E supports 3'-5'BHC DT and CBL/VDL	6.1.58882.3100	4.0
USI-SENSOR	USIT Transducer Element	6.1.58882.3100	DSP: v1.82

Composite Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
One	Log[7]:Up	Up	5184.38 ft	6987.38 ft	18-Aug-2016 10:32:04 AM	18-Aug-2016 11:06:58 AM	ON	2.26 ft	No
One	Log[11]:Up	Up	1280.11 ft	5434.15 ft	18-Aug-2016 11:29:44 AM	18-Aug-2016 12:58:51 PM	ON	11.15 ft	No
One	Log[12]:Up	Up	44.45 ft	1429.03 ft	18-Aug-2016 1:08:22 PM	18-Aug-2016 1:38:42 PM	ON	11.26 ft	No
One	Log[18]:Up	Up	21.44 ft	171.59 ft	18-Aug-2016 2:53:06 PM	18-Aug-2016 2:58:21 PM	ON	-0.05 ft	No

All depths are referenced to toolstring zero

Log

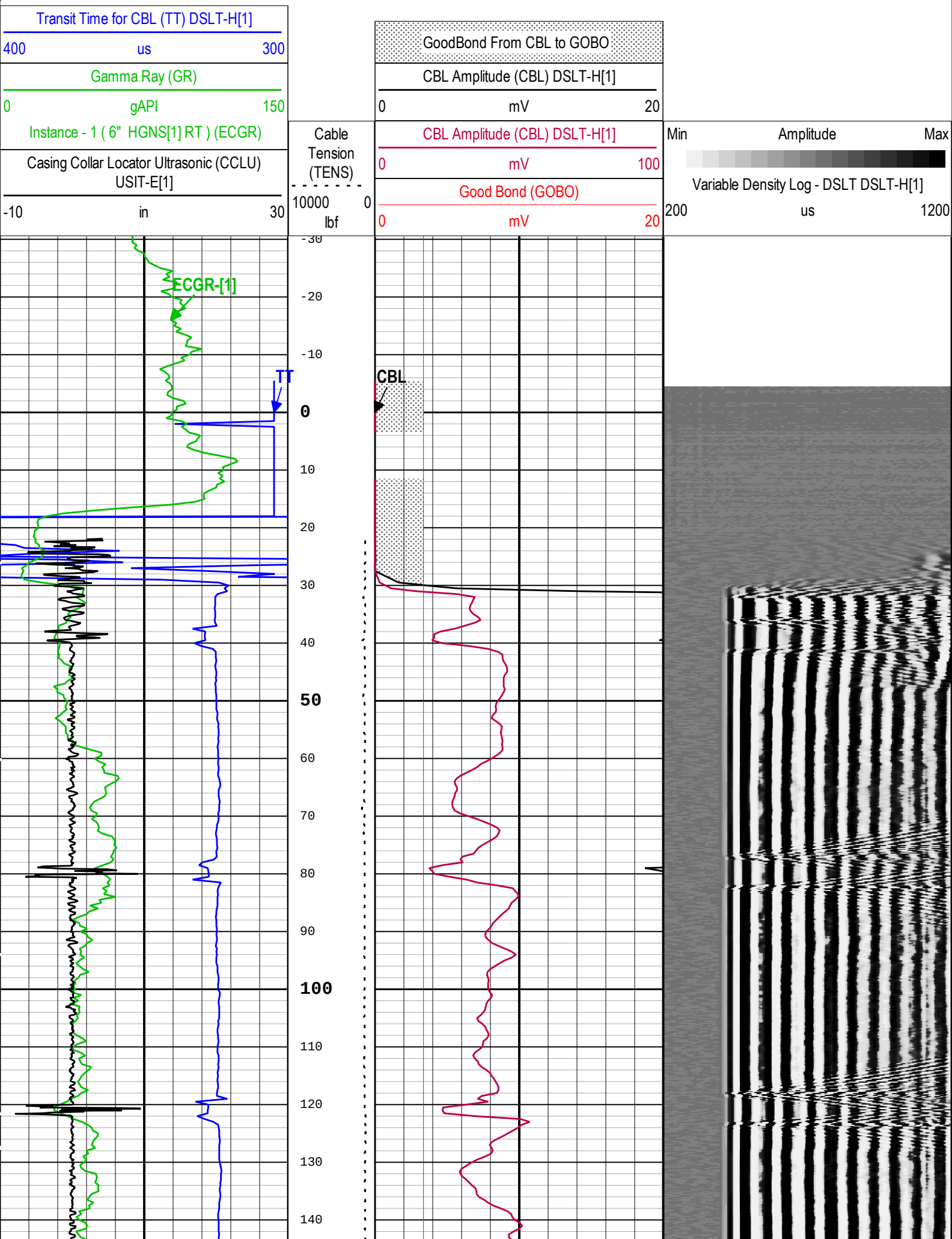
Company:Southern California Gas Company Well:Fernando Fee 35A

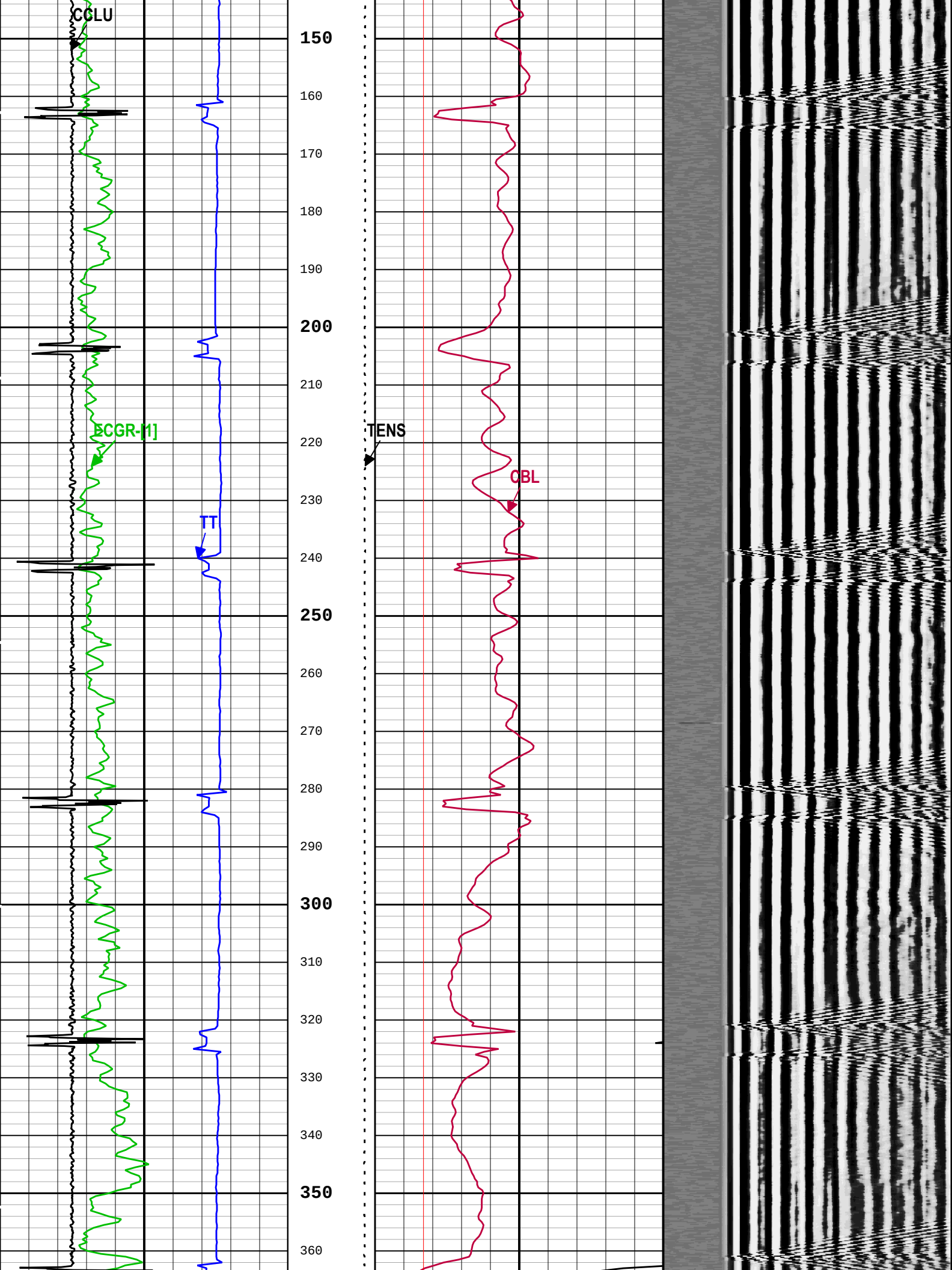
Composite 1:S006

Description: Sonic CBL with VDL Format: Log (Sonic CBL with VDL) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 18-Aug-2016 20:16:55

BIEP - Bond Index Event Pips DSLT-H[1]

TIME_1900 - Time Marked every 60.00 (s)

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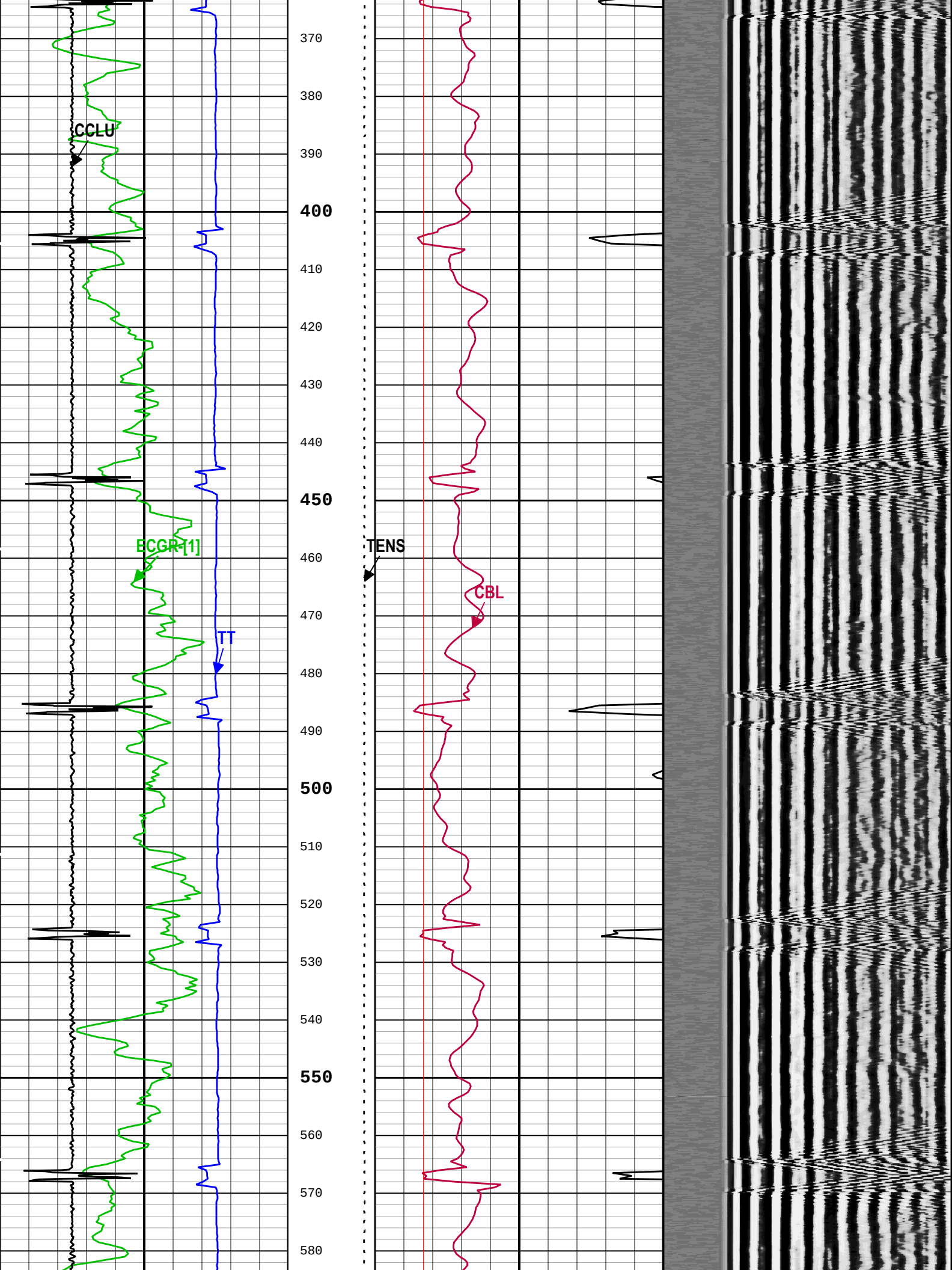
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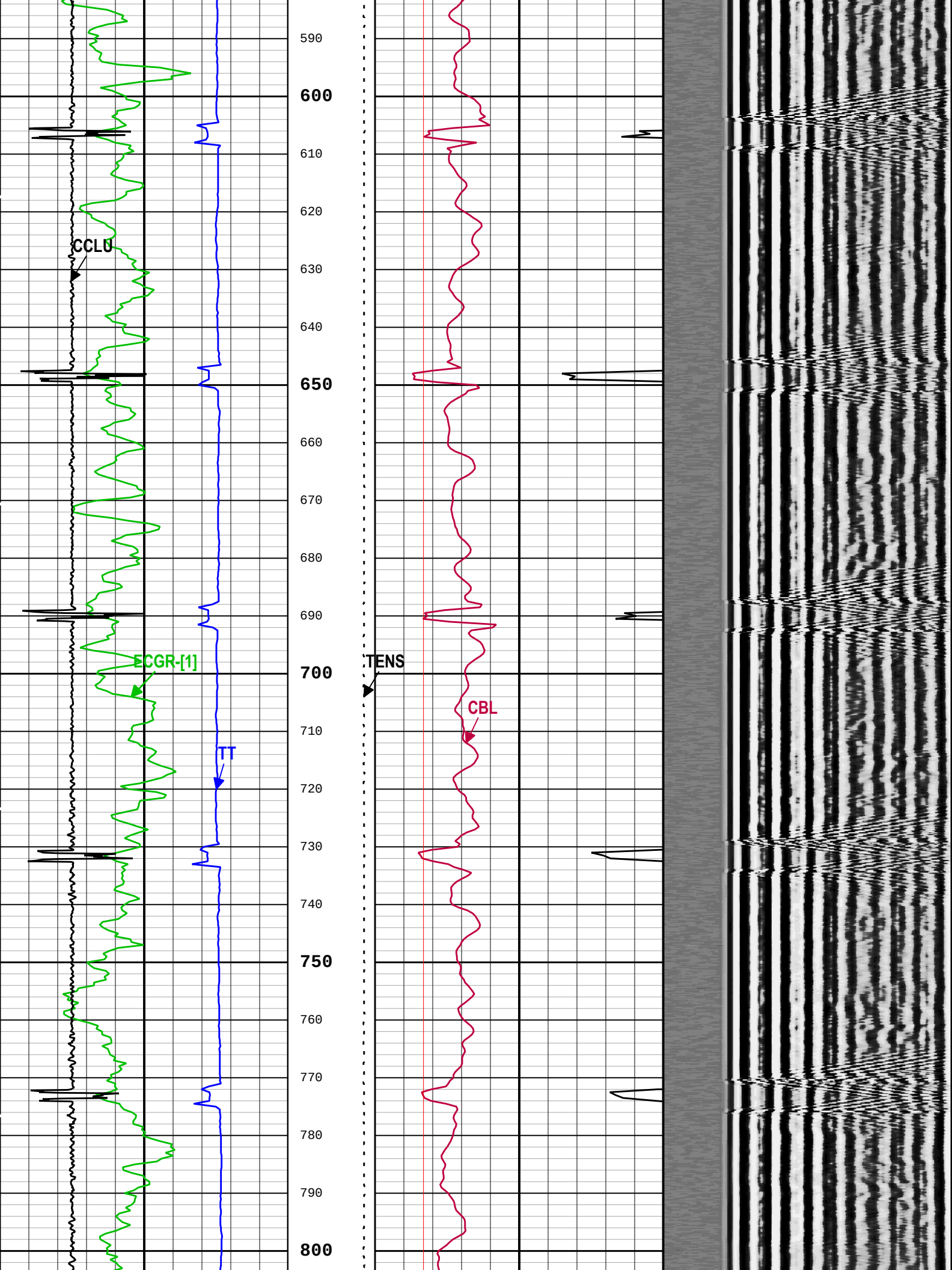
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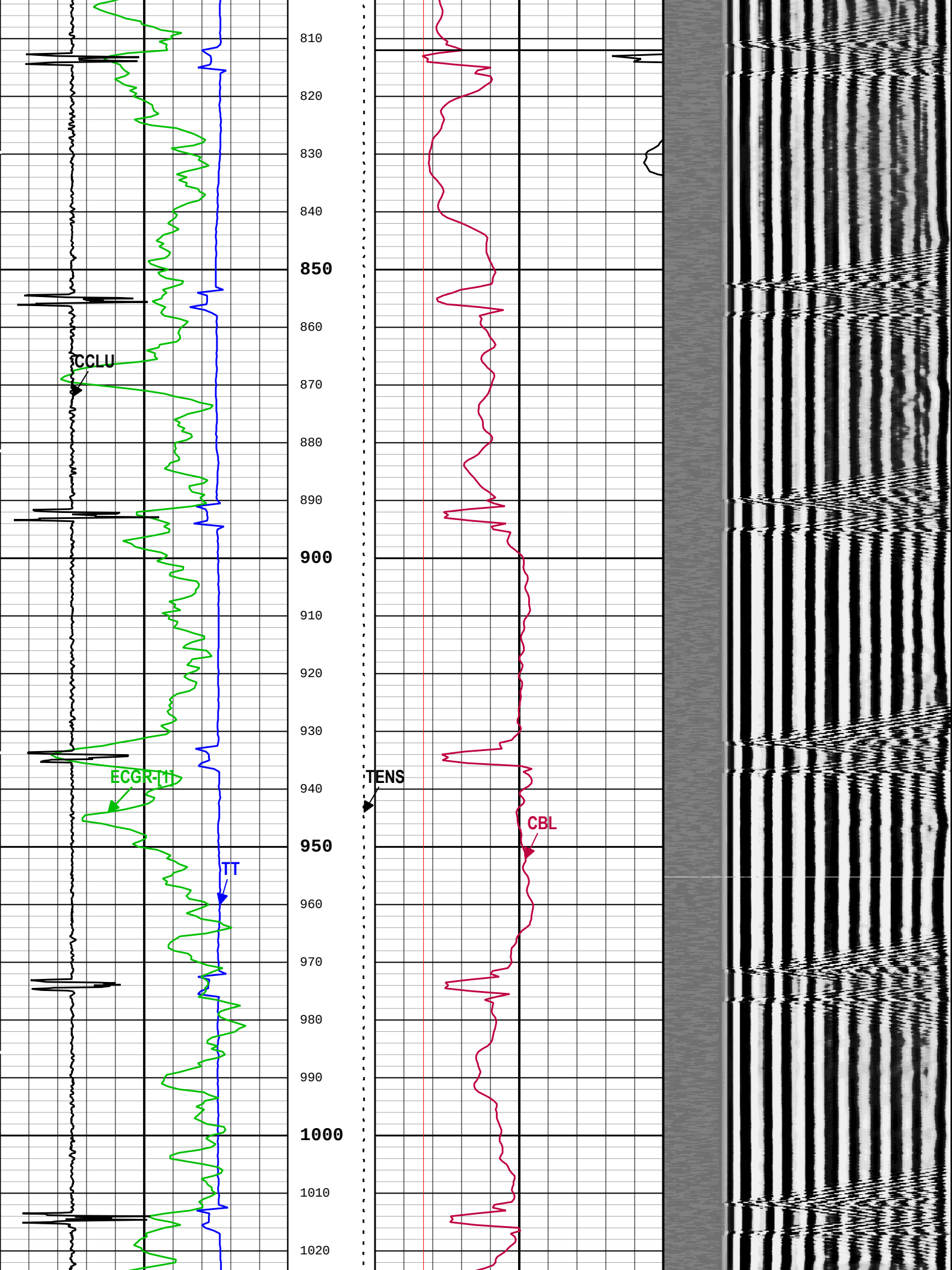
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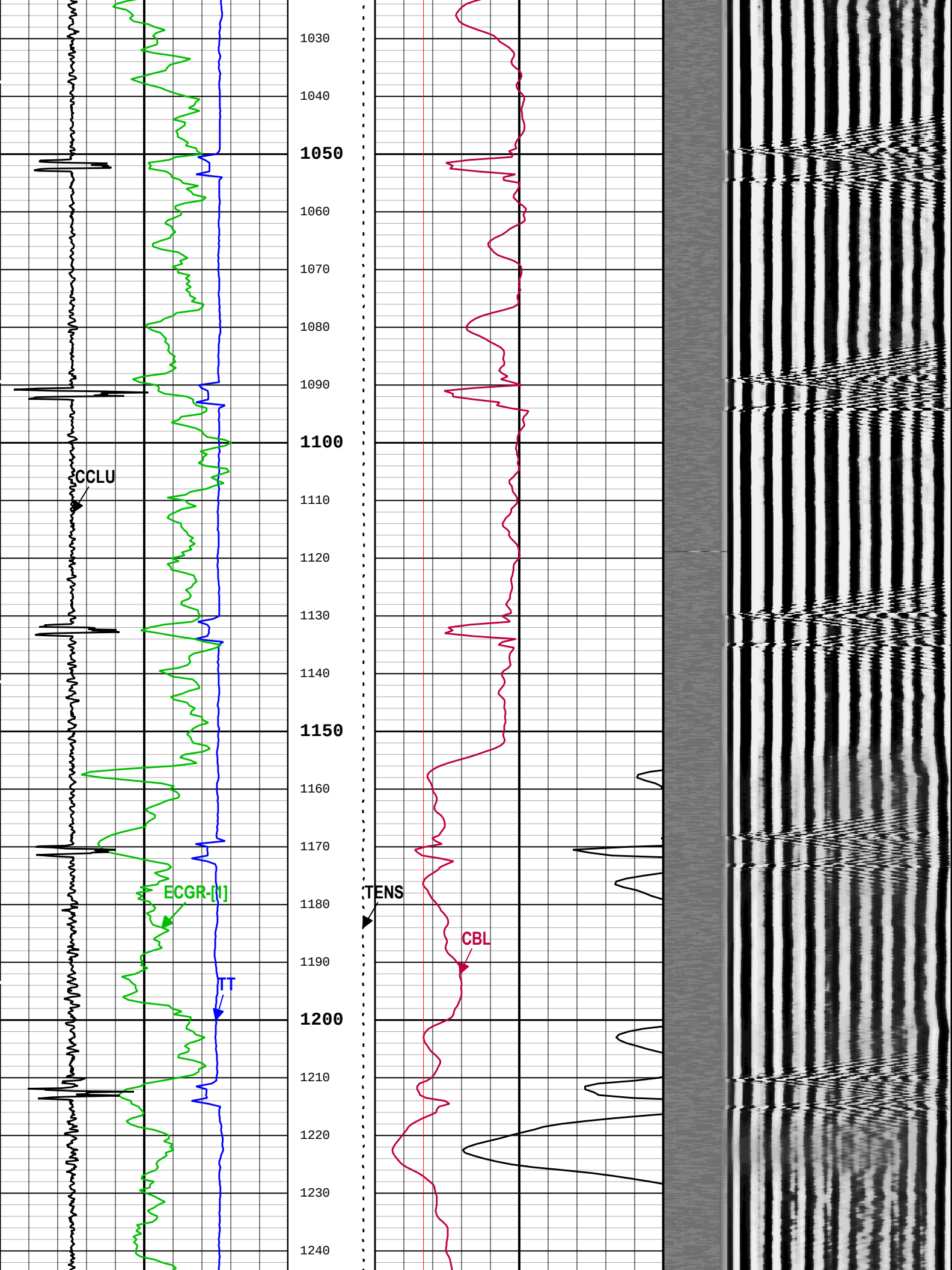
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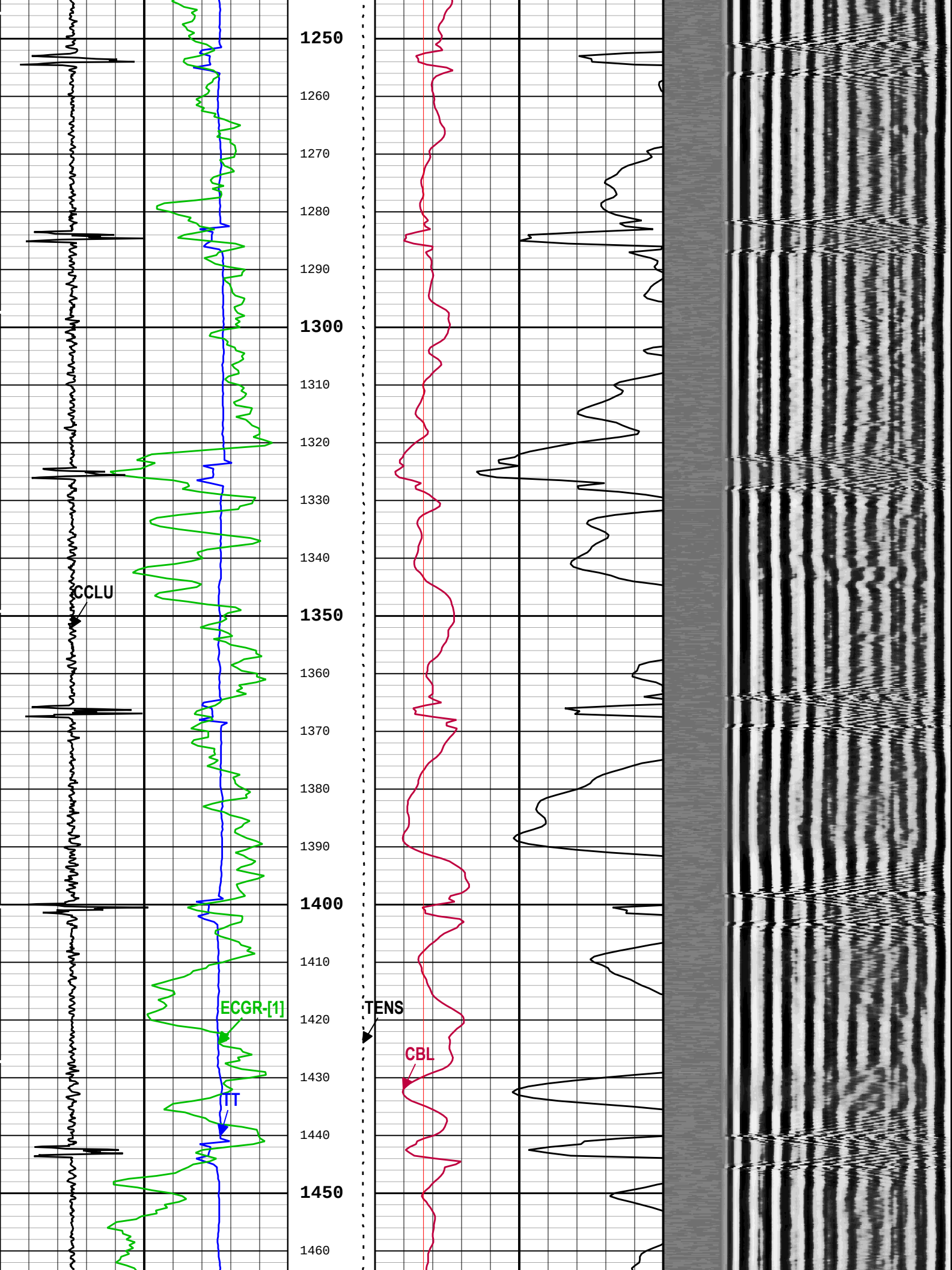
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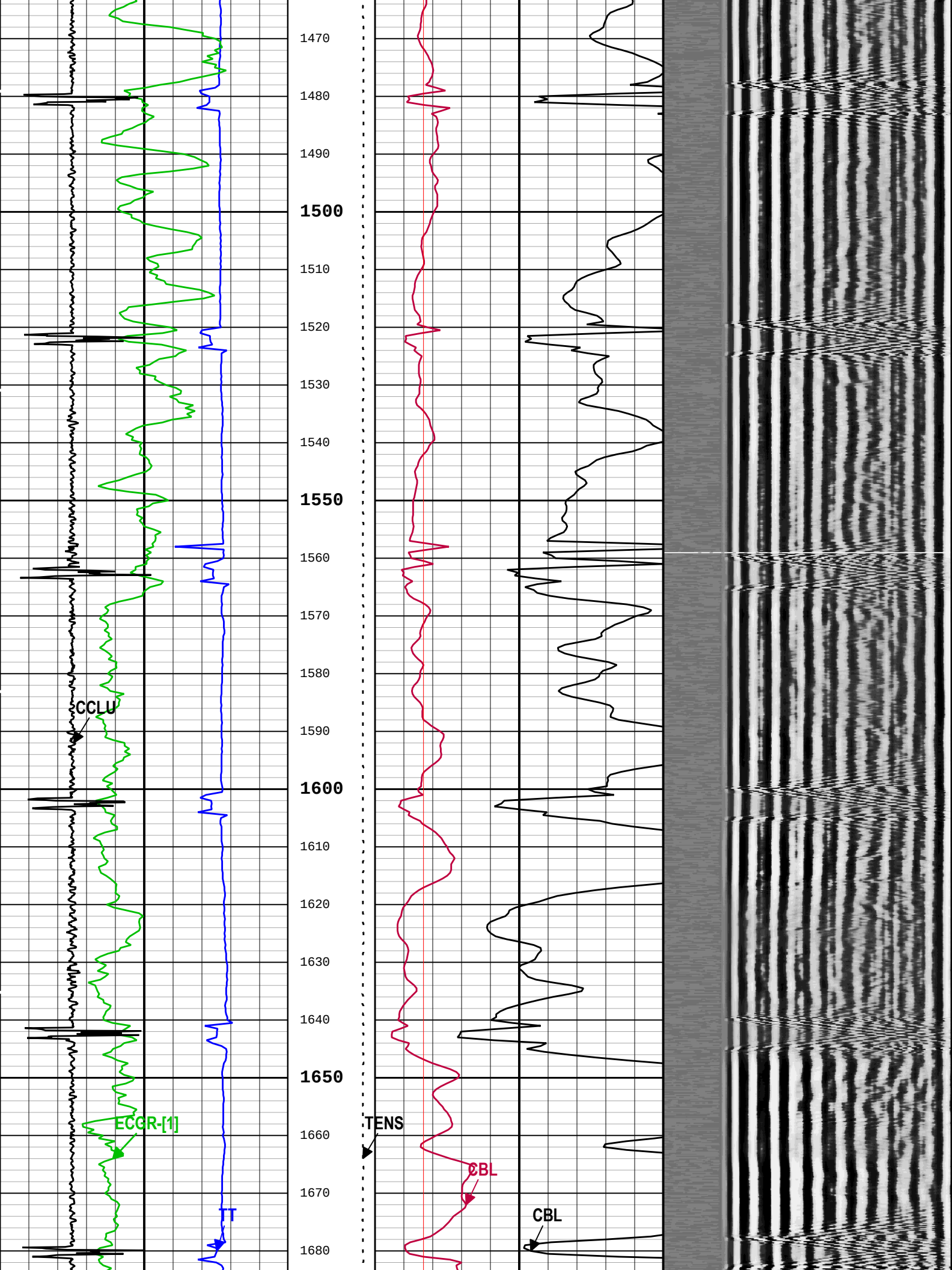
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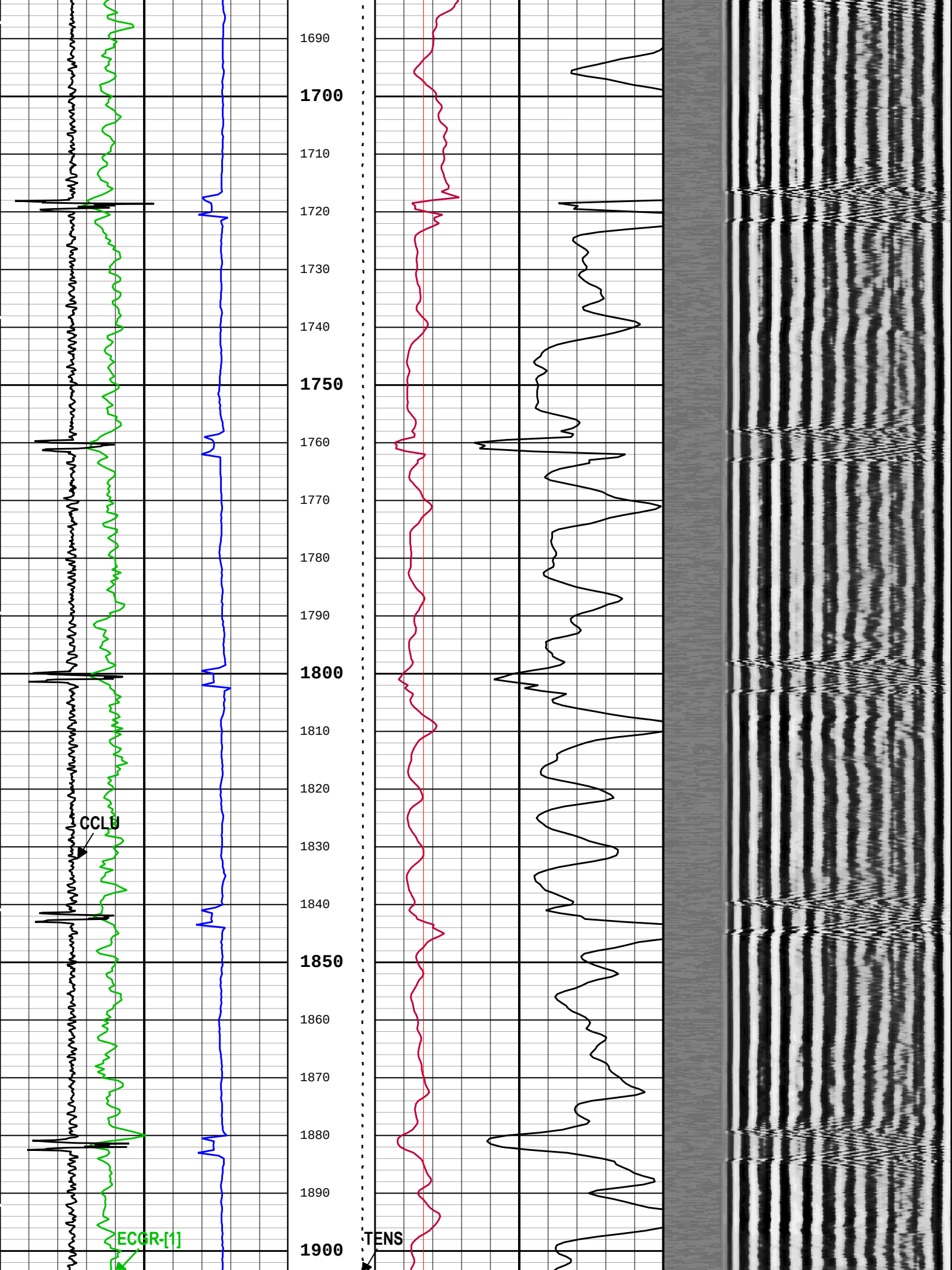
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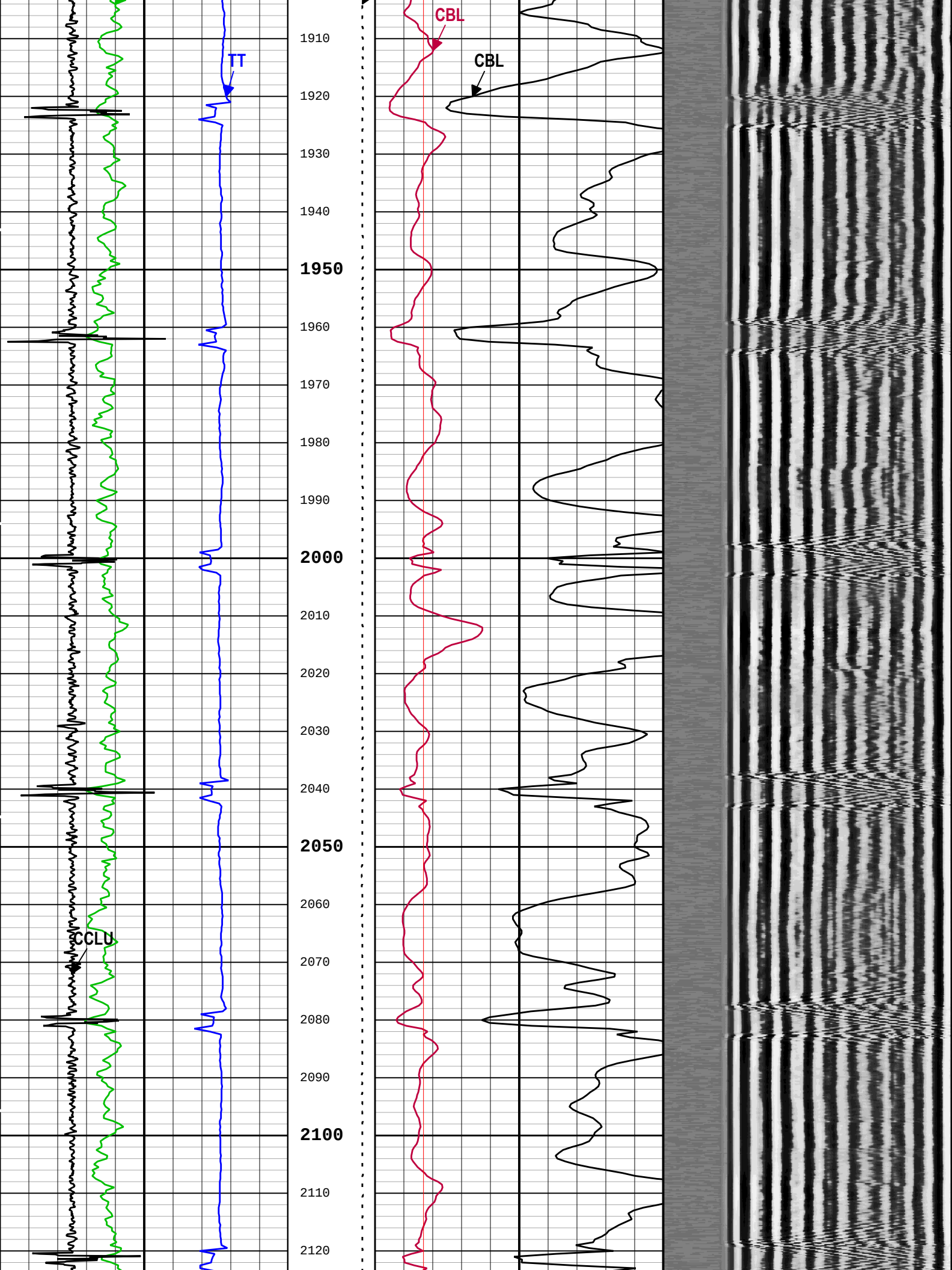
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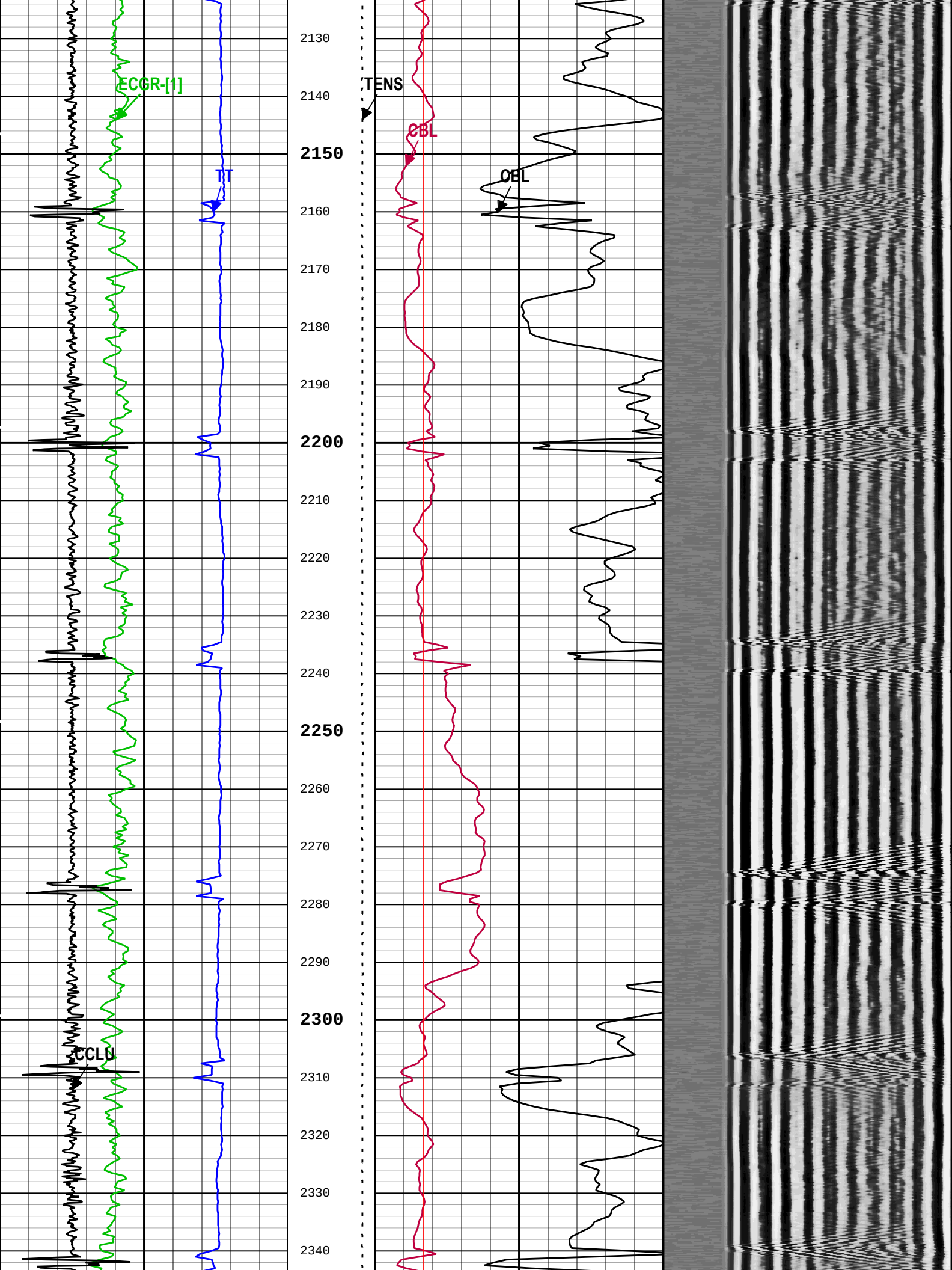
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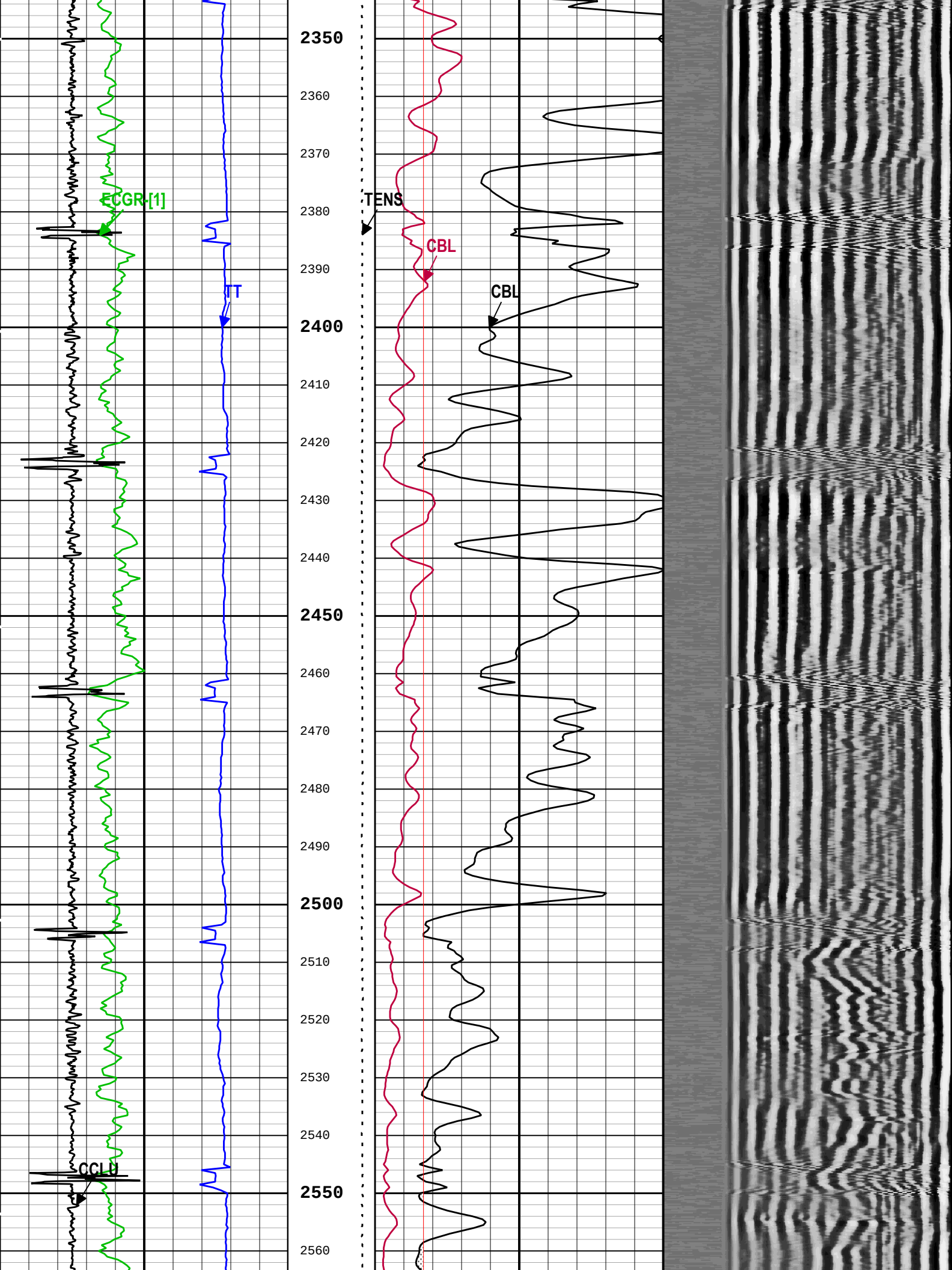
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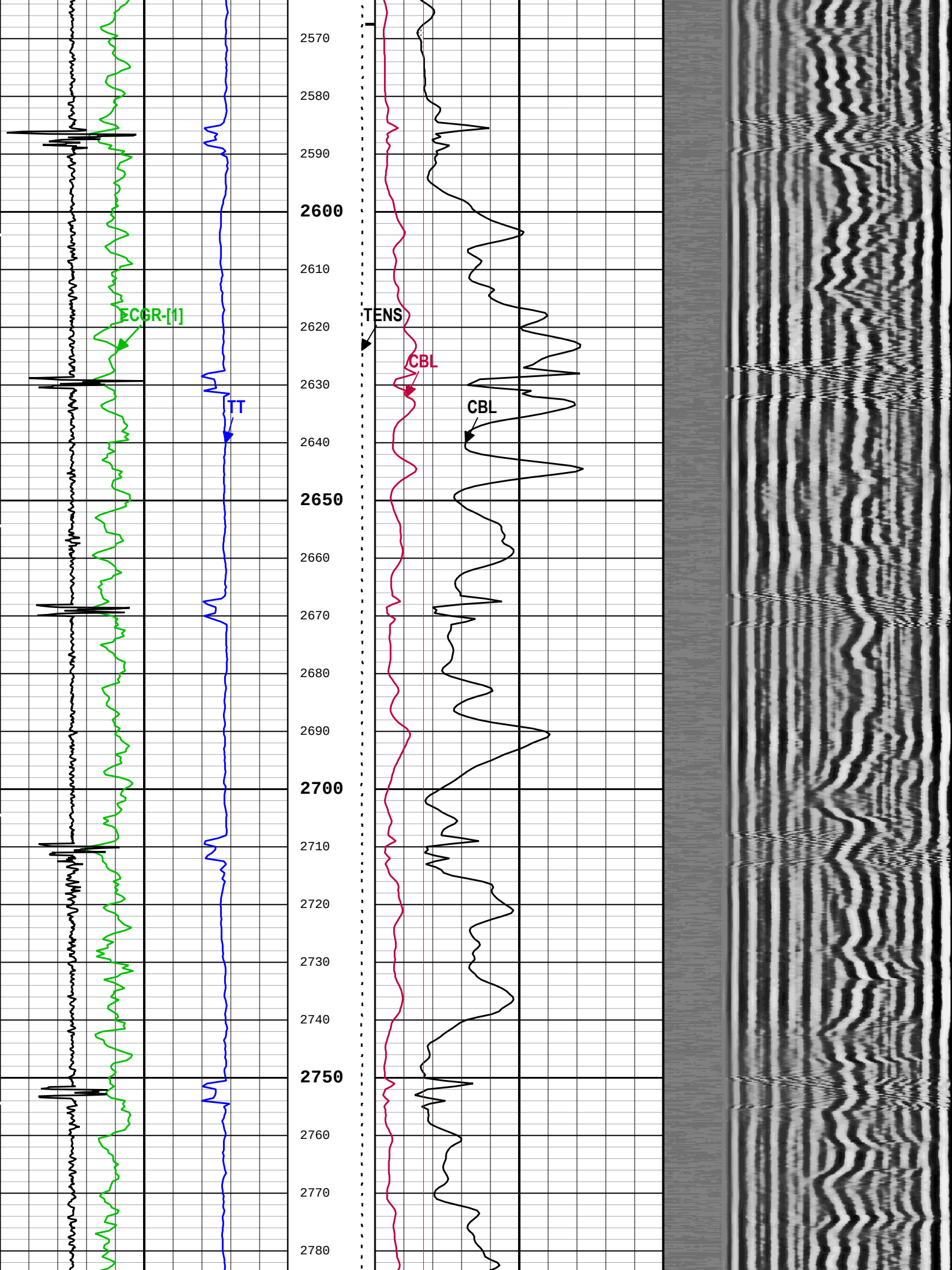
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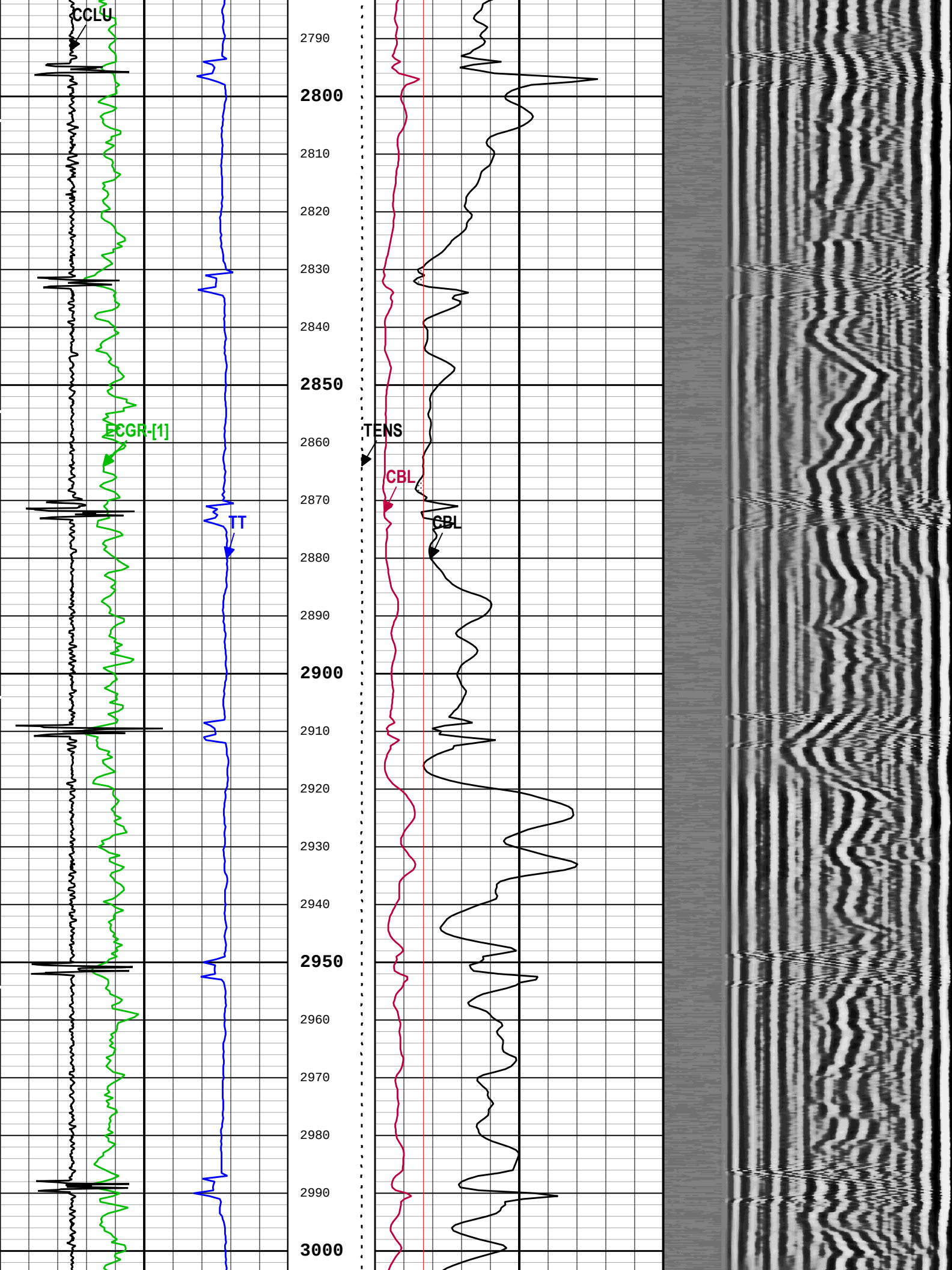
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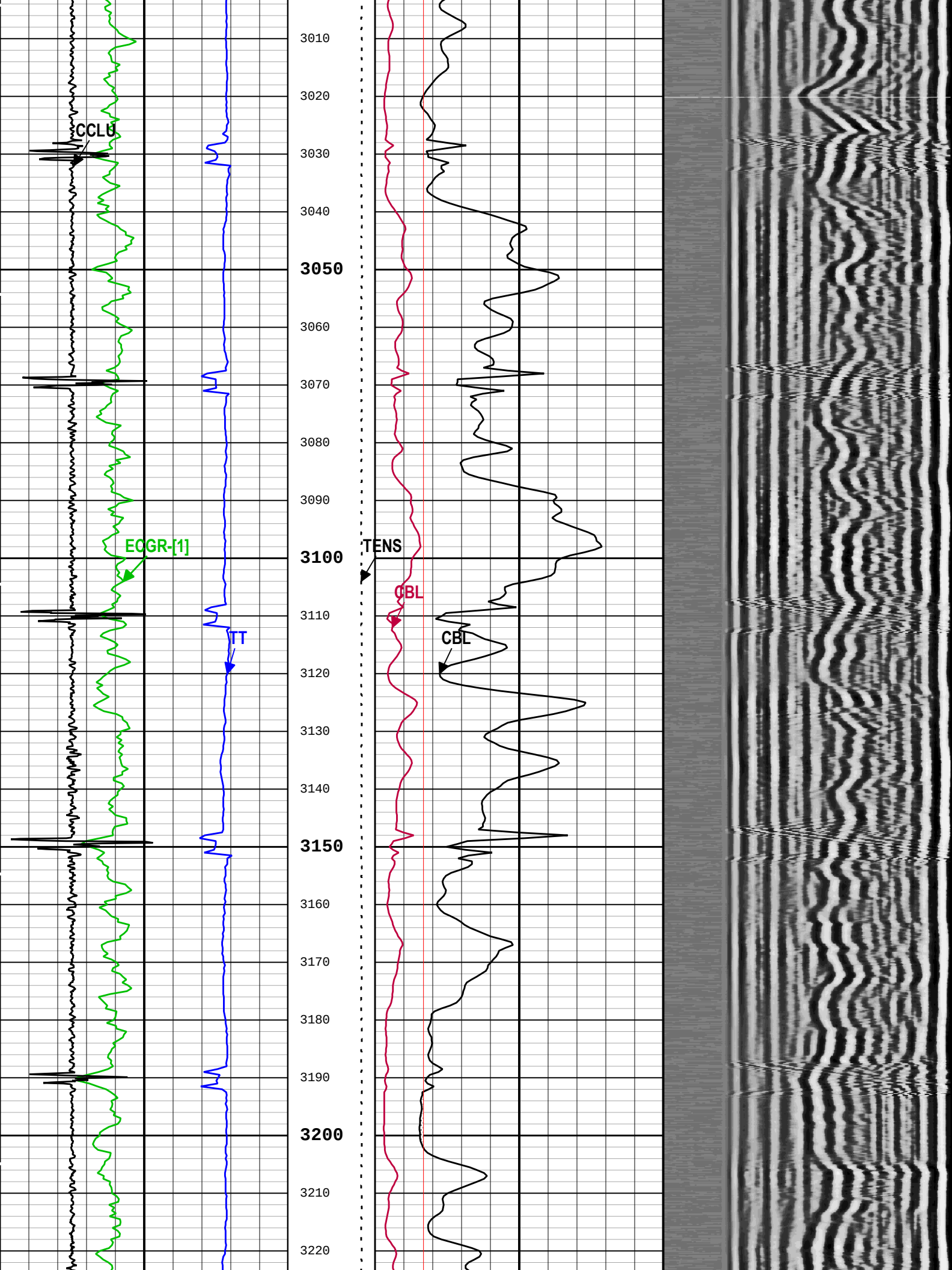
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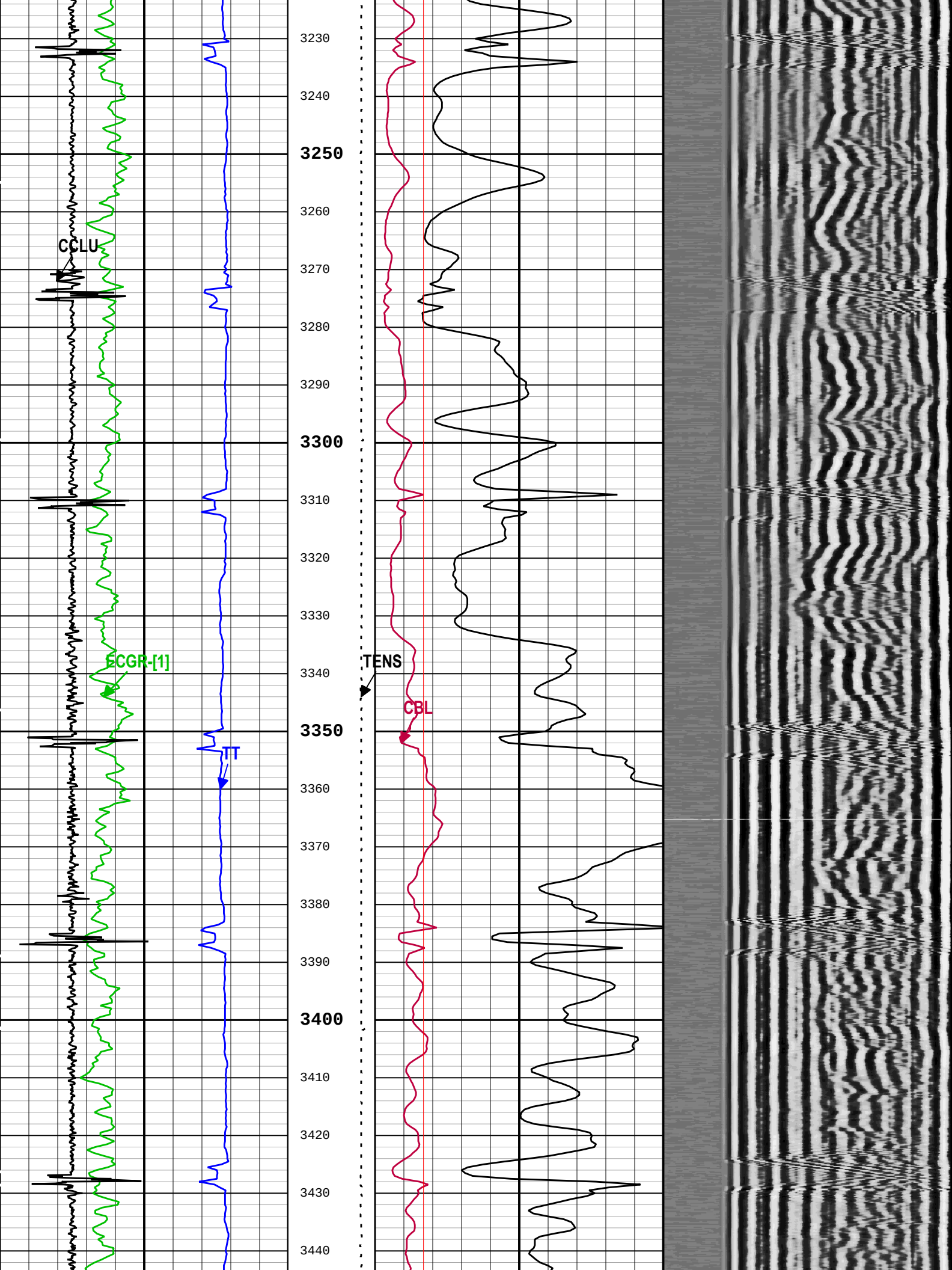
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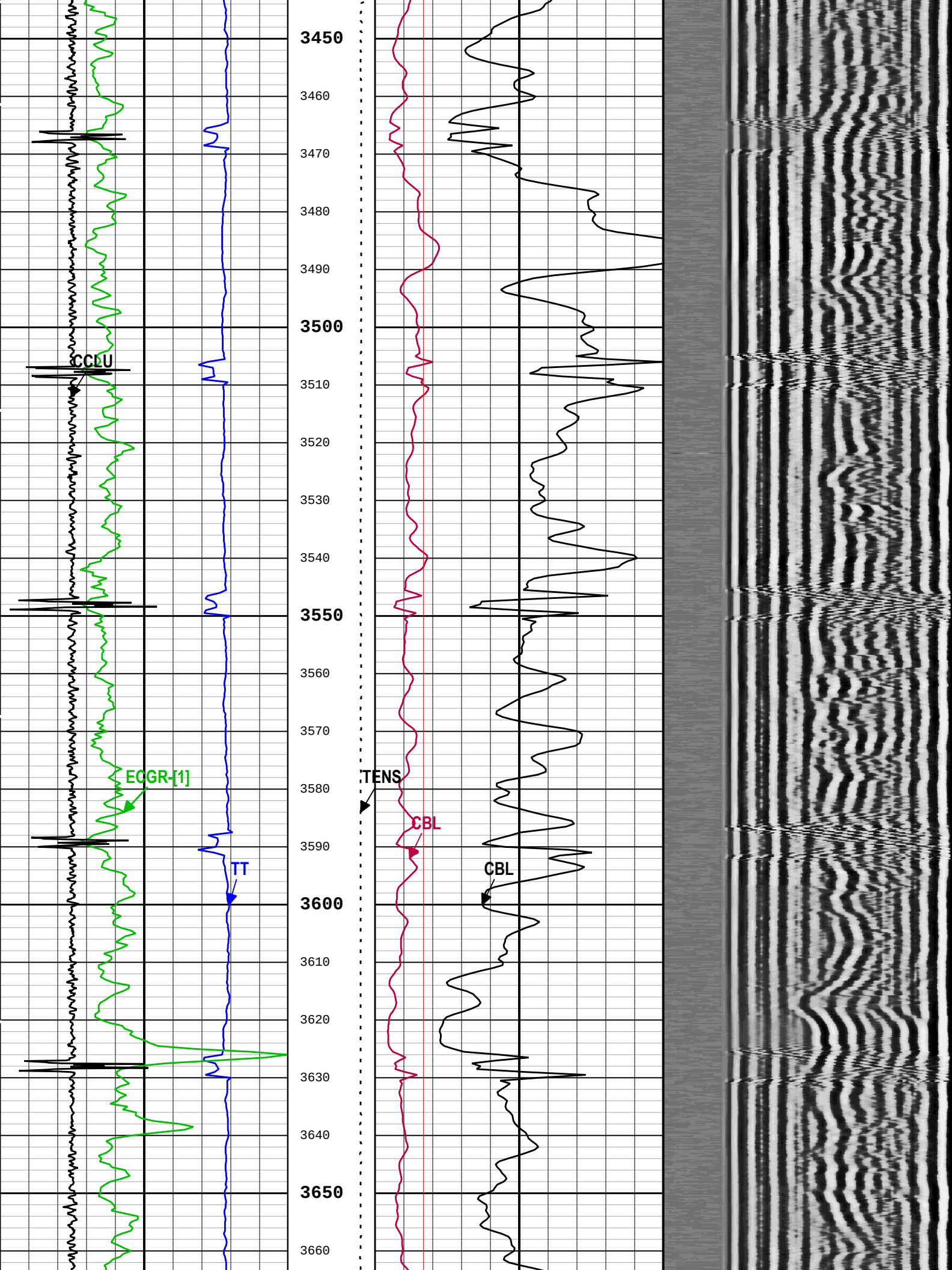
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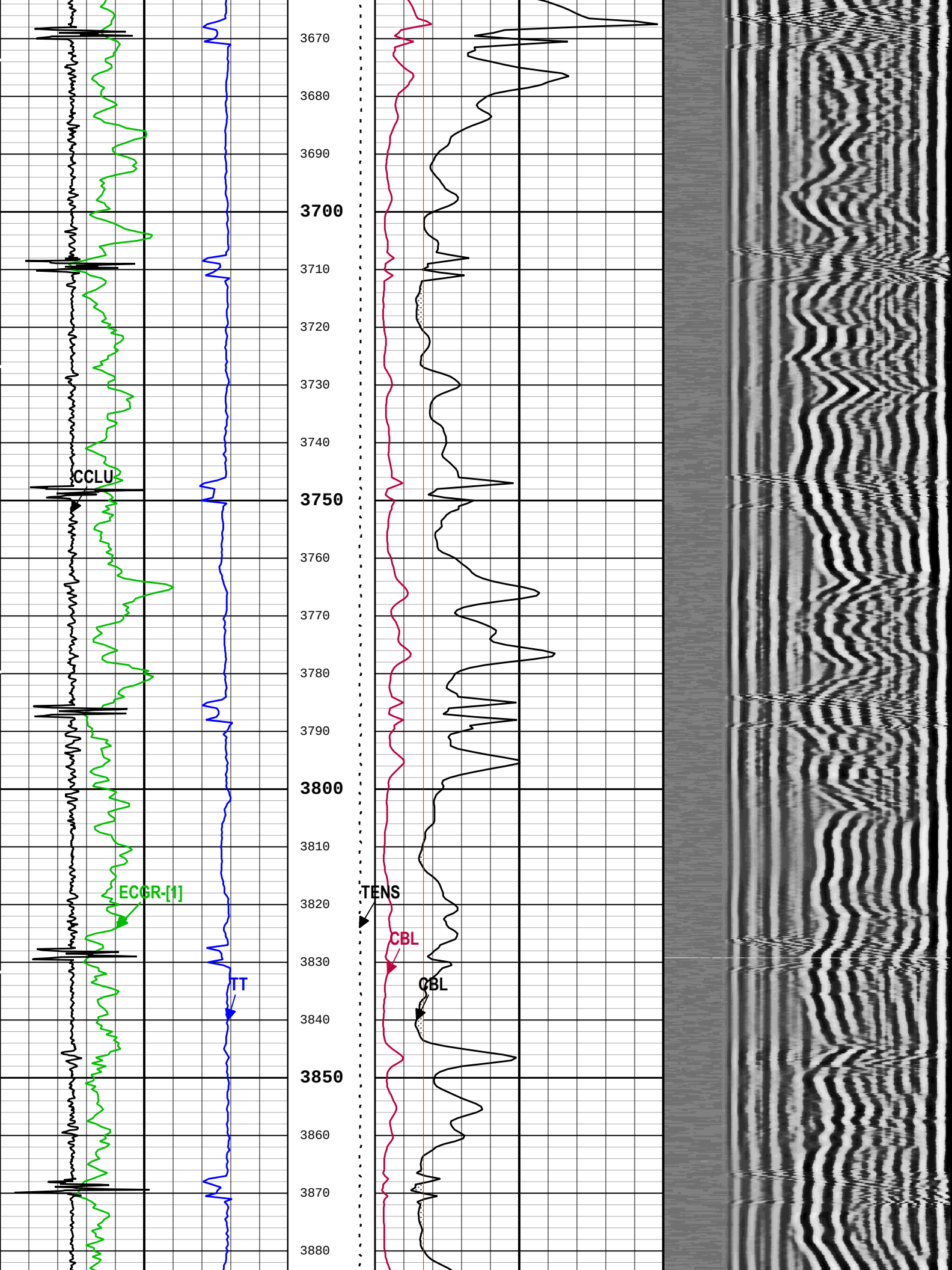
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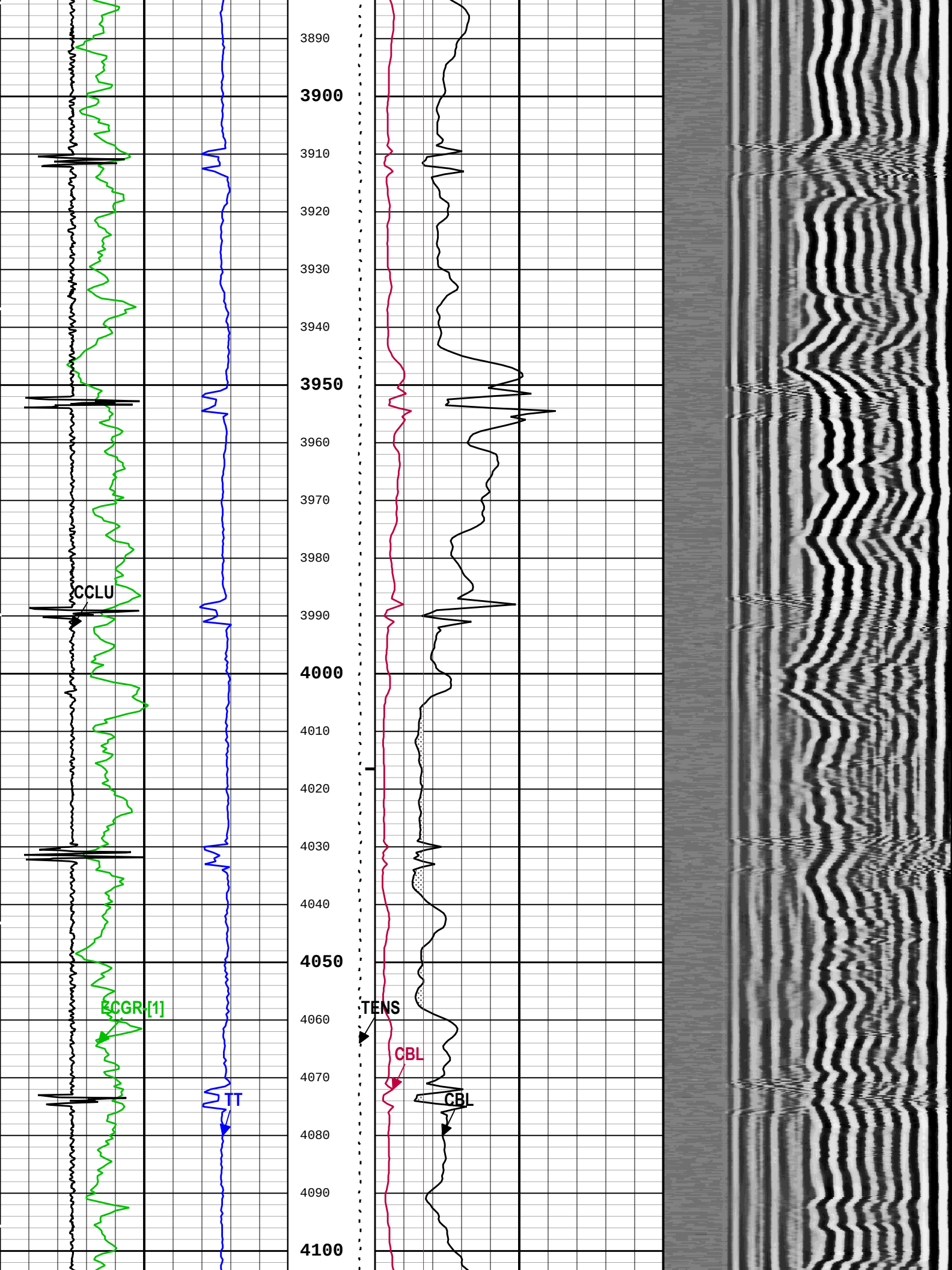
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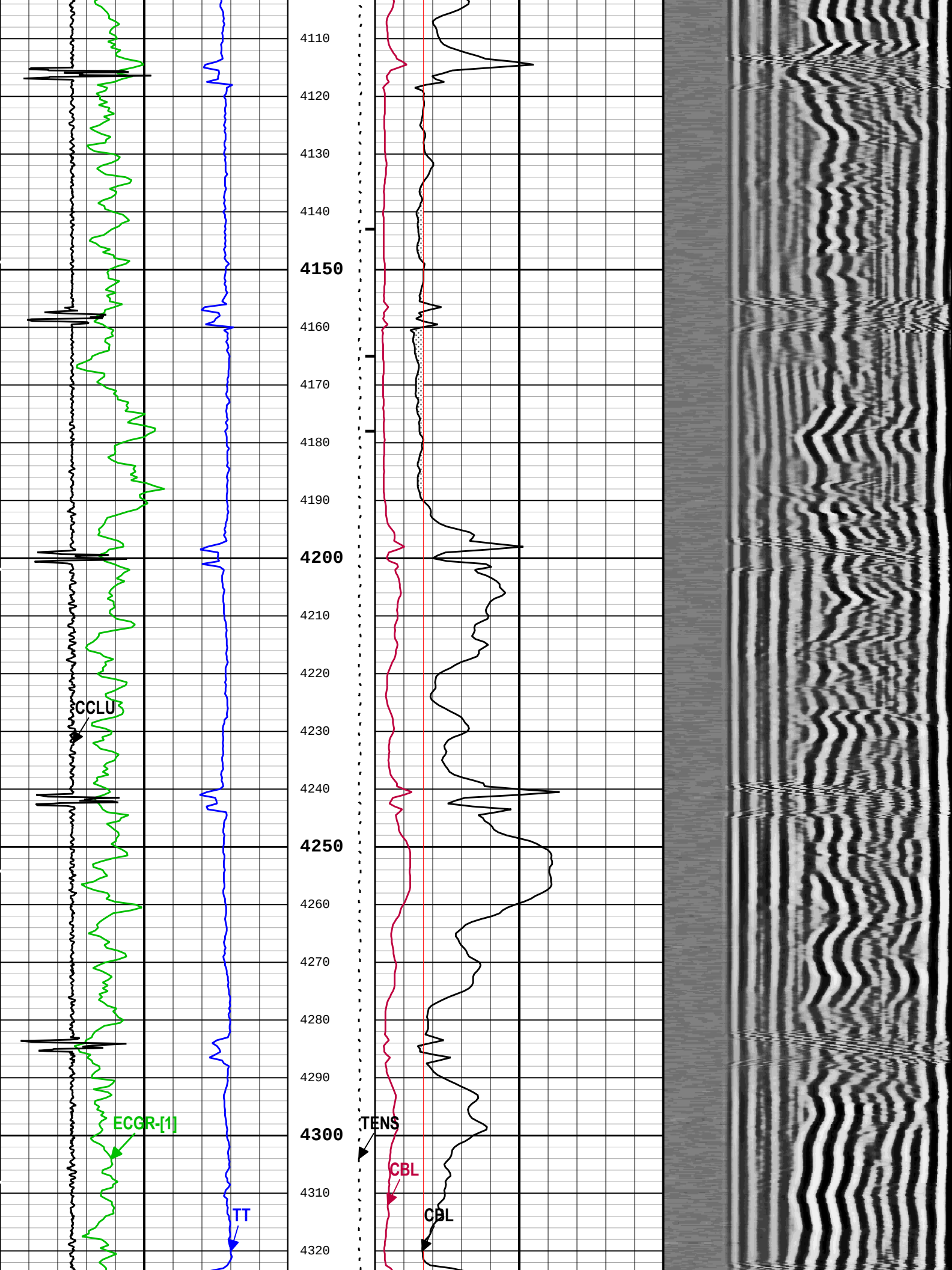
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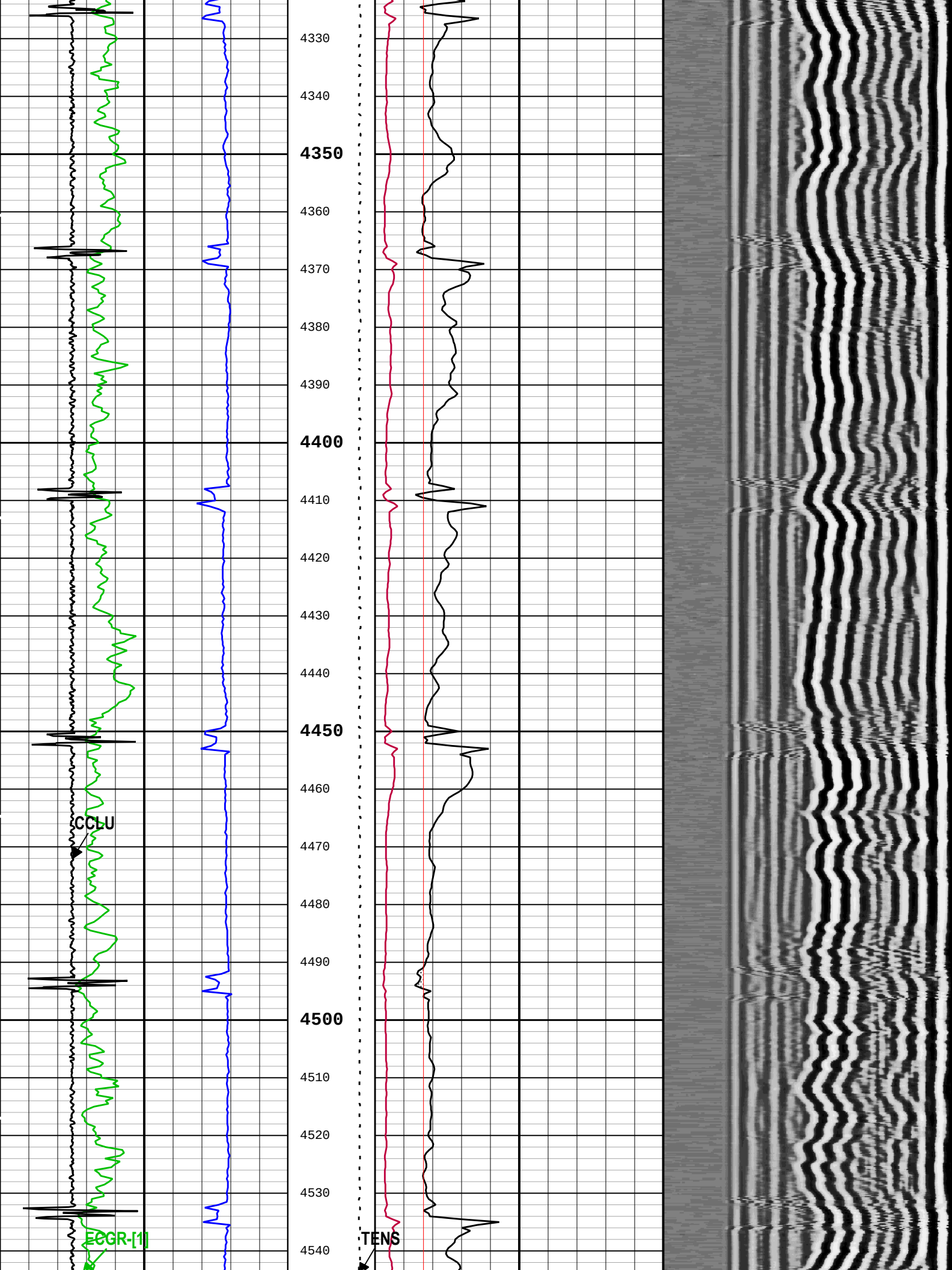
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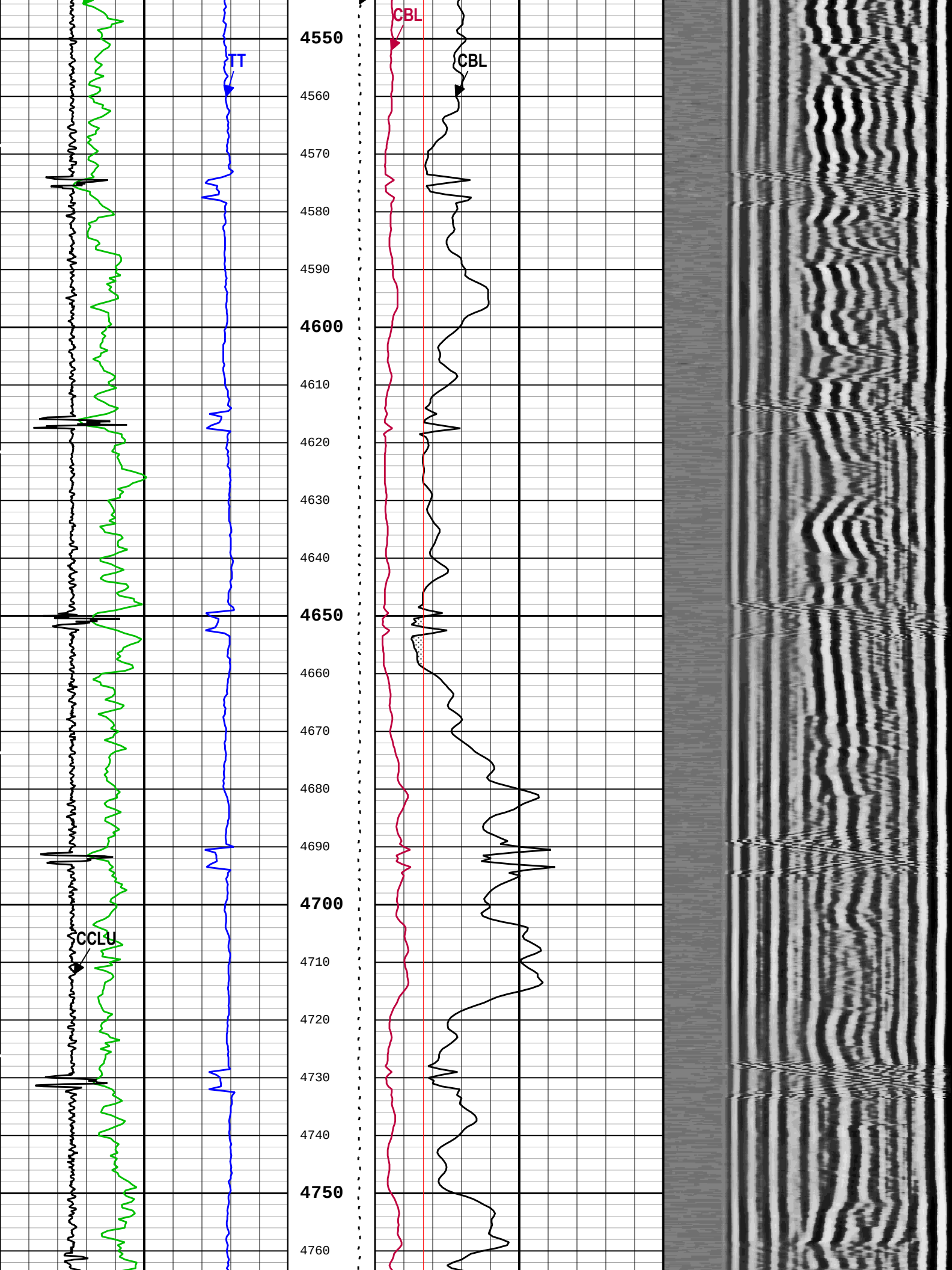
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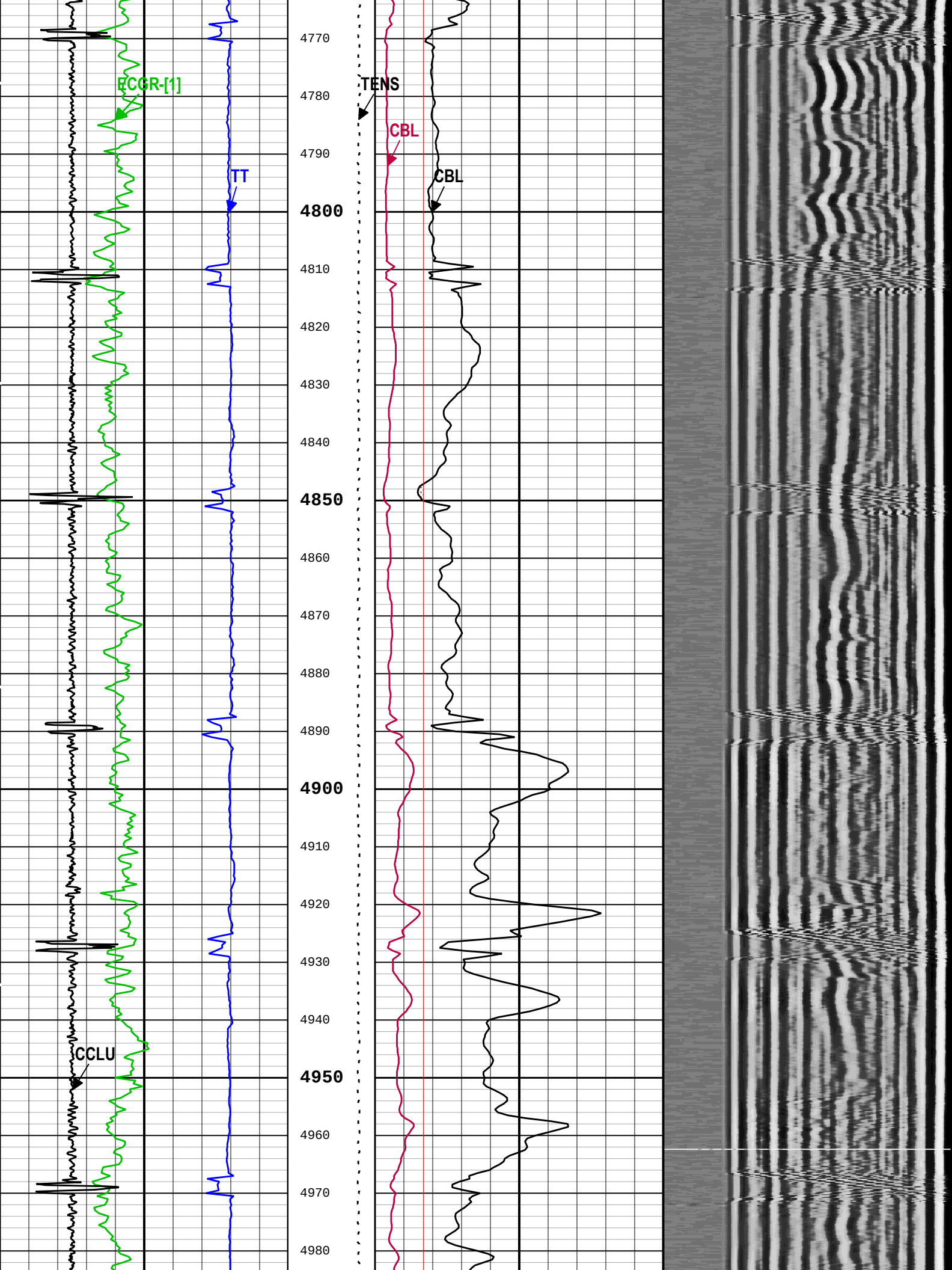
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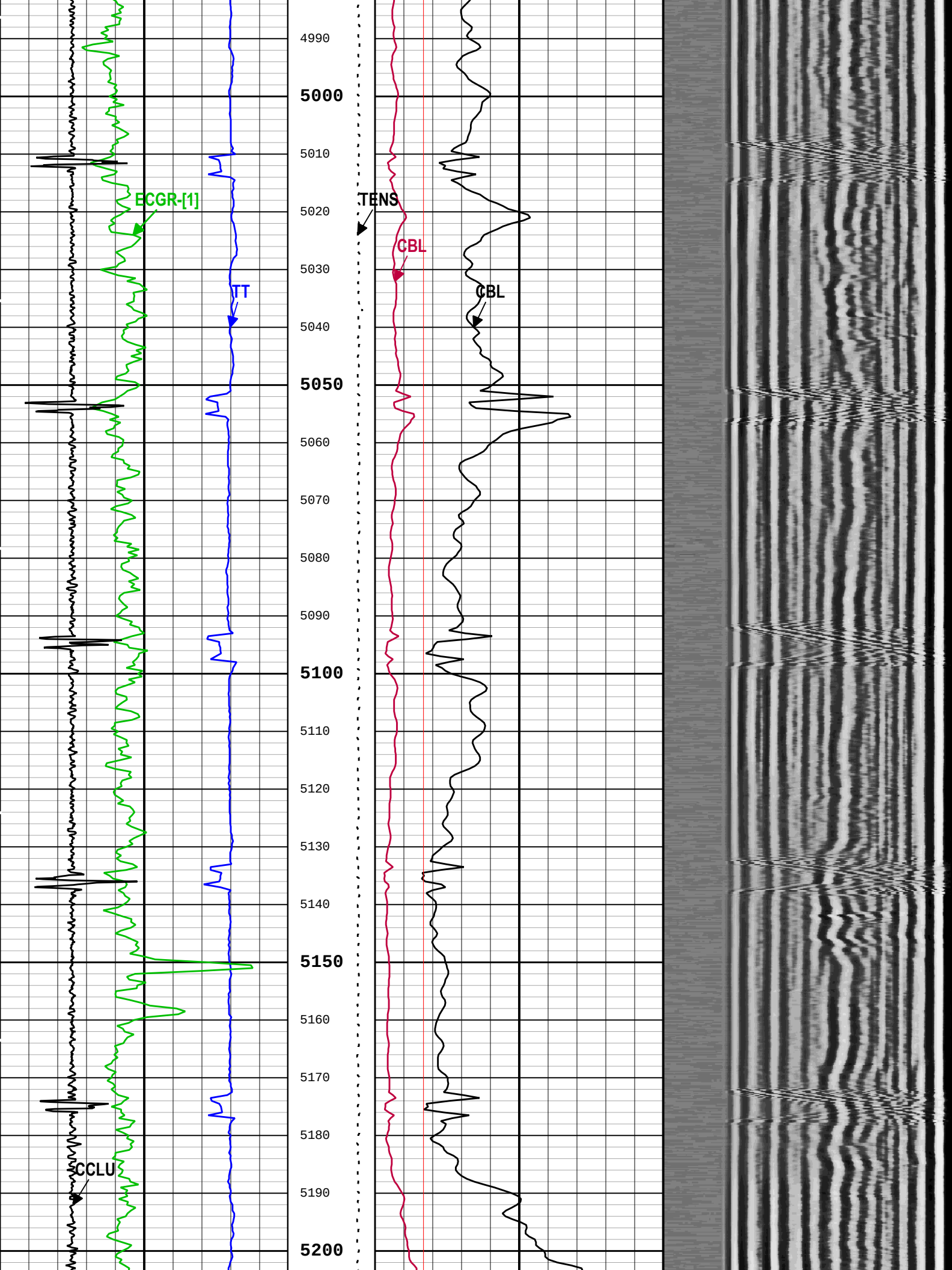
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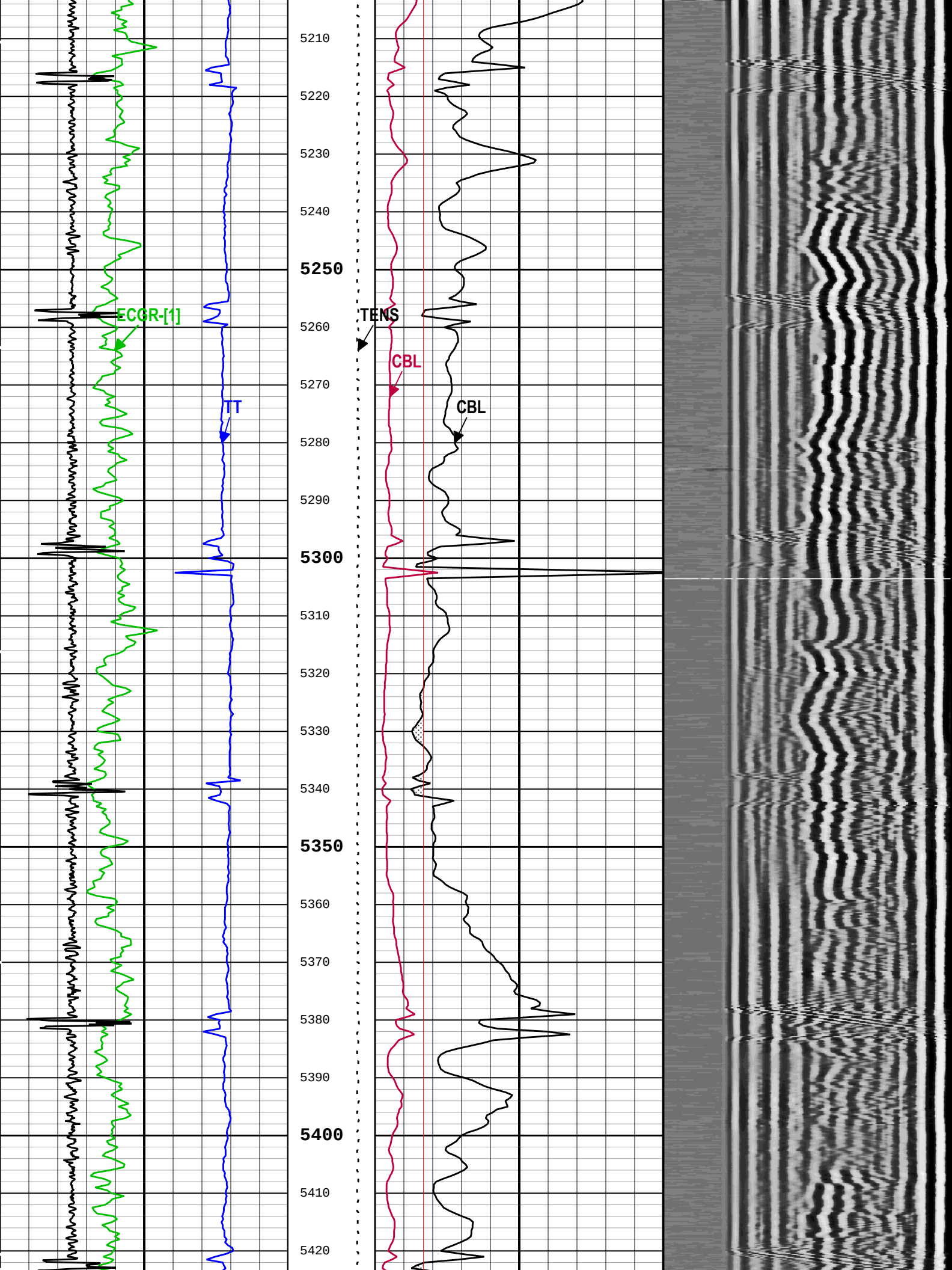
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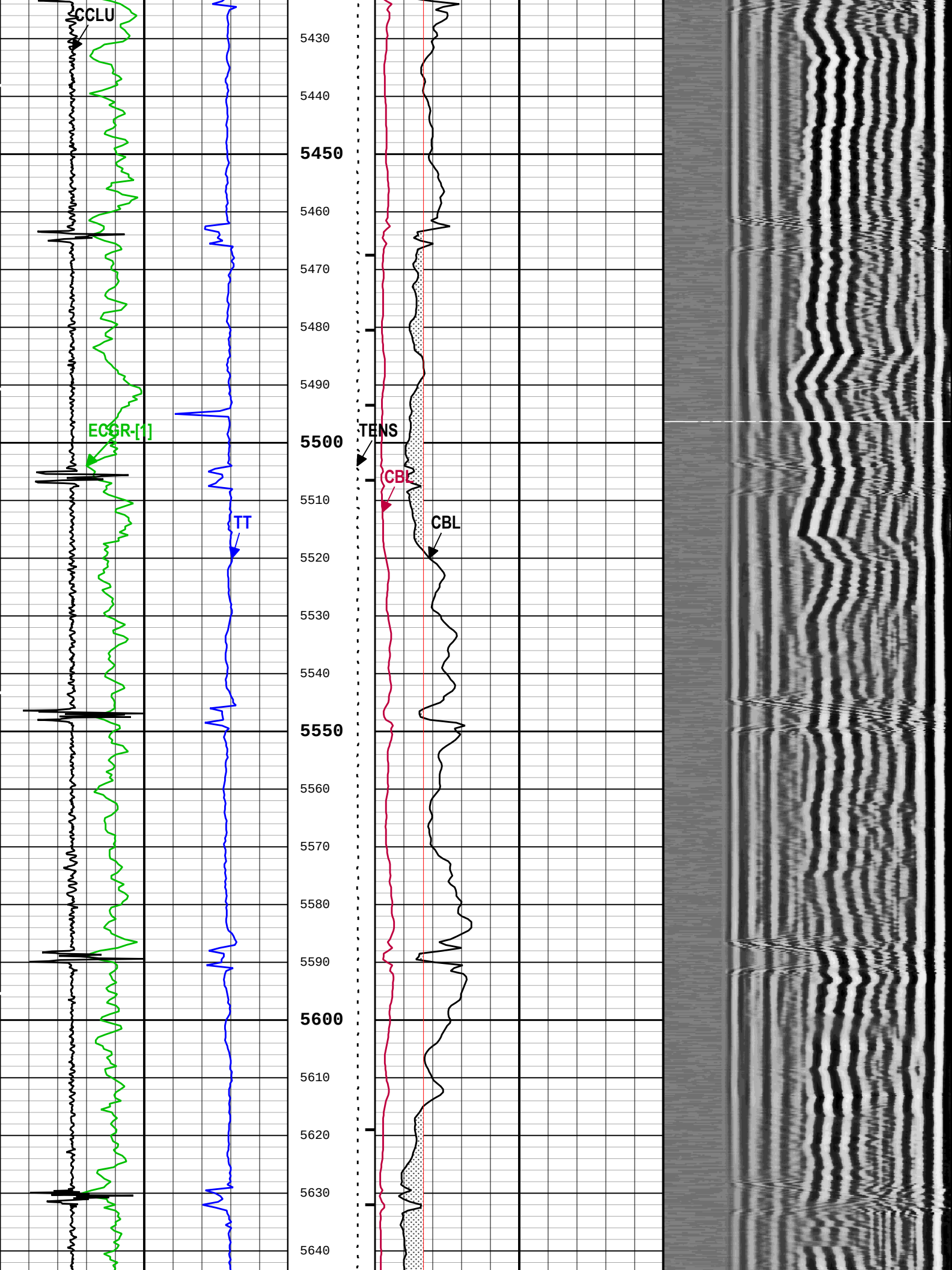
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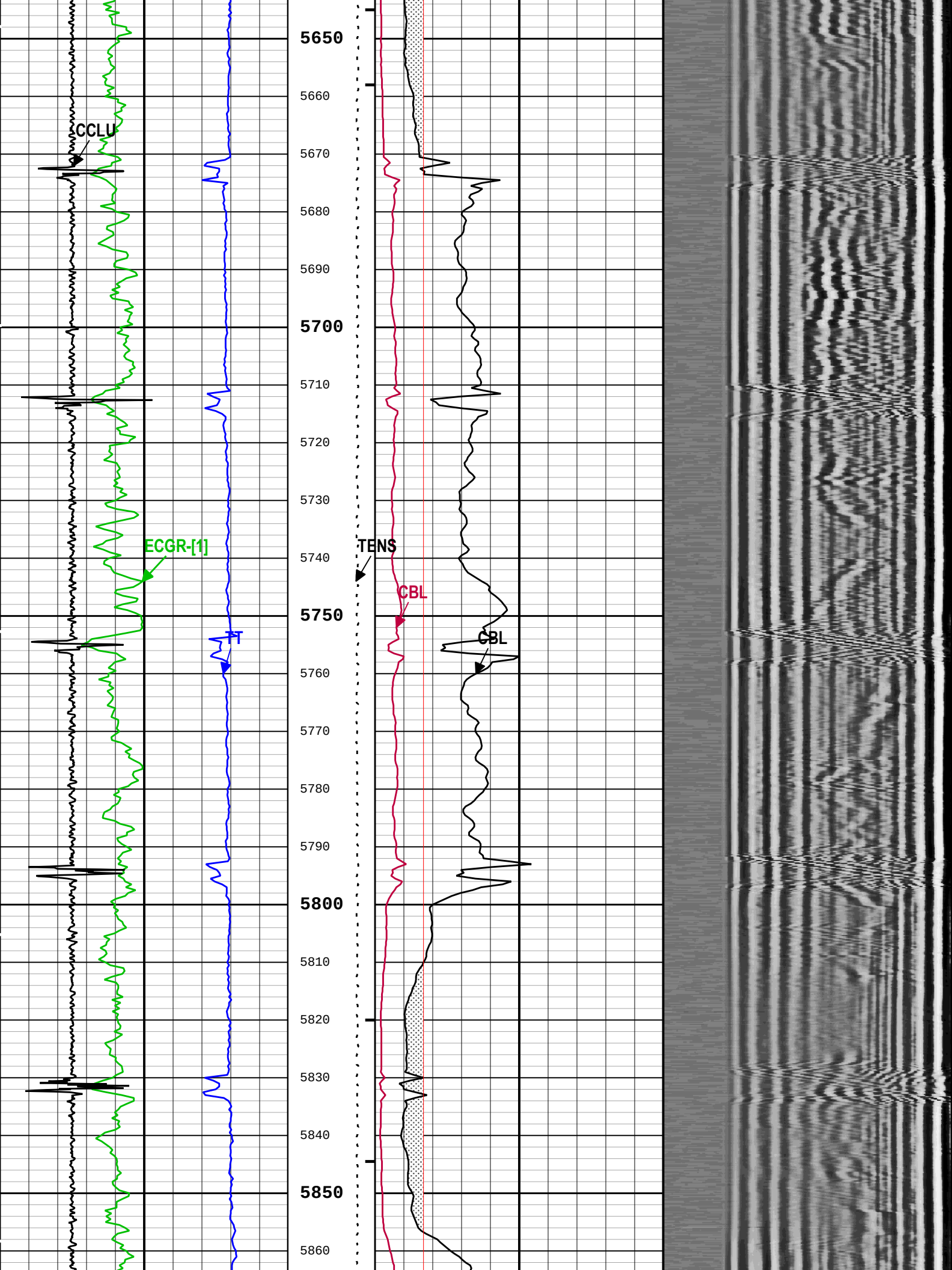
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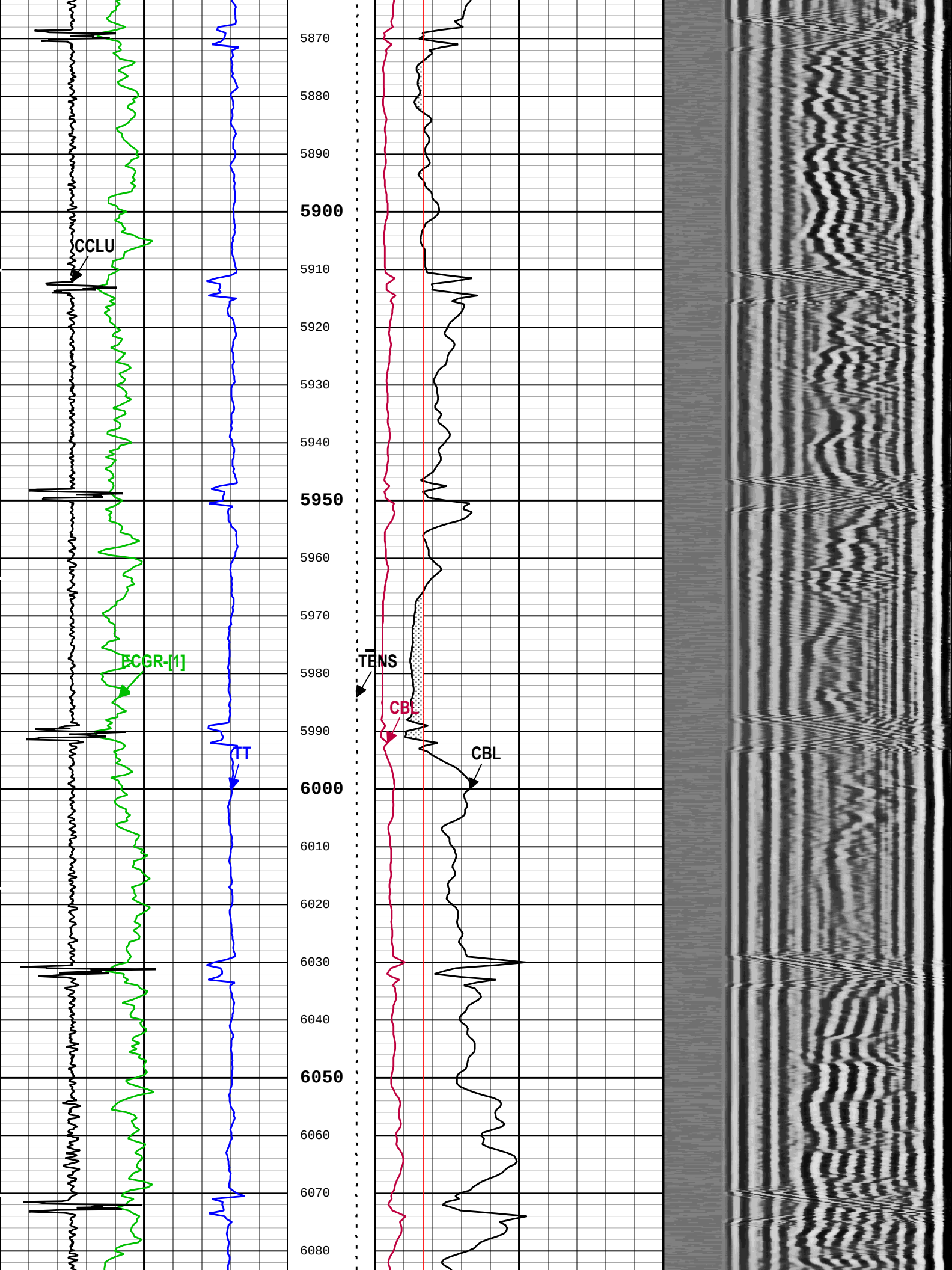
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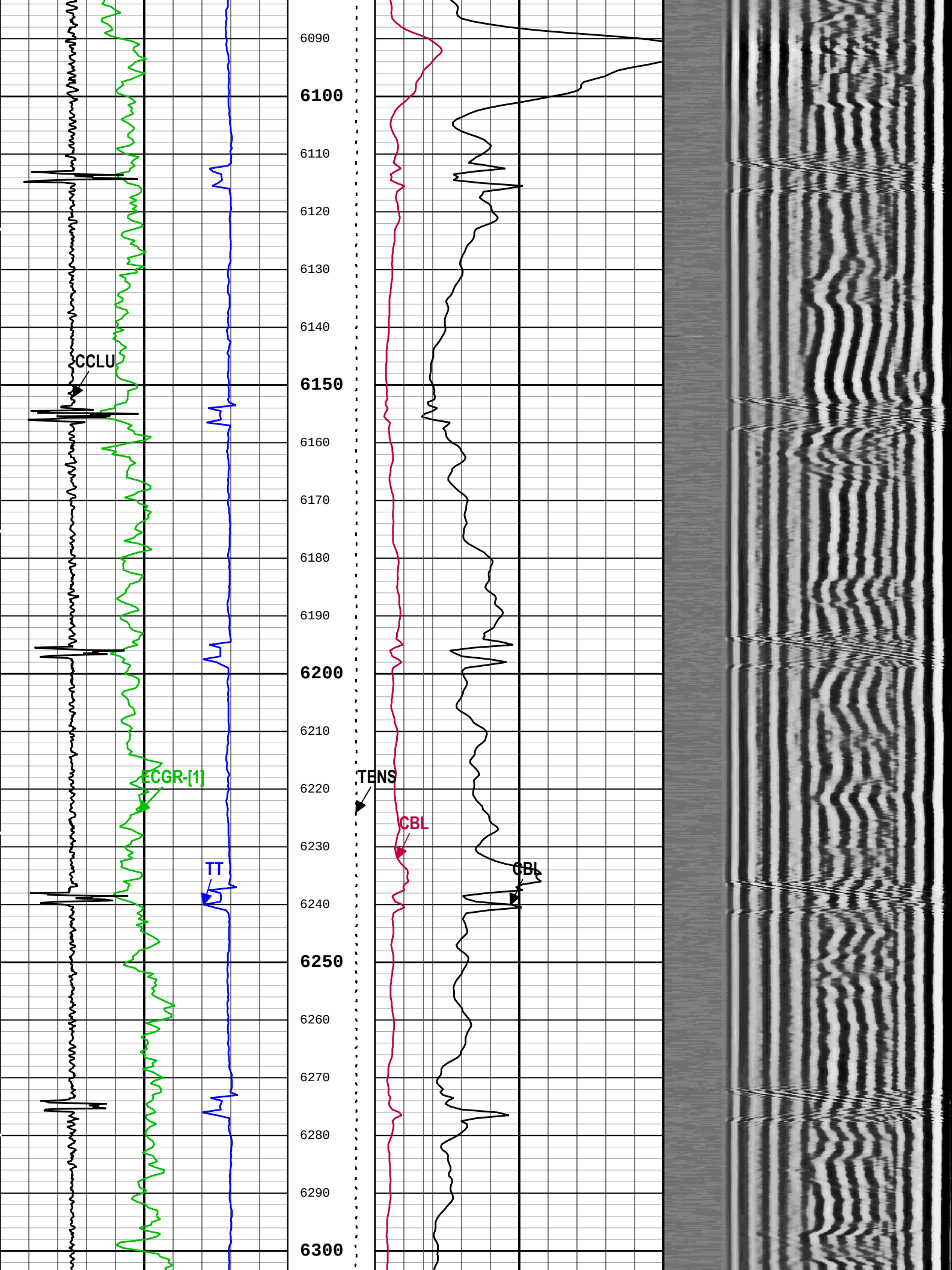
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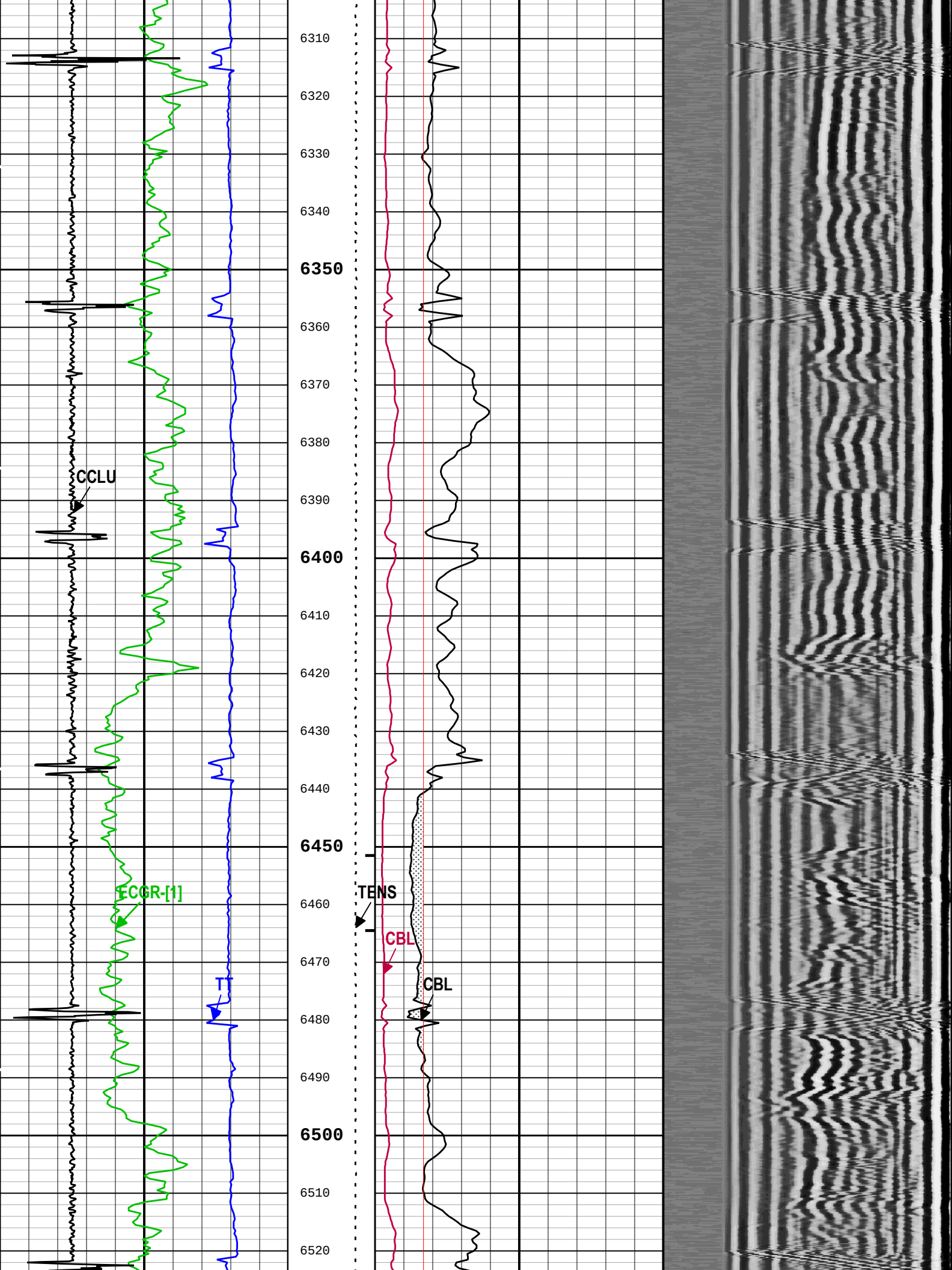
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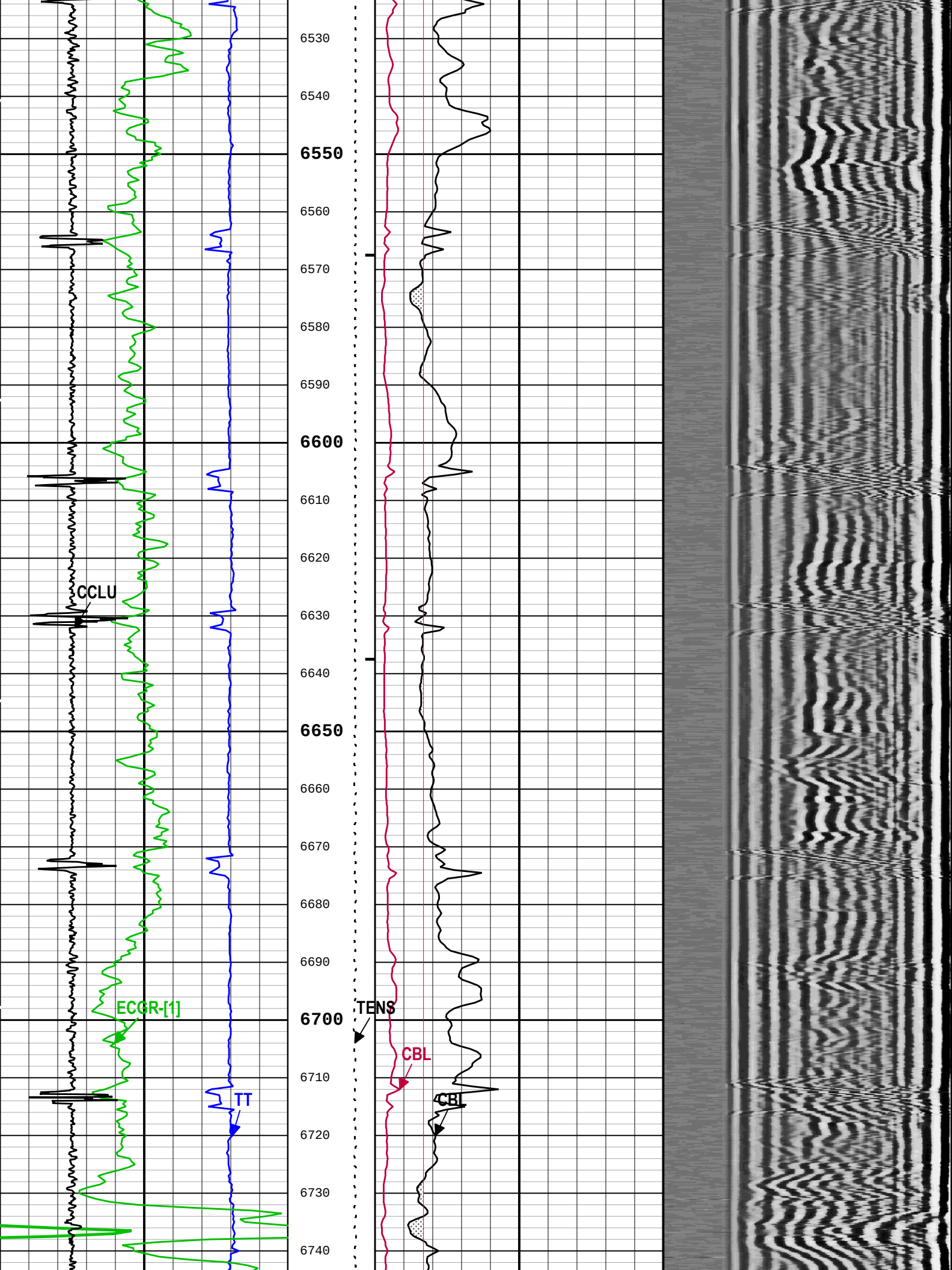
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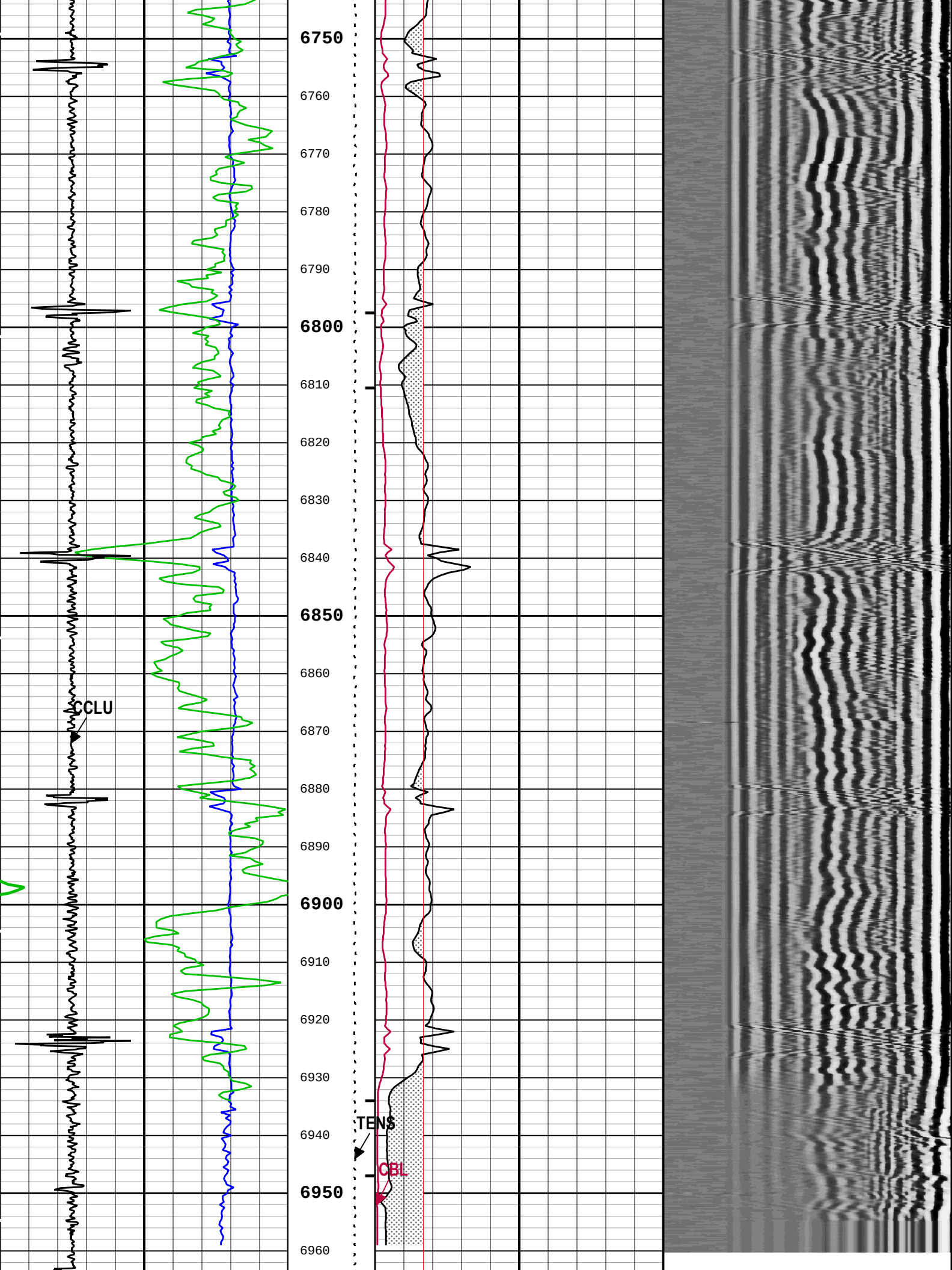
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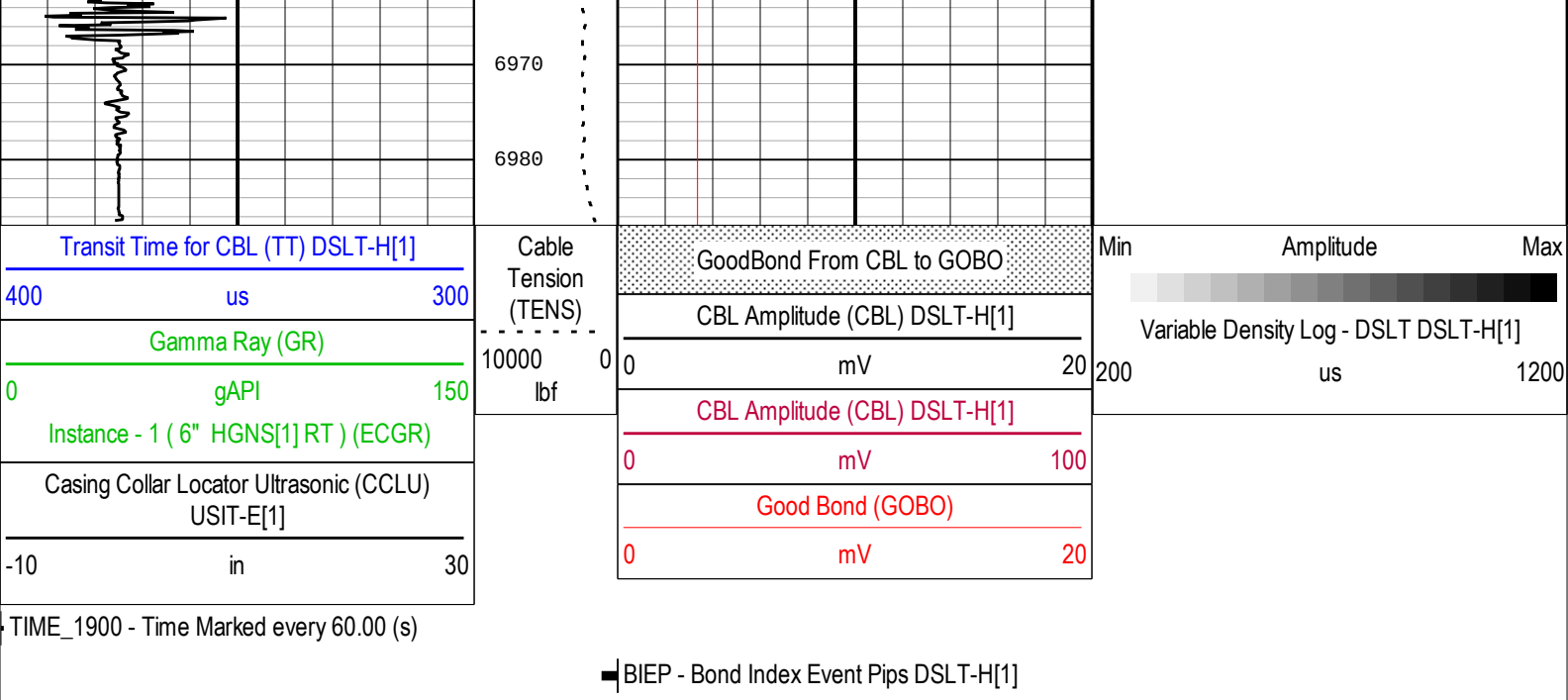


Description: Sonic CBL with VDL Format: Log (Sonic CBL with VDL) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 18-Aug-2016 20:16:55

Channel Processing Parameters

One: Parameters

Parameter	Description	Tool	Value	Unit
AMSG	Auxiliary Minimum Sliding Gate	DSLT-H	140	us
ISSBAR	Barite Mud Presence Flag	Borehole	No	
BERJ	Bad Echo Rejection	USIT-E	On	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Open	
BILI	Bond Index Level for Zone Isolation	DSLT-H	0.8	
BS	Bit Size	WLSESSION	Depth Zoned	in
CASING_PRATIO	Casing Poisson Ratio	USIT-E	Standard Poisson Ratio	
CBLG	CBL Gate Width	DSLT-H	45	us
CBLO	Casing Bottom (Logger)	WLSESSION	7026	ft
CBRA	CBL LQC Reference Amplitude in Free Pipe	DSLT-H	55	mV
CDEN	Cement Density	HGNS-H	2	g/cm3
CMCF	CBL Cement Type Compensation Factor	DSLT-H	0.6	
CMTY(U-USIT_CEMT)	Cement Type	USIT-E	Regular Cement	
DETE	Delta-T Detection	DSLT-H	E1	
DFD	Drilling Fluid Density	Borehole	9	lbm/gal
DFT	Drilling Fluid Type	Borehole	Water	
DTMD	Borehole Fluid Slowness	Borehole	206	us/ft
FCF	CBL Fluid Compensation Factor	DSLT-H	0.94	
FDII	FPM Data Interpolation Interval	USIT-E	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	
GOBO_CURR	Good Bond in Arbitrary Cement	DSLT-H	5.06	mV
GR_MULTIPLIER	Gamma Ray Multiplier	HGNS-H	1	
HEMA	Hematite Presence Flag	Borehole	No	
ICE_PROCESS	ICE Processing	USIT-E	Yes	
IMAR	Image Rotation	USIT-E	Off	
MAHTR	Manual High Threshold Reference for first arrival detection	DSLT-H	120	
MATT_CURR	Maximum Attenuation in Arbitrary Cement	DSLT-H	9.26	dB/ft

MCI	Minimum Cemented Interval for Isolation	DSLT-H	Depth Zoned	ft
MEAS_WLEN	Tcube Processing Window Length in Measurement Mode	USIT-E	24.96	us
MNHTR	Minimum High Threshold Reference for first arrival detection	DSLT-H	100	
MSA	Minimum Sonic Amplitude	DSLT-H	1.67	mV
MSA_CURR	Minimum Sonic Amplitude in Arbitrary Cement	DSLT-H	2.78	mV
MUD_N_THE	Theoretical Mud Normalization Factor	USIT-E	1	
NMSG	Near Minimum Sliding Gate	DSLT-H	305	us
NMXG	Near Maximum Sliding Gate	DSLT-H	950	us
NUMP	Number of Detection Passes	DSLT-H	2	
RCOD	Reference Calibrator Outer Diameter	USIT-E	7	in
RCSO	Reference Calibrator Standoff	USIT-E	1.181	in
RCTH	Reference Calibrator Thickness	USIT-E	0.295	in
SFAF	Sonic Formation Attenuation Factor	DSLT-H	3.25	dB/ft
SGAD	Sliding Gate Status	DSLT-H	Off	
SGCL	Sliding Gate Closing Delta-T	DSLT-H	130	us/ft
SGCW	Sliding Gate Closing Width	DSLT-H	25	us
SGDT	Sliding Gate Delta-T	DSLT-H	57	us/ft
SGW	Sliding Gate Width	DSLT-H	110	us
SLEV	Signal Level for AGC	DSLT-H	5000	mV
SOCN	Standoff Distance	HGNS-H	0.125	in
SOCO	Standoff Correction Option	HGNS-H	No	
TCUB	T^3 Processing Level	USIT-E	Loop	
THDH	Maximum Search Thickness (percentage of nominal)	USIT-E	130	%
THDL	Minimum Search Thickness (percentage of nominal)	USIT-E	65	%
HISC	Tool Position: Centered or Eccentered	HGNS-H	Eccentered	
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-E	0	Mrayl
UFGDE	Fiberglass Density	USIT-E	1.95	g/cm3
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	Theoretical	
THDP	Thickness Detection Policy	USIT-E	Fundamental	
VCAS	Ultrasonic Transversal Velocity in Casing	USIT-E	51.4	us/ft
VDLG	VDL Manual Gain	DSLT-H	5	
ZCAS	Acoustic Impedance of Casing	USIT-E	46.25	Mrayl
ZCMT	Acoustic Impedance of Cement	DSLT-H	5.5	Mrayl
ZCMT_NEAT	Acoustic Impedance of Cement in Neat Cement	DSLT-H	6.8	Mrayl
ZINI	Initial Estimate of Cement Impedance	USIT-E	-1	Mrayl
ZMUD	Acoustic Impedance of Mud	Borehole	1.48	Mrayl
ZTCM	Acoustic Impedance Threshold for Cement	USIT-E	2.6	Mrayl
ZTGS	Acoustic Impedance Threshold for Gas	USIT-E	0.3	Mrayl

OneDepth Zoned Parameters

Parameter	Value	Start (ft)	Stop (ft)
BS	17.5	0	812
BS	11	812	6986.92
MCI	21.68	0	812
MCI	12.98	812	6986.92

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
DDEL	Digitizing Delay	DSLT-H	0	us
U-USIT_DDT5	USIC Downhole Decimation for T5 only	USIT-E	0_NONE	
DOT(DOS)	Distance between Opposite Transducer Faces	USIT-E	2.874	in
MODE	DSLT Acquisition Mode	DSLT-H	CBL	
RATE	DSLT Firing Rate	DSLT-H	15 Hz	
DTFS	DSLT Telemetry Frame Size	DSLT-H	536	
DWCO	Digitizer Word Count	DSLT-H	250	
EMXV	EMEX Voltage	USIT-E	Time Zoned	V
HRES	Horizontal Resolution	USIT-E	10 deg	
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3375	ft/h
MOTOR_PROTECT	Motor Protection	USIT-E	On	
SDTH	Switch Down Threshold	DSLT-H	20000	
SGAI	Selectable Acquisition Gain	DSLT-H	x1	
SUTH	Switch Up Threshold	DSLT-H	1000	
TMUC	Type of Mud	USIT-E	BRI	
UACLV_PERM	Ultrasonic ACLV Permanent	USIT-E	No	
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 500 KHz	
UWKM	USIT Working Mode	USIT-E	Uncompressed 10 deg at 1.5 in LF	
USIT_DEPTHLOG	Starting Depth Log for Ultrasonics	USIT-E	6970	ft
USSP	Ultrasonic Service	USIT-E	USI	
VRES	Vertical Resolution	USIT-E	1.5 in	
WINB	Window Begin Time	USIT-E	Time Zoned	us
WINE	Window End Time	USIT-E	125	us
WMOD	Waveform Firing Mode	DSLT-H	Full	

OneTime Zoned Parameters

Pass Log[7]:Up

Parameter	Value	Start Time	Stop Time	Start Depth (ft)	Stop Depth (ft)
EMXV	40	18-Aug-2016 10:32:10	18-Aug-2016 11:06:58	6986.88	5423.2
WINB	45	18-Aug-2016 10:32:10	18-Aug-2016 11:06:58	6986.88	5423.2

Pass Log[11]:Up

EMXV	40	18-Aug-2016 11:29:56	18-Aug-2016 12:58:51	5423.85	1400.42
WINB	45	18-Aug-2016 11:29:56	18-Aug-2016 12:58:51	5423.85	1400.42

Pass Log[12]:Up

EMXV	40	18-Aug-2016 13:09:00	18-Aug-2016 13:38:42	1400.91	121.63
WINB	45	18-Aug-2016 13:09:00	18-Aug-2016 13:38:42	1400.91	121.63

Pass Log[18]:Up

EMXV	80	18-Aug-2016 14:53:06	18-Aug-2016 14:57:22	122.15	47.73
EMXV	125	18-Aug-2016 14:57:22	18-Aug-2016 14:58:21	47.73	22.25

WINB	40	18-Aug-2016 14:55:10	18-Aug-2016 14:58:21	122.15	22.25

All depth are at tool zero.

One

Repeat Pass 5 in = 100 ft

Pass Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
One	Log[6]:Up	Up	6724.32 ft	6983.35 ft	18-Aug-2016 10:24:27 AM	18-Aug-2016 10:30:11 AM	ON	1.56 ft	No

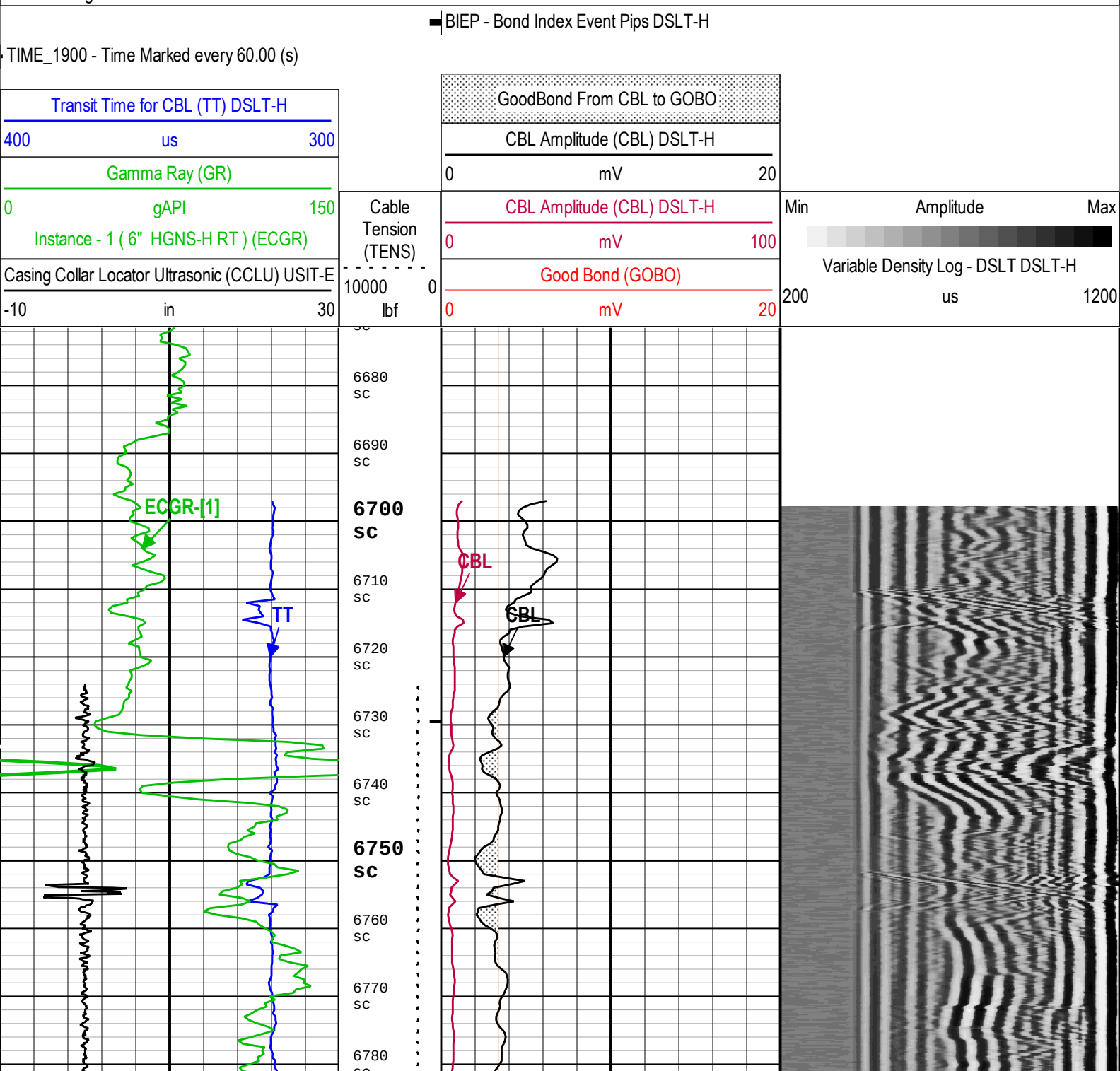
All depths are referenced to toolstring zero

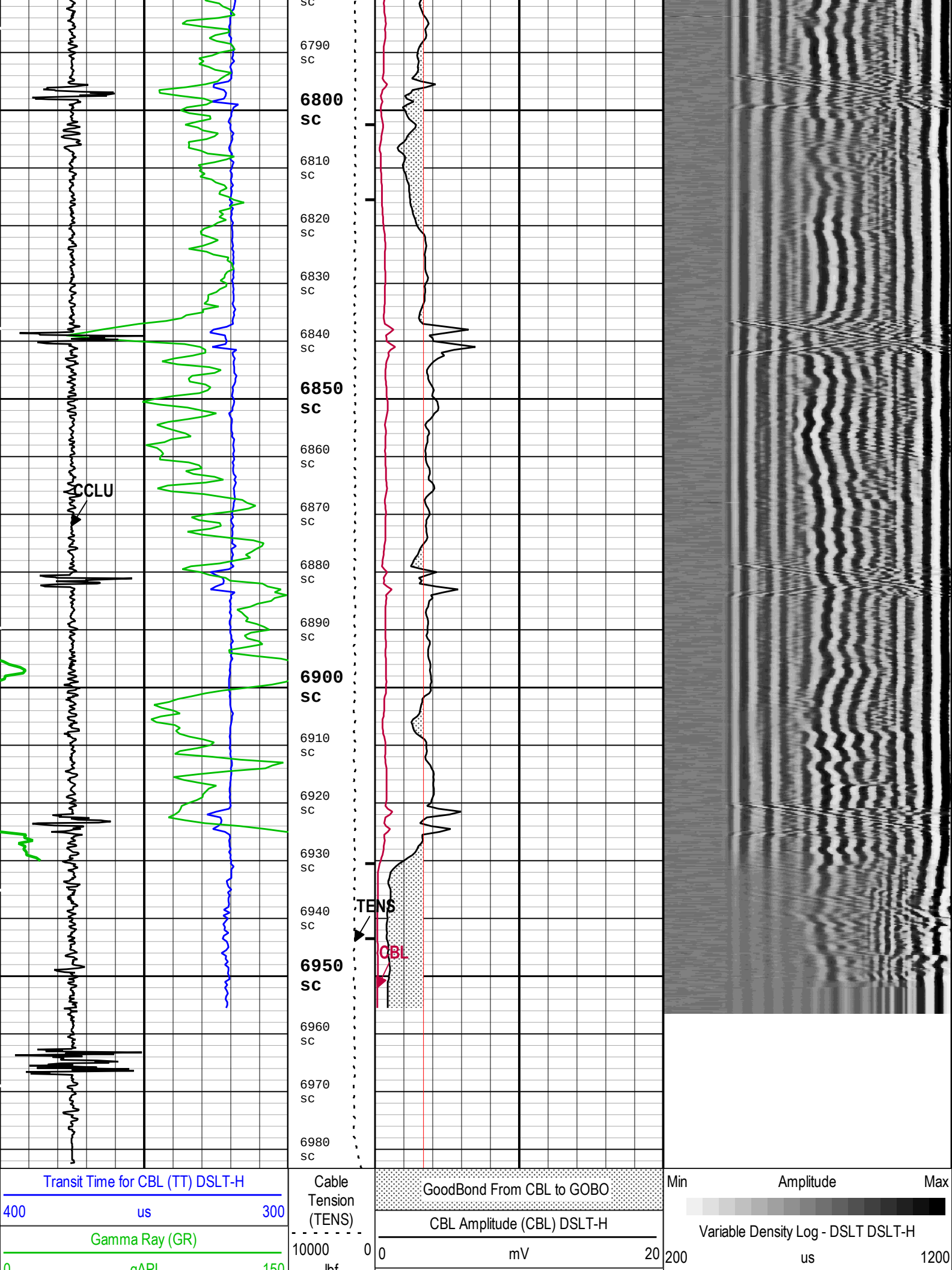
Log

Company:Southern California Gas Company Well:Fernando Fee 35A

One: Log[6]:Up:S006

Description: Sonic CBL with VDL Format: Log (Sonic CBL with VDL) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 18-Aug-2016 20:17:01

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6920 sc
6930 sc
6940 sc
6950 sc
6960 sc
6970 sc
6980 sc
CCLU
TENS
CBL
Transit Time for CBL (TT) DSLT-H
400 us 300
Gamma Ray (GR)
0 gAPI 150
Cable Tension (TENS)
10000 0
lbf
GoodBond From CBL to GOBO
CBL Amplitude (CBL) DSLT-H
0 mV 20
Min Amplitude Max
Variable Density Log - DSLT DSLT-H
200 us 1200

0 gAPI 150

Instance - 1 (6" HGNS-H RT) (ECGR)

Casing Collar Locator Ultrasonic (CCLU) USIT-E

-10 in 30

CBL Amplitude (CBL) DSLT-H

0 mV 100

Good Bond (GOBO)

0 mV 20

TIME_1900 - Time Marked every 60.00 (s)

BIEP - Bond Index Event Pips DSLT-H

Description: Sonic CBL with VDL Format: Log (Sonic CBL with VDL) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 18-Aug-2016 20:17:01

USIT - Fluid Properties Measurement

Run Name	Pass Name	Start Depth(ft)	Stop Depth(ft)
Run 1	Log[18]:Up	171.59	21.44

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=1.00
DFD=1.08g/cm3(9.00lbm/gal)

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

Composite 1

Main Pass 5 in = 100 ft

Composite Summary

Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
One	Log[7]:Up	Up	5184.38 ft	6987.38 ft	18-Aug-2016 10:32:04 AM	18-Aug-2016 11:06:58 AM	ON	2.26 ft	No
One	Log[11]:Up	Up	1280.11 ft	5434.15 ft	18-Aug-2016 11:29:44 AM	18-Aug-2016 12:58:51 PM	ON	11.15 ft	No
One	Log[12]:Up	Up	44.45 ft	1429.03 ft	18-Aug-2016 1:08:22 PM	18-Aug-2016 1:38:42 PM	ON	11.26 ft	No
One	Log[18]:Up	Up	21.44 ft	171.59 ft	18-Aug-2016 2:53:06 PM	18-Aug-2016 2:58:21 PM	ON	-0.05 ft	No

All depths are referenced to toolstring zero

Log

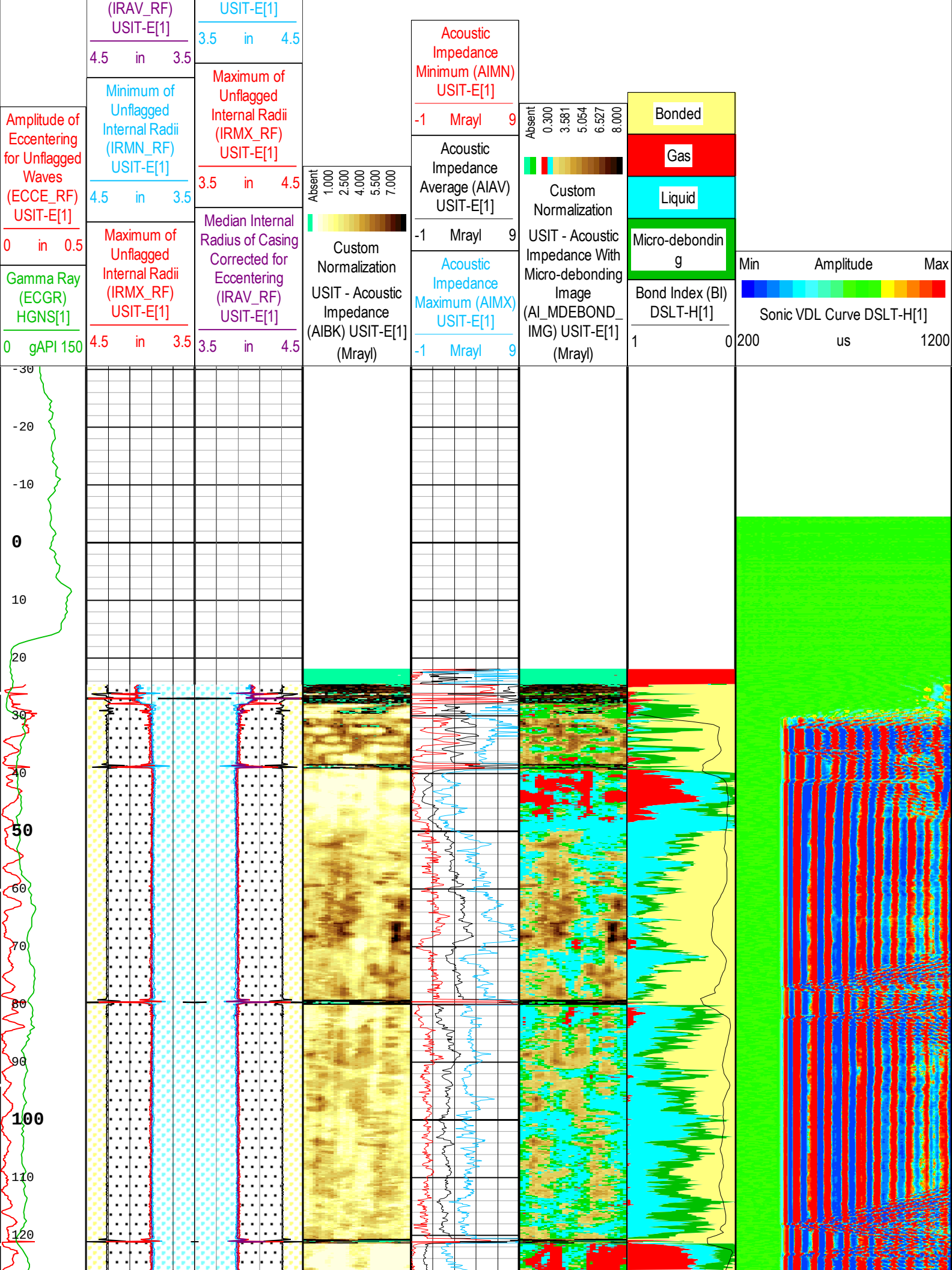
Company:Southern California Gas Company Well:Fernando Fee 35A

Composite 1:S006

Description: USI VDL Cement Format: Log (LBV1_USI-VDL (DSLT) Cement 9.625inch) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 18-Aug-2016 20:17:09

TIME_1900 - Time Marked every 60.00 (s)

ERAV_IRAV	ERAV_RHF1
IRAV_LHF1	IRAV_ERAV
LHF1_ERAV	RHF1_IRAV
Median of Unflagged External Radii (ERAV_RF) USIT-E[1] 4.5 in 3.5	Median of Unflagged External Radii (ERAV_RF) USIT-E[1] 3.5 in 4.5
Median Internal Radius of Casing Corrected for Eccentering	Minimum of Unflagged Internal Radii (IRMN_RF)


Amplitude of Eccentering for Unflagged Waves (ECCE_RF) USIT-E[1]
0 in 0.5
Gamma Ray (ECGR) HGNS[1]
0 gAPI 150
(IRAV_RF) USIT-E[1]
4.5 in 3.5
Minimum of Unflagged Internal Radii (IRMN_RF) USIT-E[1]
4.5 in 3.5
Maximum of Unflagged Internal Radii (IRMX_RF) USIT-E[1]
4.5 in 3.5
USIT-E[1]
3.5 in 4.5
Maximum of Unflagged Internal Radii (IRMX_RF) USIT-E[1]
3.5 in 4.5
Median Internal Radius of Casing Corrected for Eccentering (IRAV_RF) USIT-E[1]
3.5 in 4.5
Absent 1.000 2.500 4.000 5.500 7.000
Custom Normalization
USIT - Acoustic Impedance (AIBK) USIT-E[1] (Mrayl)
Acoustic Impedance Minimum (AIMN) USIT-E[1]
-1 Mrayl 9
Acoustic Impedance Average (AIAV) USIT-E[1]
-1 Mrayl 9
Acoustic Impedance Maximum (AIMX) USIT-E[1]
-1 Mrayl 9
Absent 0.300 3.581 5.054 6.527 8.000
Custom Normalization
USIT - Acoustic Impedance With Micro-debonding Image (AI_MDEBOND_IMG) USIT-E[1] (Mrayl)
Bonded
Gas
Liquid
Micro-debonding
Bond Index (BI) DSLT-H[1]
1 0
Min Amplitude Max
Sonic VDL Curve DSLT-H[1]
200 us 1200
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-20
-10
0
10
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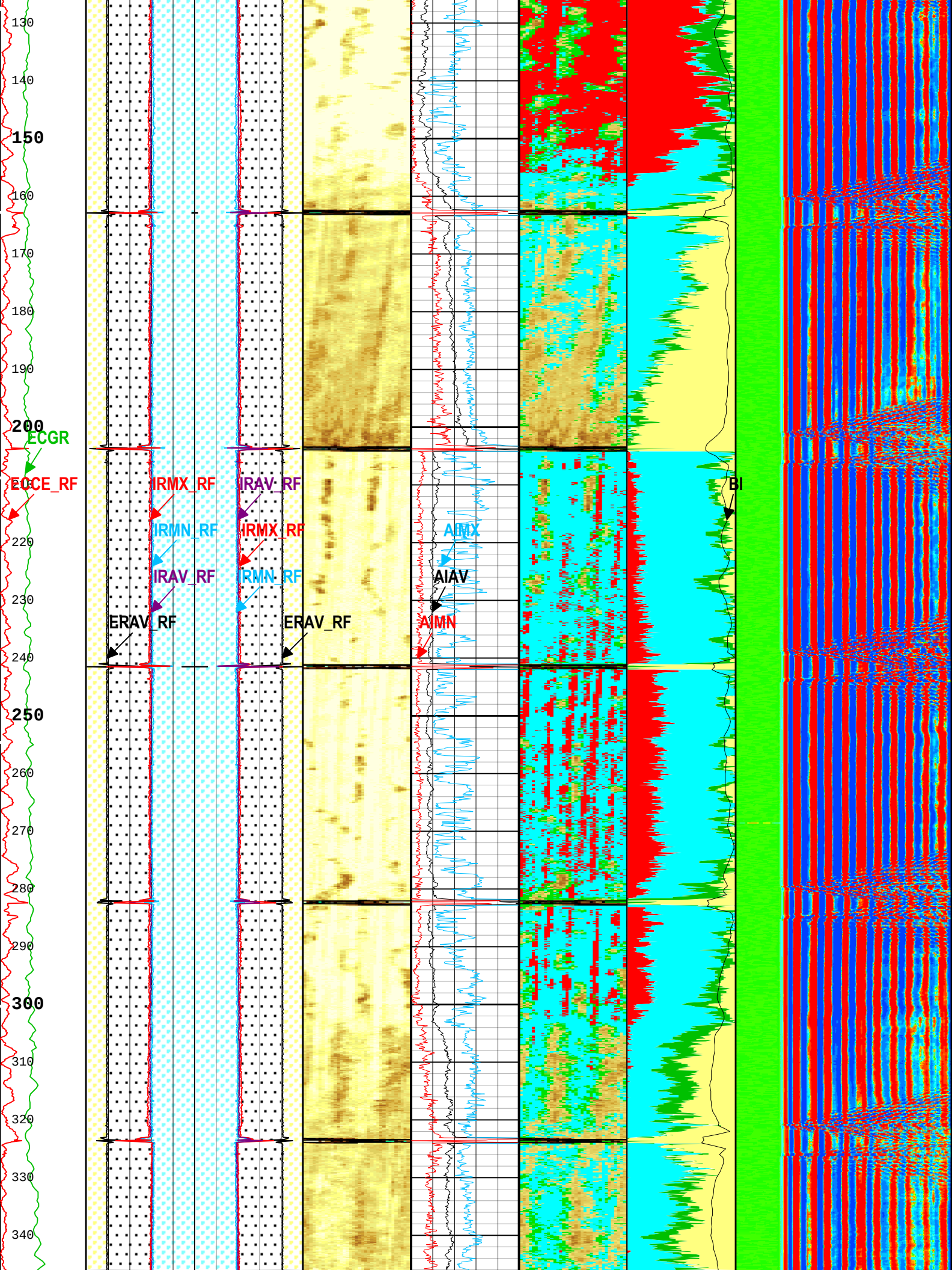
40
50
60
70
80
90
100
110
120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340
ECGR
ECCE_RF
IRMX_RF
IRMN_RF
IRAV_RF
ERAV_RF
IRAV_RF
IRMX_RF
IRMN_RF
ERAV_RF
AIMX
AIAV
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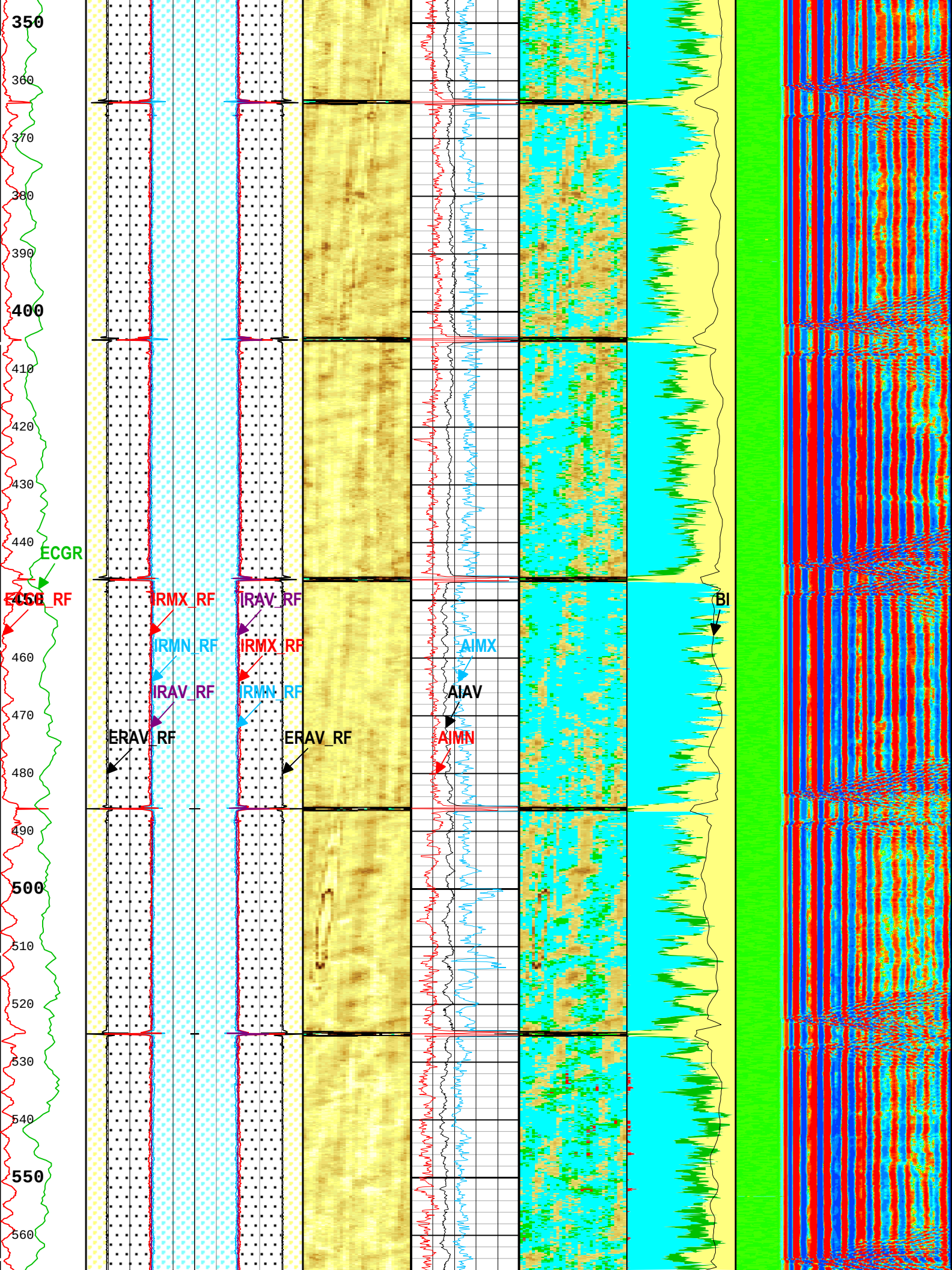
BI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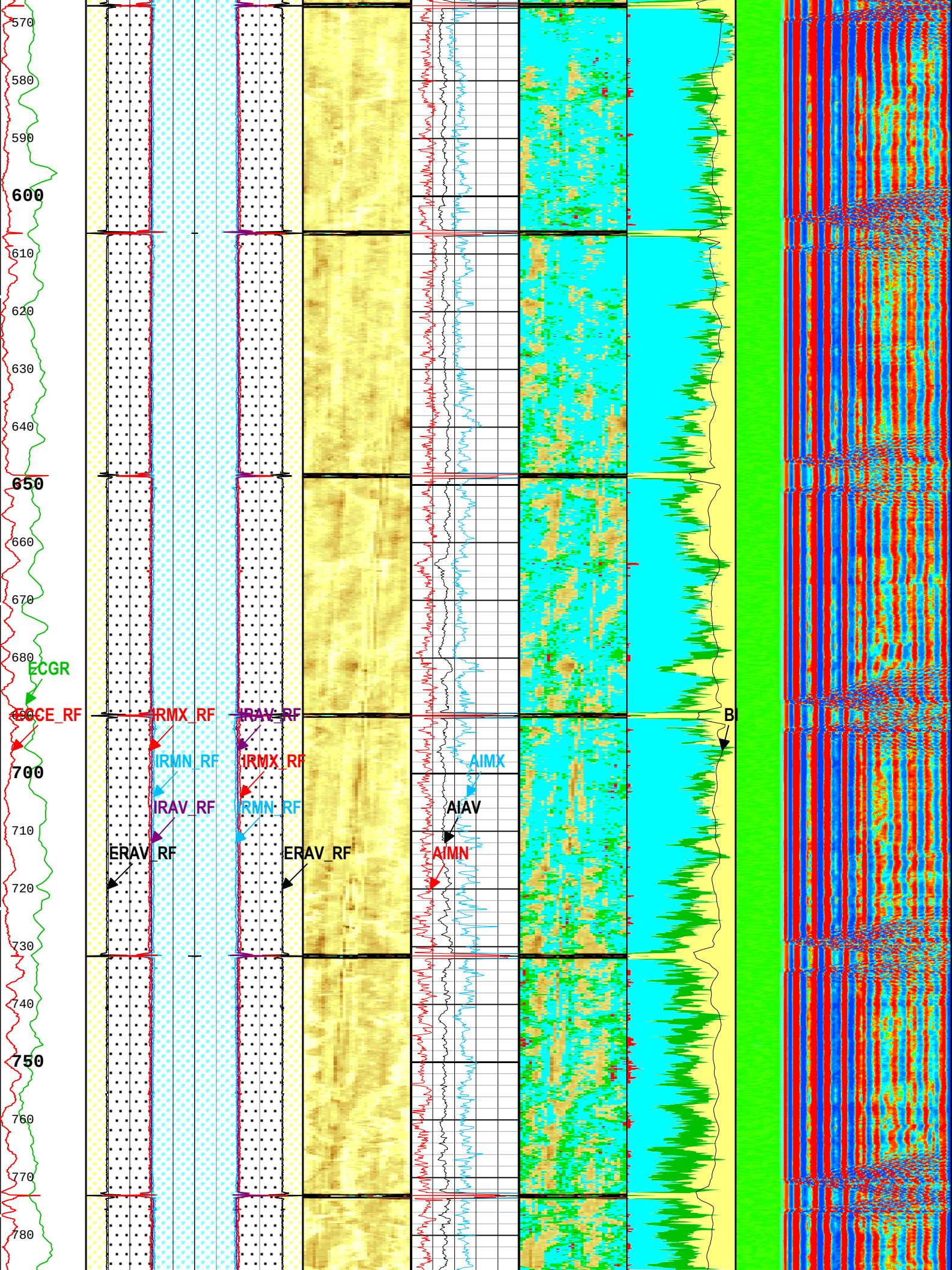
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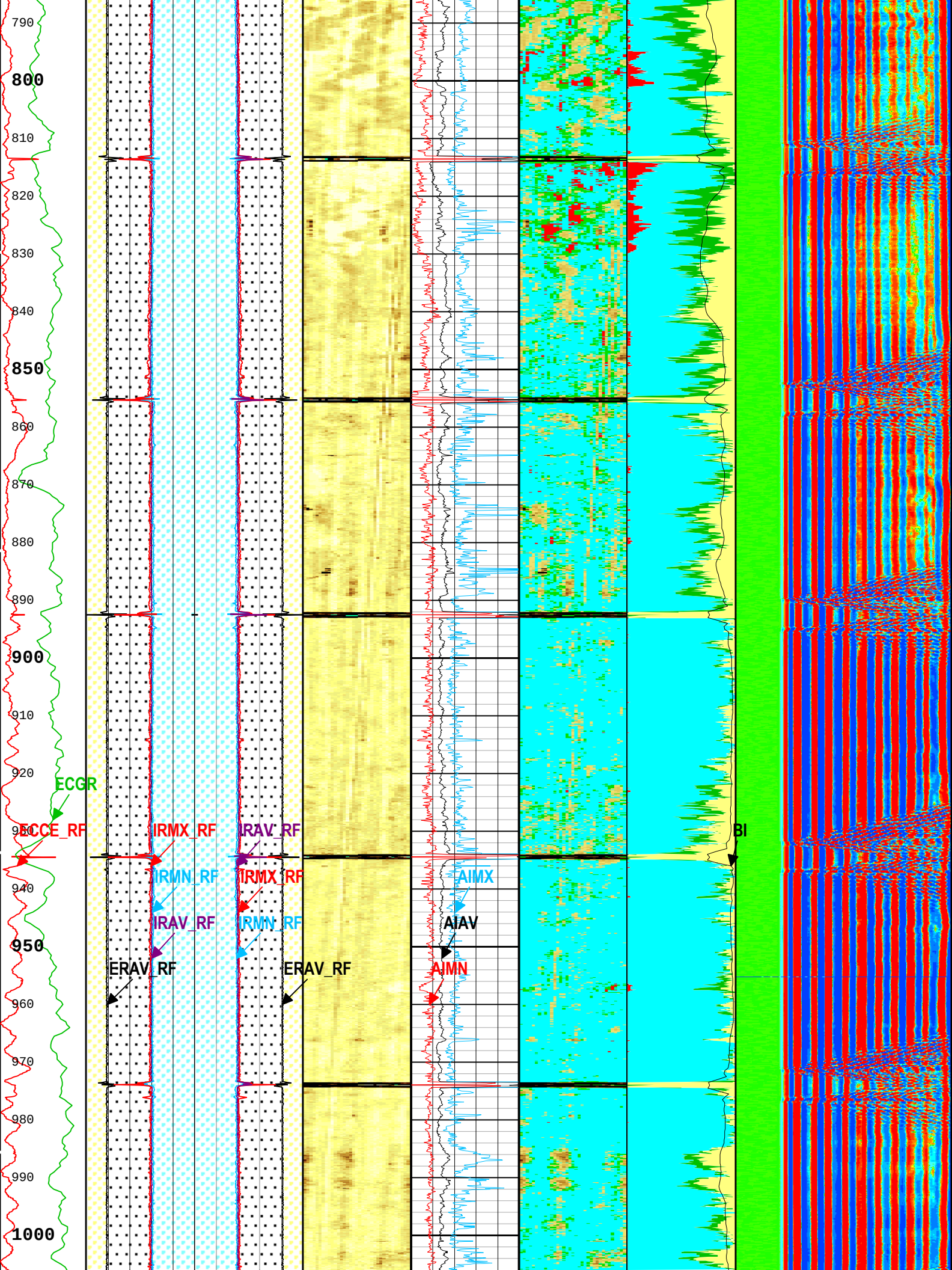
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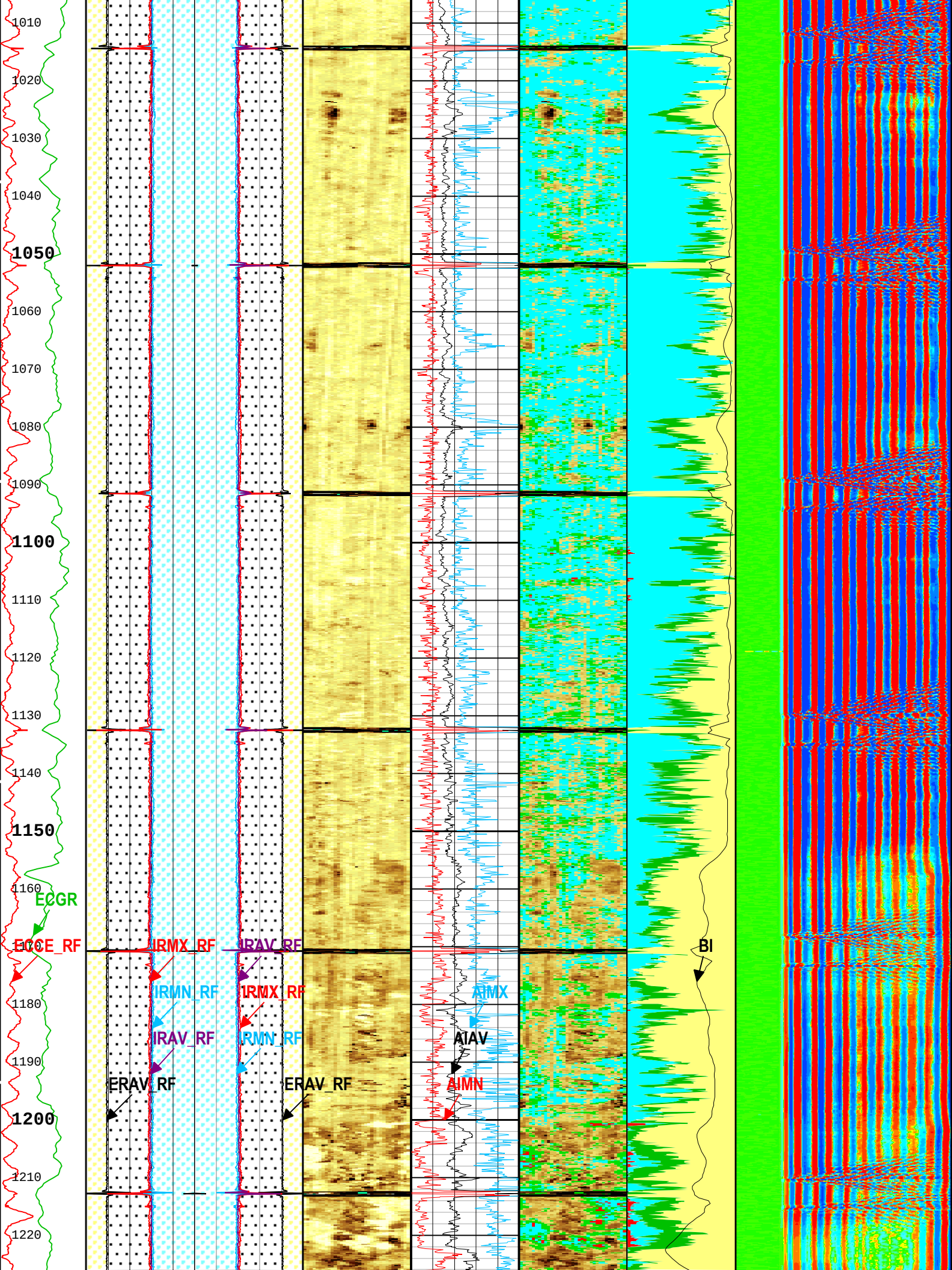
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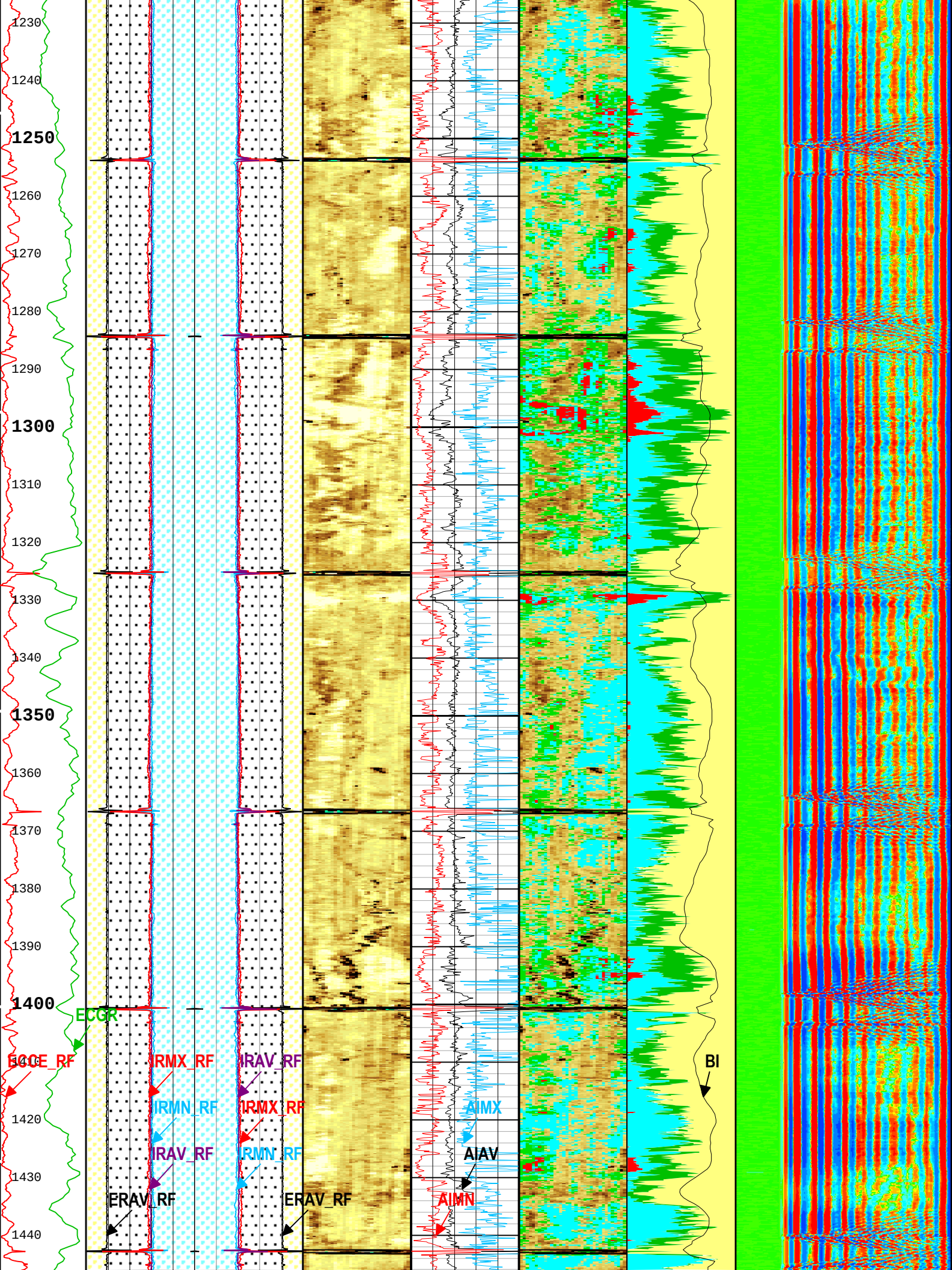
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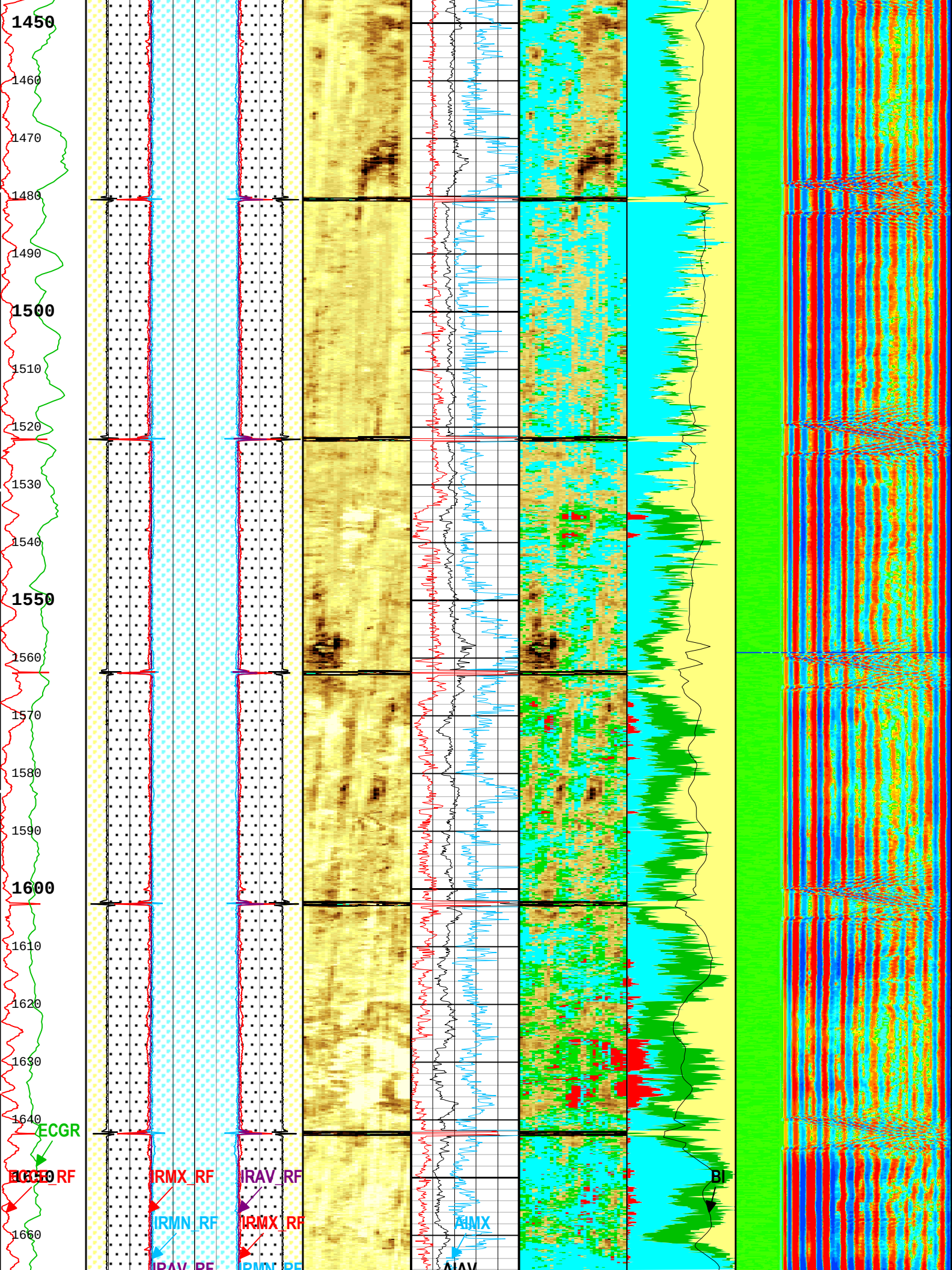
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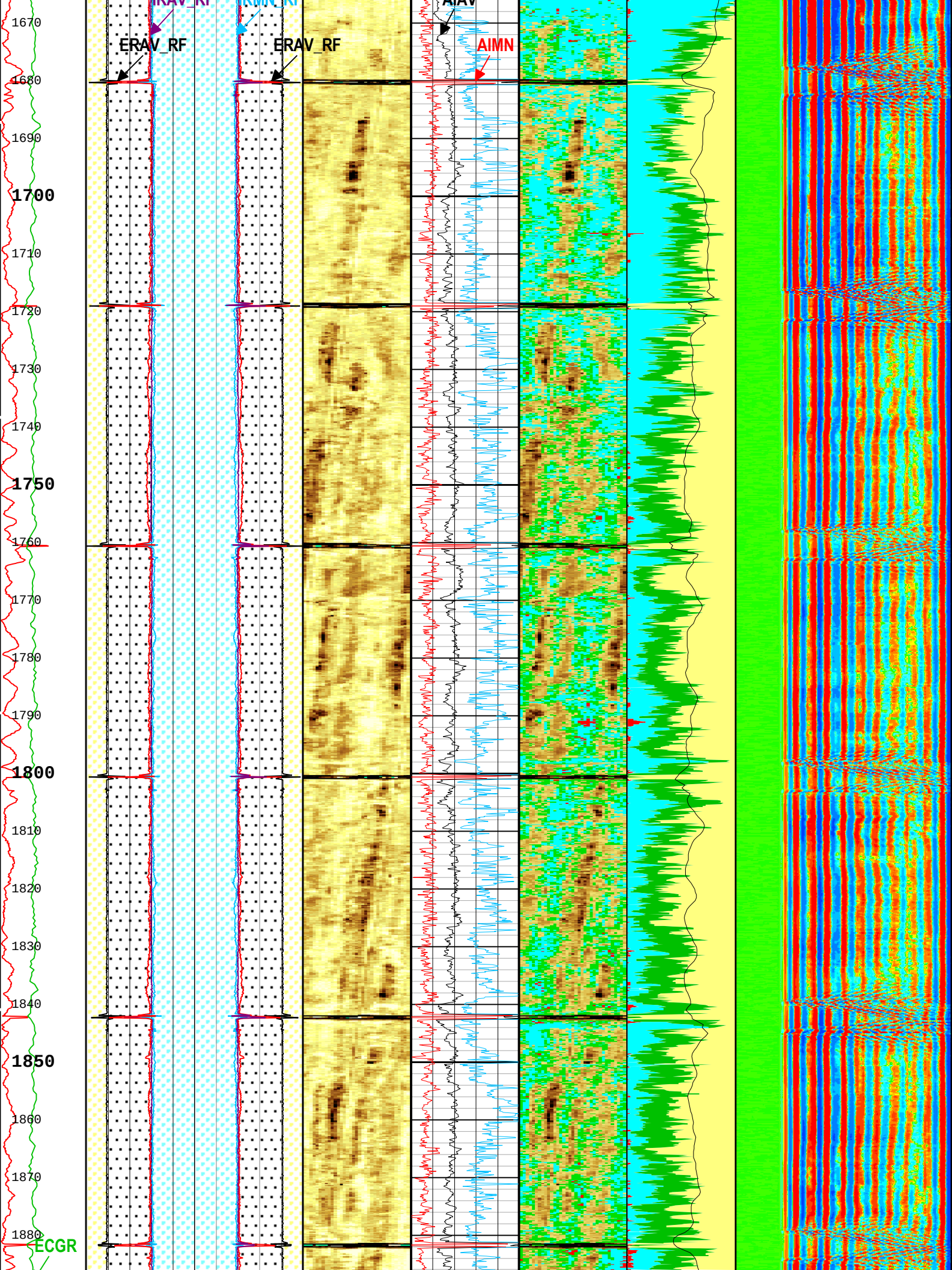
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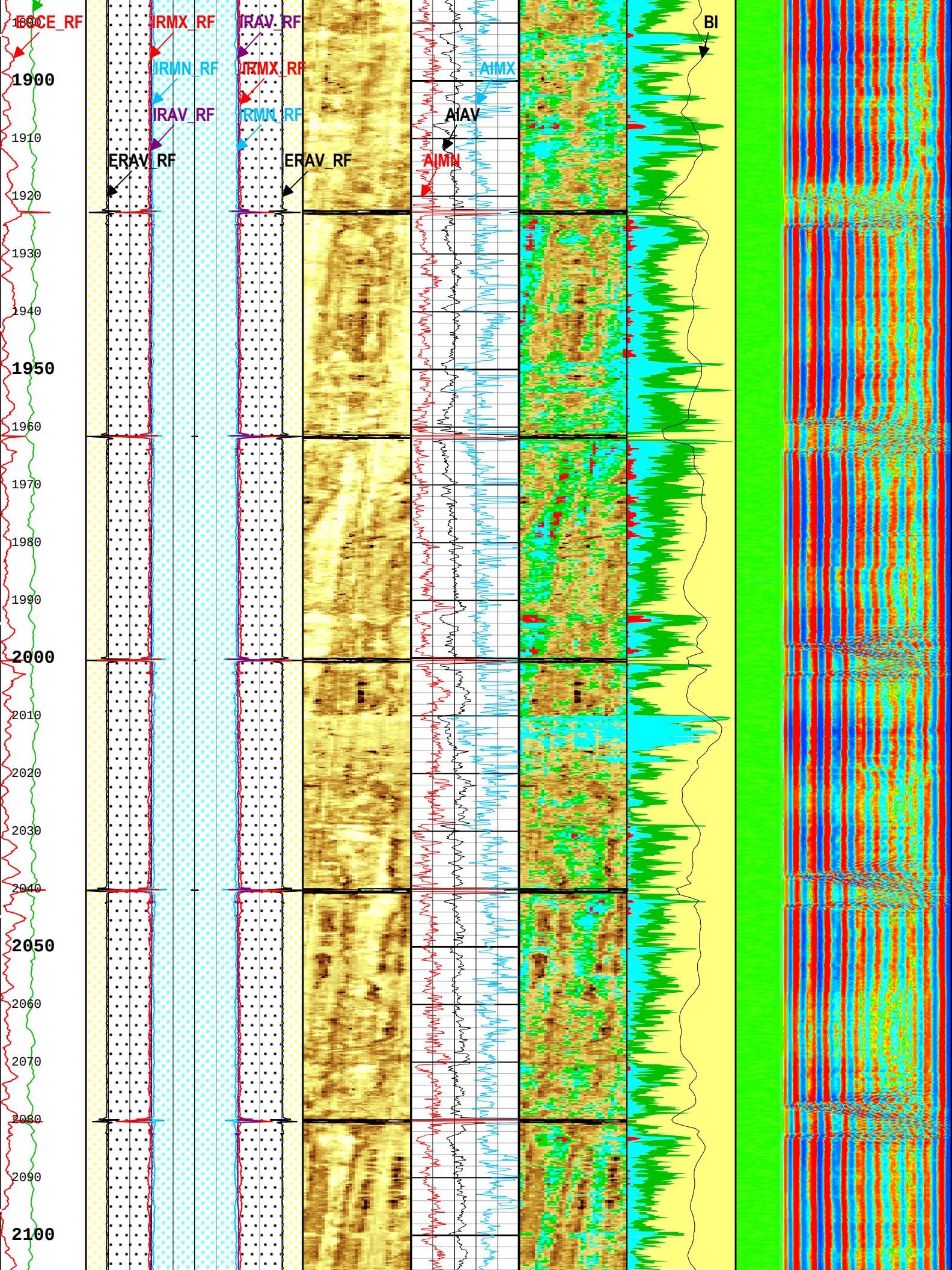
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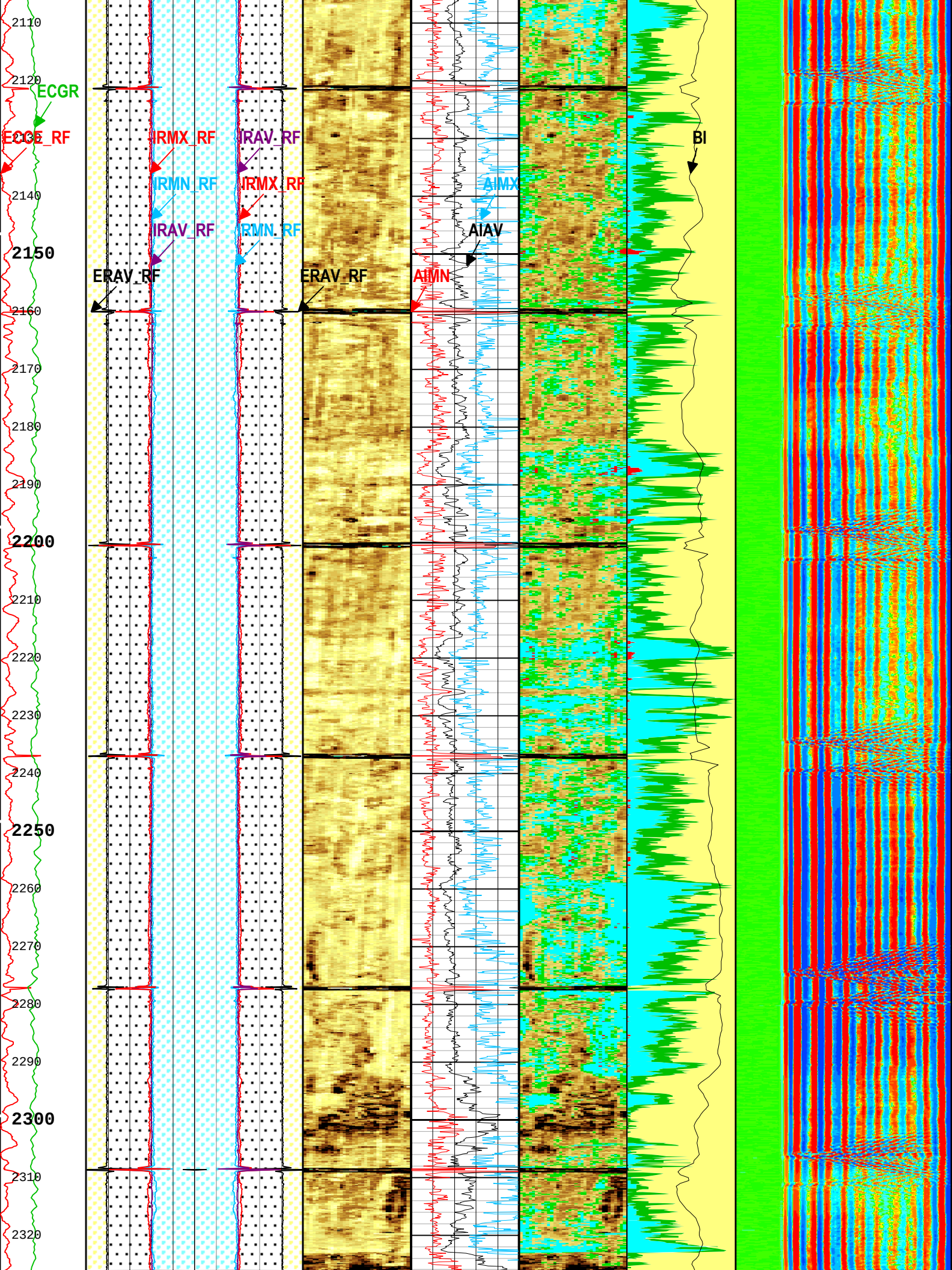
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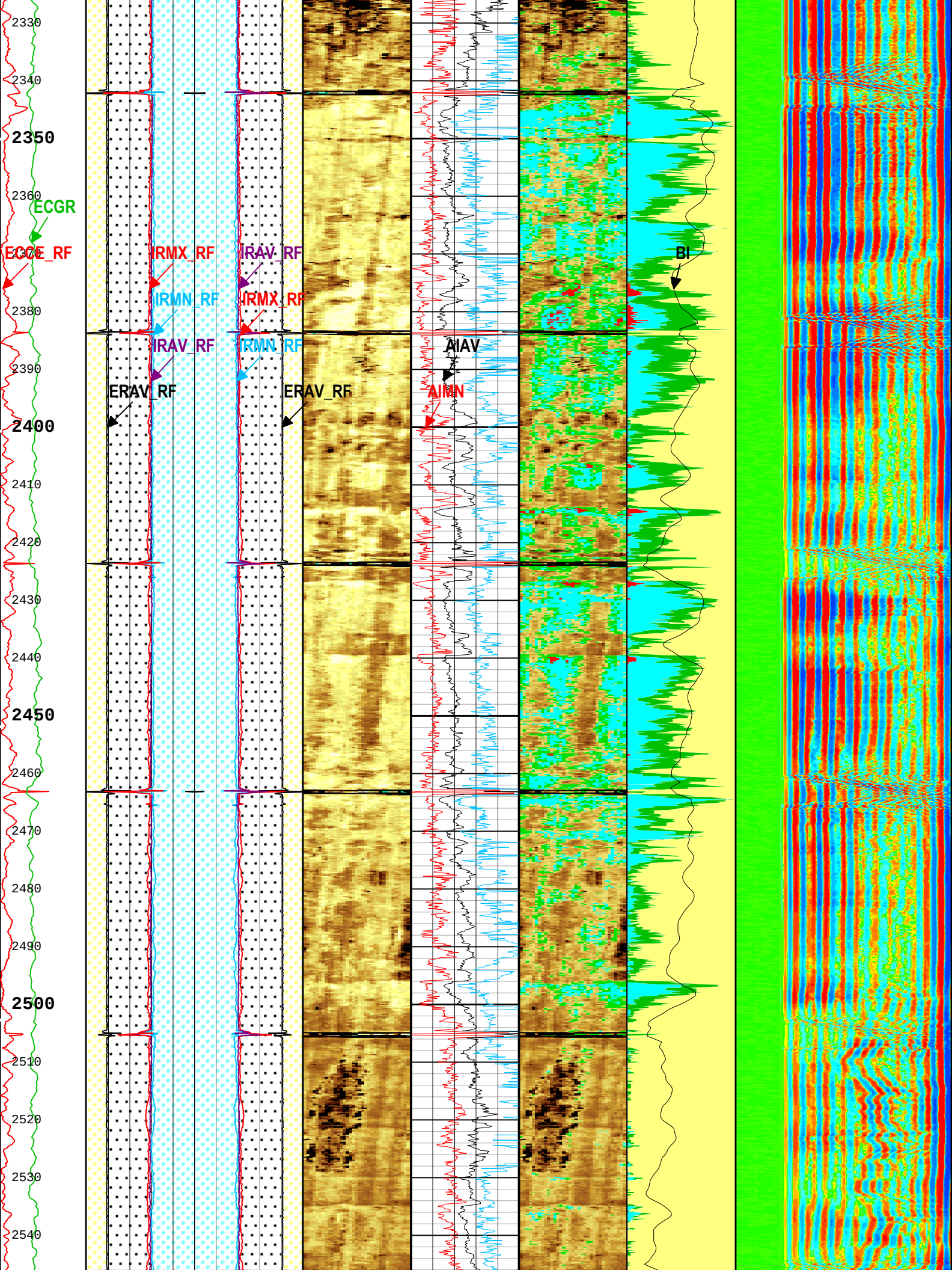
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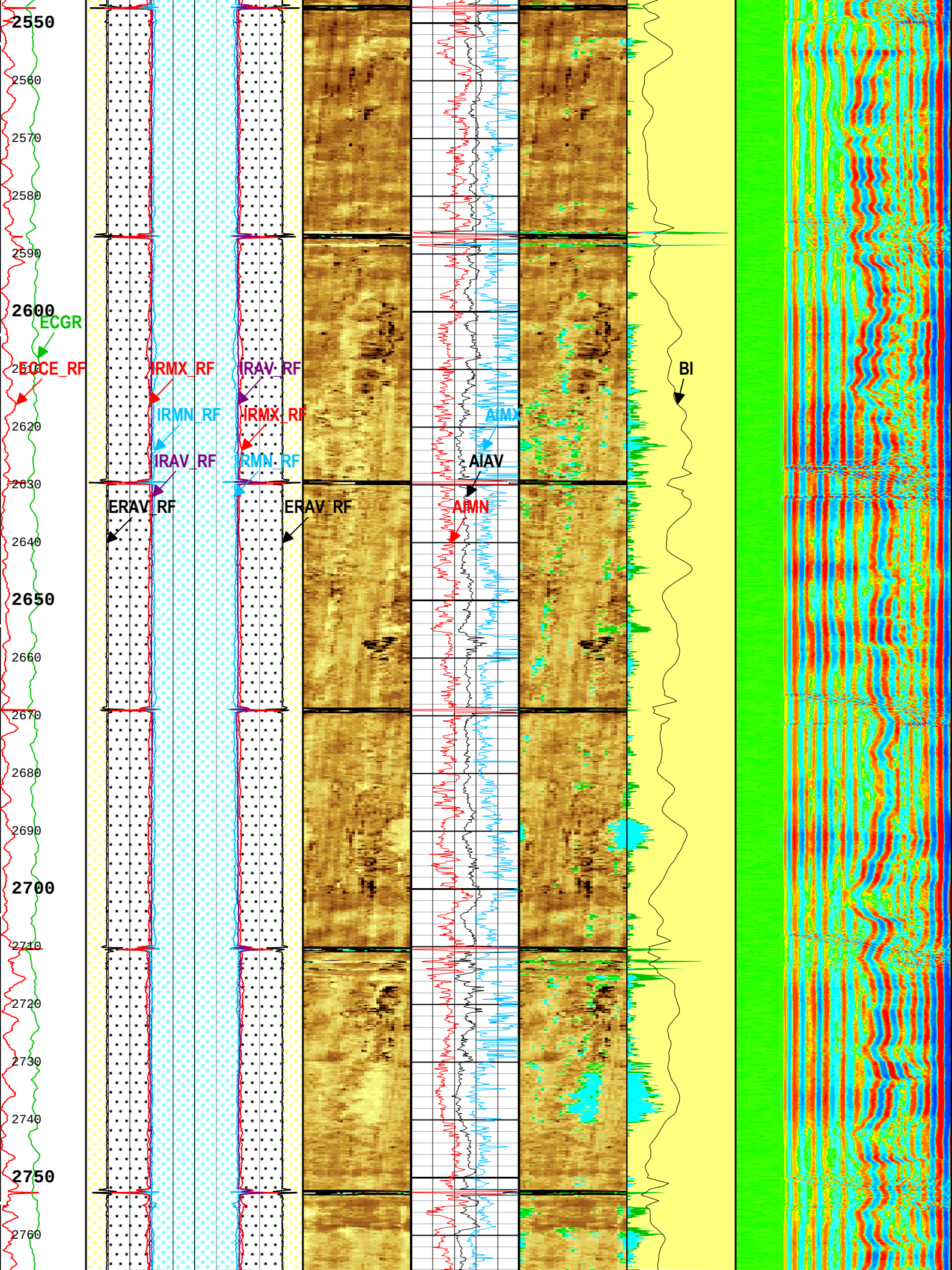
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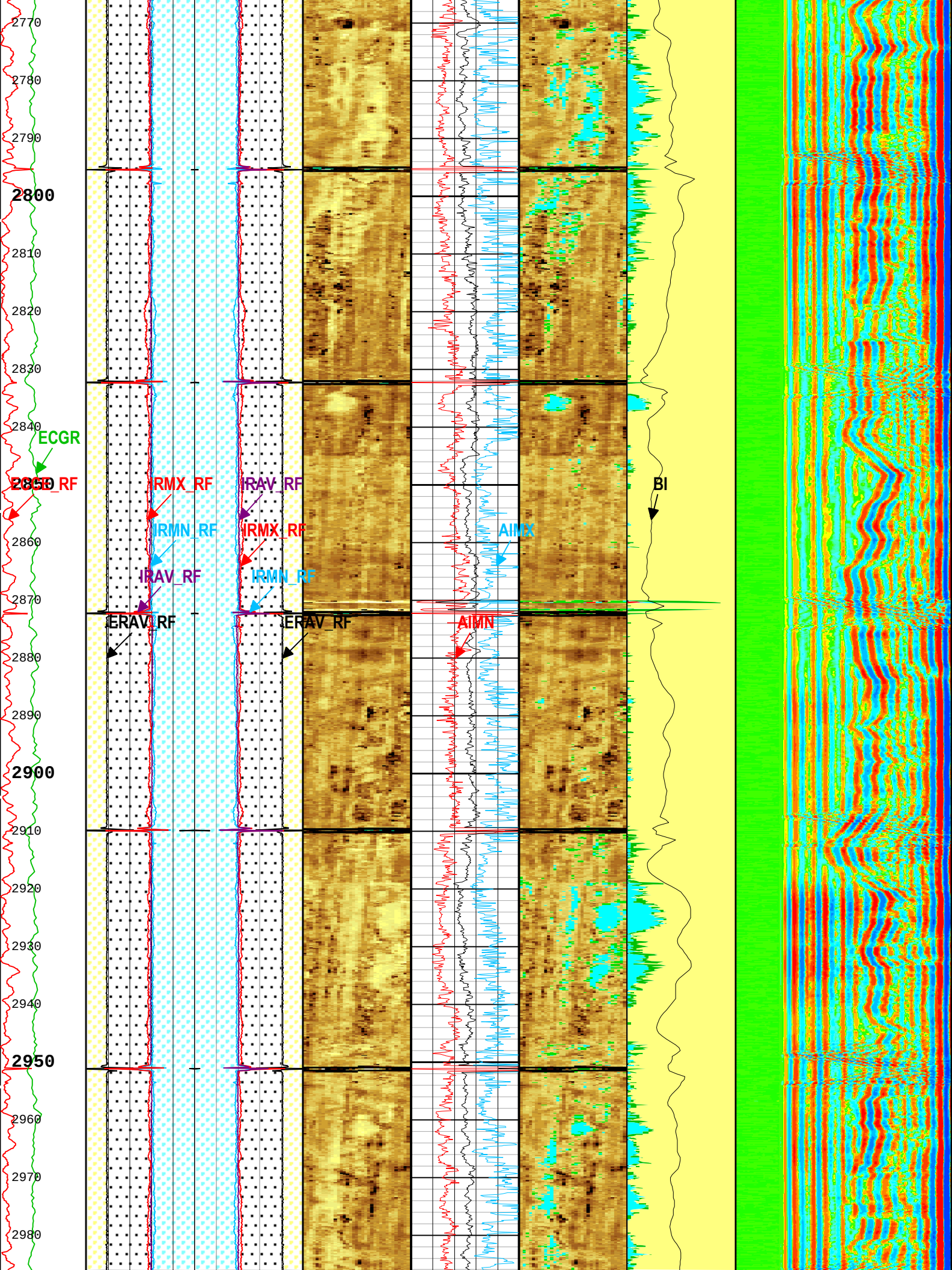

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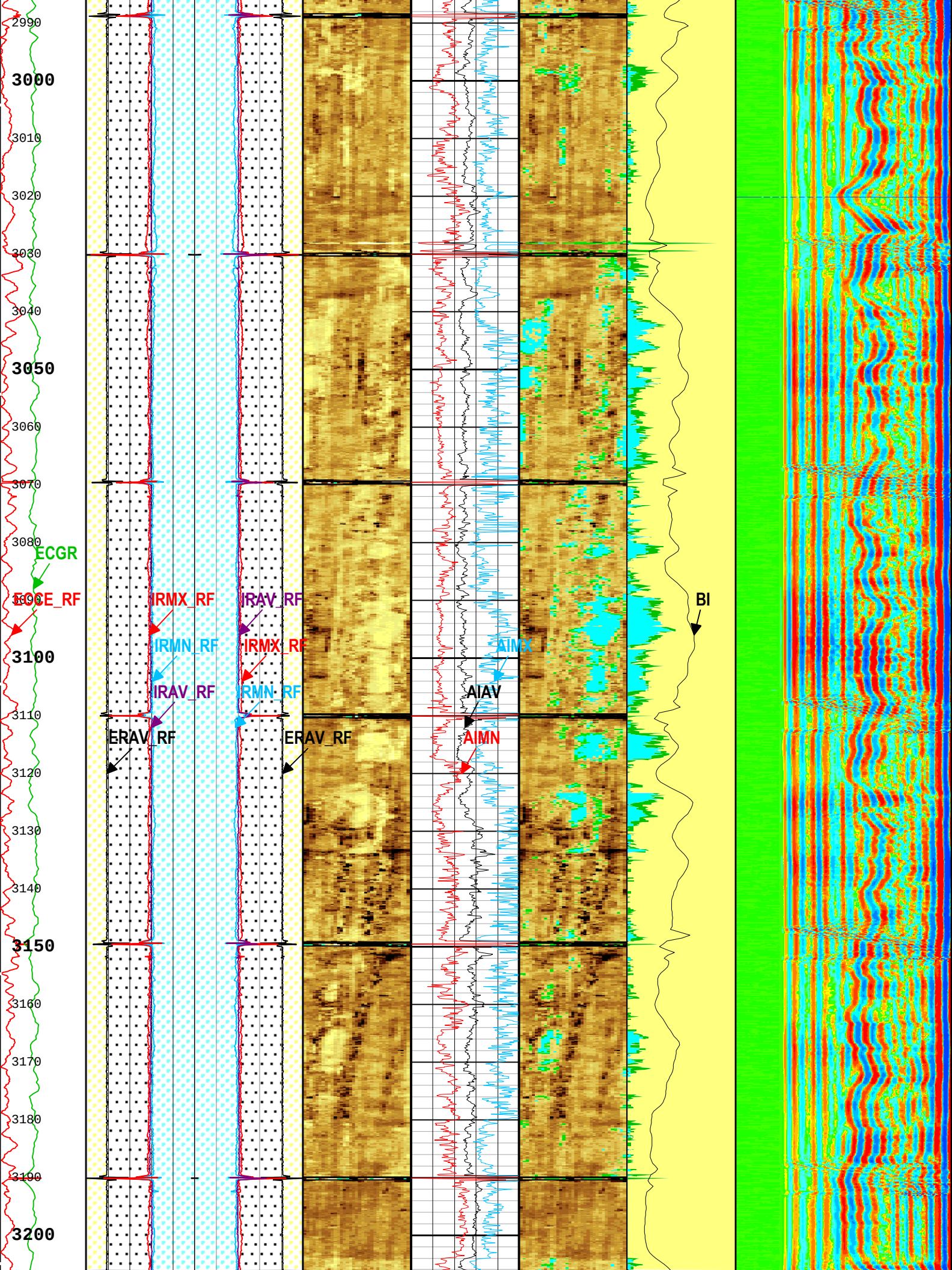
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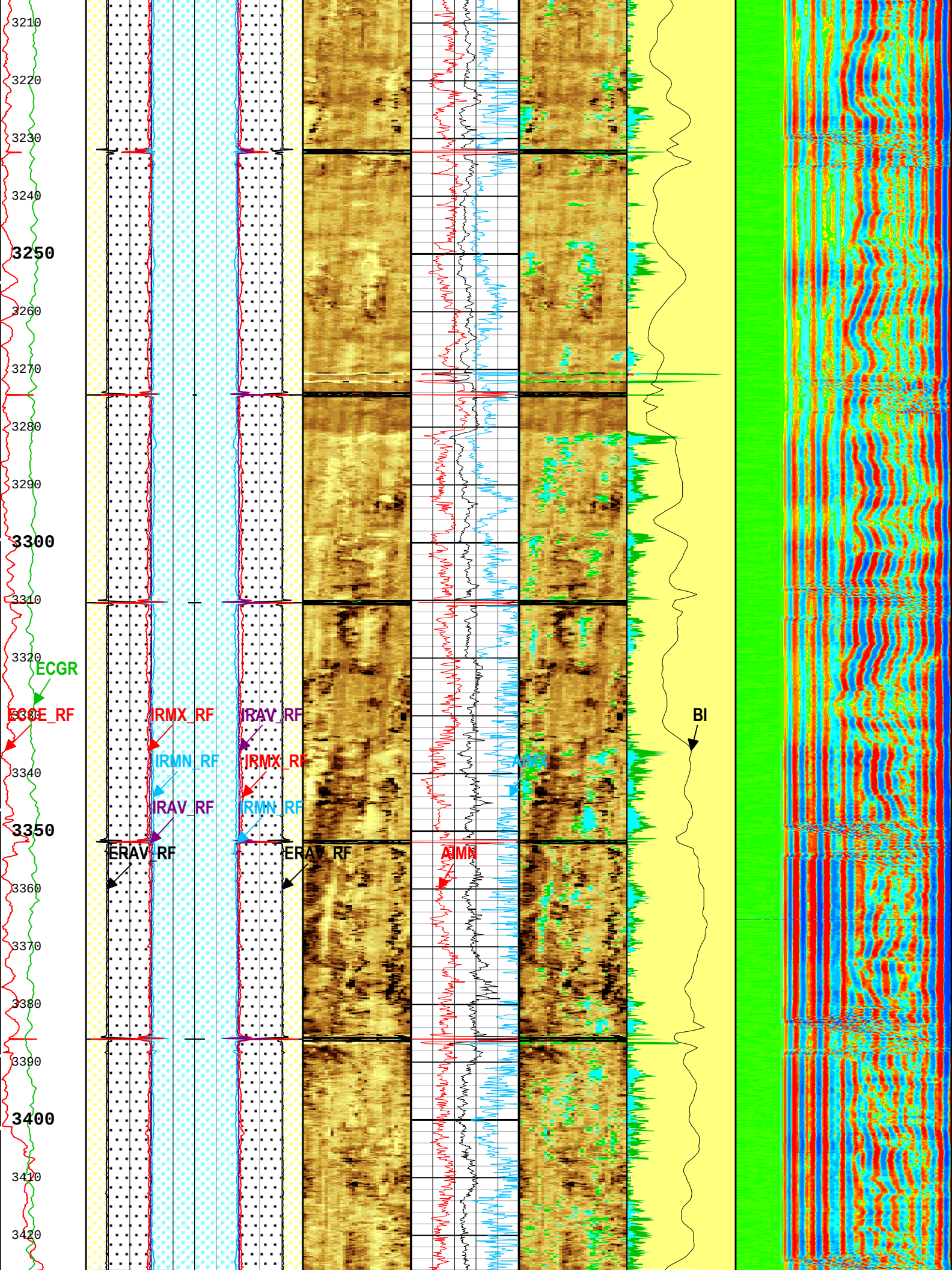
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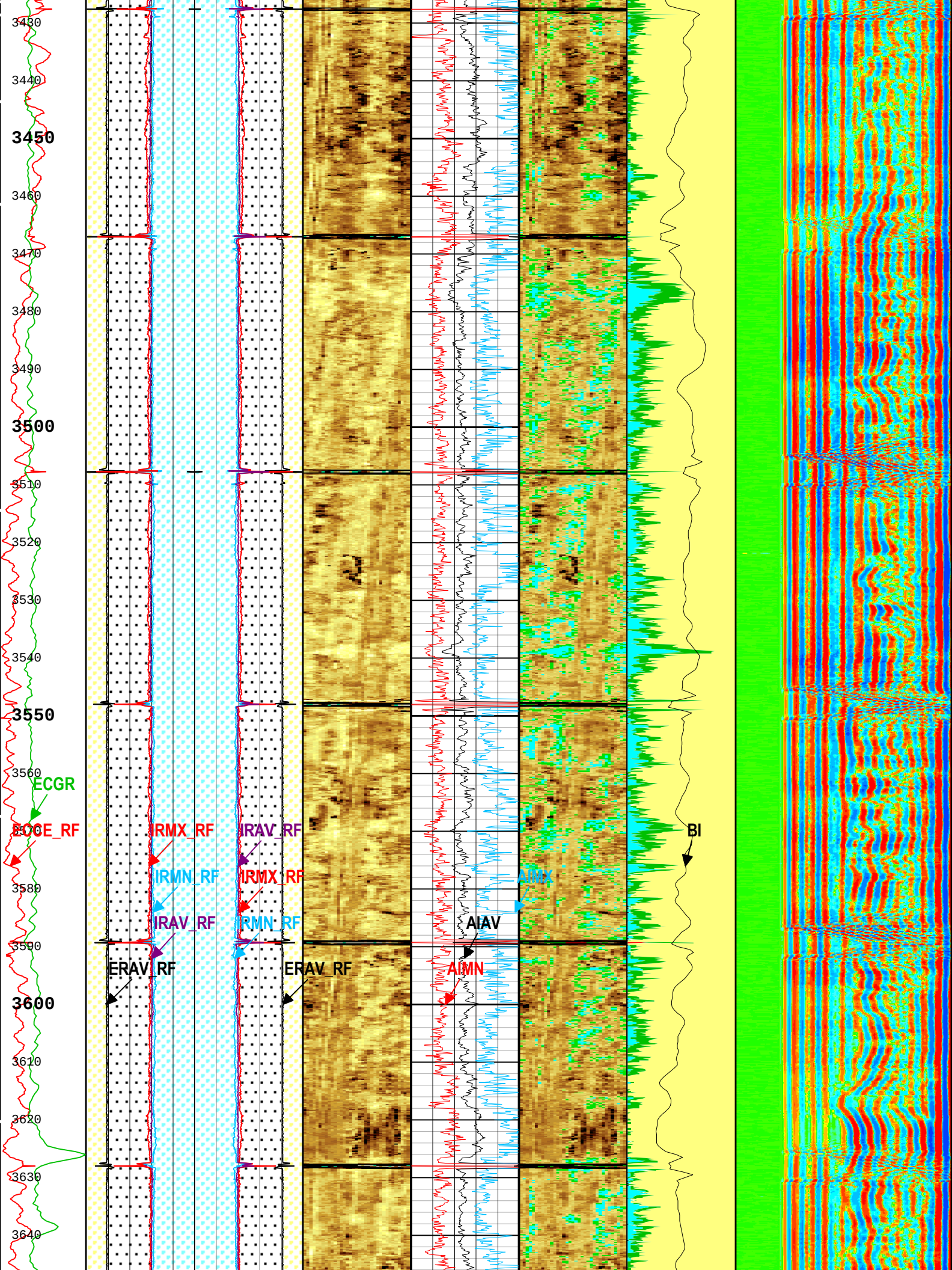
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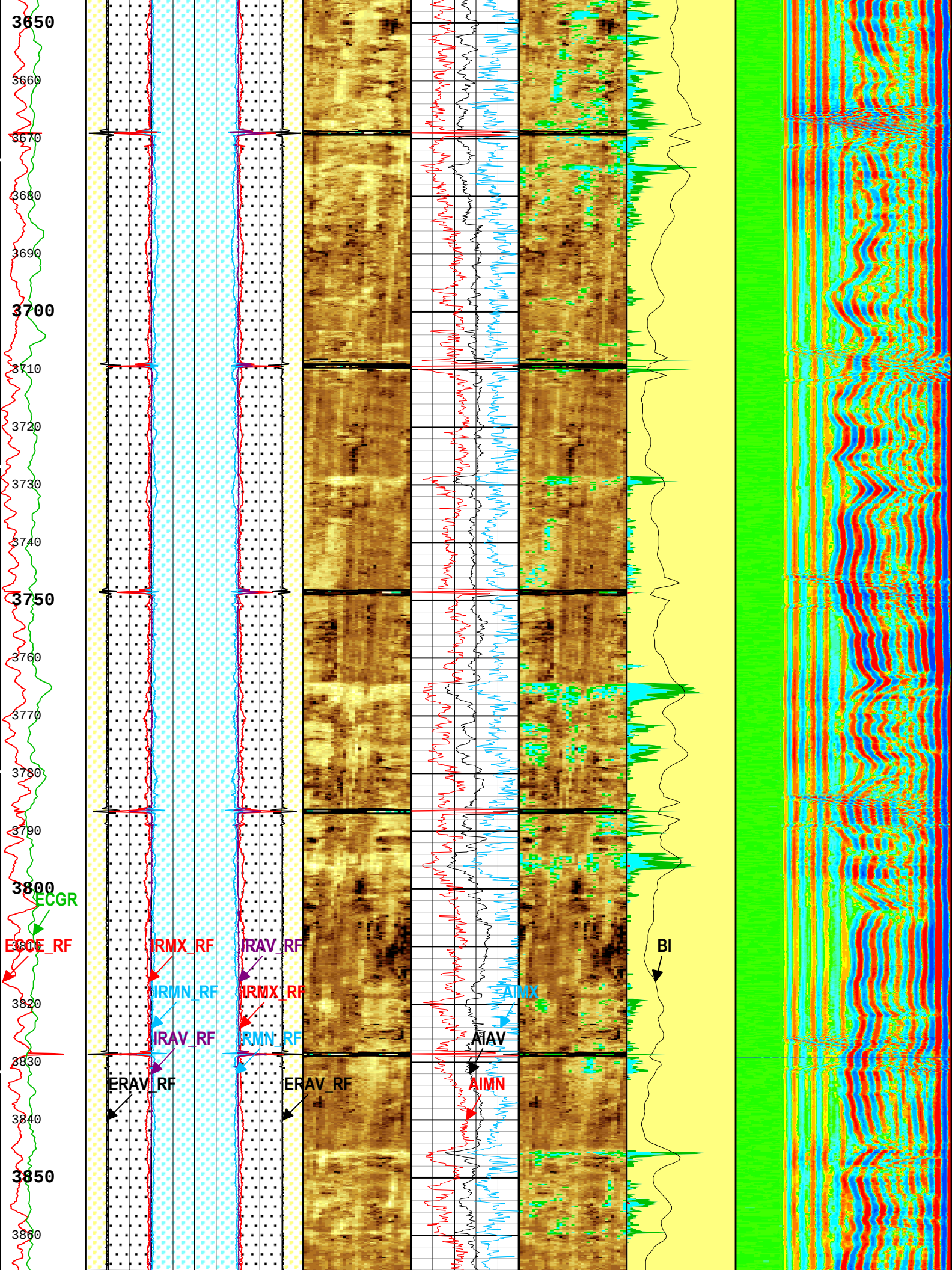
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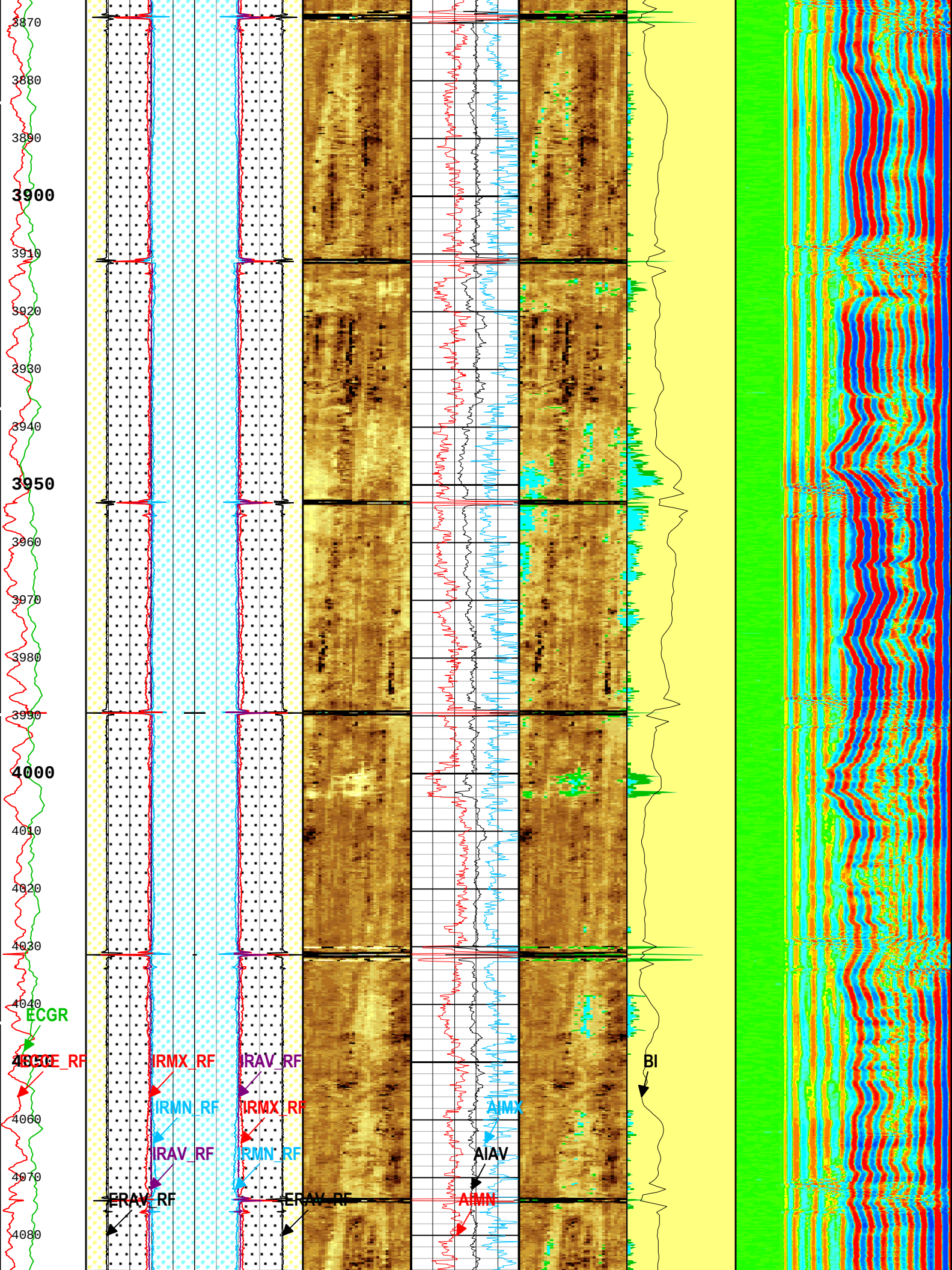
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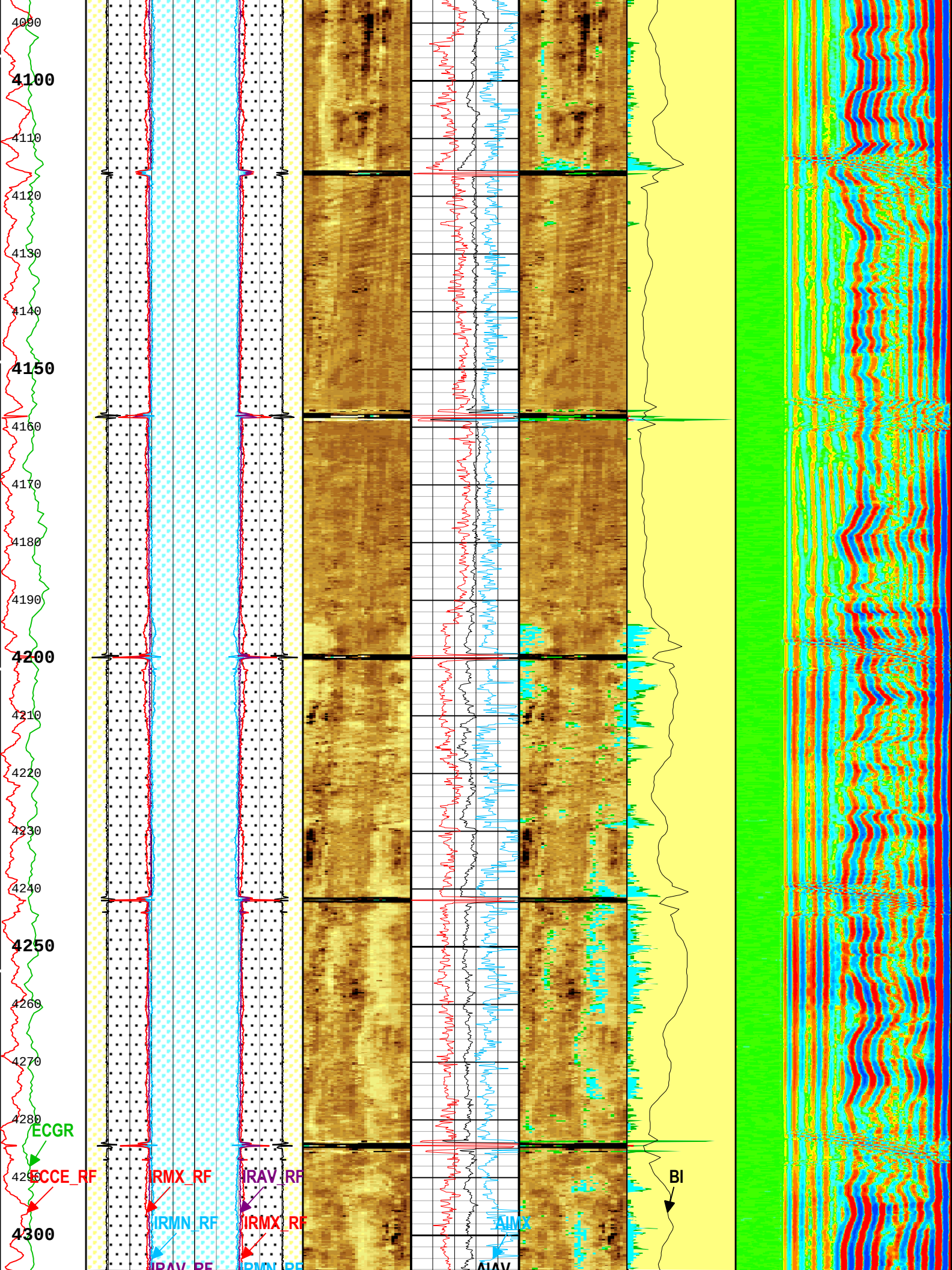
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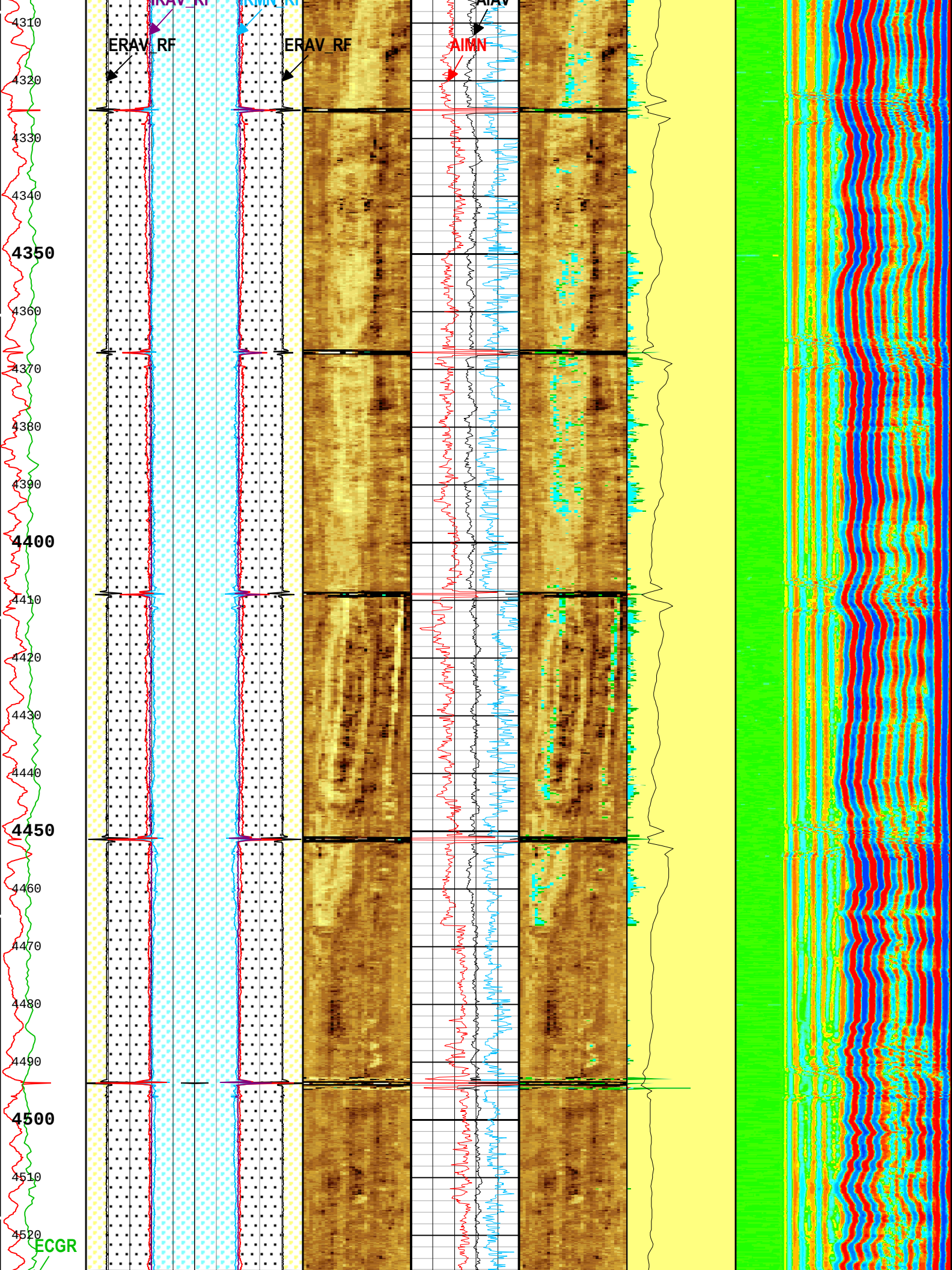
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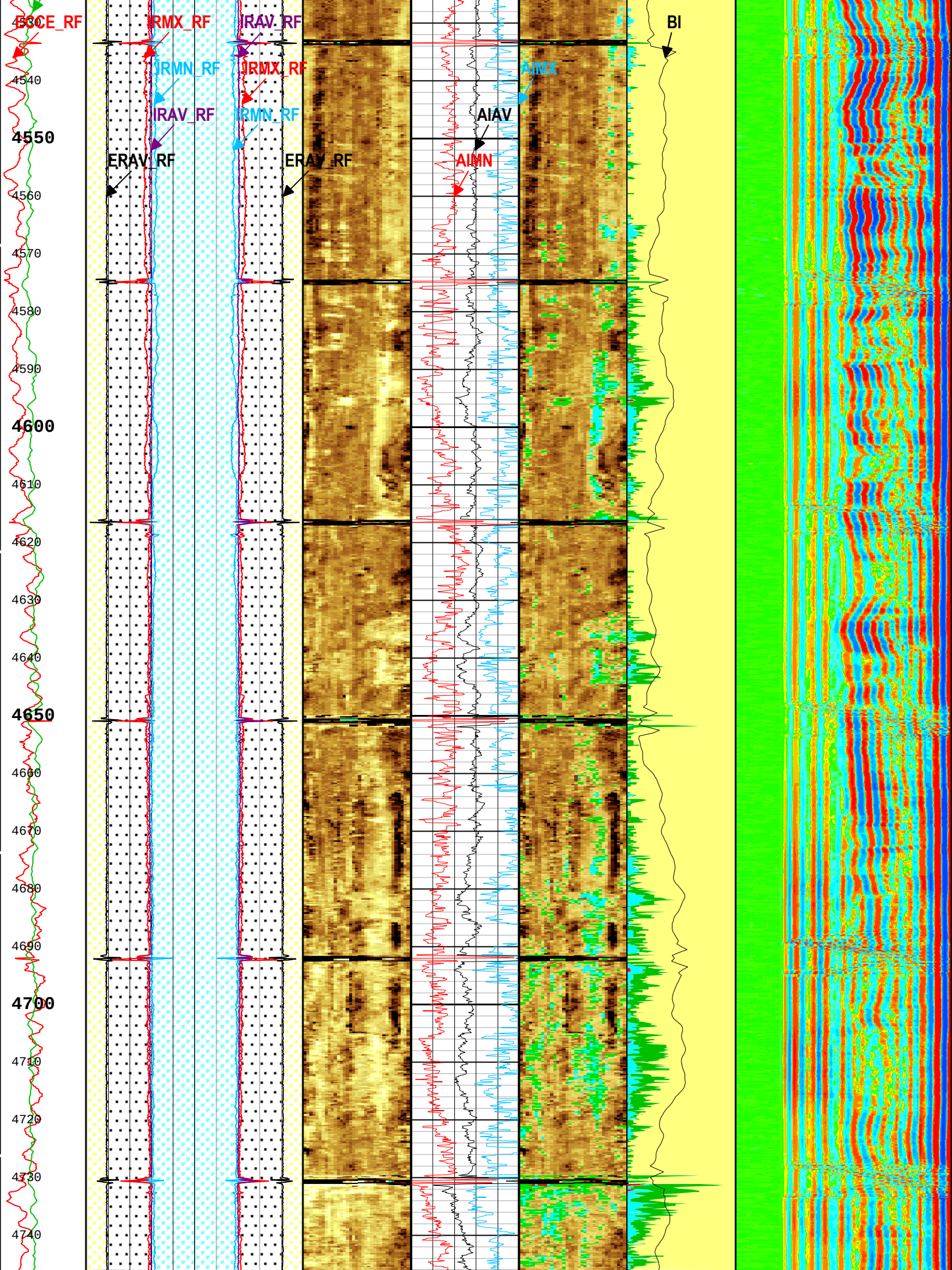
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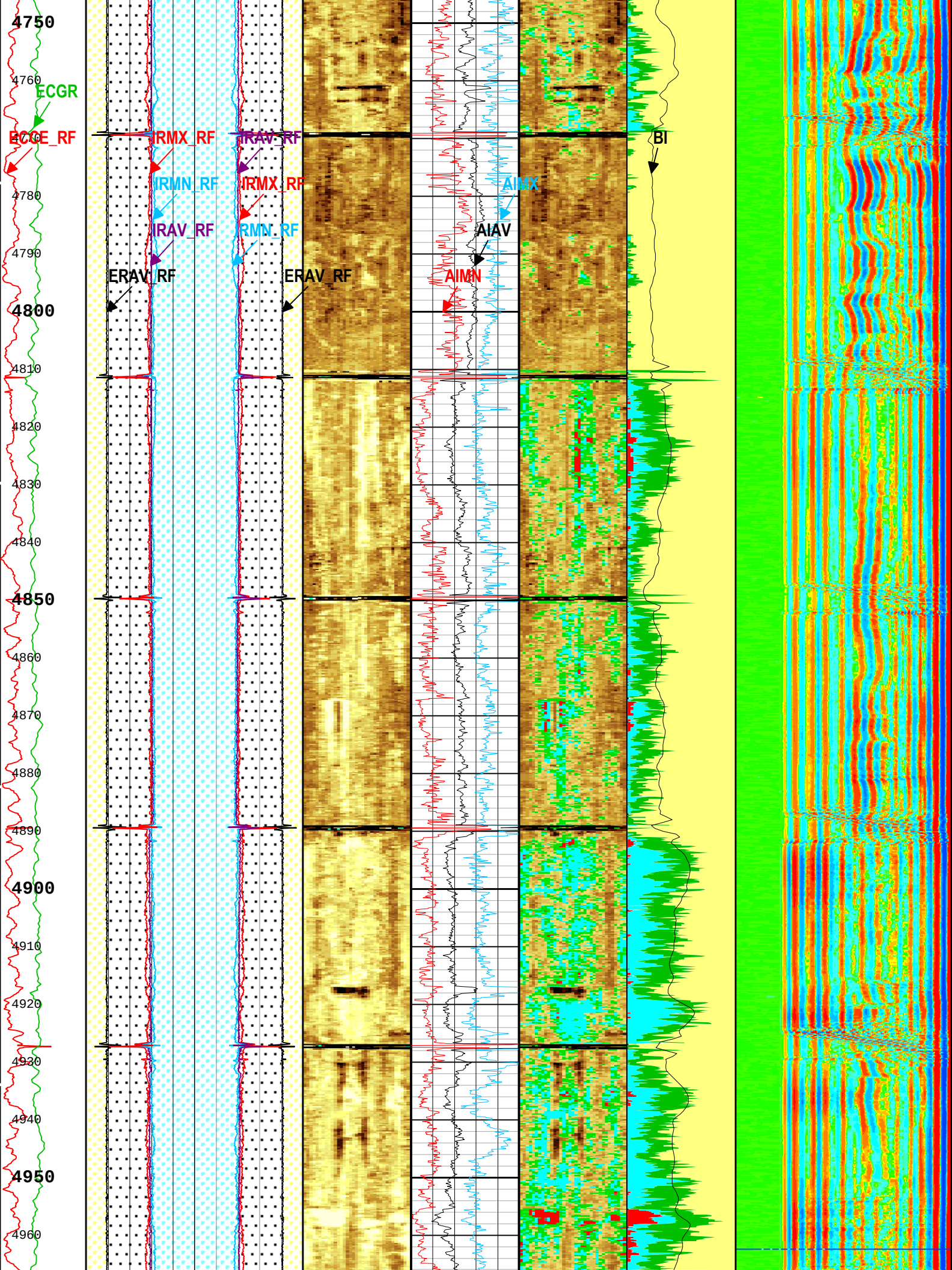
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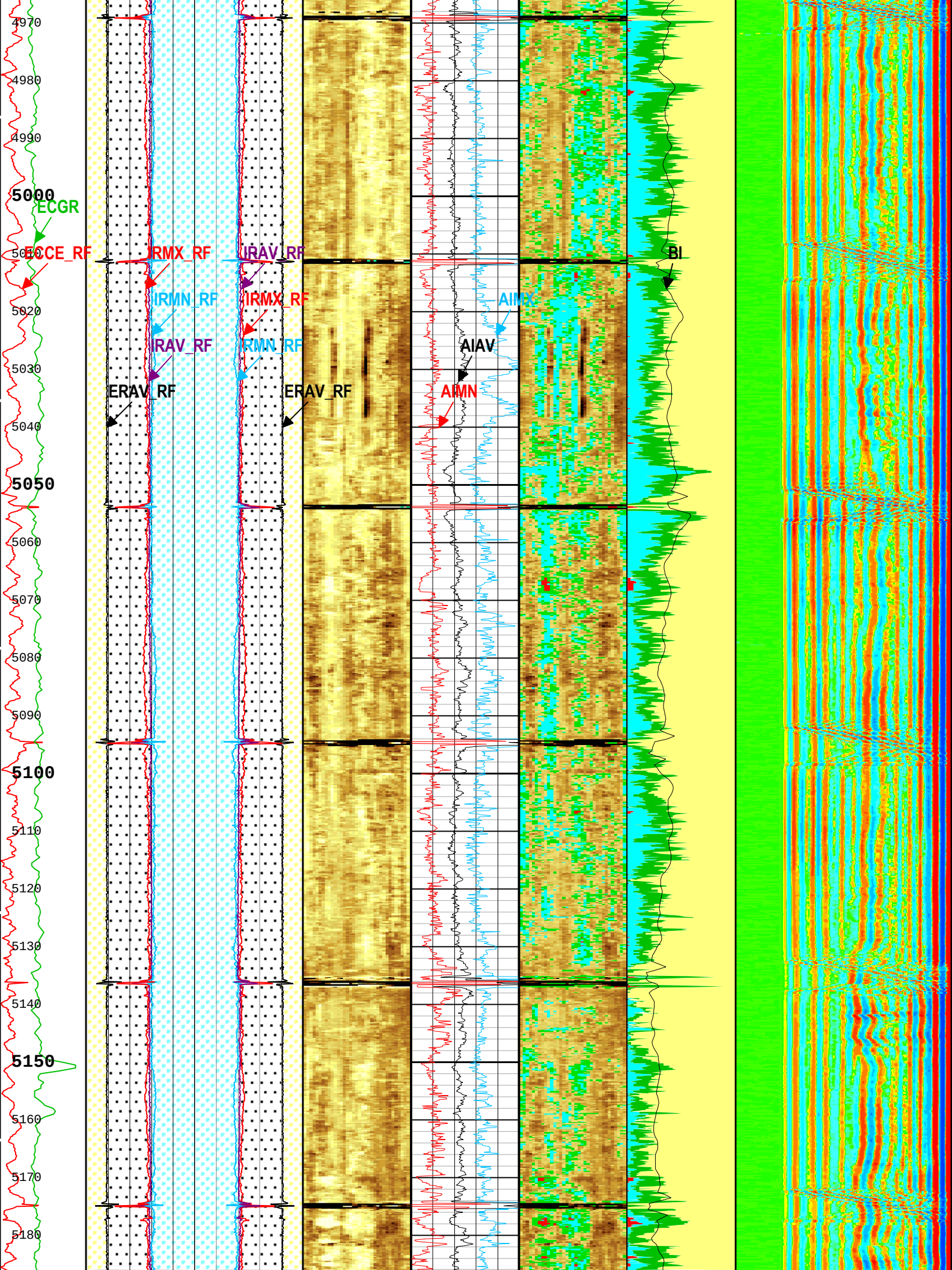
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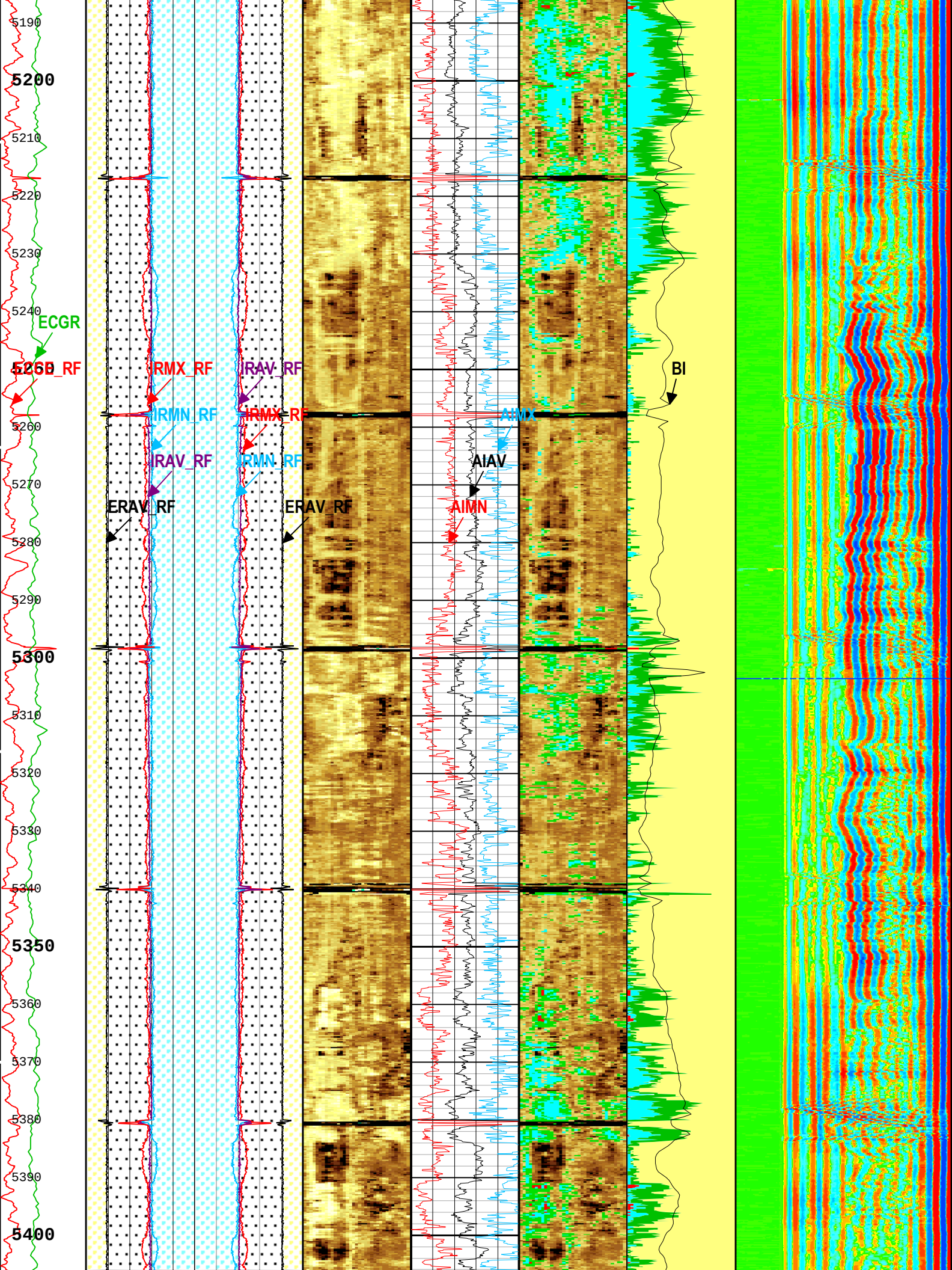
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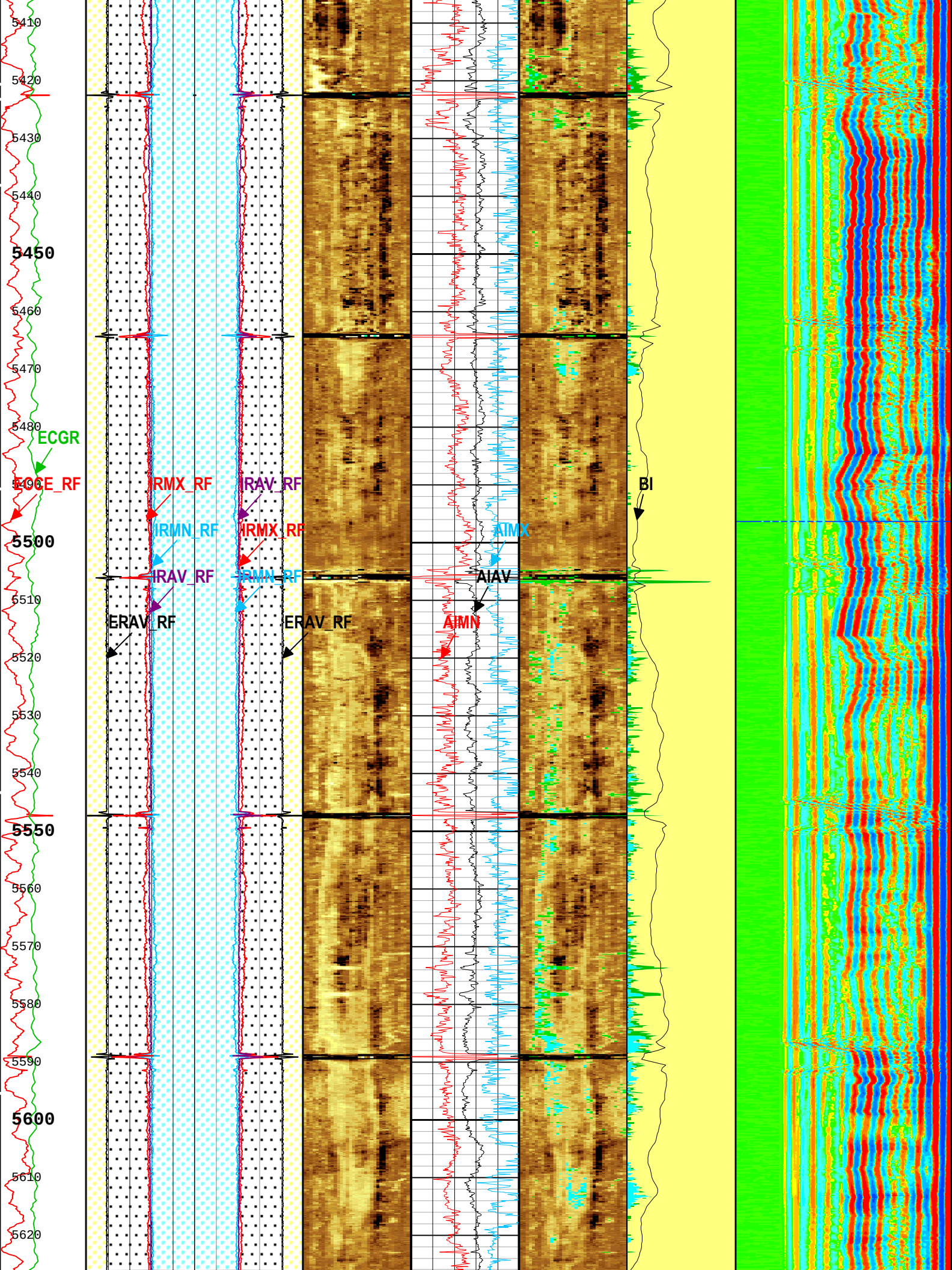
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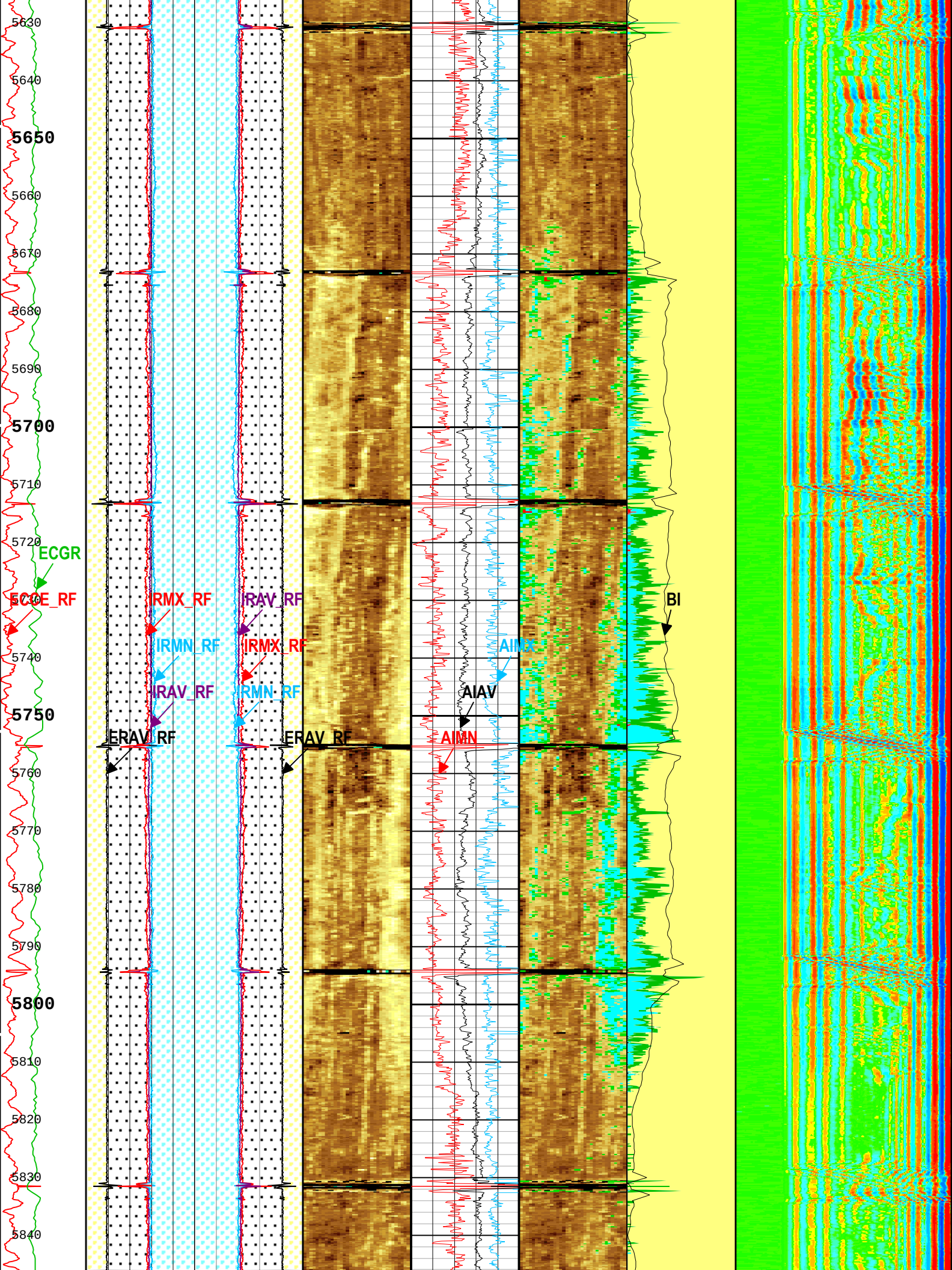
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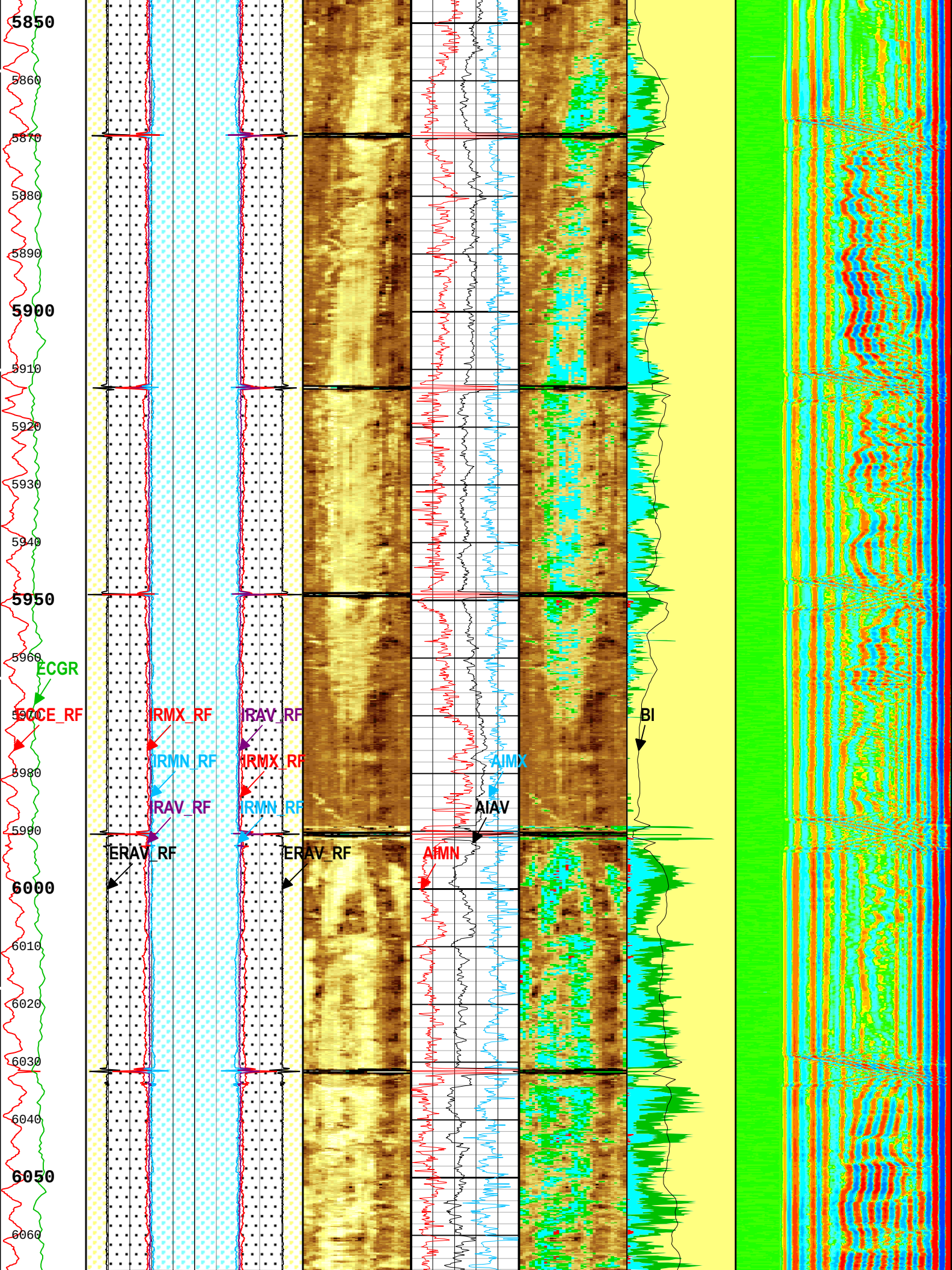
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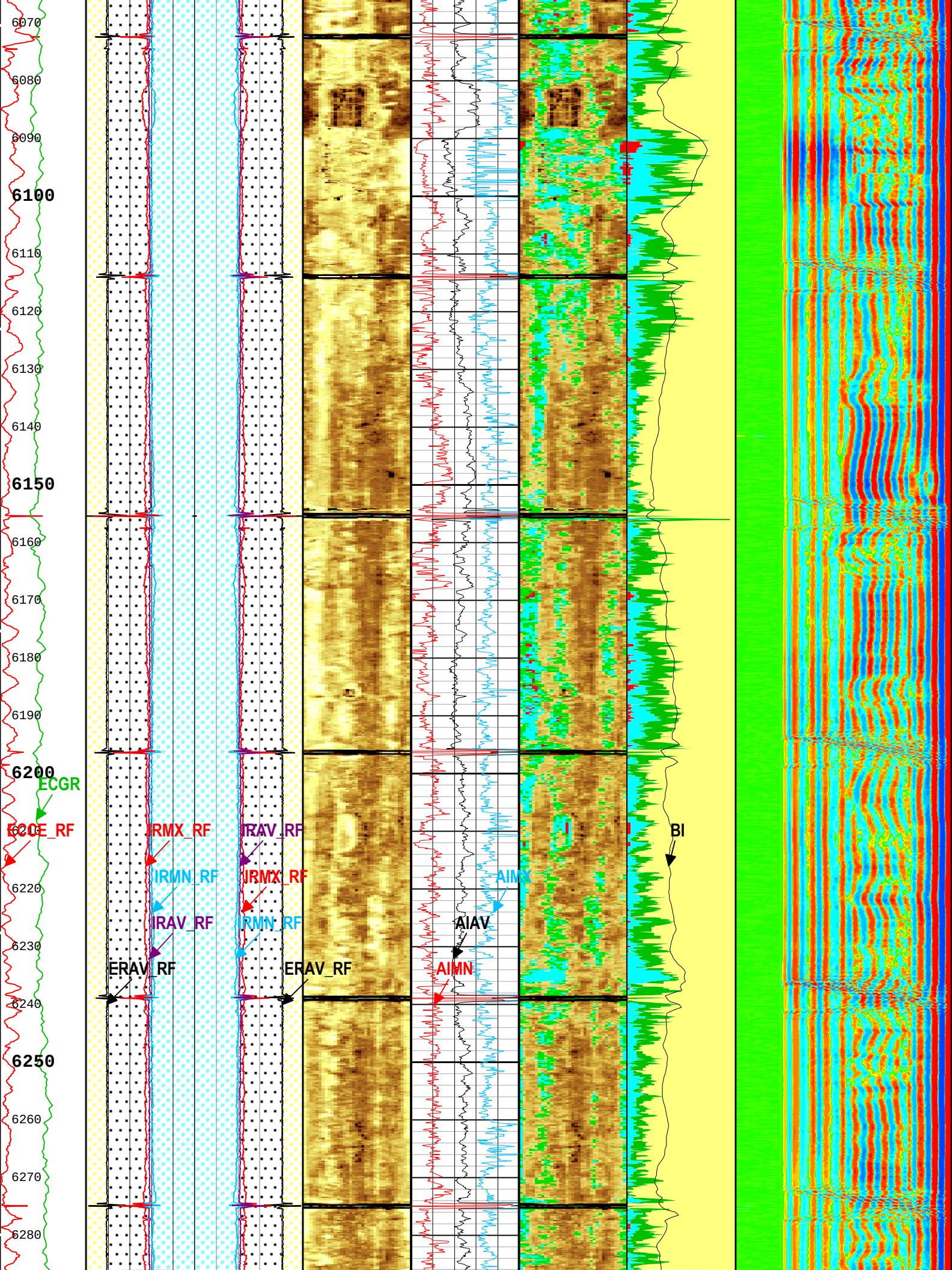
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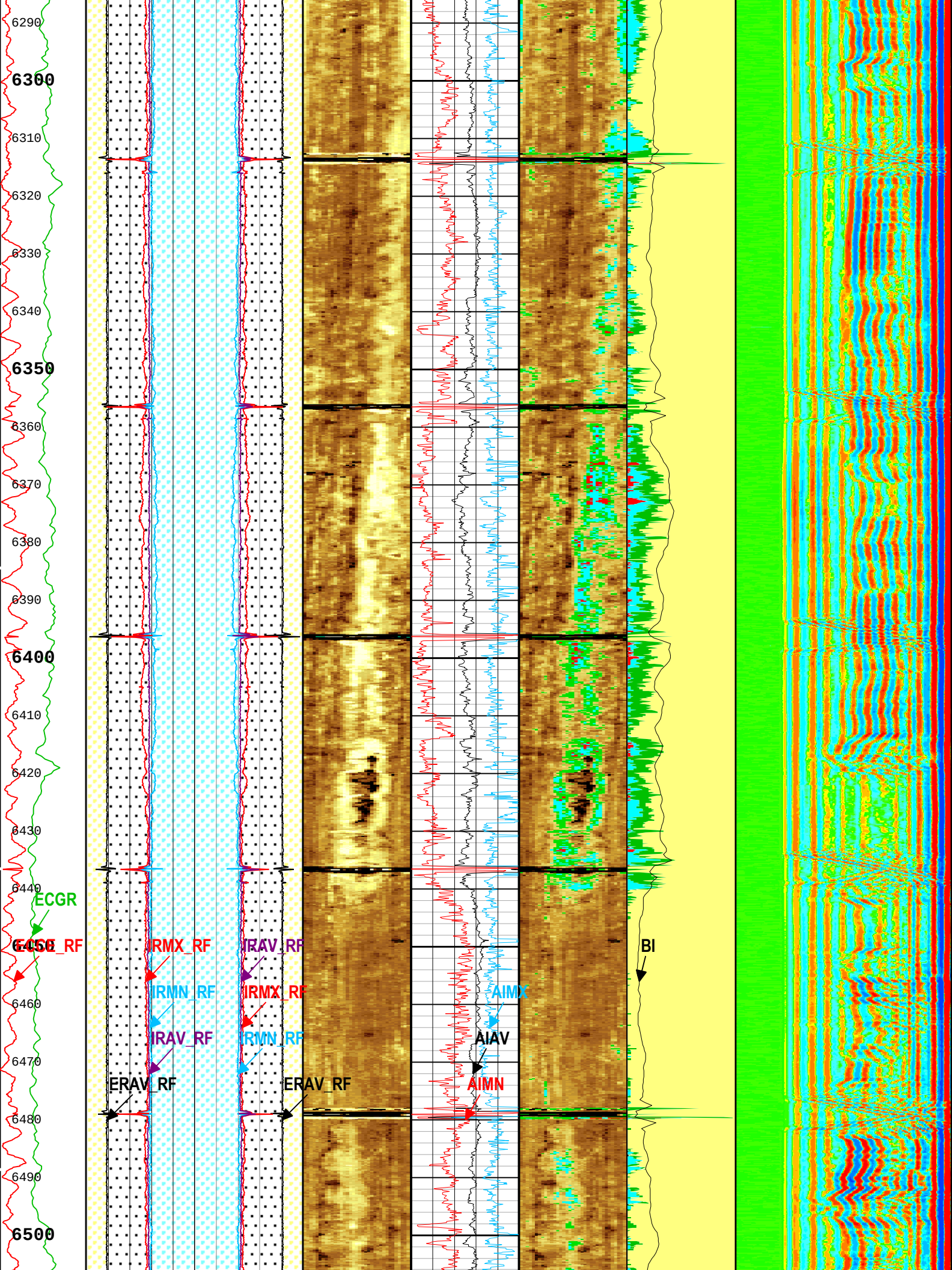
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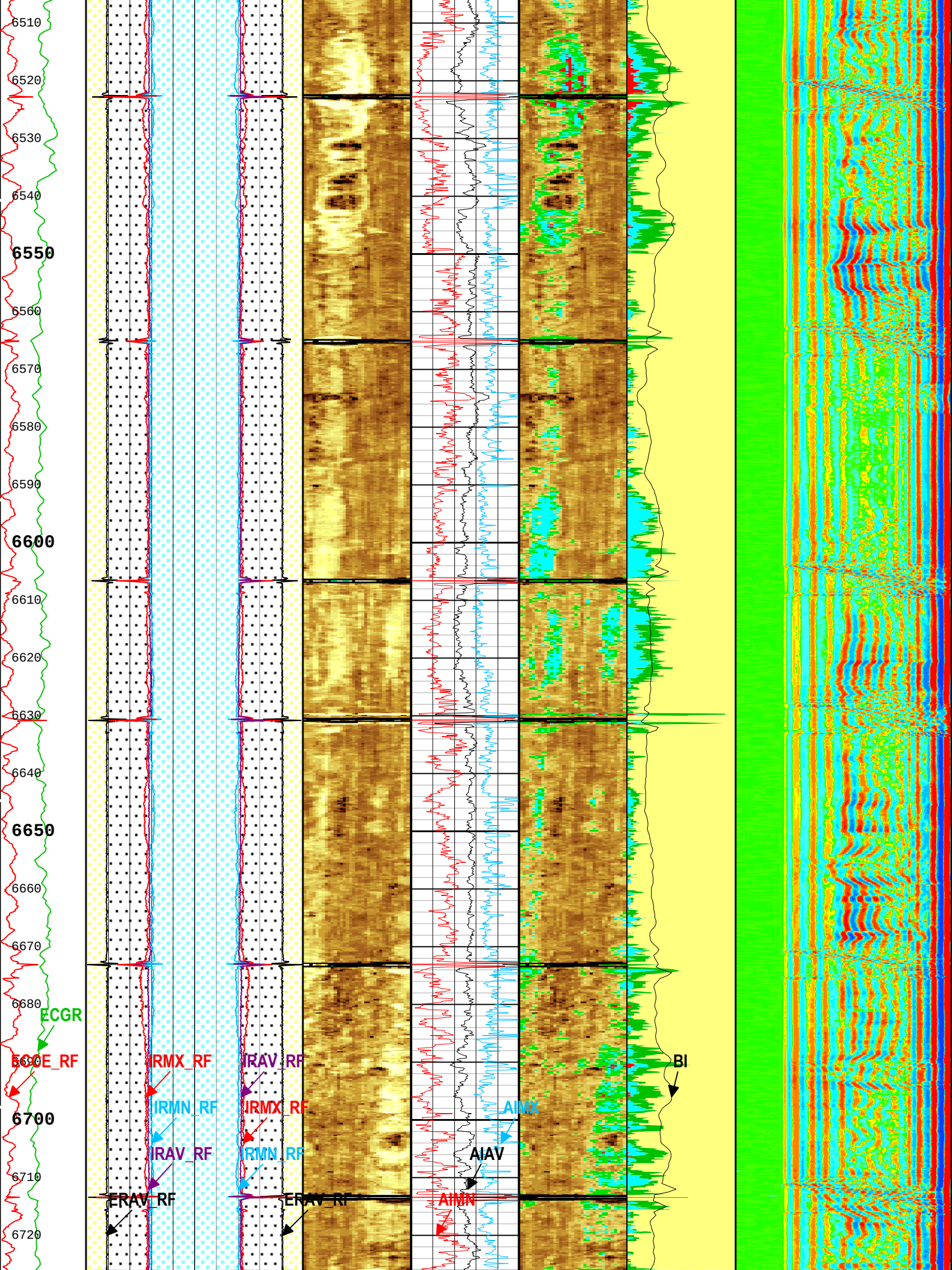
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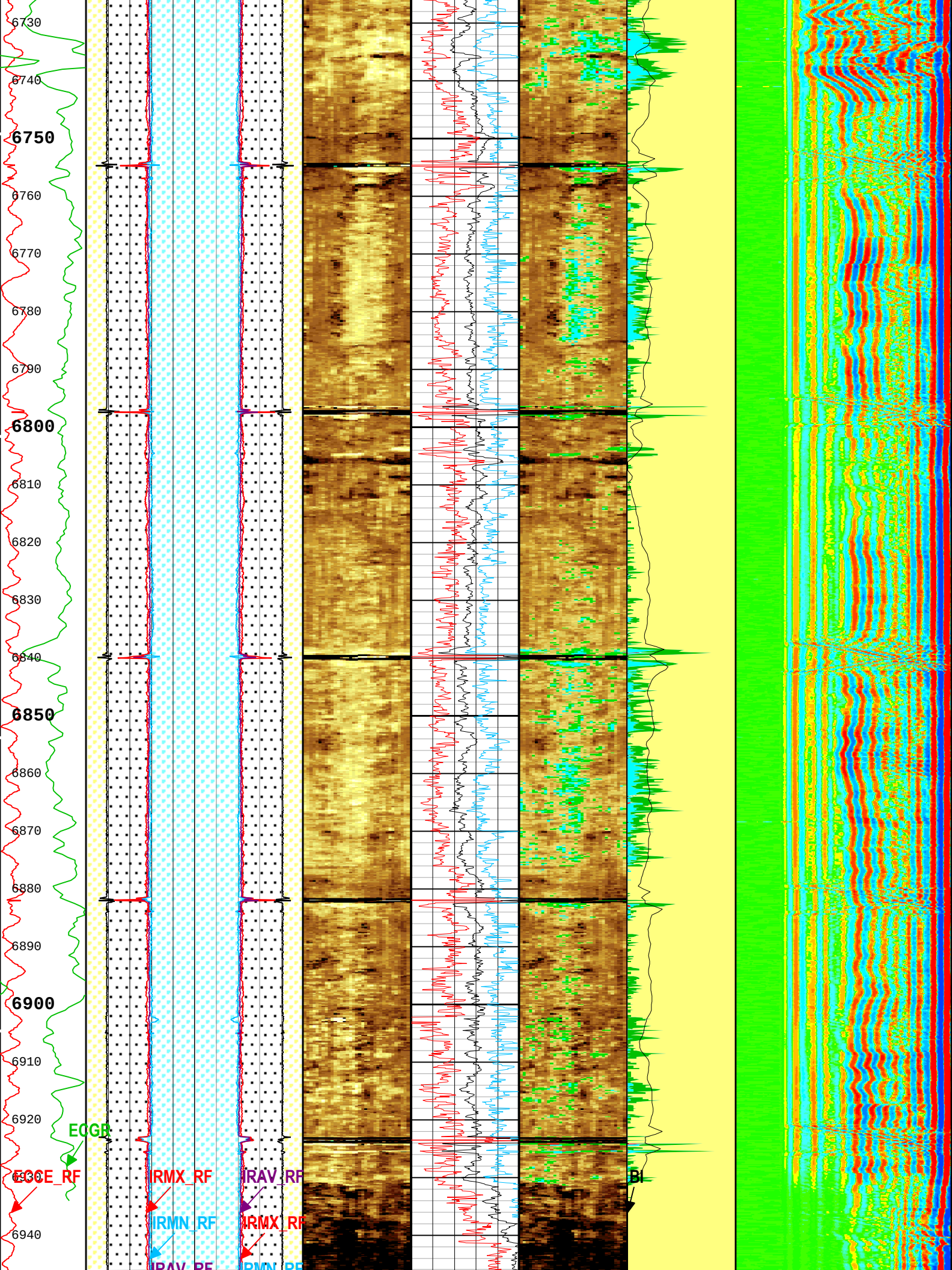
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ECCE_RF
IRMX_RF
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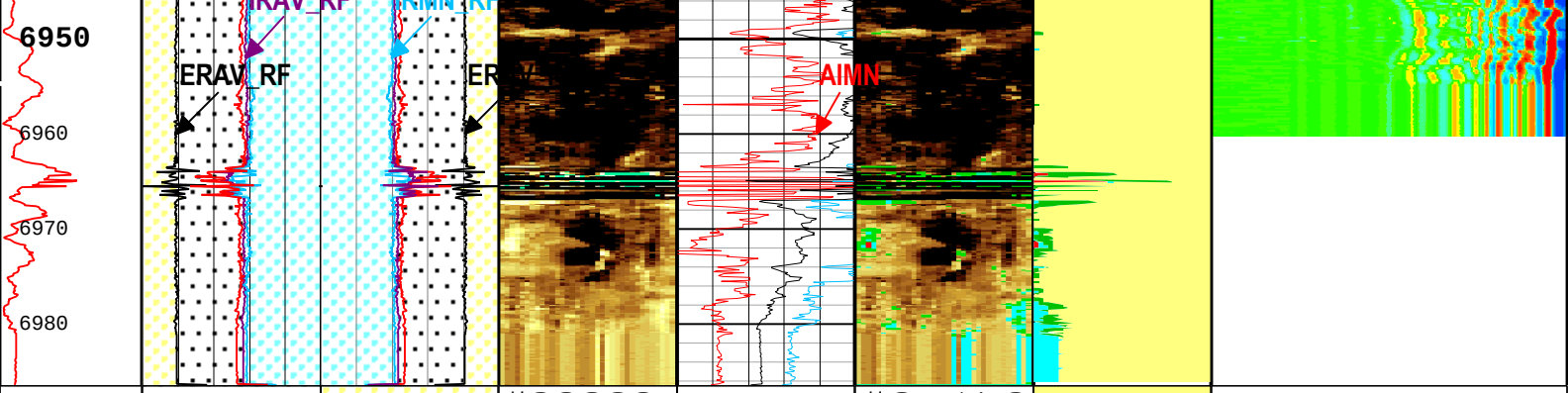
BI



TIME_1900 - Time Marked every 60.00 (s)

Description: USI VDL Cement Format: Log (LBV1_USI-VDL (DSLT) Cement 9.625inch) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 18-Aug-2016 20:17:09

Company:	Southern California Gas Company
Well:	Fernando Fee 35A
Field:	Aliso Canyon
County:	Los Angeles

Schlumberger

State:	California

Cement Bond Log

Variable Density Log

Gamma Ray - CCL