



LWD MEMORY LOG

Gamma Ray

Scale: 1:240 Measured Depth	Company: Noble Energy									
	Well: Independence D30-711									
	Field: Wattenberg									
	Depth Reference:		County:		Weld		Country: United States			
	Driller's Depth		State:		Colorado					
Status:	Final Print		Surface Location:				Other Services:			
API No: 05-123-47706-0000		Longitude:		040° 13' 01.956" N 104° 35' 17.448" W						
Job ID: 109454491		SEC:		19 TWN:		3N RGE:		64W		
Permanent Datum (P.D.): Mean Sea Level		Elevation:		0.00 ft		Elev. KB:		N/A		
Log Measured From: Rig Floor		Above P.D.		4798.00 ft		Elev. DF:		4798.00 ft		
Elev. GL:				4768.00 ft						
Dates	Interval Drilled				Magnetic Field Reference					
Date From: 2018-12-10	Top: (ft) 1956.00		Azi Reference North: Grid		Dip Angle: (deg)		66.69			
Date To: 2018-12-14	Bottom: (ft) 17754.00		Total Magnetic Field Strength: (nT)				52067			
Spud Date: 2018-12-09			Mag to Reference North Correction: (deg)				7.51			
Borehole Record										
Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)				
13.500	0.00	1956.00	9.625	36.00	0.00	1946.00				
8.500	1956.00	17754.00								
Mud Record										
Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)				
Oil Based Mud	1956.00	17754.00	8.500	15798.00	1.28 246.06	89.97 179.87				
Acquisition System										
Baker Hughes Cadence	Software Version				Other					
Plot Studio	RT 5.0 5.0.8260.3				Rig: H&P 517 Contractor: Helmerich & Payne Drilling Co District: RMA Unit: RMA					

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Log Run Summary

Run No	Bit Run No.	Bit Size (in)	Bit Type	Bit Gauge Length (in)	Assembly Type	Logged Interval		Bit Depth Interval		Date / Time		Circ. Hours
						Top	Bottom	From	To	Start Logging	End Logging	
						(ft)	(ft)	(ft)	(ft)			
1	1	8.500	PDC	2.50	AutoTrak Curve	1956.00	17741.00	1956.00	17754.00	2018-12-10 13:49	2018-12-13 16:38	68.91

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Andrew Hays	2018-12-09	2018-12-14						

Mud Properties Record

Date / Time	Run No.	Measured Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2018-12-10 15:00	1	2235.00	Oil Based Mud	9.2	12	N/A	N/A	79.8/20.2	Active Pit	27500	0.00
2018-12-11 04:00	1	6256.00	Oil Based Mud	9.0	9	N/A	N/A	80.2/19.8	Active Pit	30000	0.00
2018-12-12 04:00	1	11107.00	Oil Based Mud	9.3	10	N/A	N/A	82/18	Active Pit	28000	0.00
2018-12-13 04:00	1	15979.00	Oil Based Mud	9.3	9	N/A	N/A	84.3/15.7	Active Pit	25000	0.00

Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset (ft)	Bit Offset (ft)	Max O.D. (in)	Min I.D. (in)
1	AutoTrak Curve Steering Unit	14236903	Near Bit VSS	5.93	6.73	7.000	4.330
1	AutoTrak Curve Steering Unit	14236903	Near Bit Inclination	5.93	6.73	7.000	4.330
1	AutoTrak Curve MWD	14334114	Gamma (single)	2.77	12.90	7.000	3.250
1	AutoTrak Curve MWD	14334114	Directional (mag)	12.27	22.40	7.000	3.250

Service and Tool Mnemonics

Mnemonic	Name	Description
ATC-CH	Ant-Tet-C	Ant-Tet-C

ATC SU	AutoTrak Curve SU	Auto Trak Curve Steering Unit
ATC MWD	AutoTrak Curve MWD	Auto Trak Curve MWD
ATC LCPM	AutoTrak Curve LCPM	Auto Trak Curve LCPM

Comments

- 1
- Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes. Due to the lack of control by Baker Hughes, depth calibrations and measurements could not be independently verified.
- 2
- Baker Hughes LWD run 1 utilized a 6.75 inch NaviGamma service (Directional and Gamma Ray) behind a 8.5 inch bit and rotary steerable assembly from 1956 to 17754 feet MD (1956 to 7021 feet TVD).
- 3
- The Gamma Ray Apparent (GRAM, GRAUM, GRADM) data is presented 0 to 300 API, per the customer's request.

Remarks

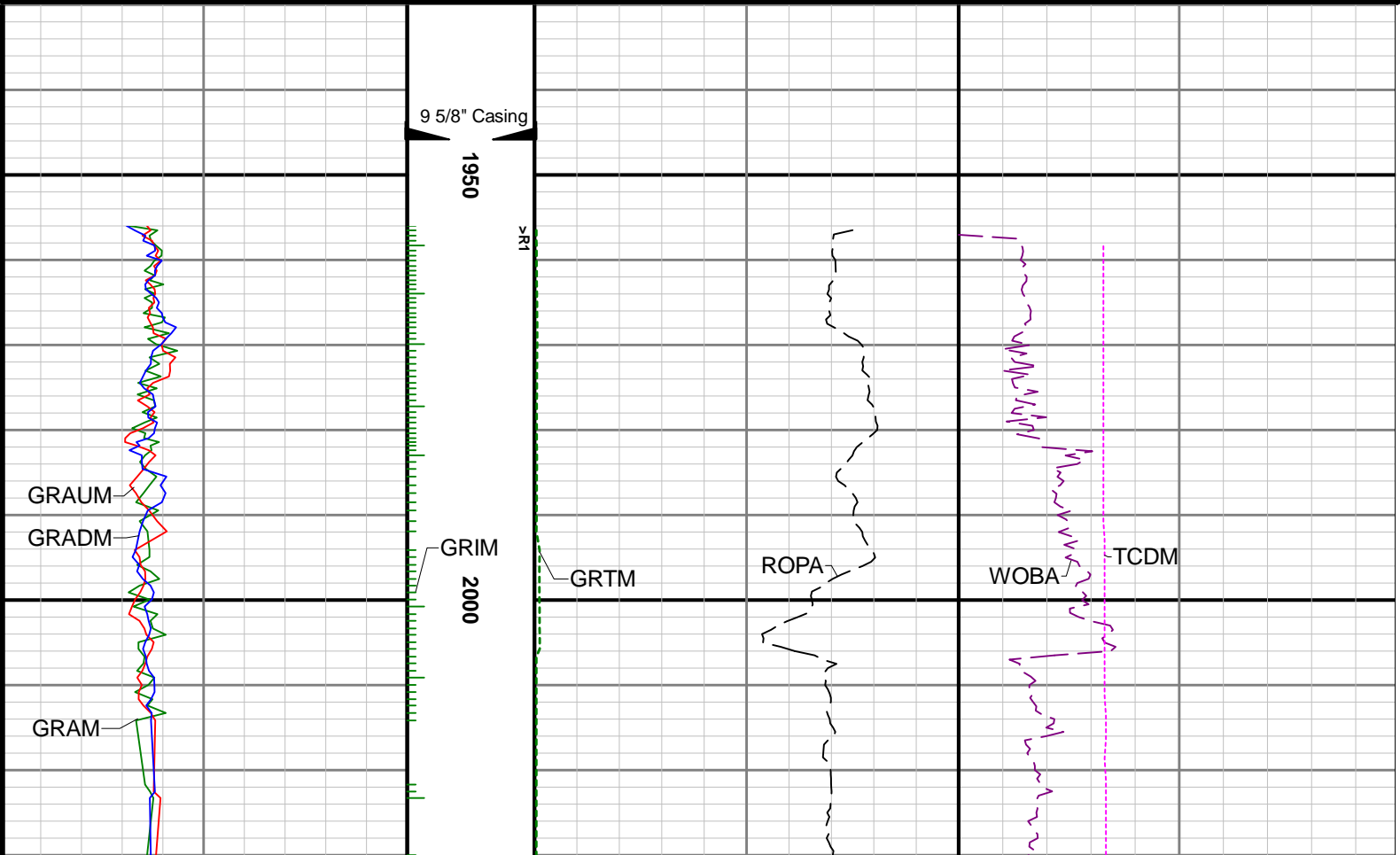
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	17741.00	8.500	1	The interval from 17741 to 17754 feet MD (7021 feet TVD) was not logged after being drilled due to sensor to bit offset at well TD.

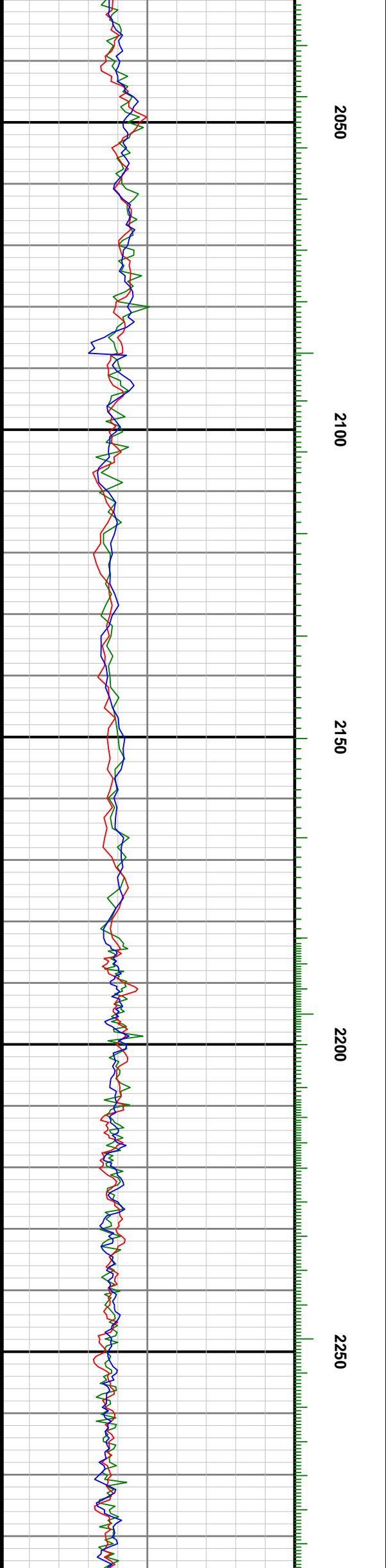
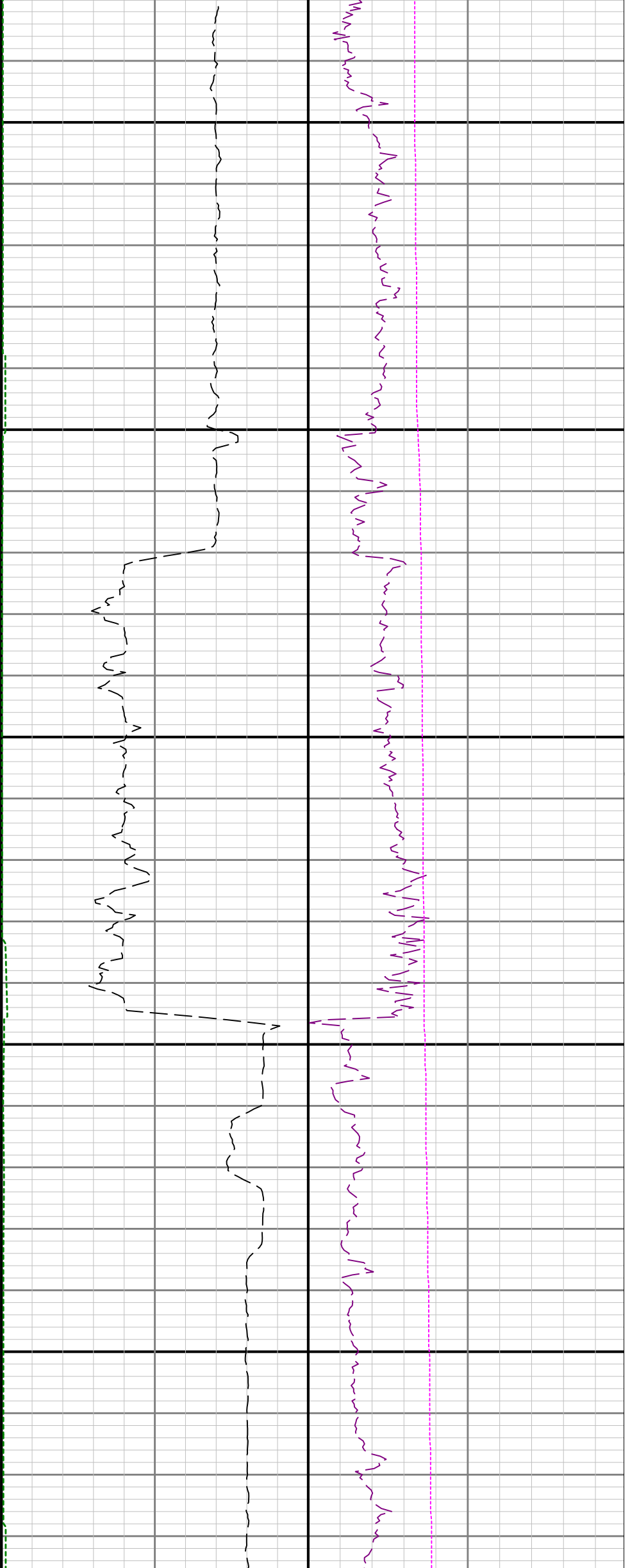
Curve Mnemonics

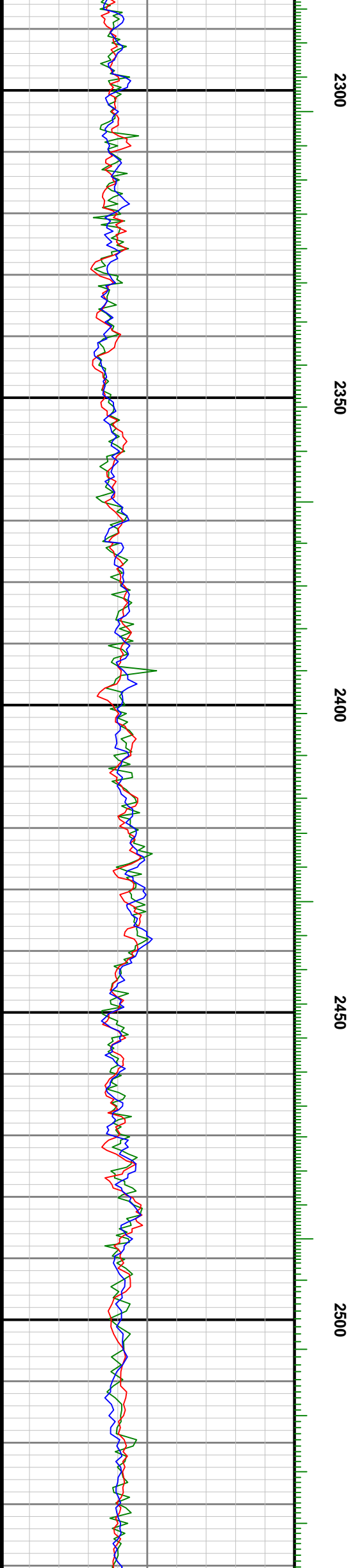
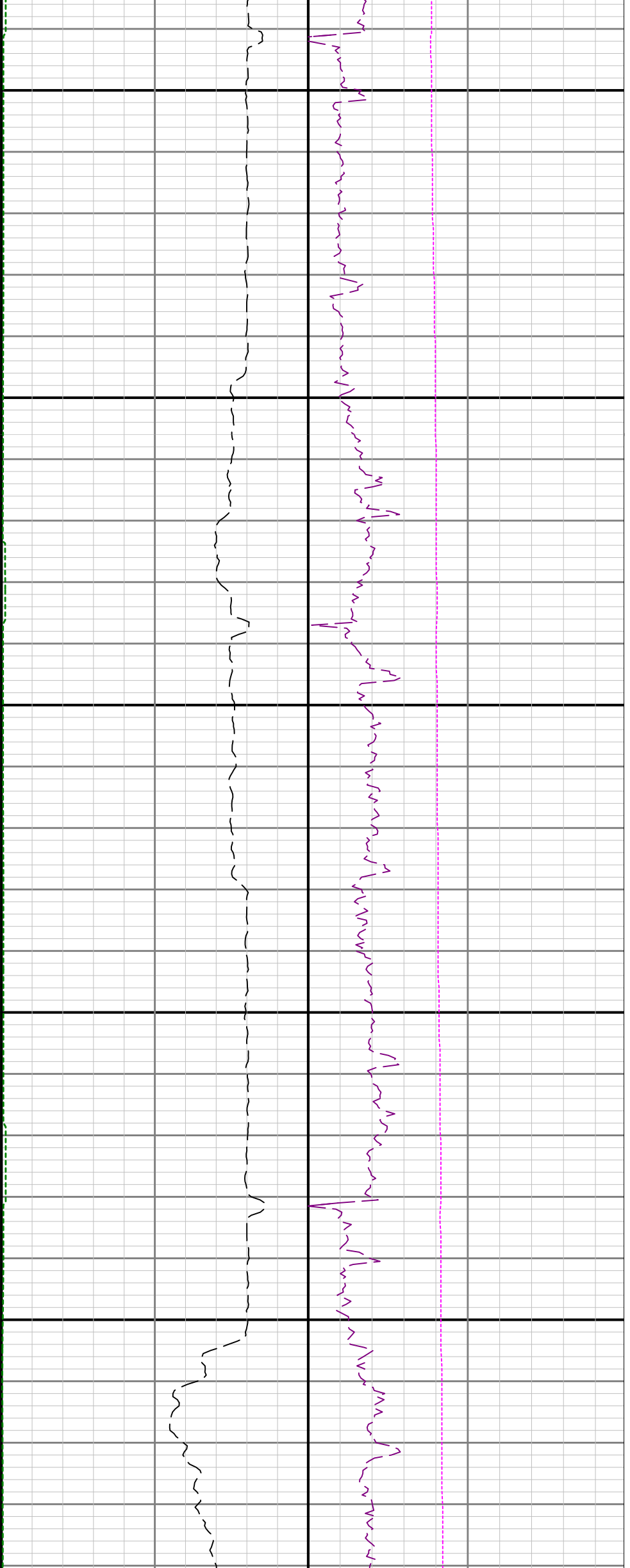
Presented Curves	Description	Units
ROPA	Depth Averaged ROP 3 ft Average	ft/h
TVD	True Vertical Depth	ft
WOBA	Weight On Bit, Average 1 ft Average	klb
GRAM	Gamma Ray - Apparent - Memory 0.5 ft Average	API
GRIM	Gamma Ray - Data Point Indicator - Memory	unitless
GRTM	Gamma Ray - Time Since Drilled - Memory	min
GRADM	Gamma Ray - Apparent - Down Quadrant - Memory 0.5 ft Average	API
GRAUM	Gamma Ray - Apparent - Up Quadrant - Memory 0.5 ft Average	API
TCDM	Directional Real-Time Survey Temperature	degF

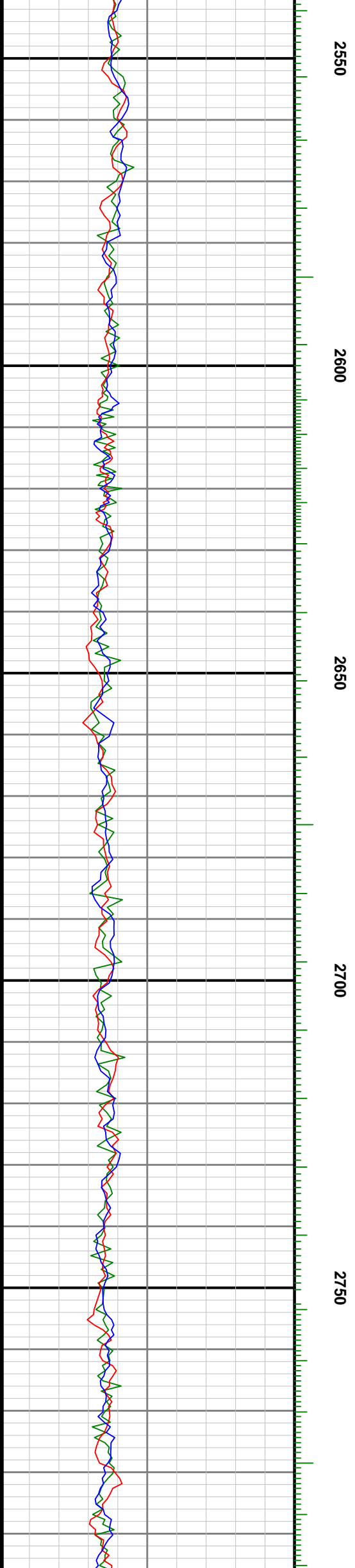
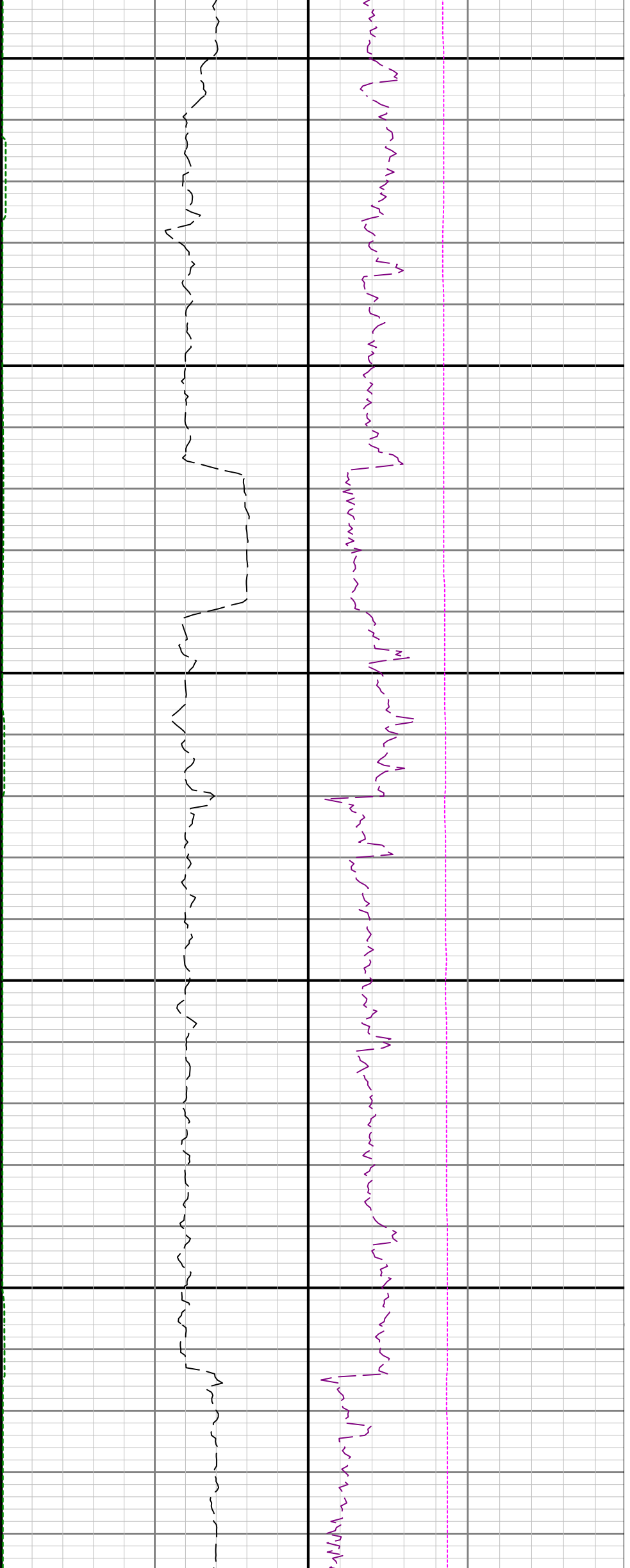
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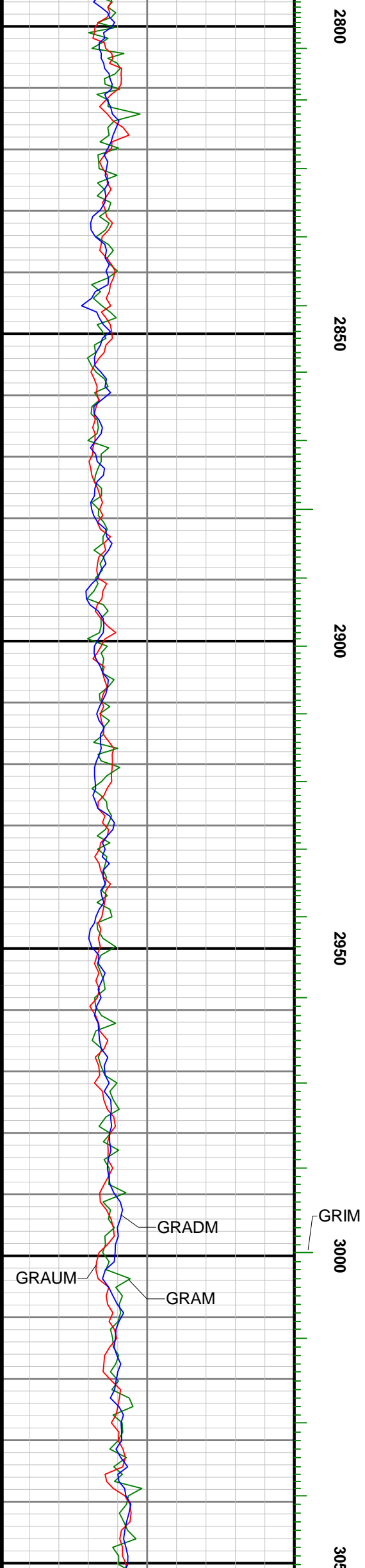
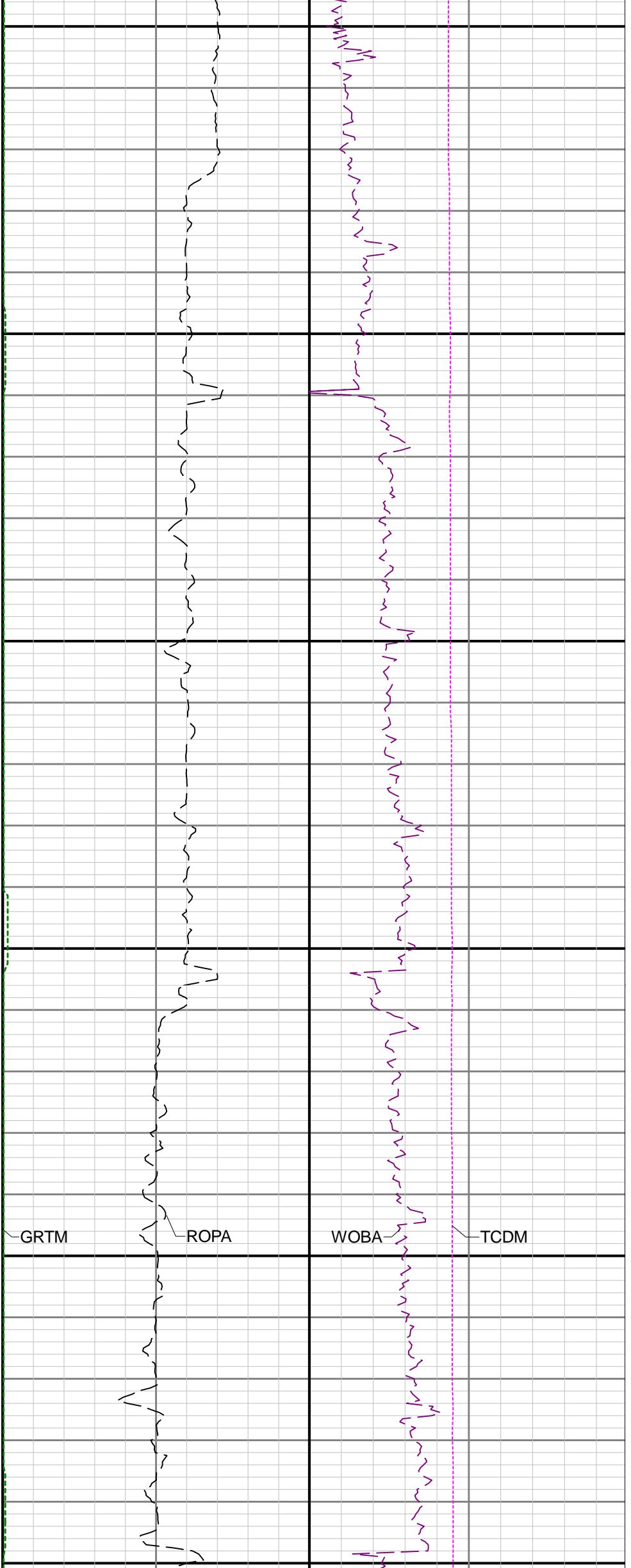
Gamma Ray - Apparent 0.5 ft Average GRAM	MD 1:240 feet	Depth Averaged ROP 3 ft Average ROPA	Weight On Bit, Average 1 ft Average WOBA
0 300		1000 0	0 50
API		ft/h	klb
Azimuthal Gamma Ray - Apparent - Up Quadrant 0.5 ft Average GRAUM		Gamma Time Since Drilled GRTM	Downhole Temperature TCDM
0 300		0 600	0 300
API		min	degF
Azimuthal Gamma Ray - Apparent - Down Quadrant 0.5 ft Average GRADM			
0 300			
API			
True Vertical Depth TVD			
7500 6500			
ft			

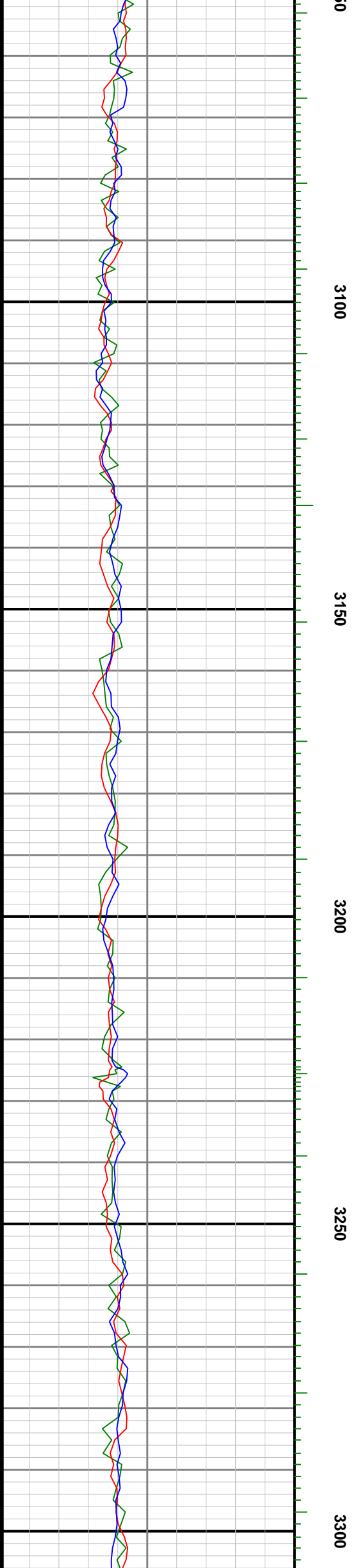
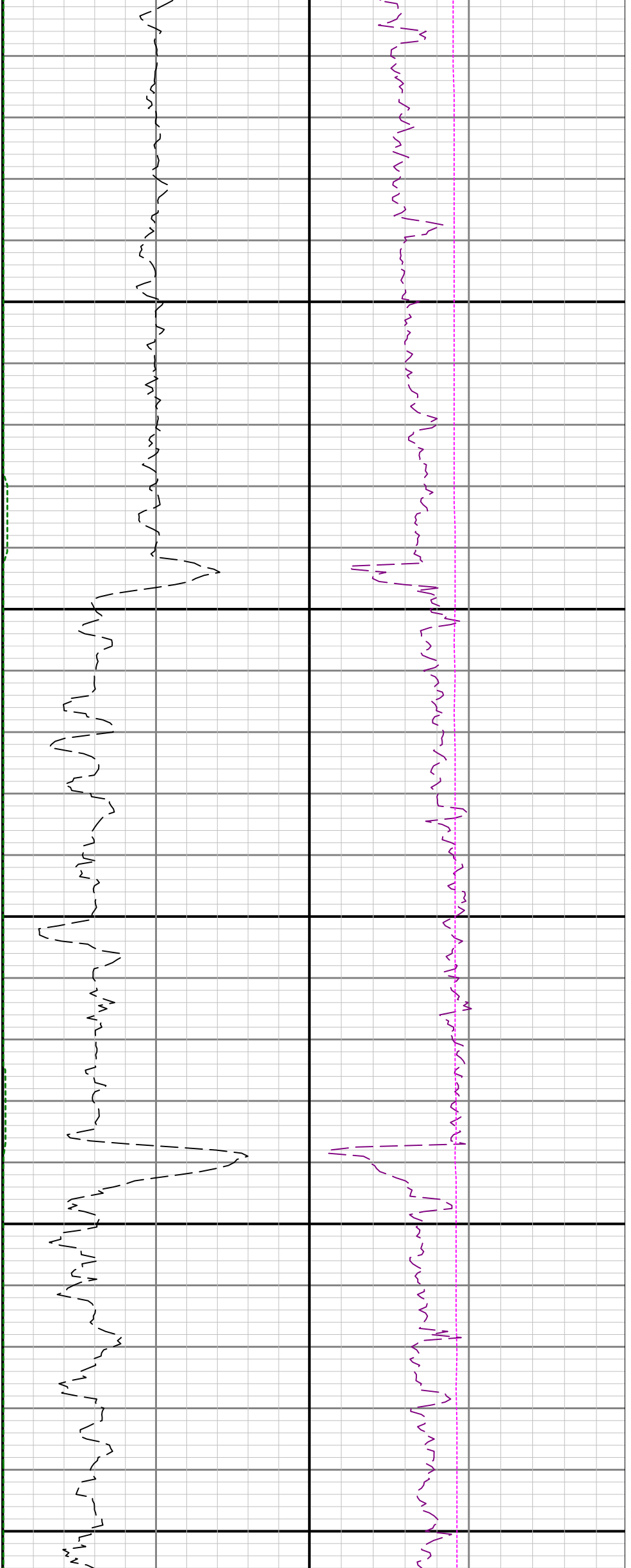


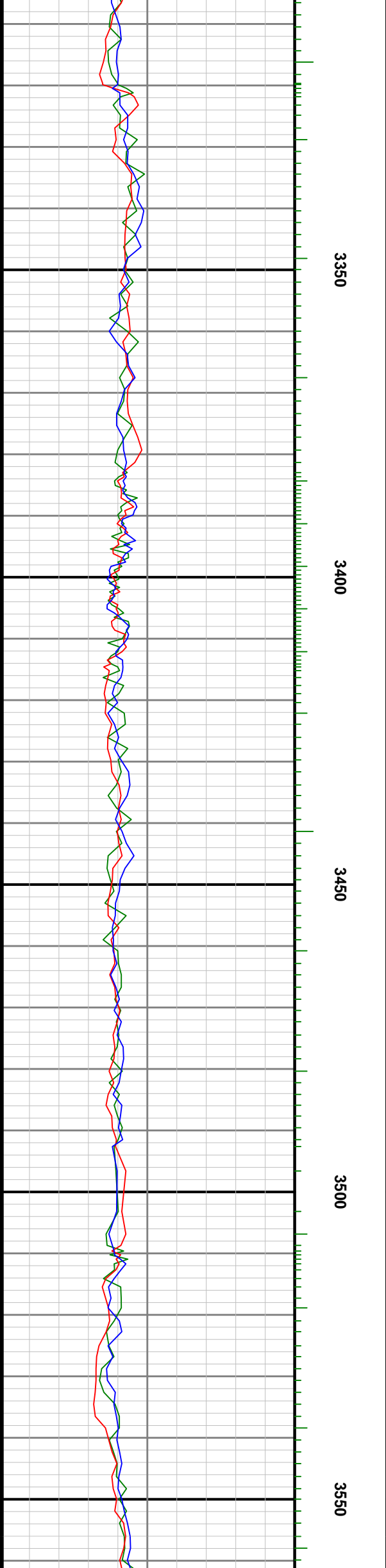
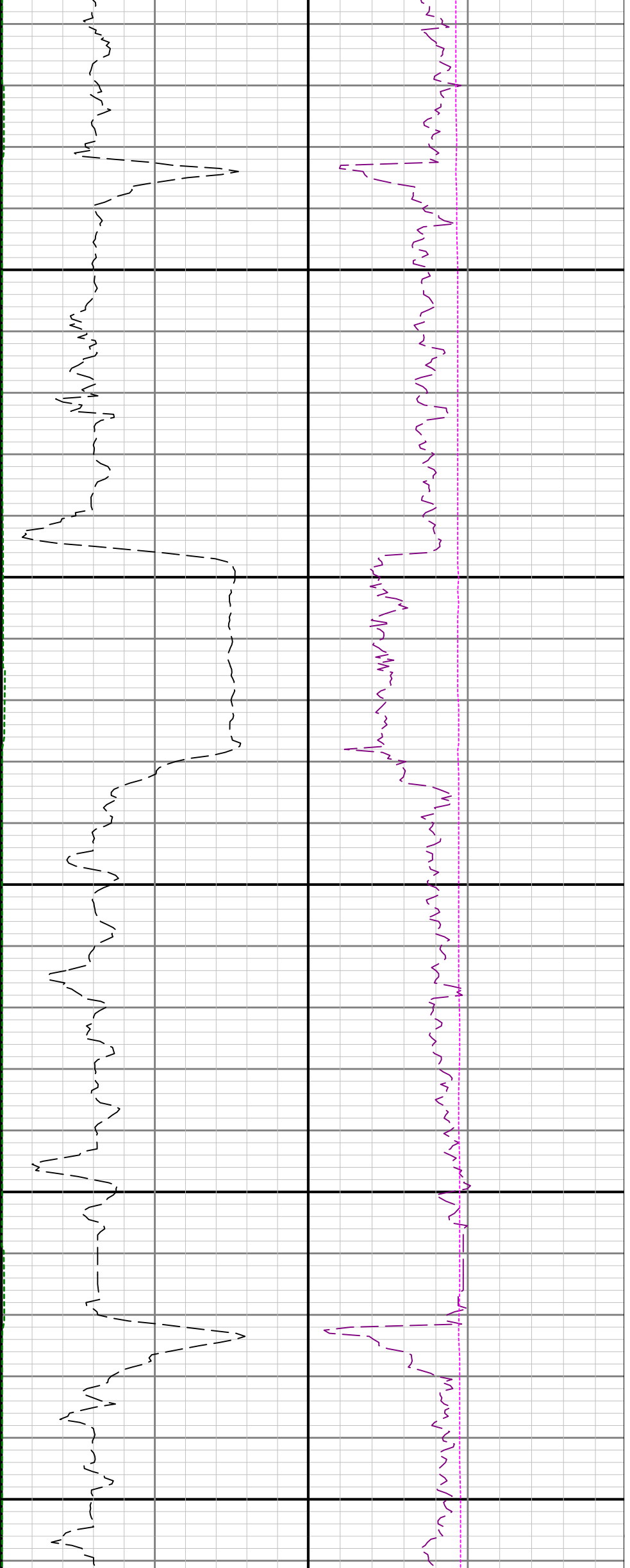


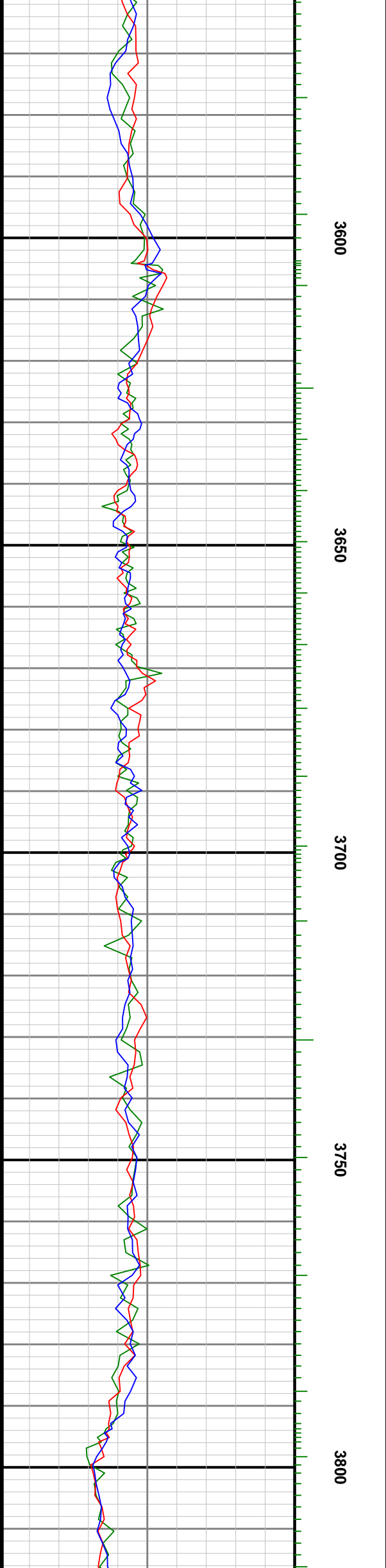
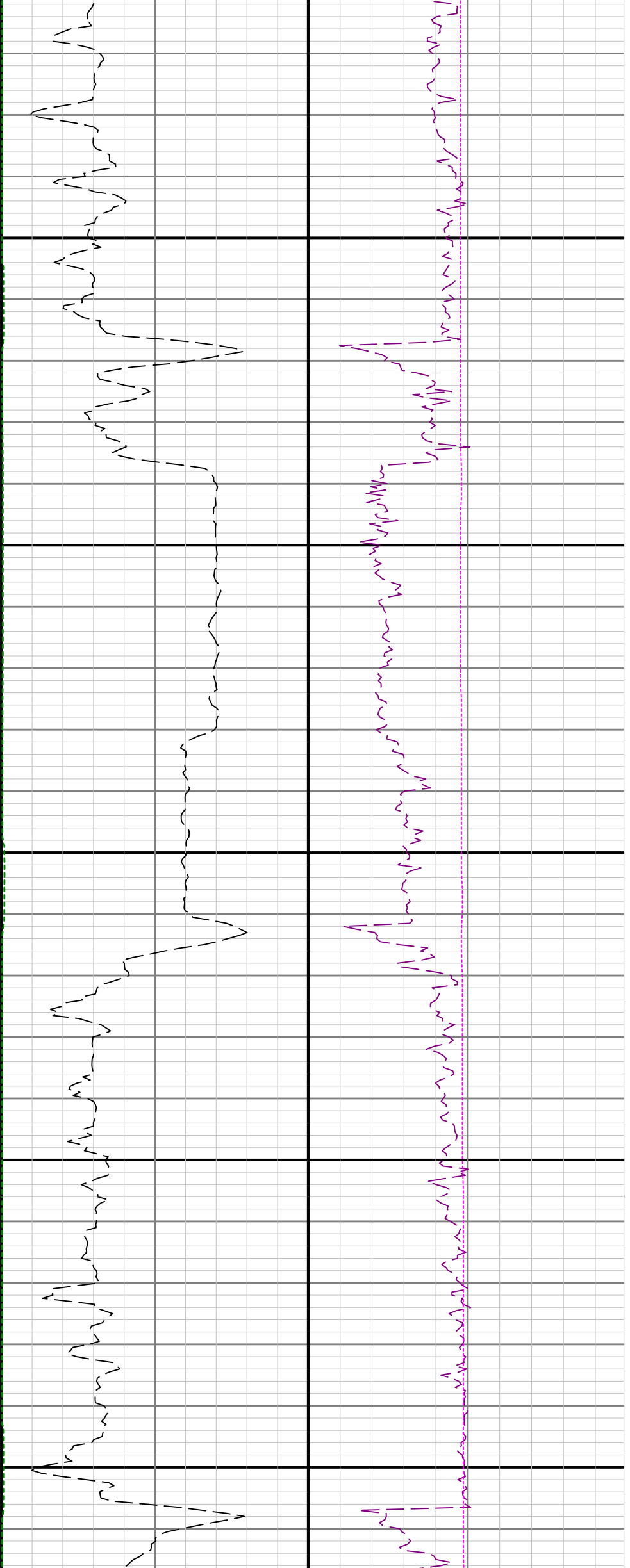


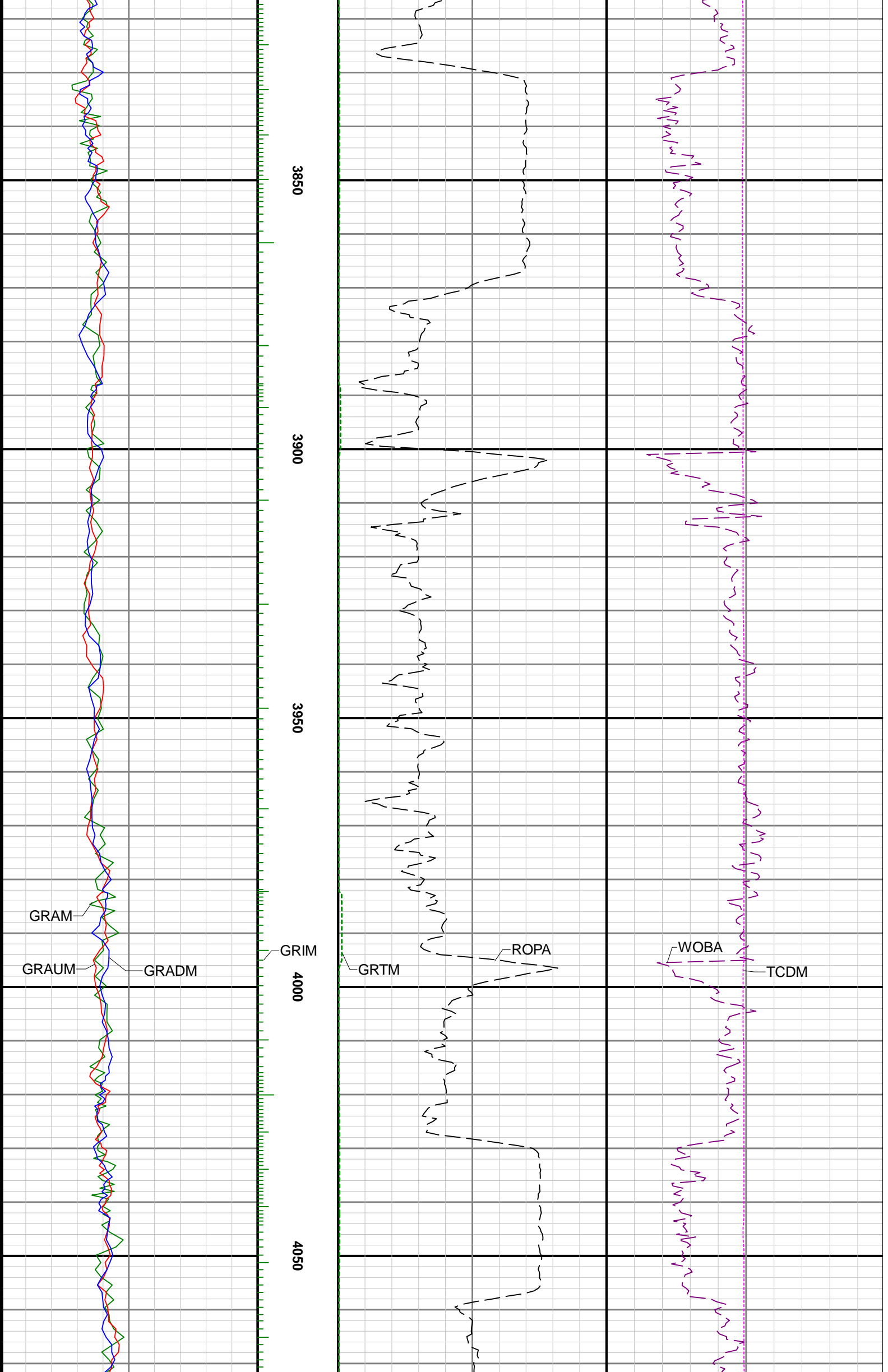


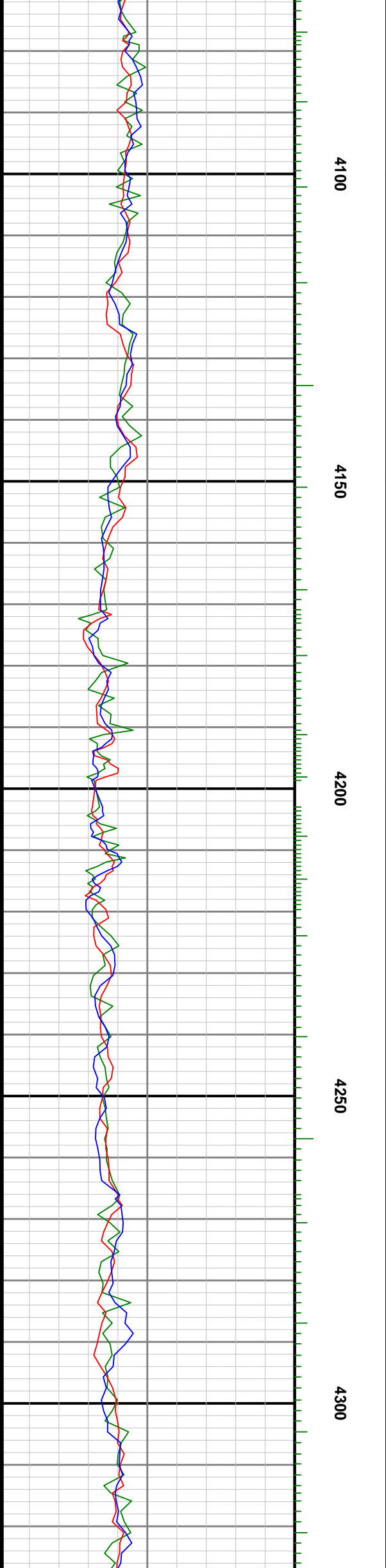
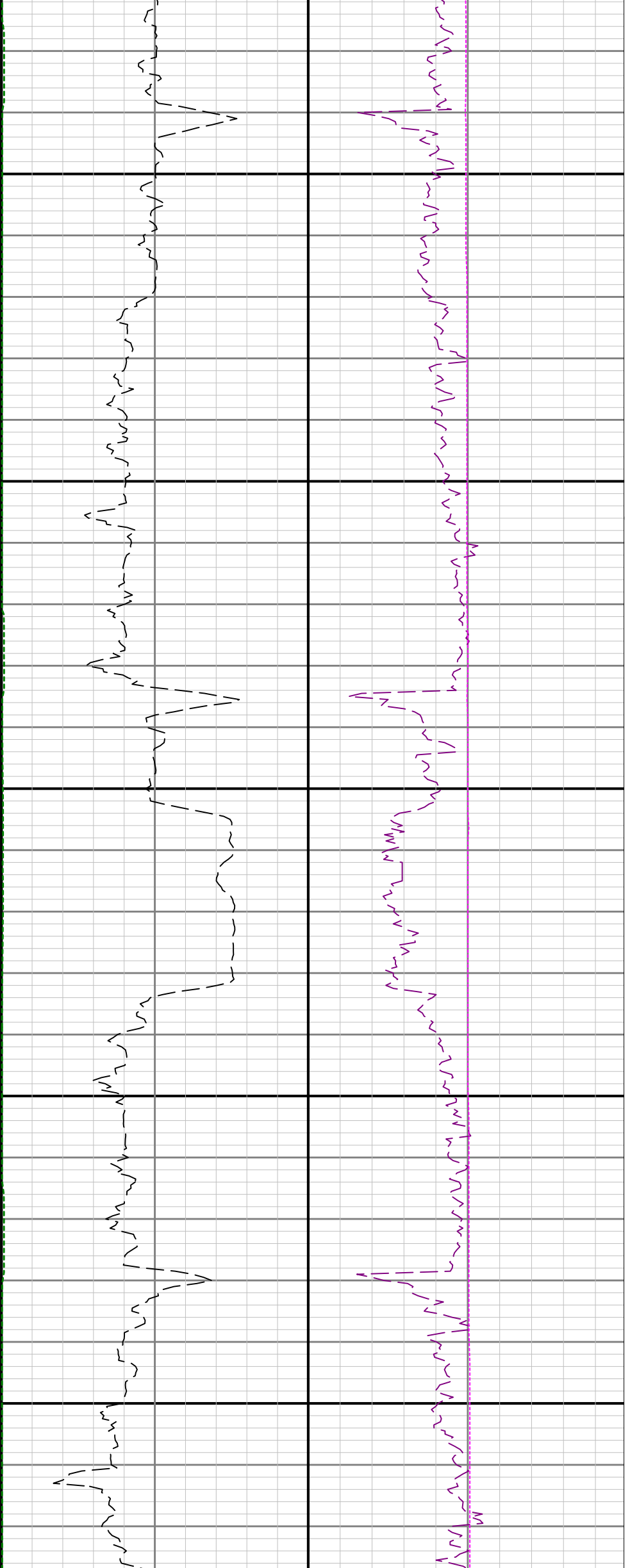


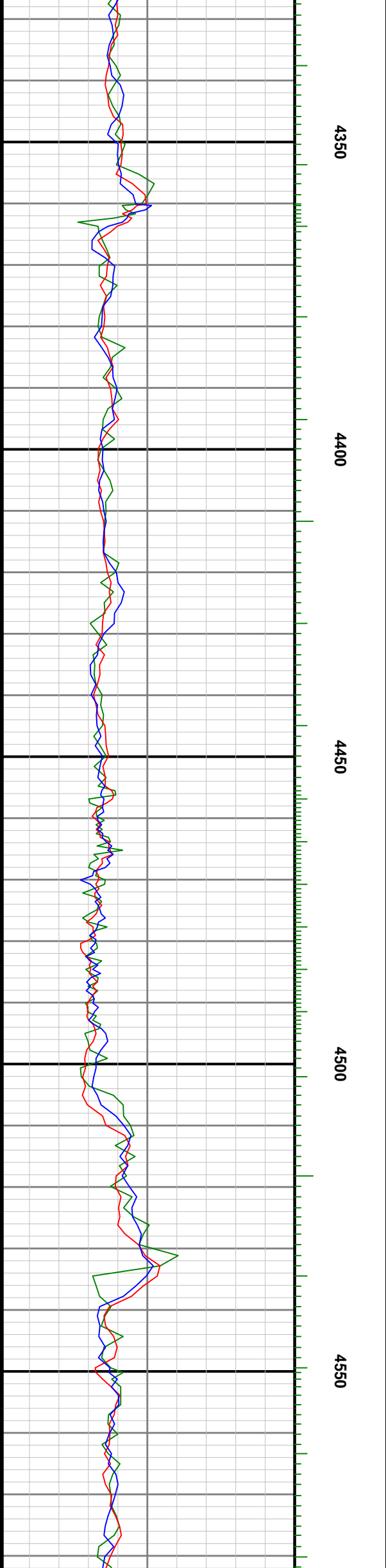
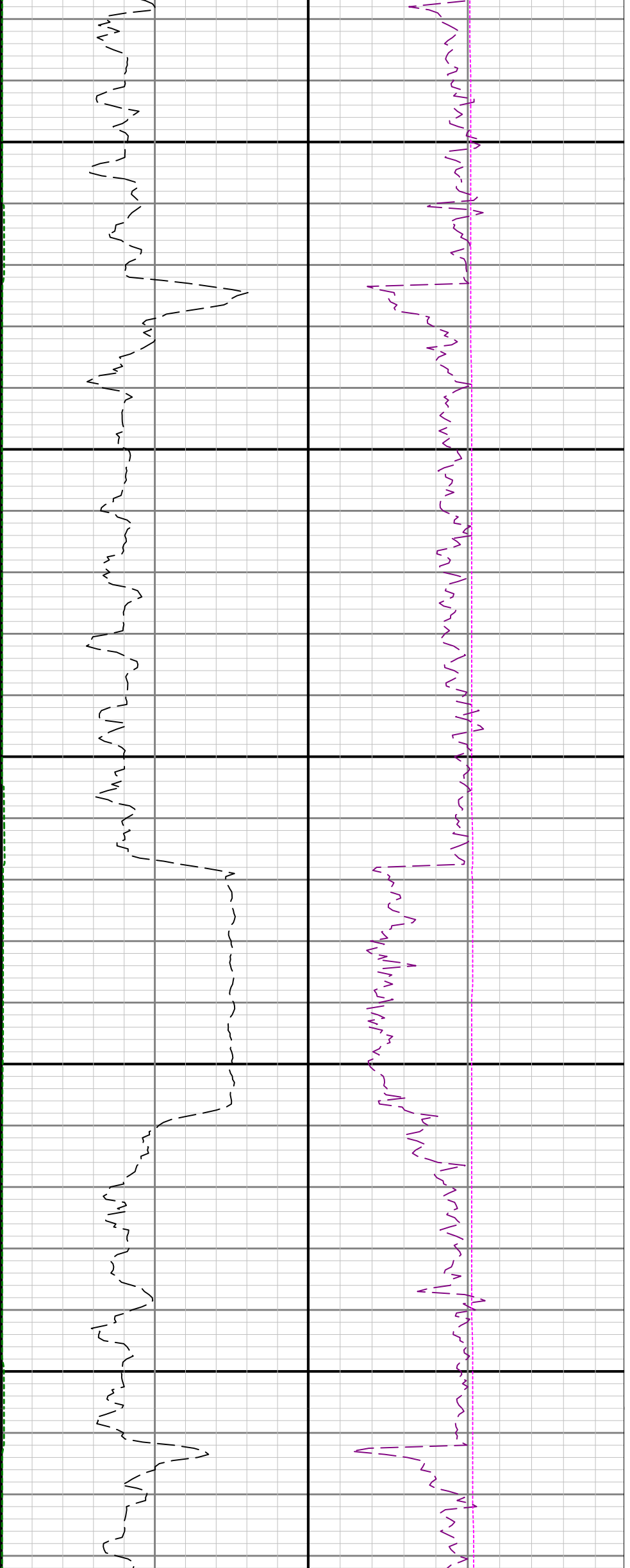


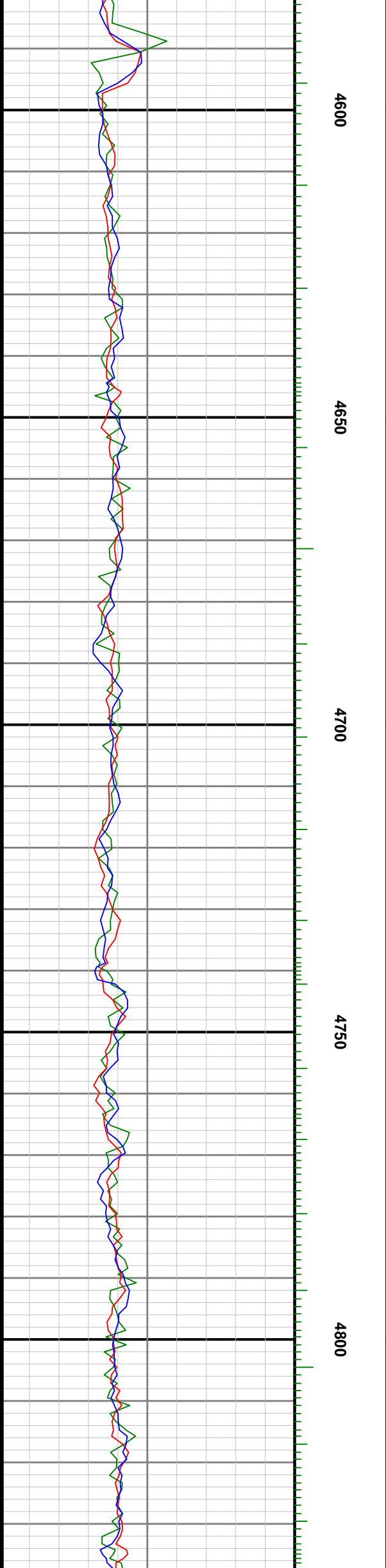
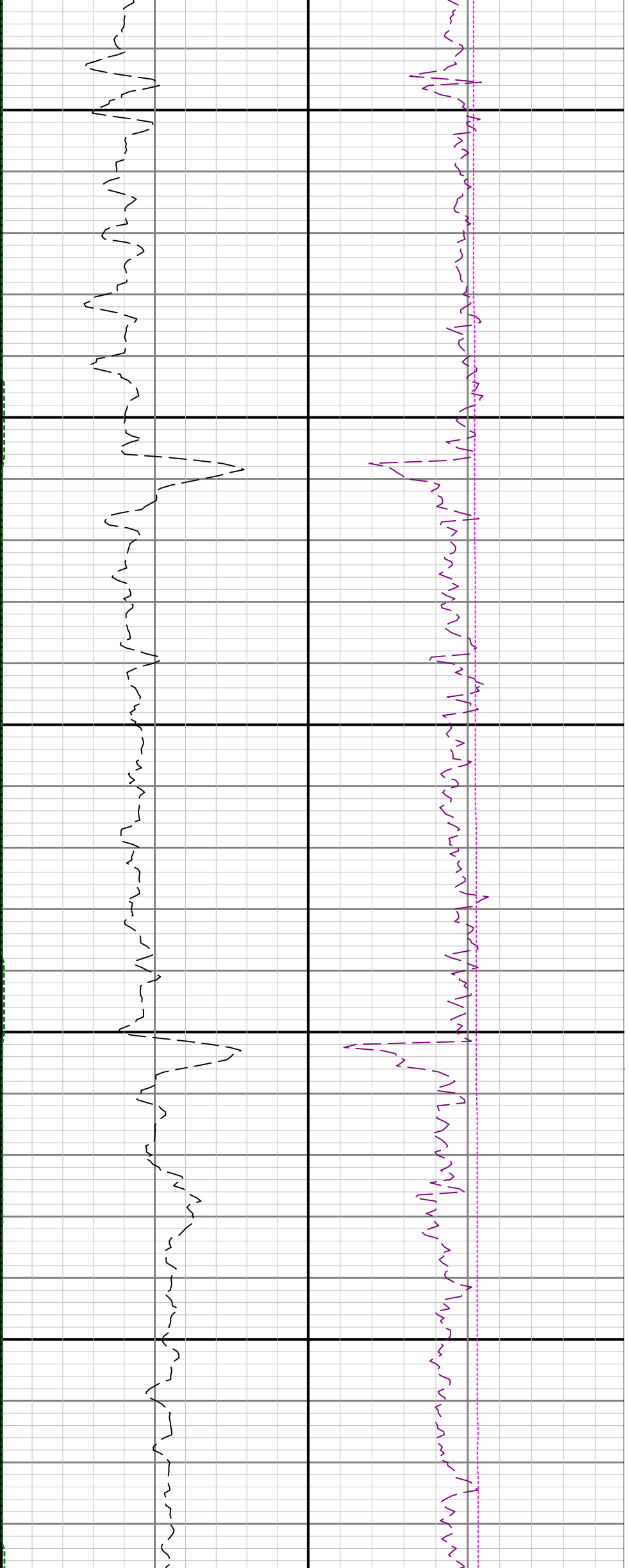


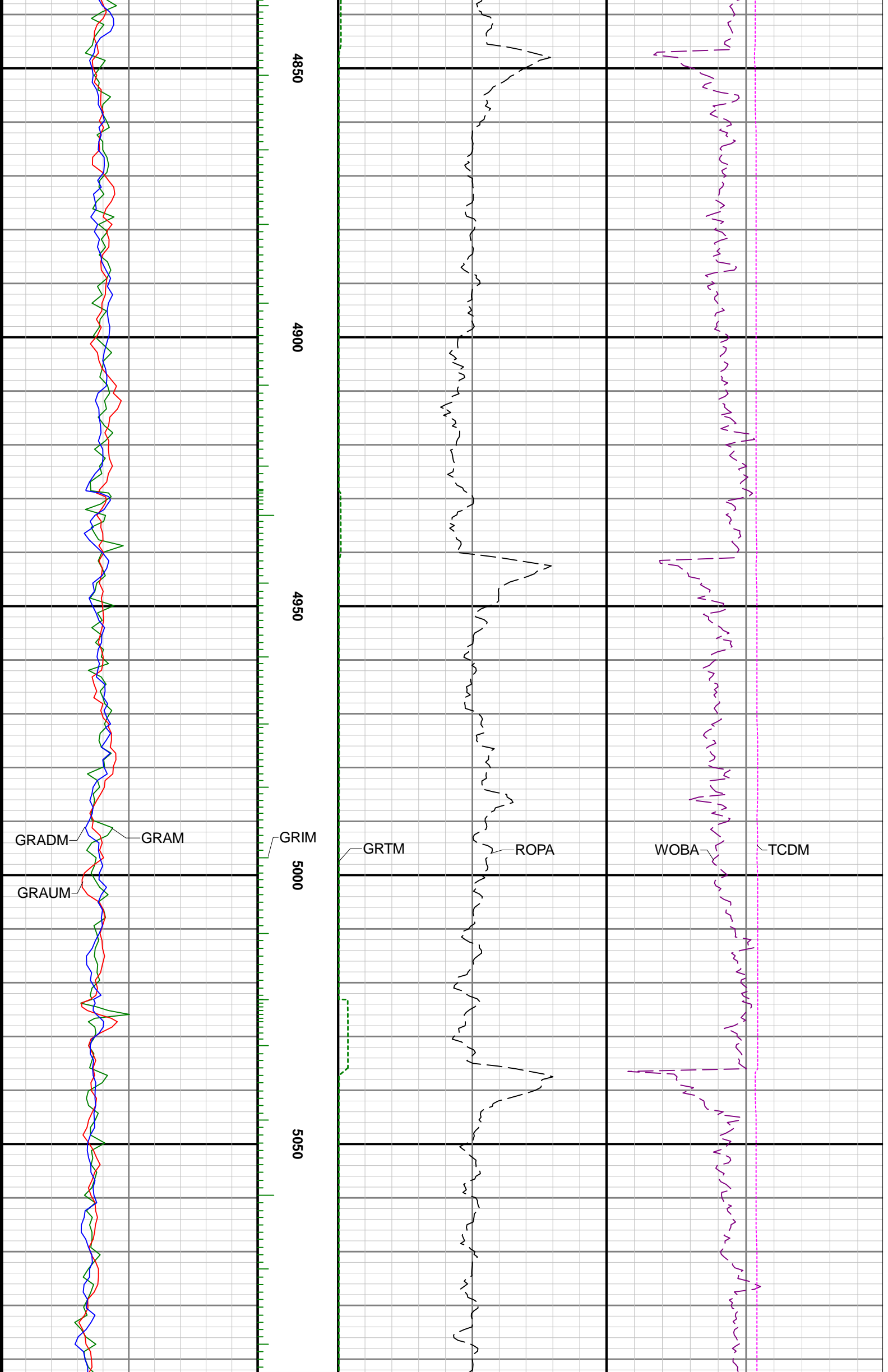


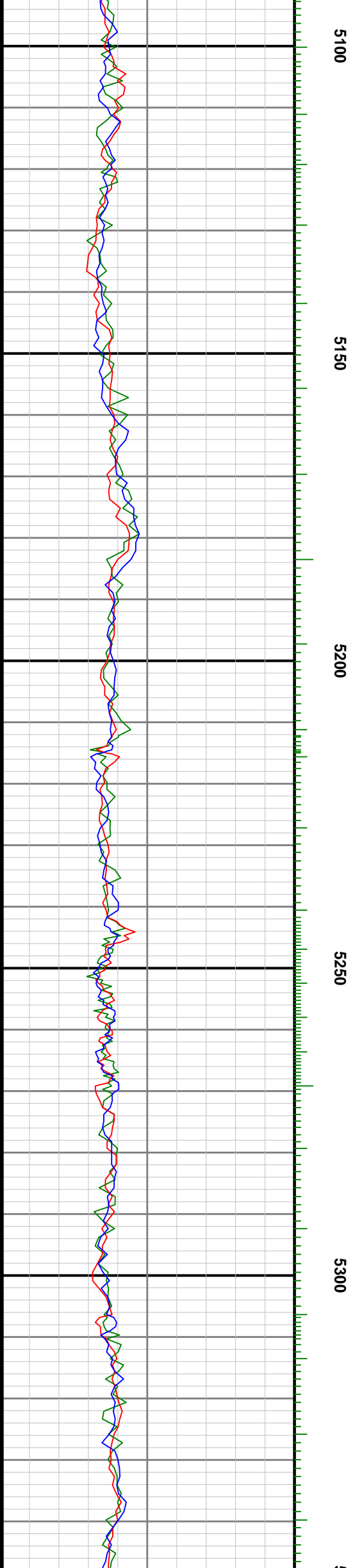
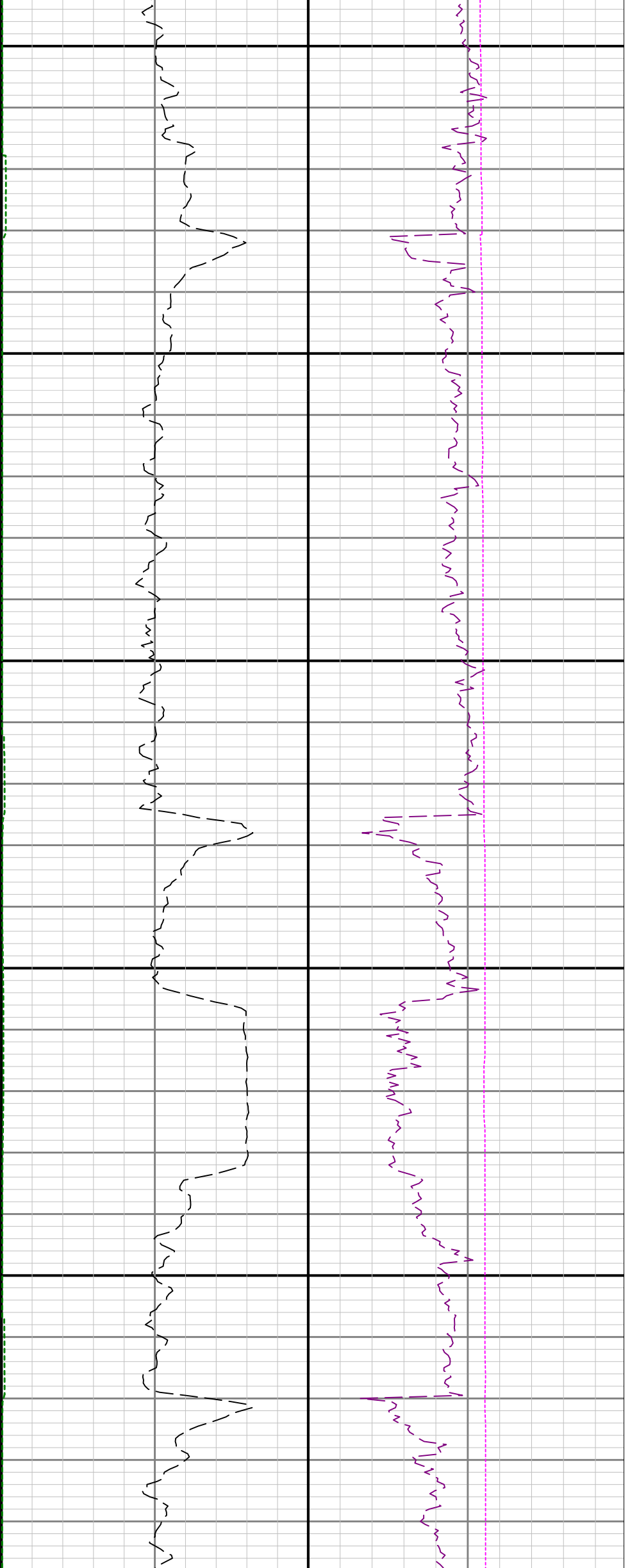


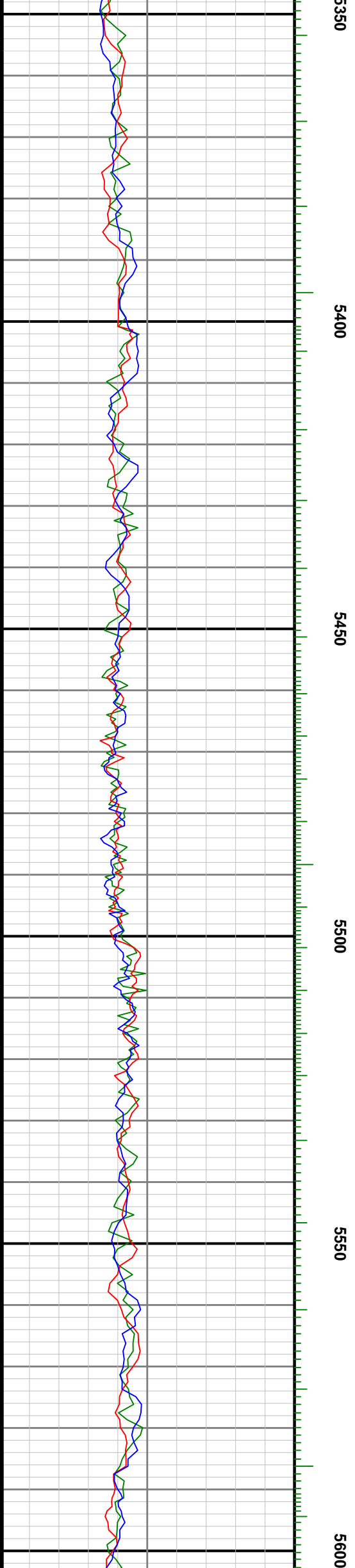
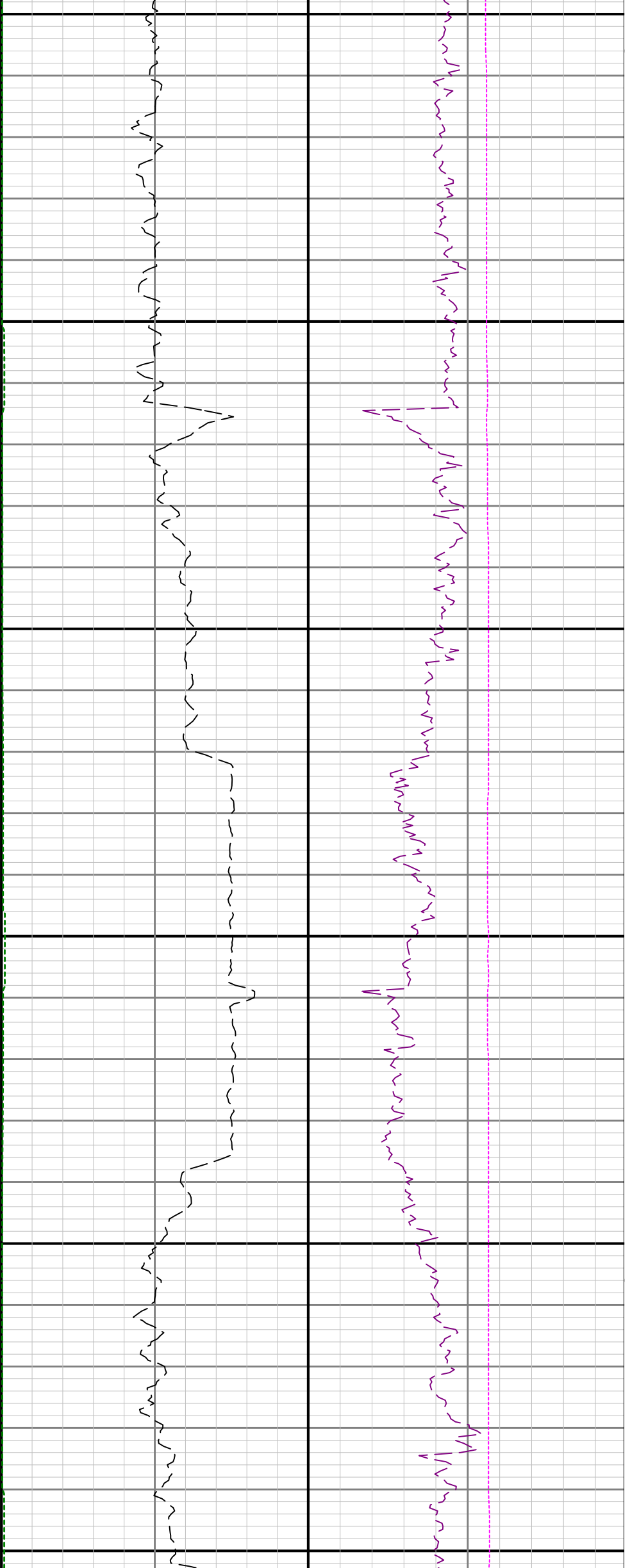


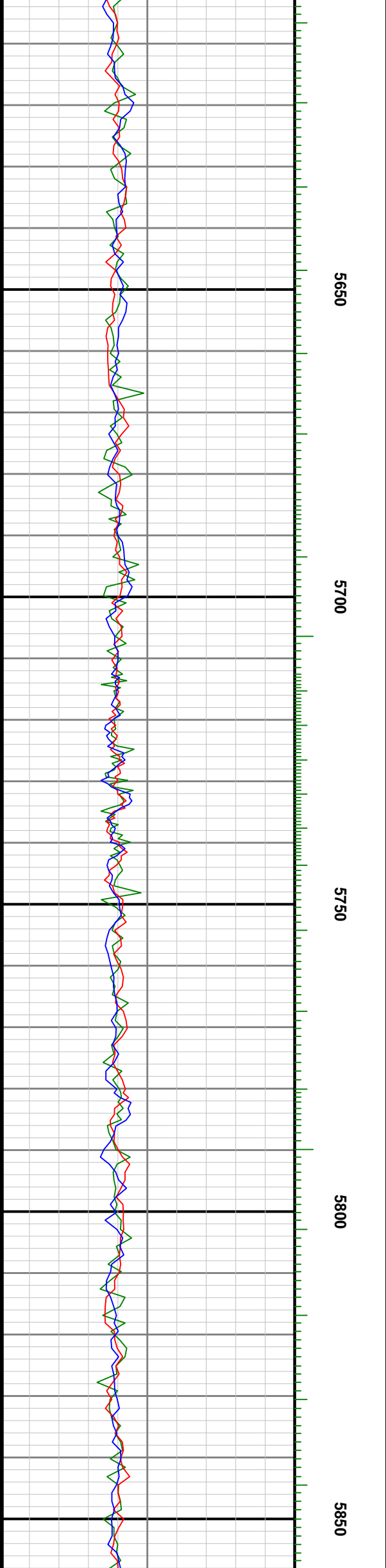
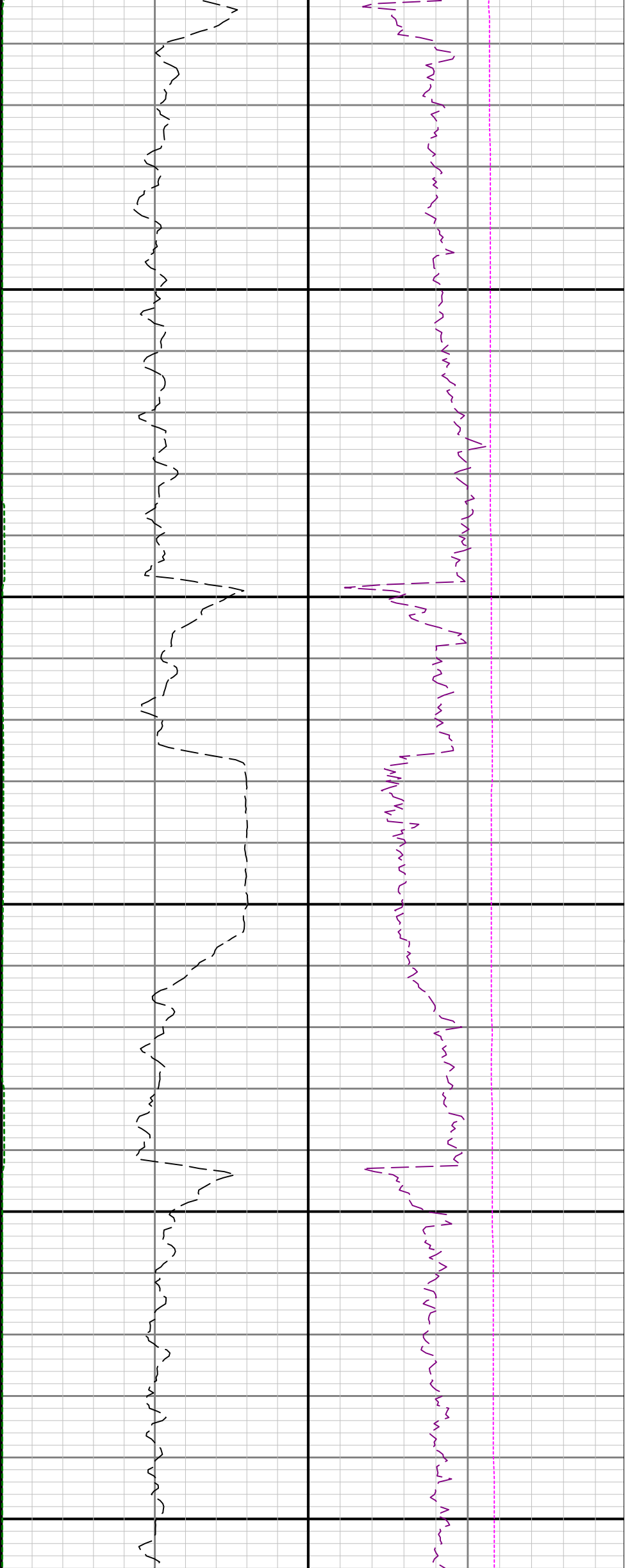


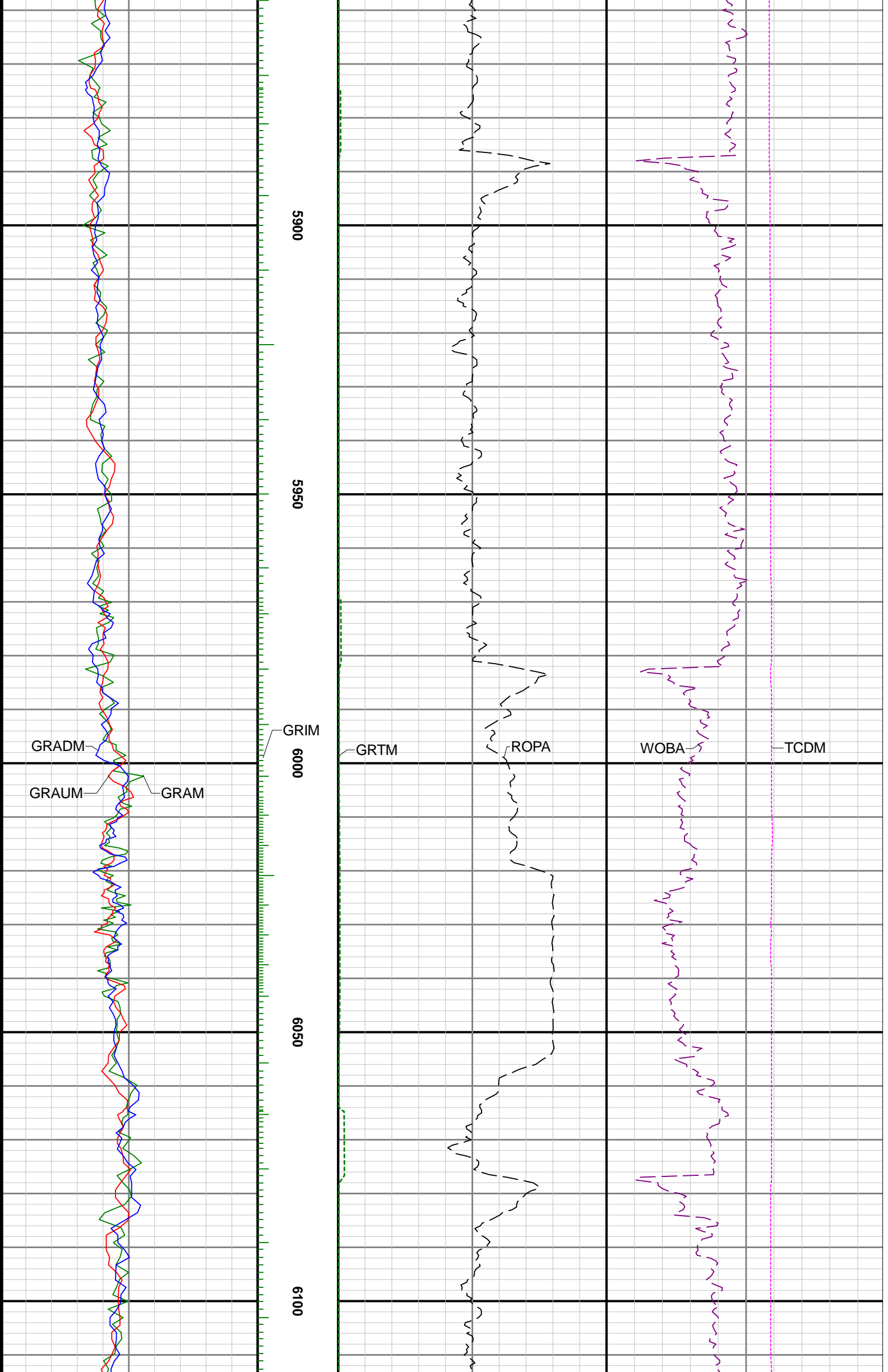


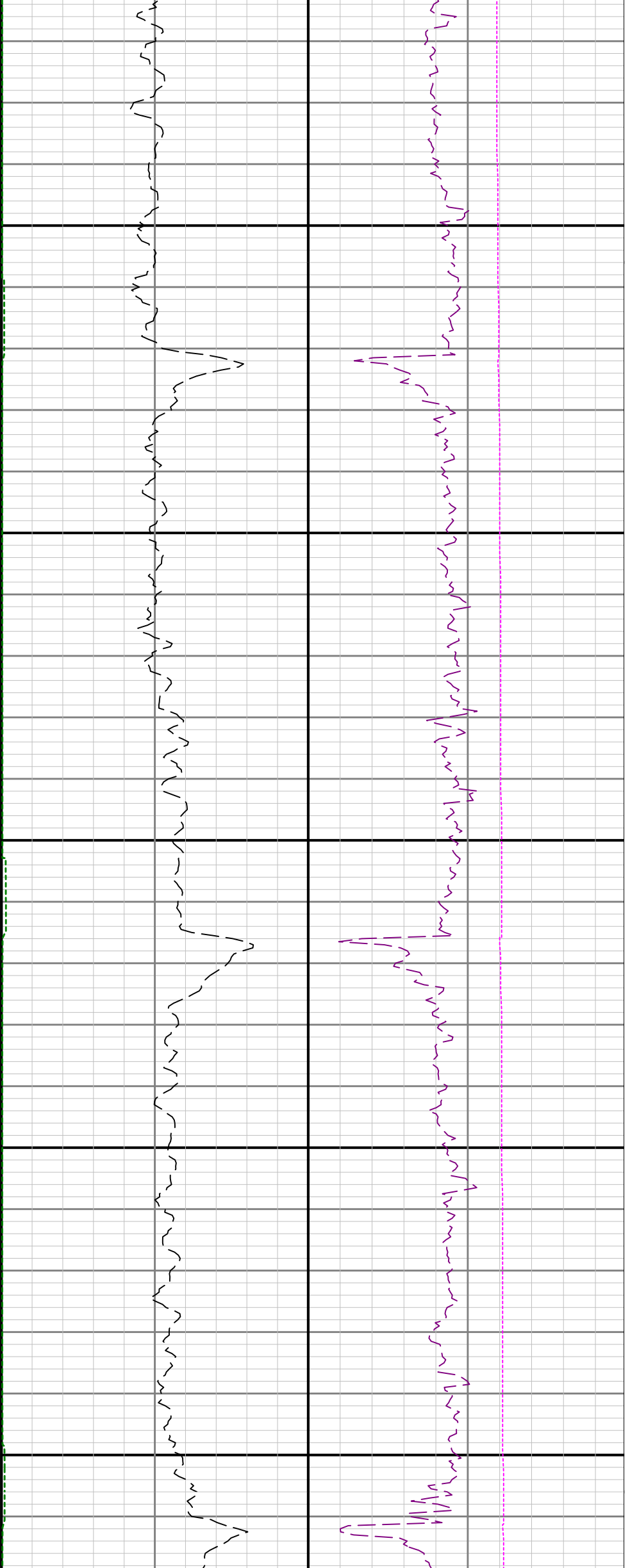












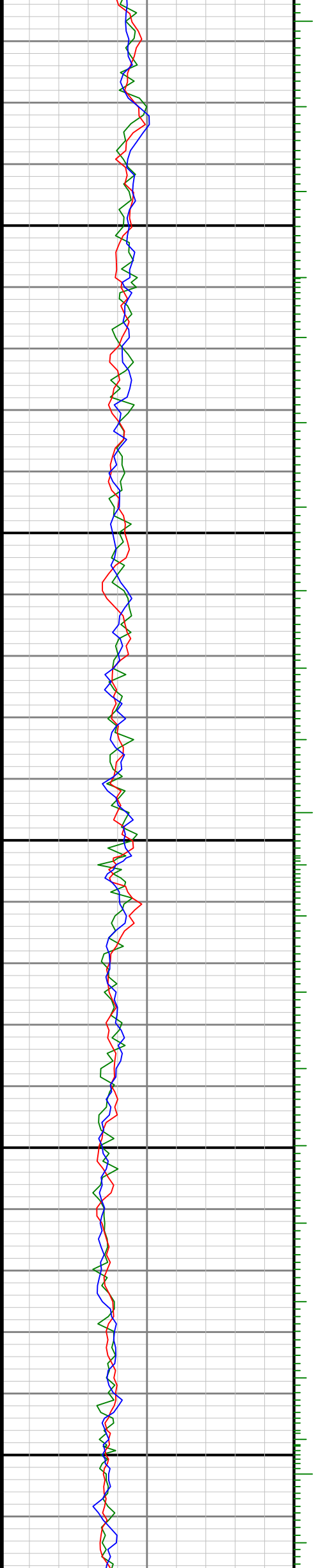
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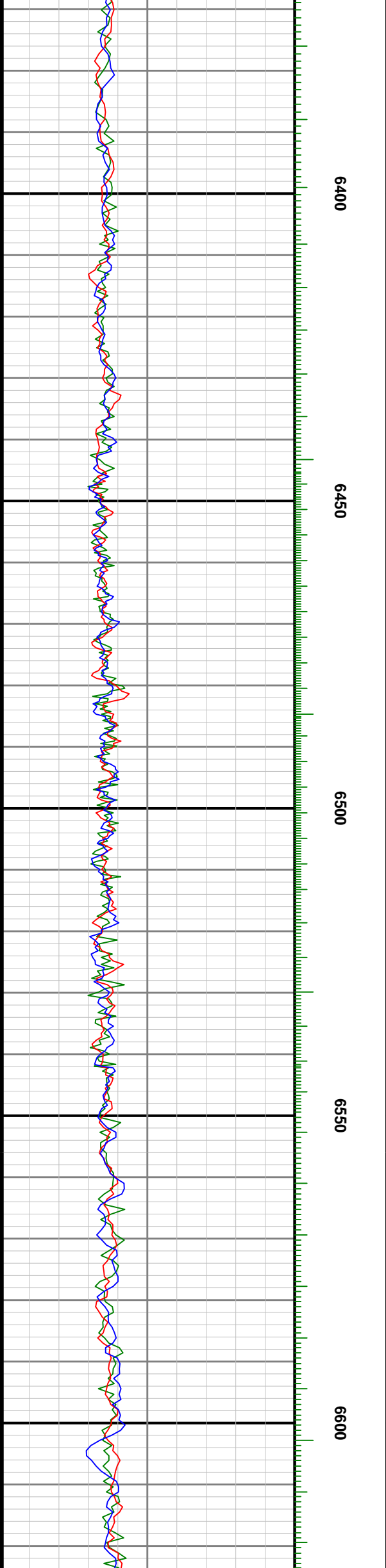
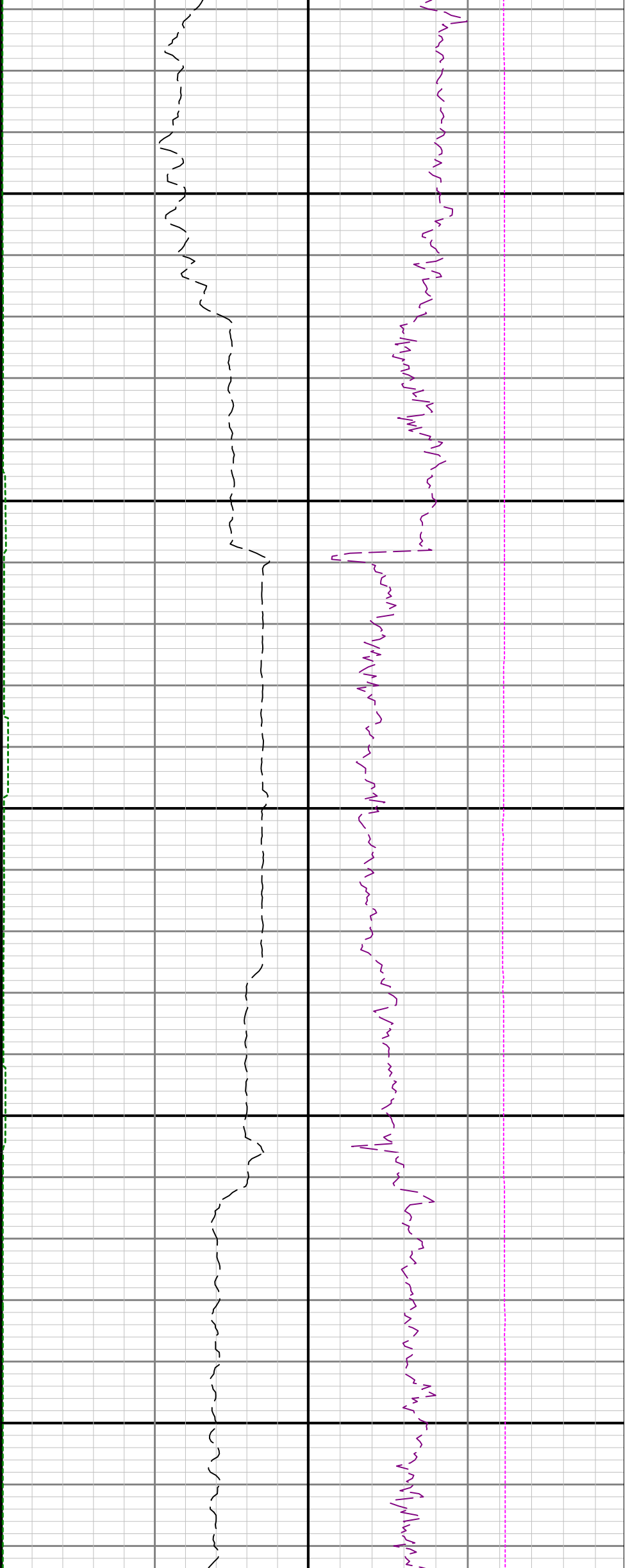
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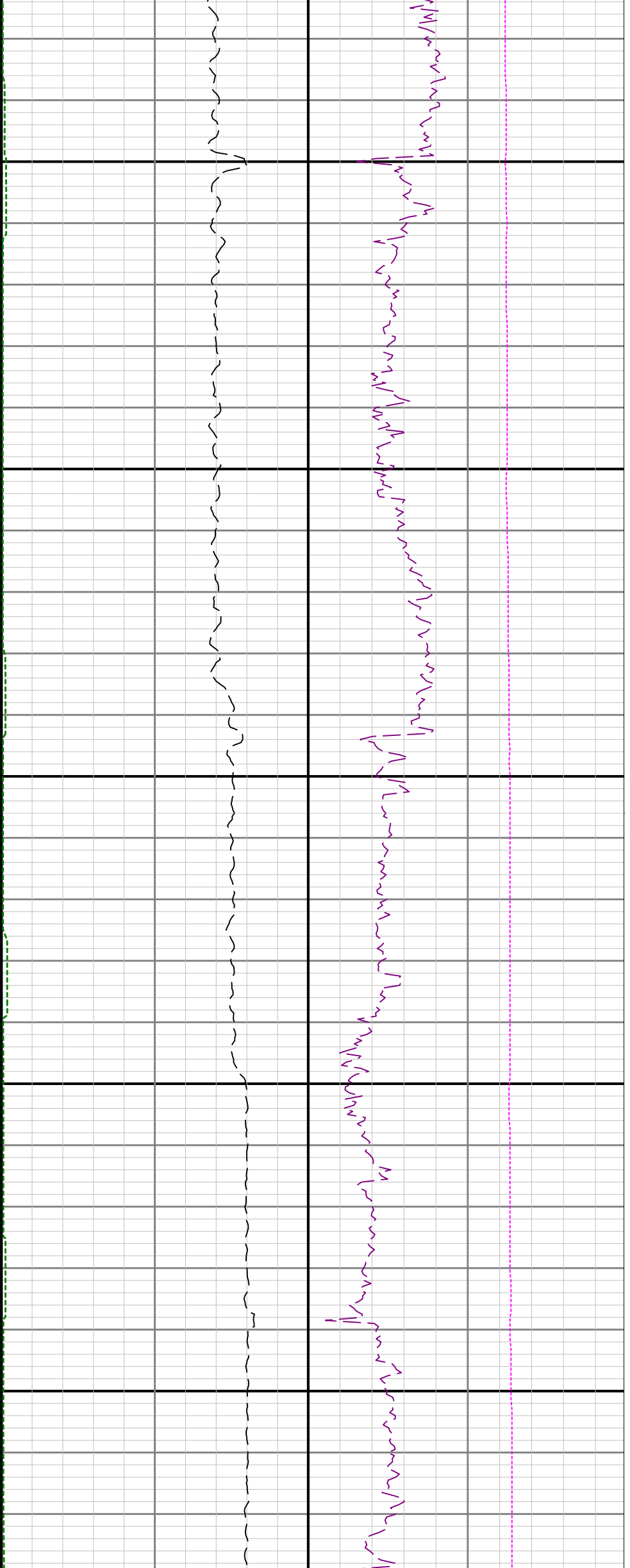
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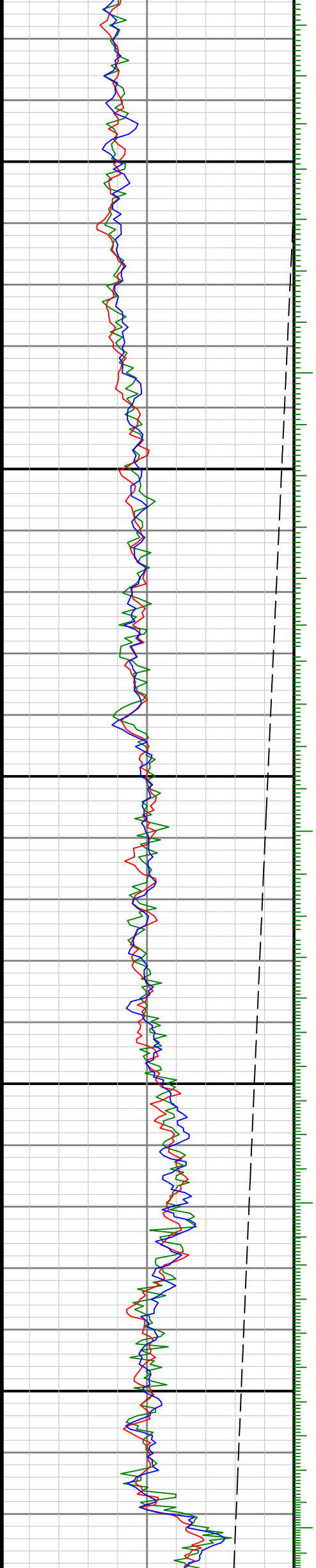
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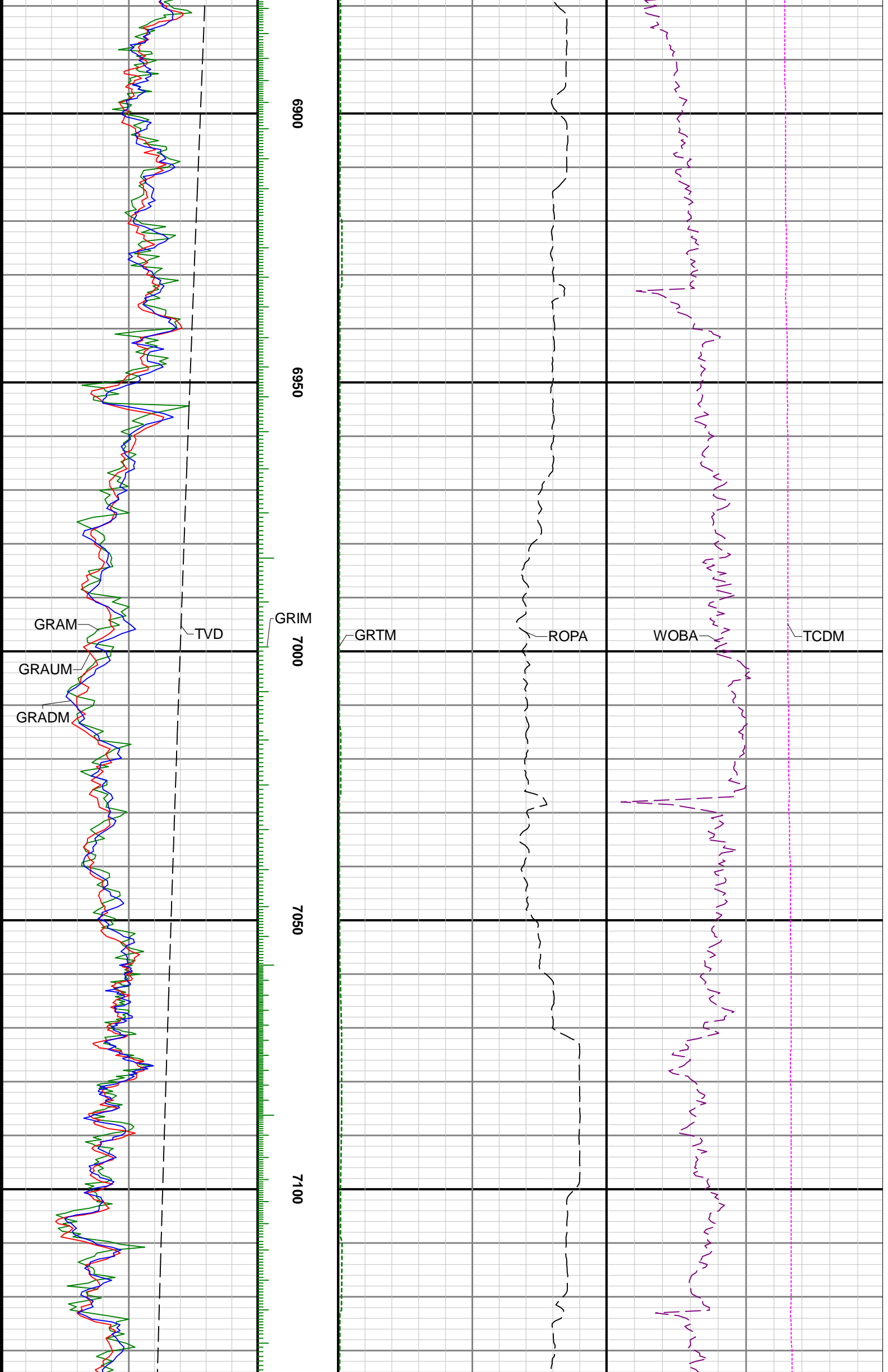
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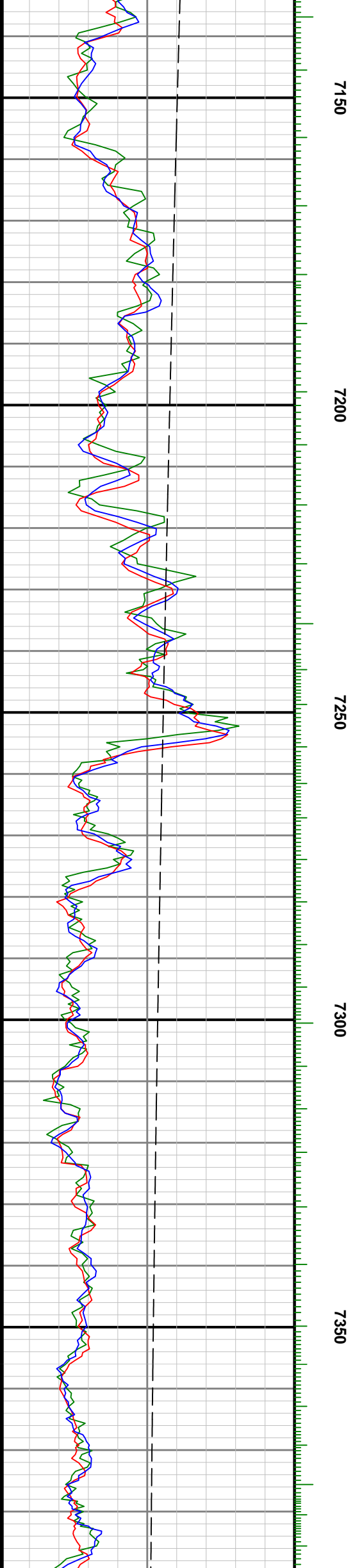
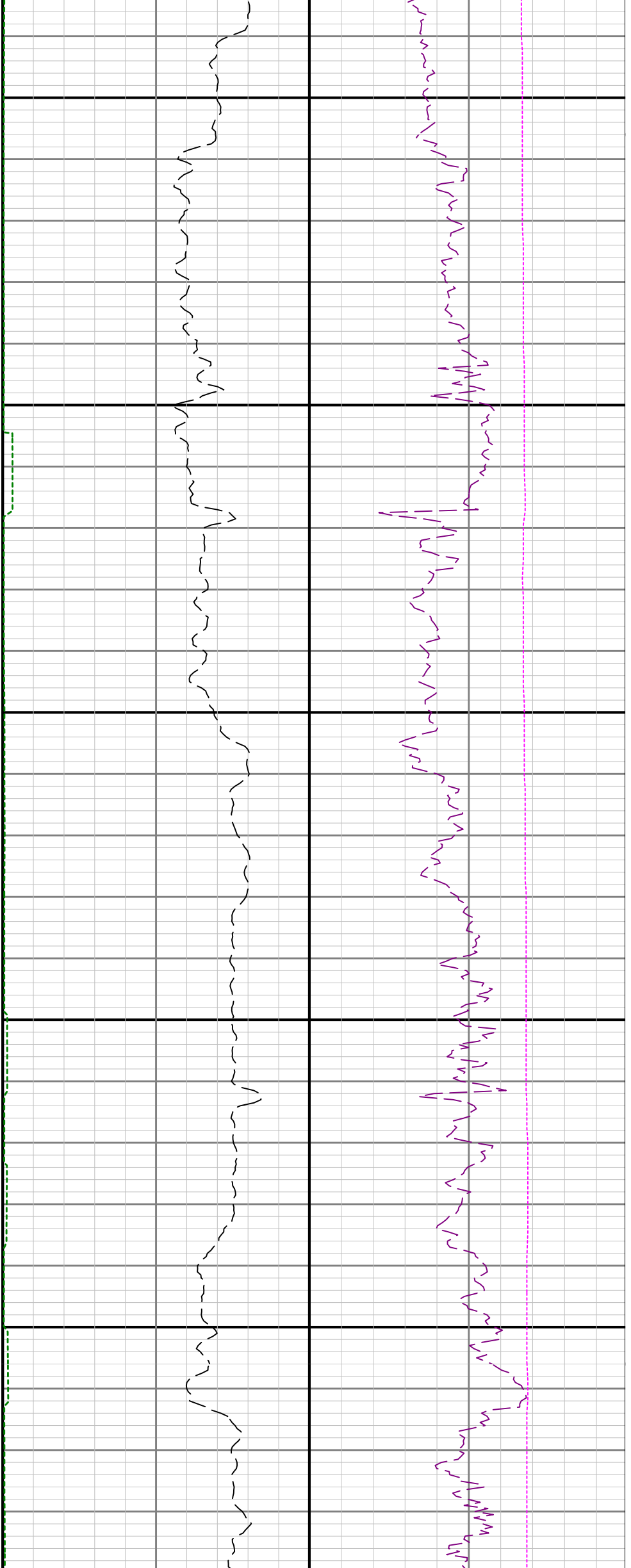
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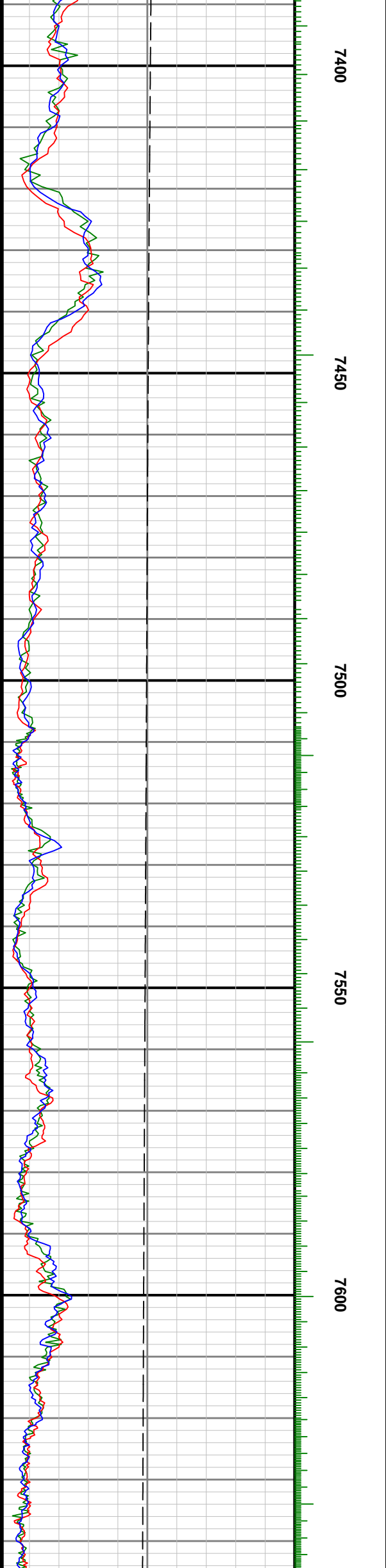
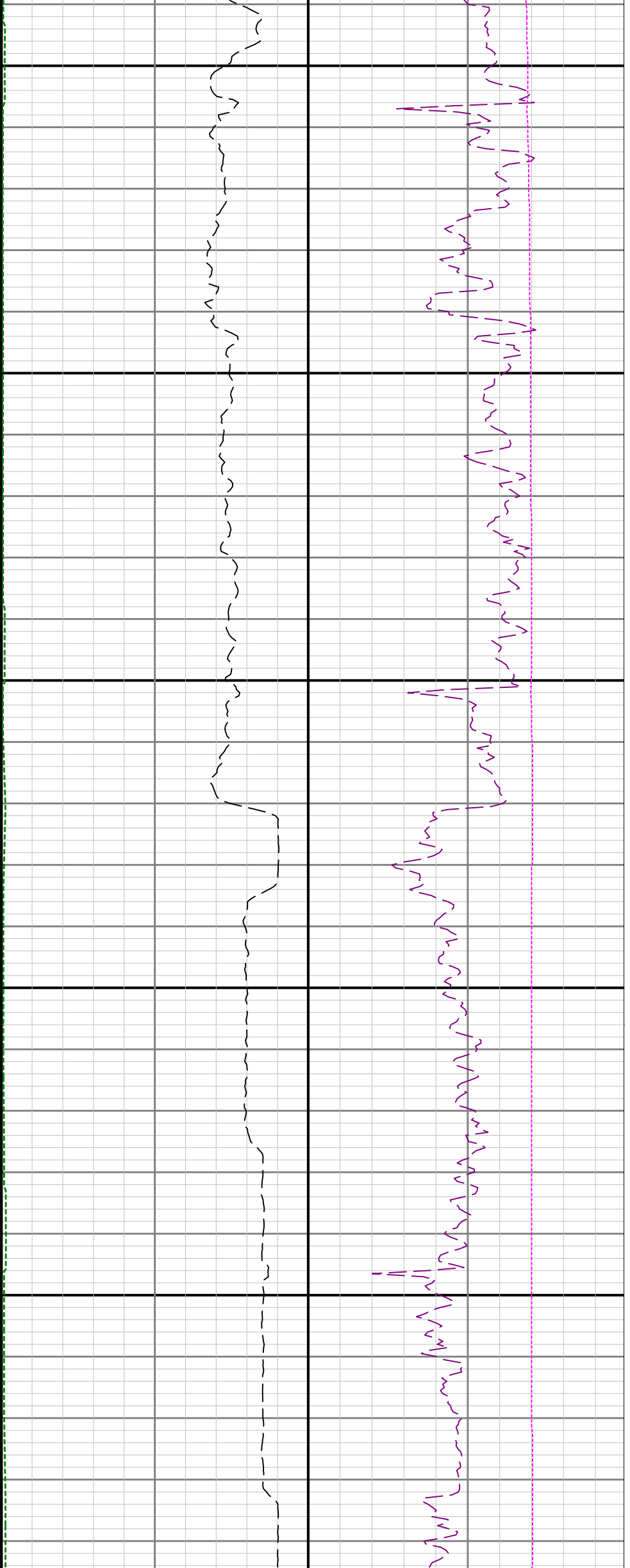
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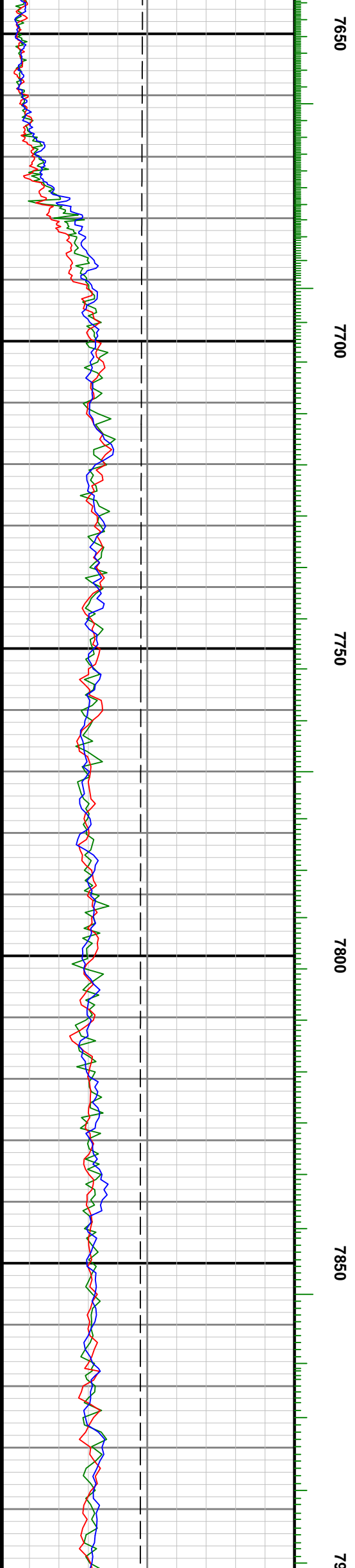
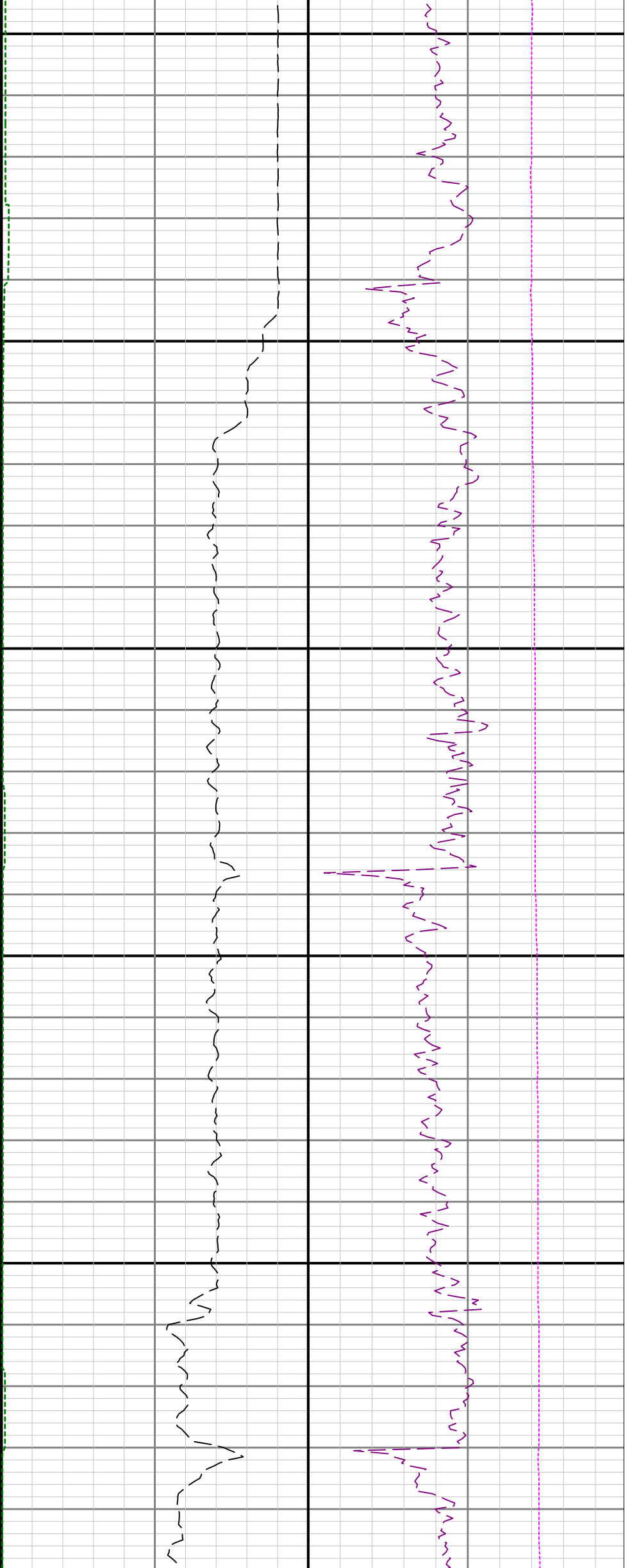
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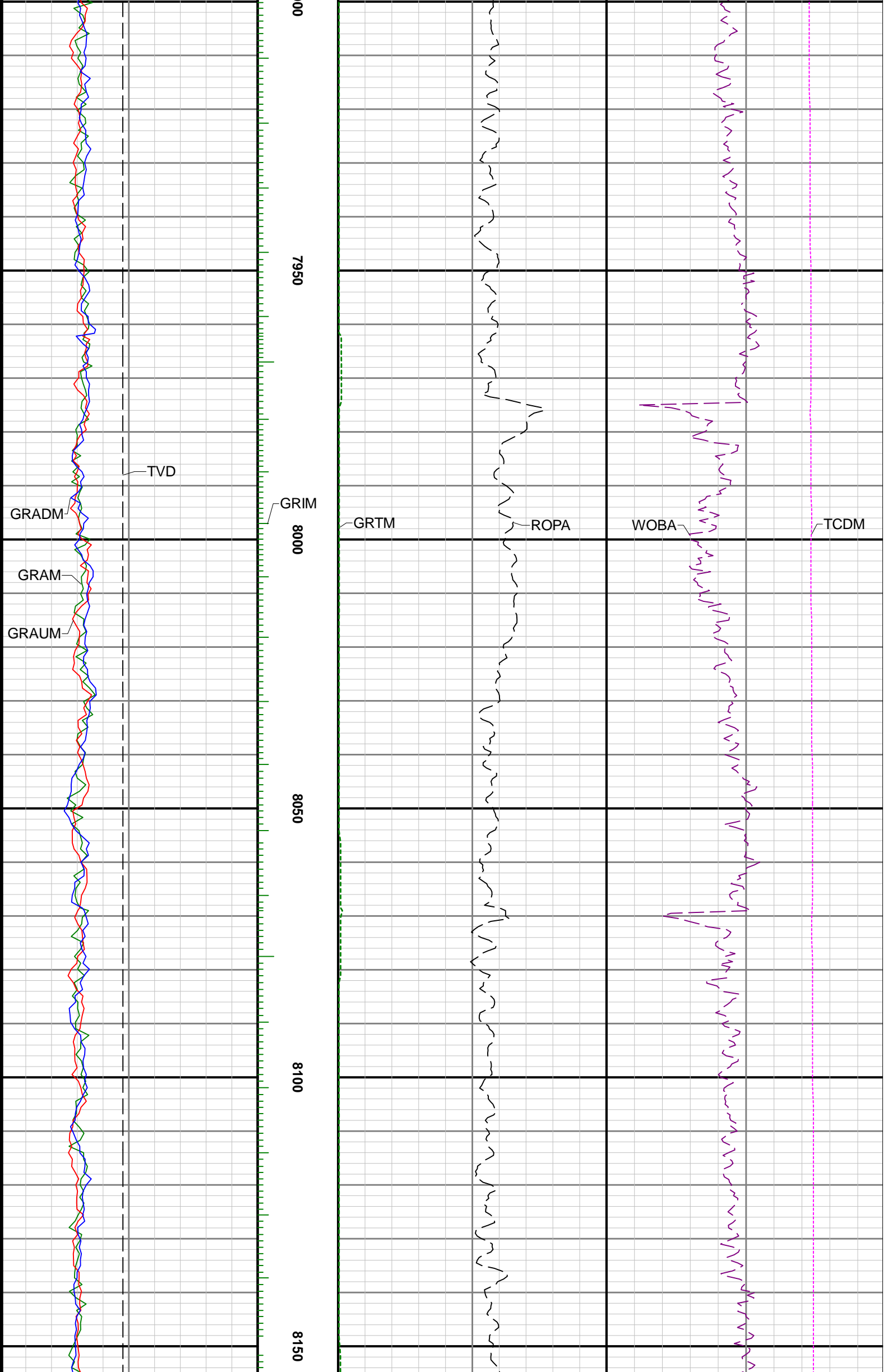


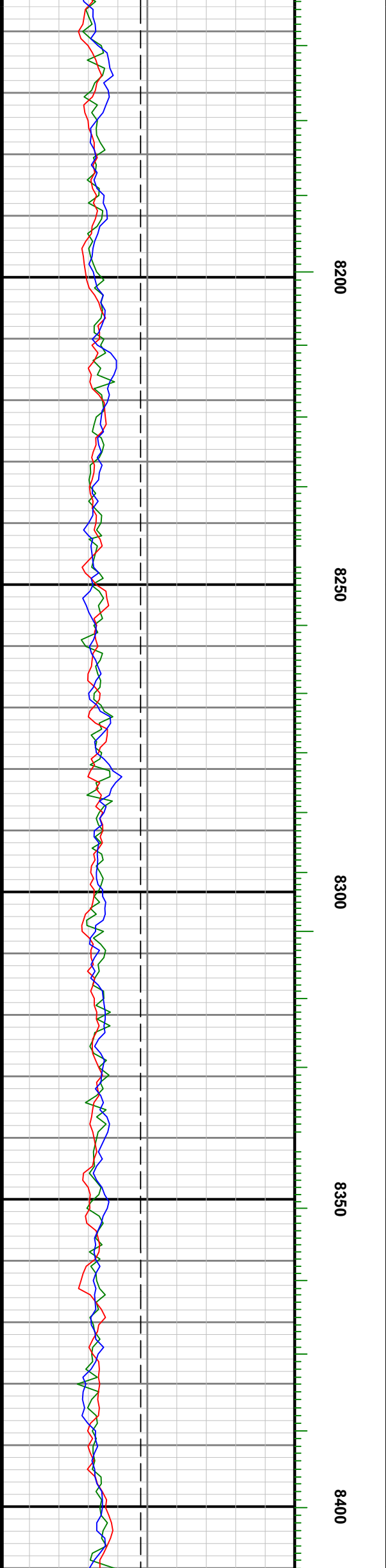
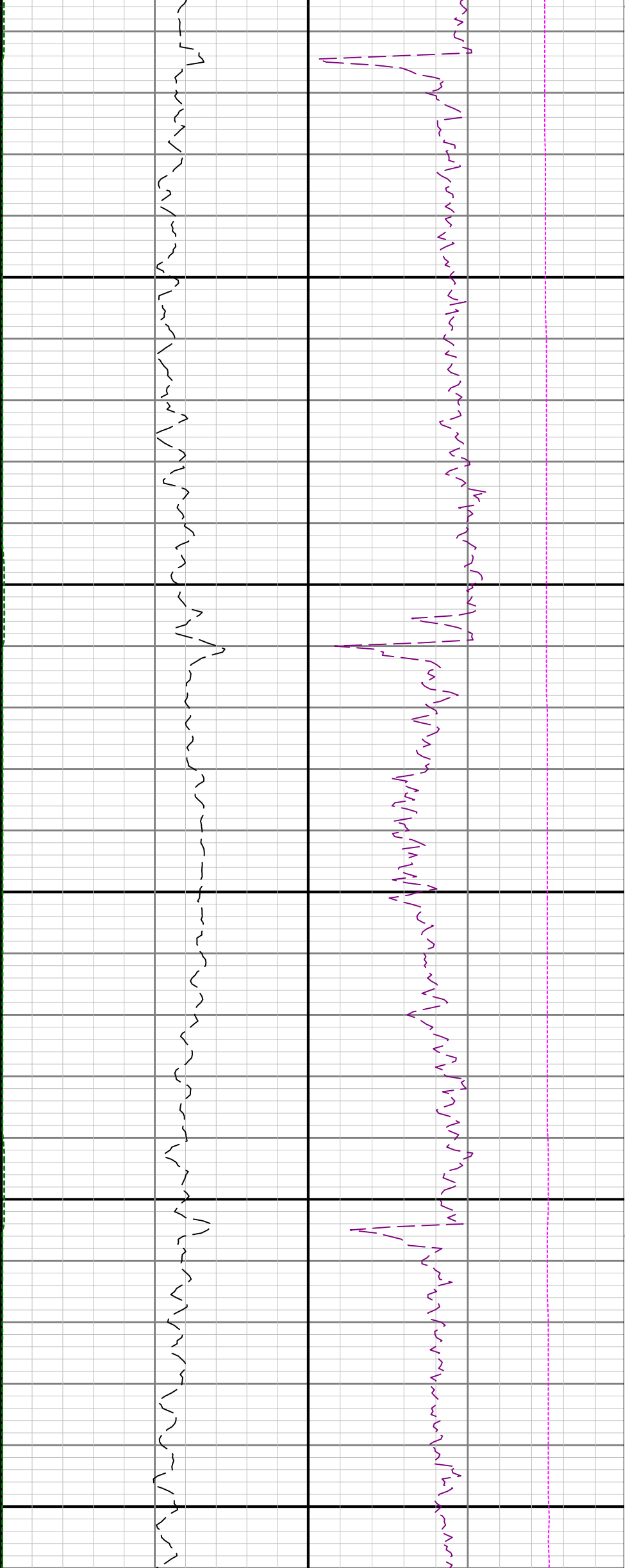


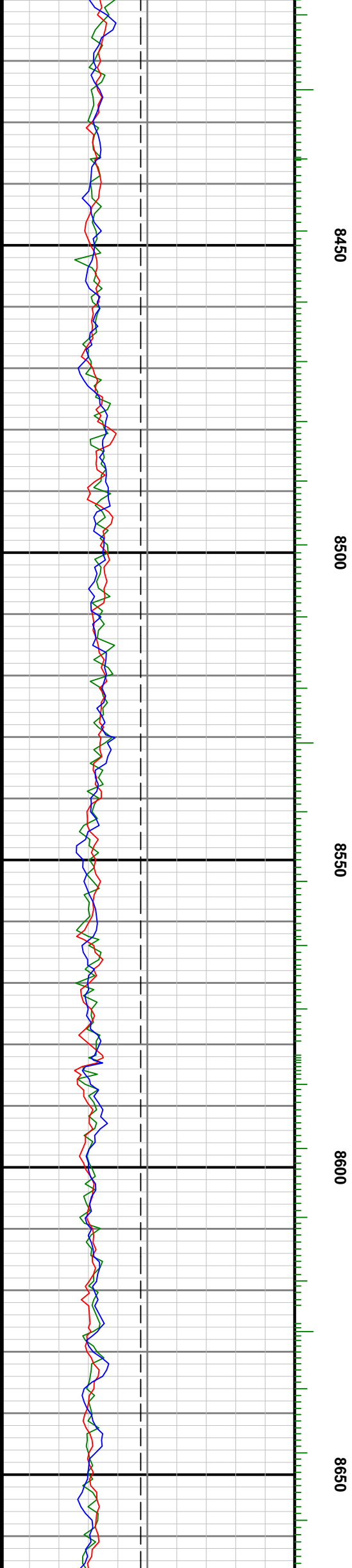
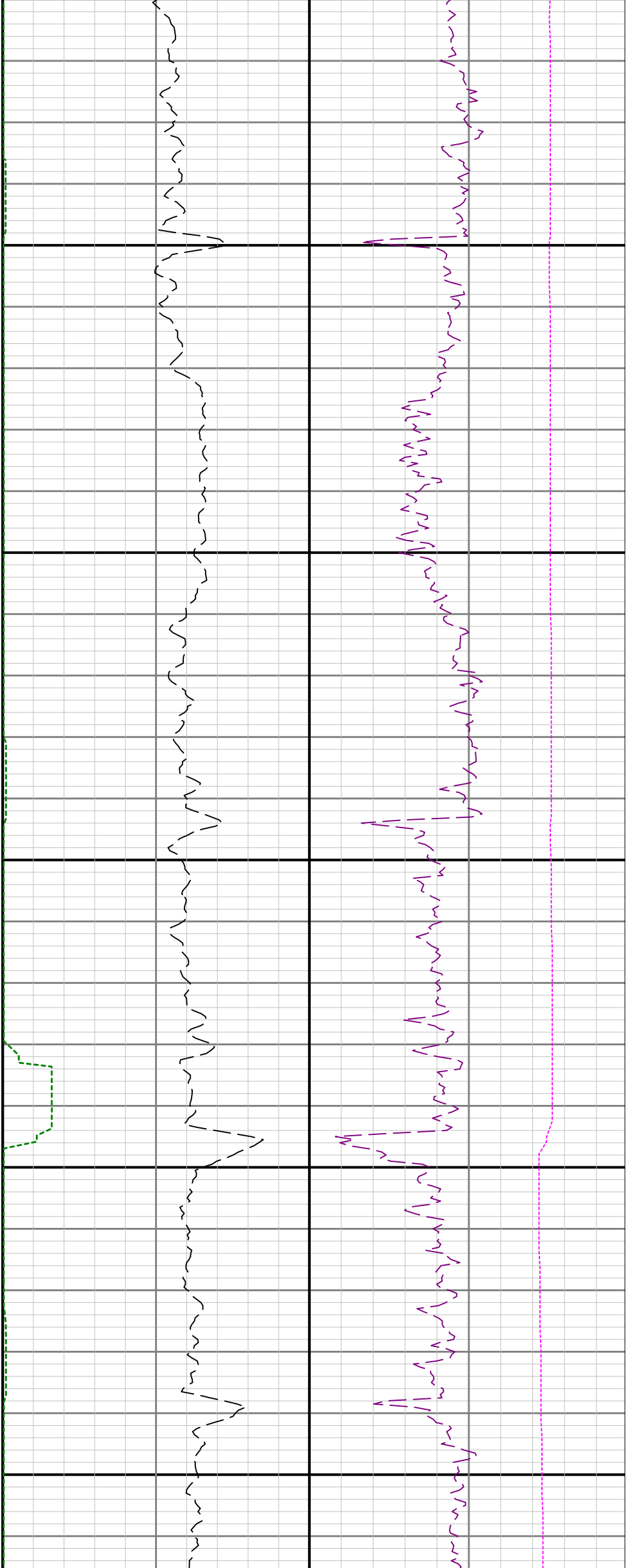


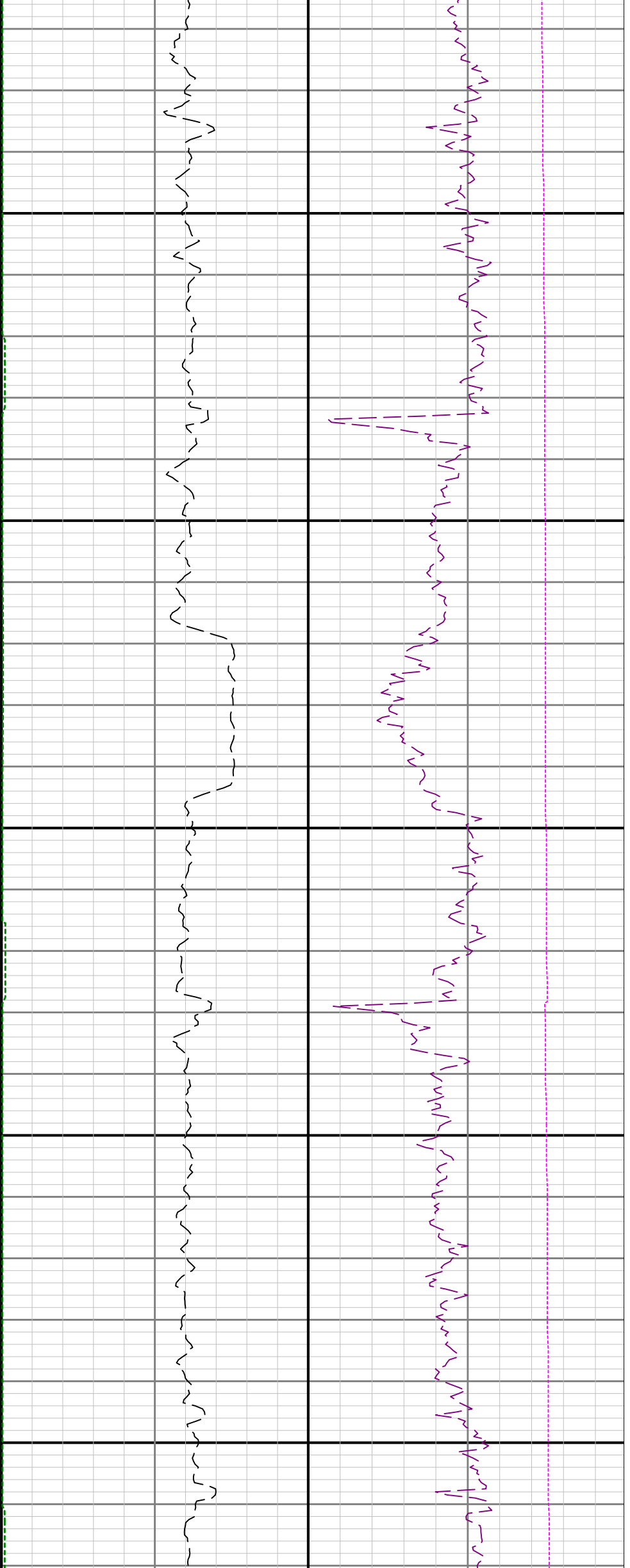












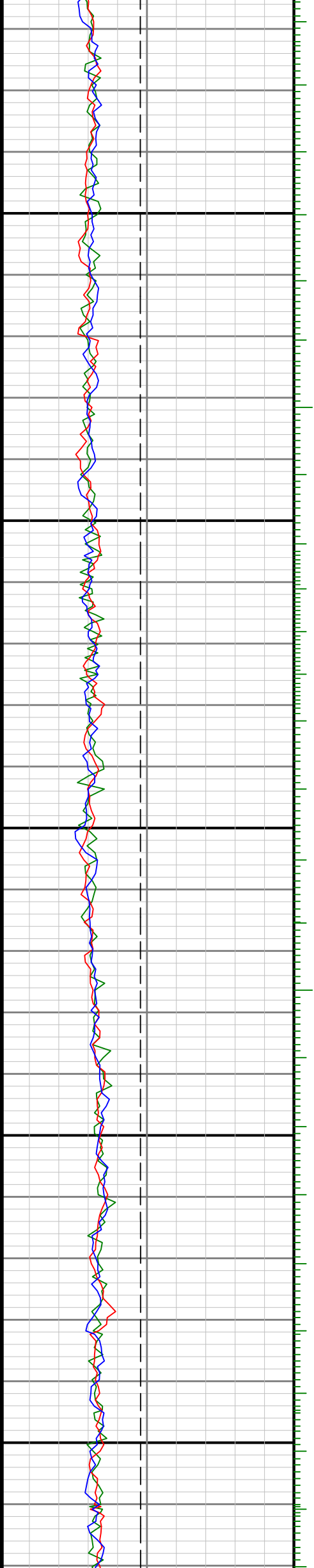
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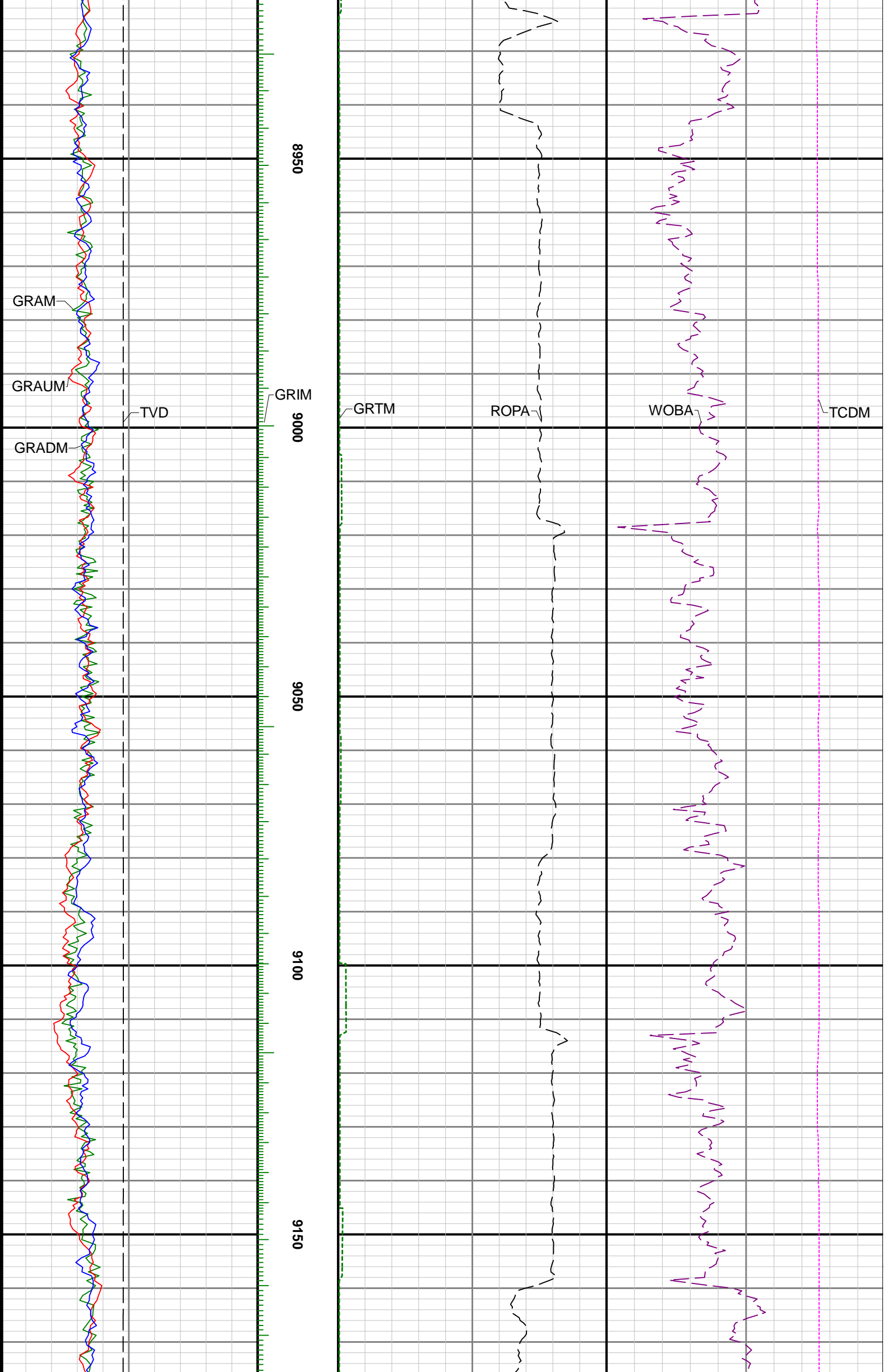
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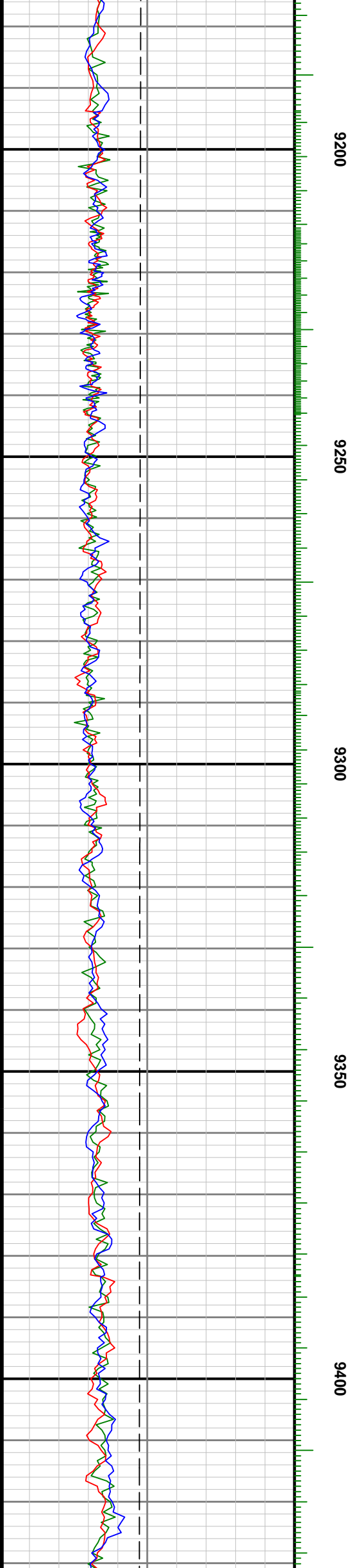
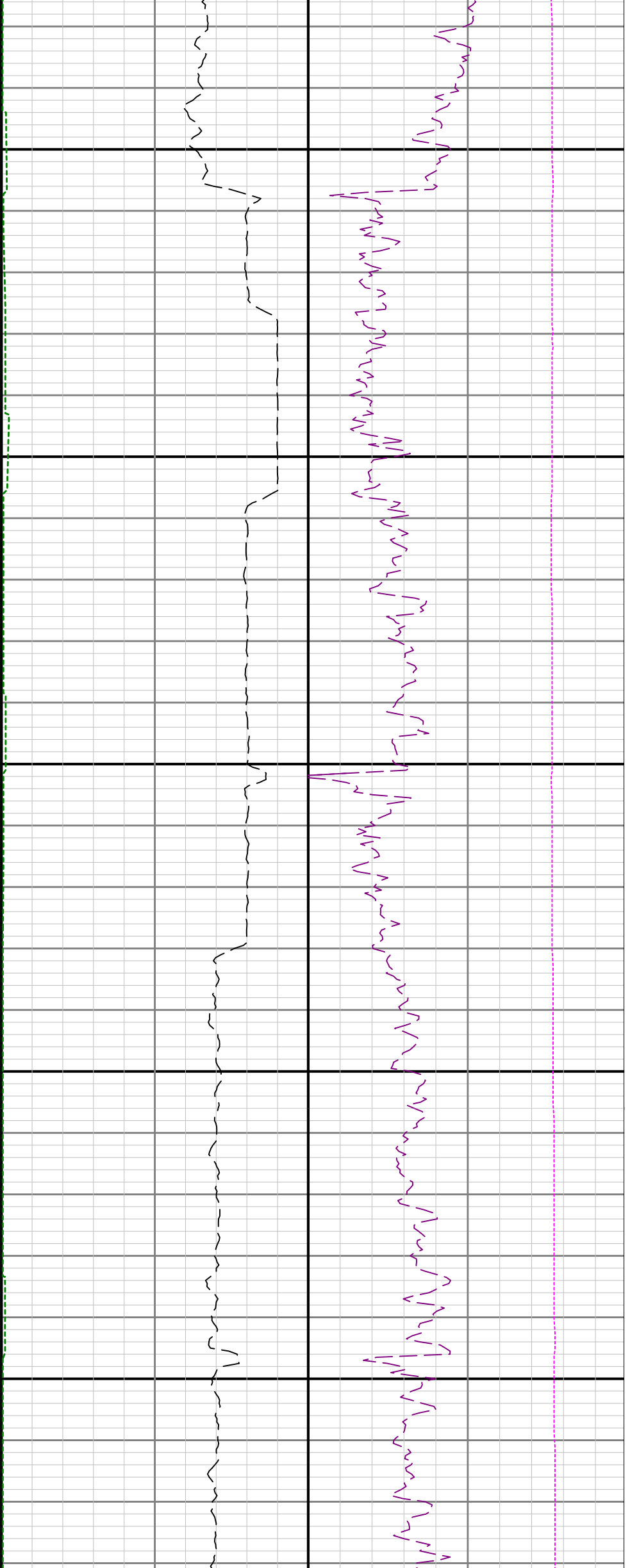
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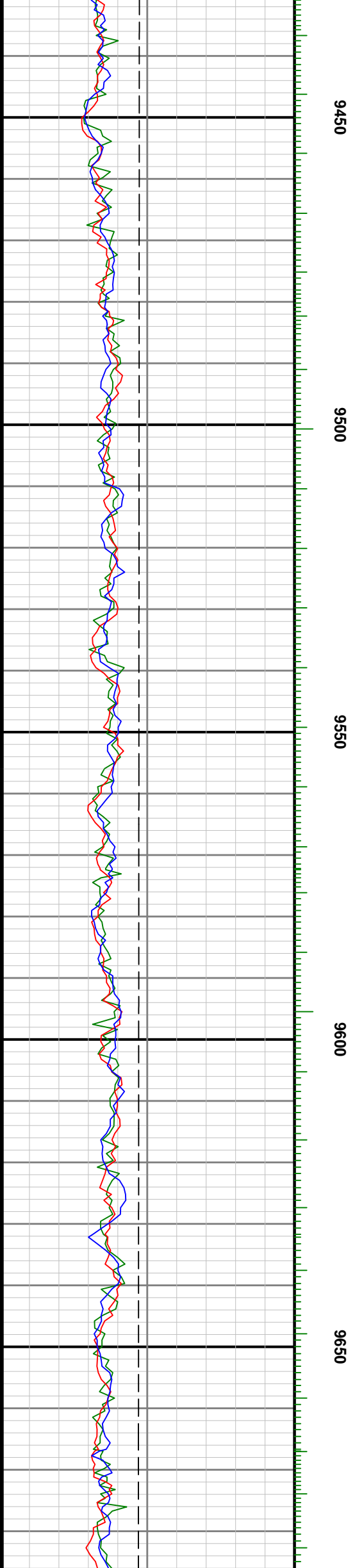
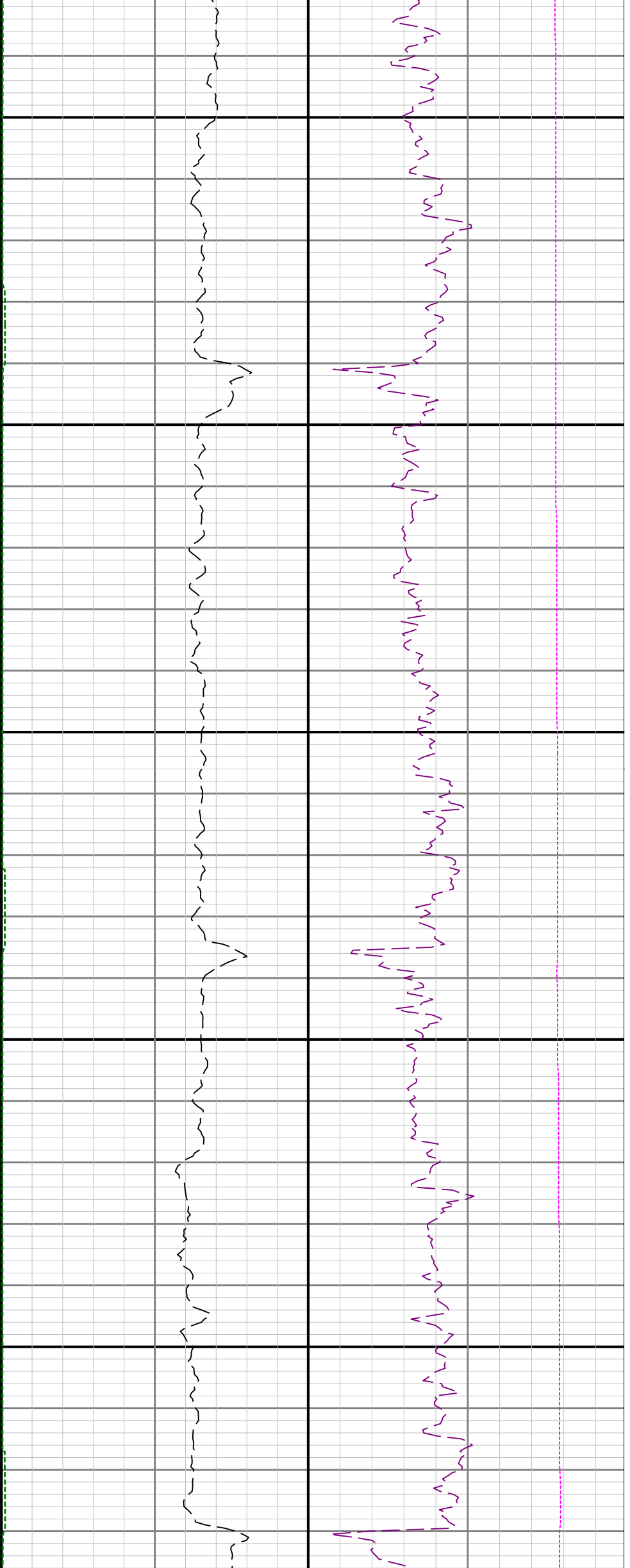
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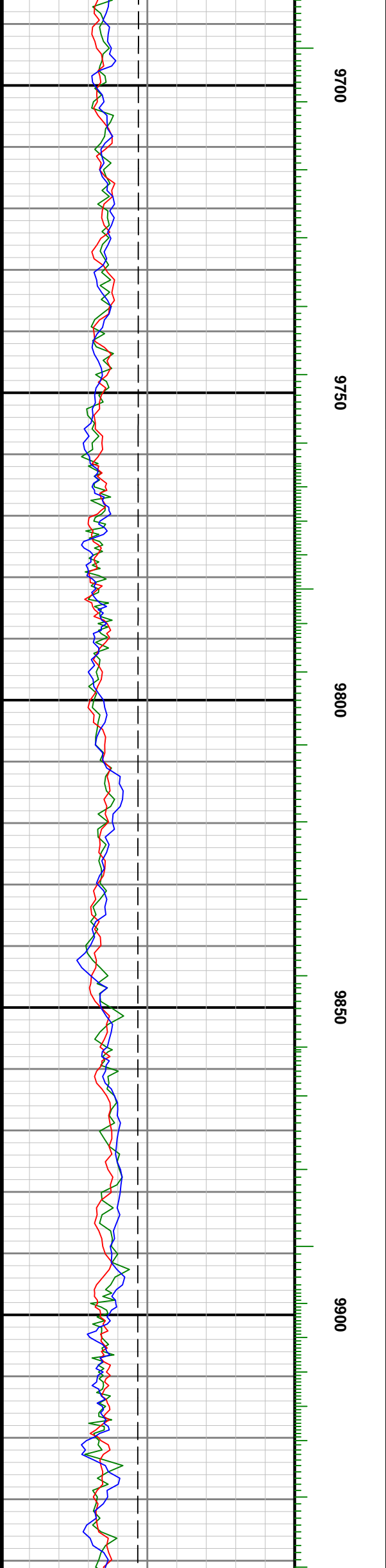
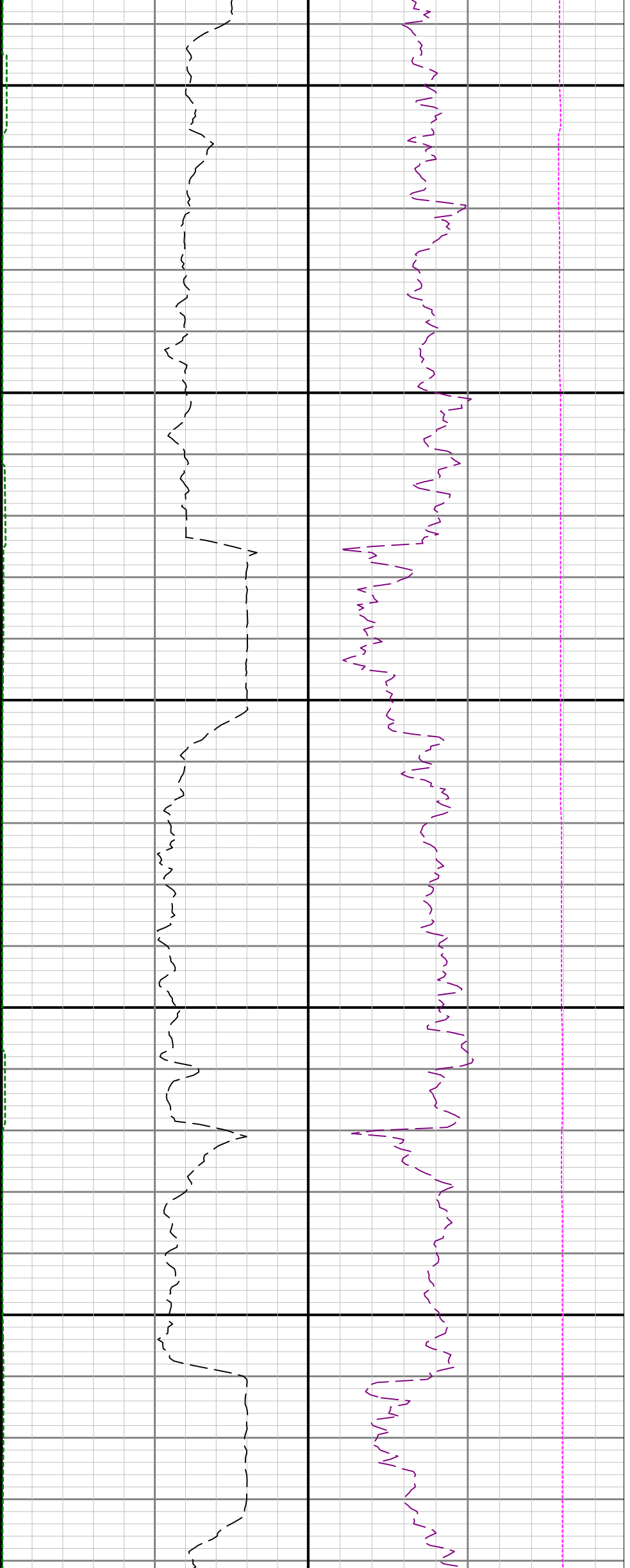
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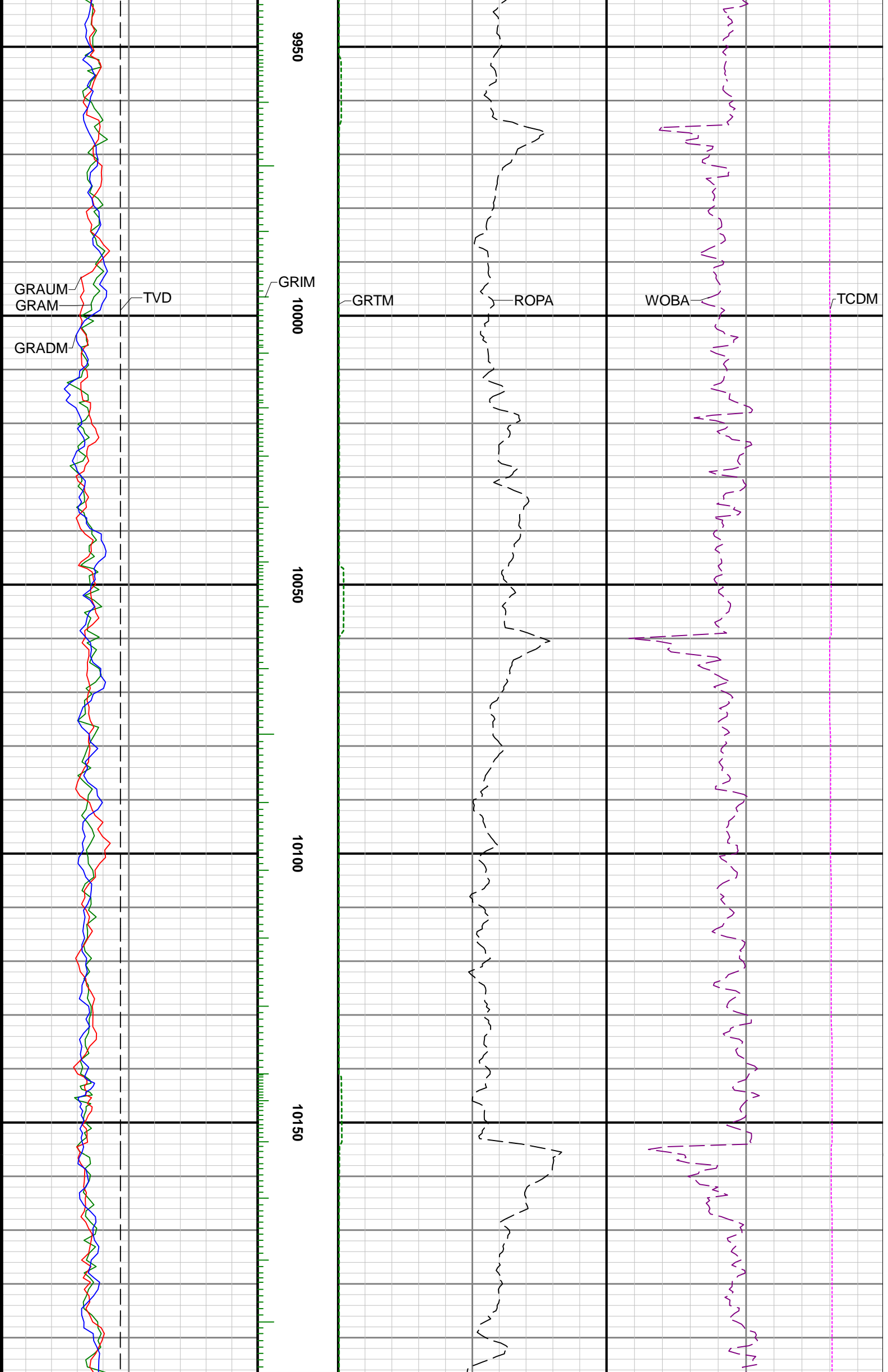


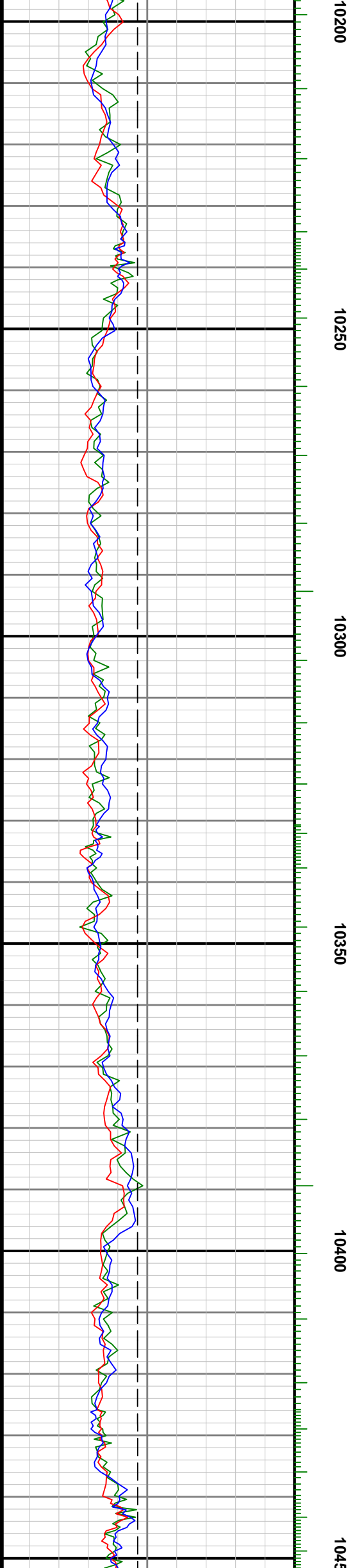
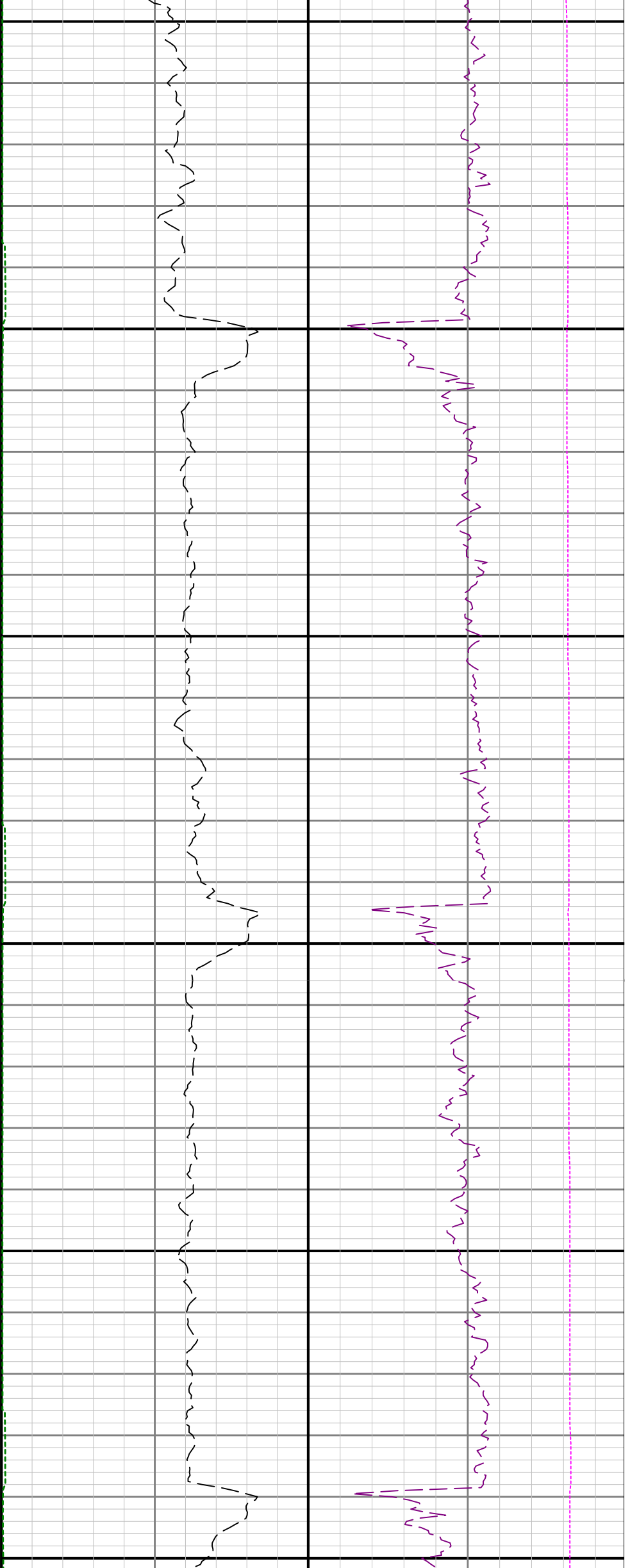


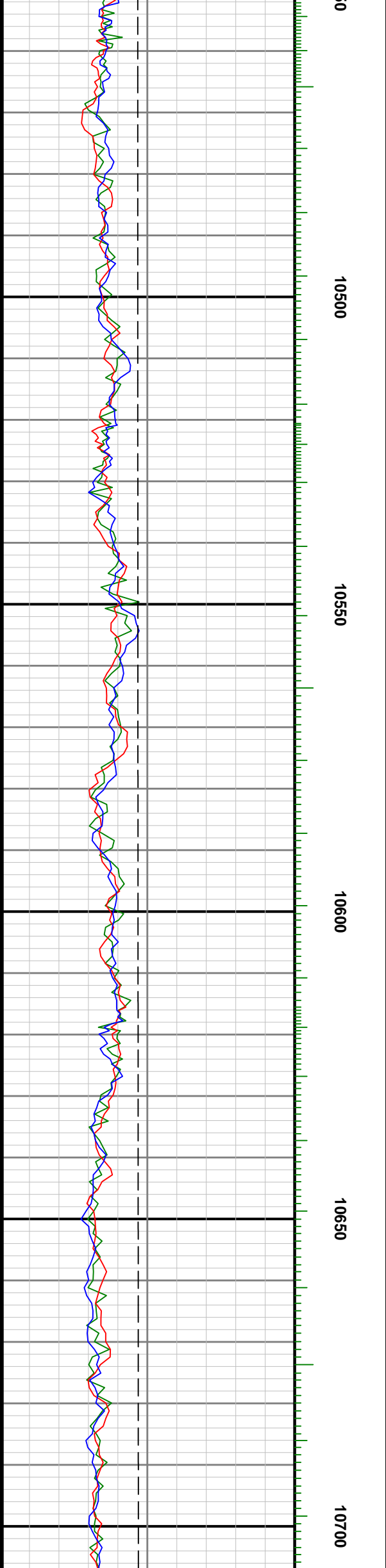
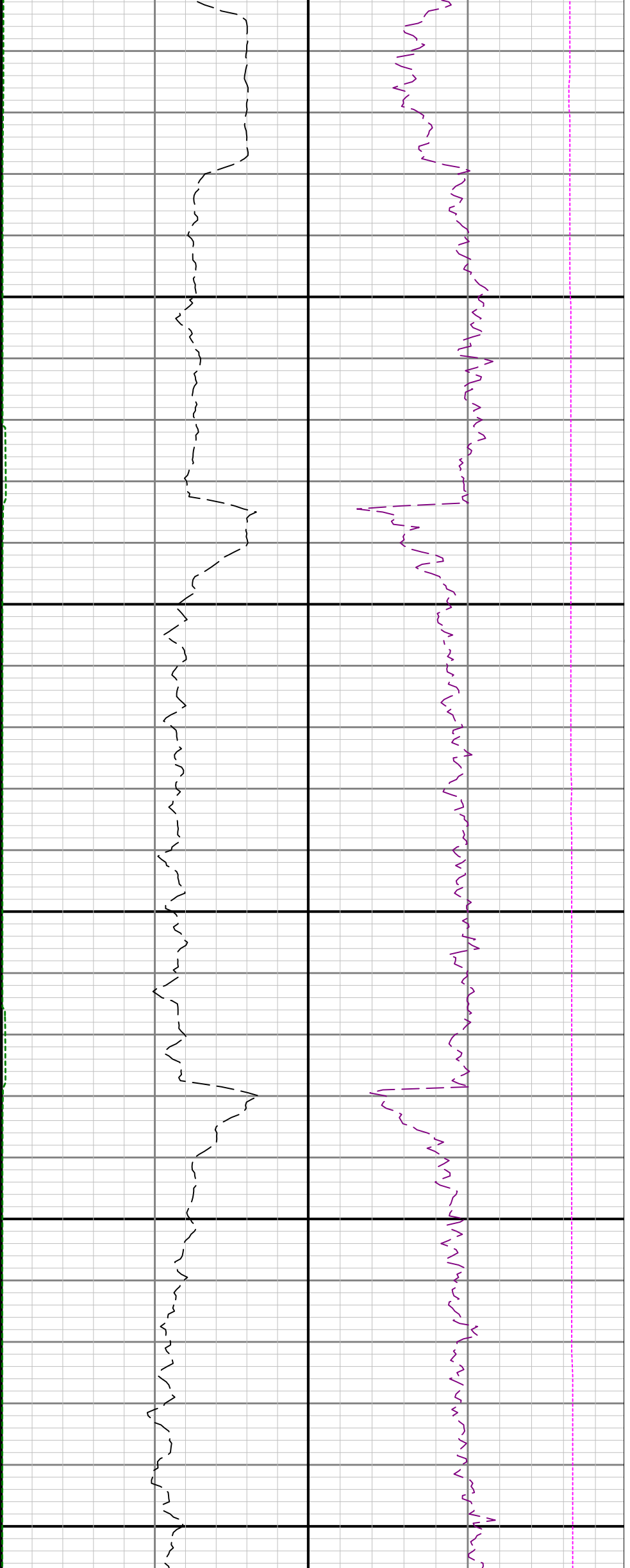


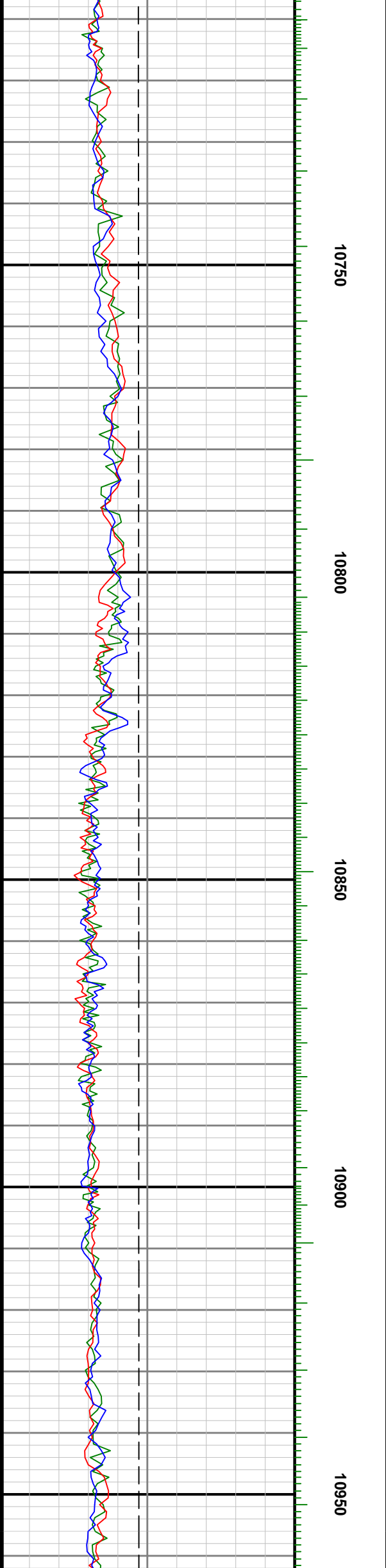
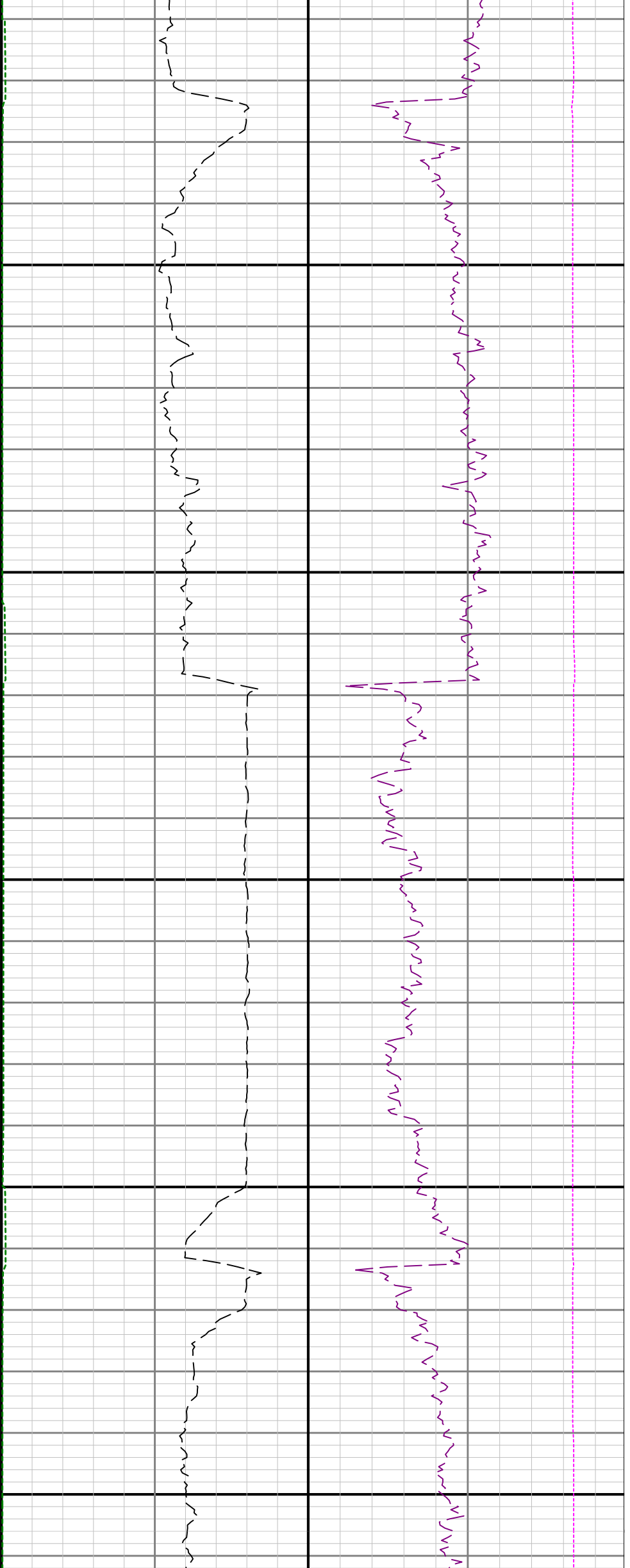


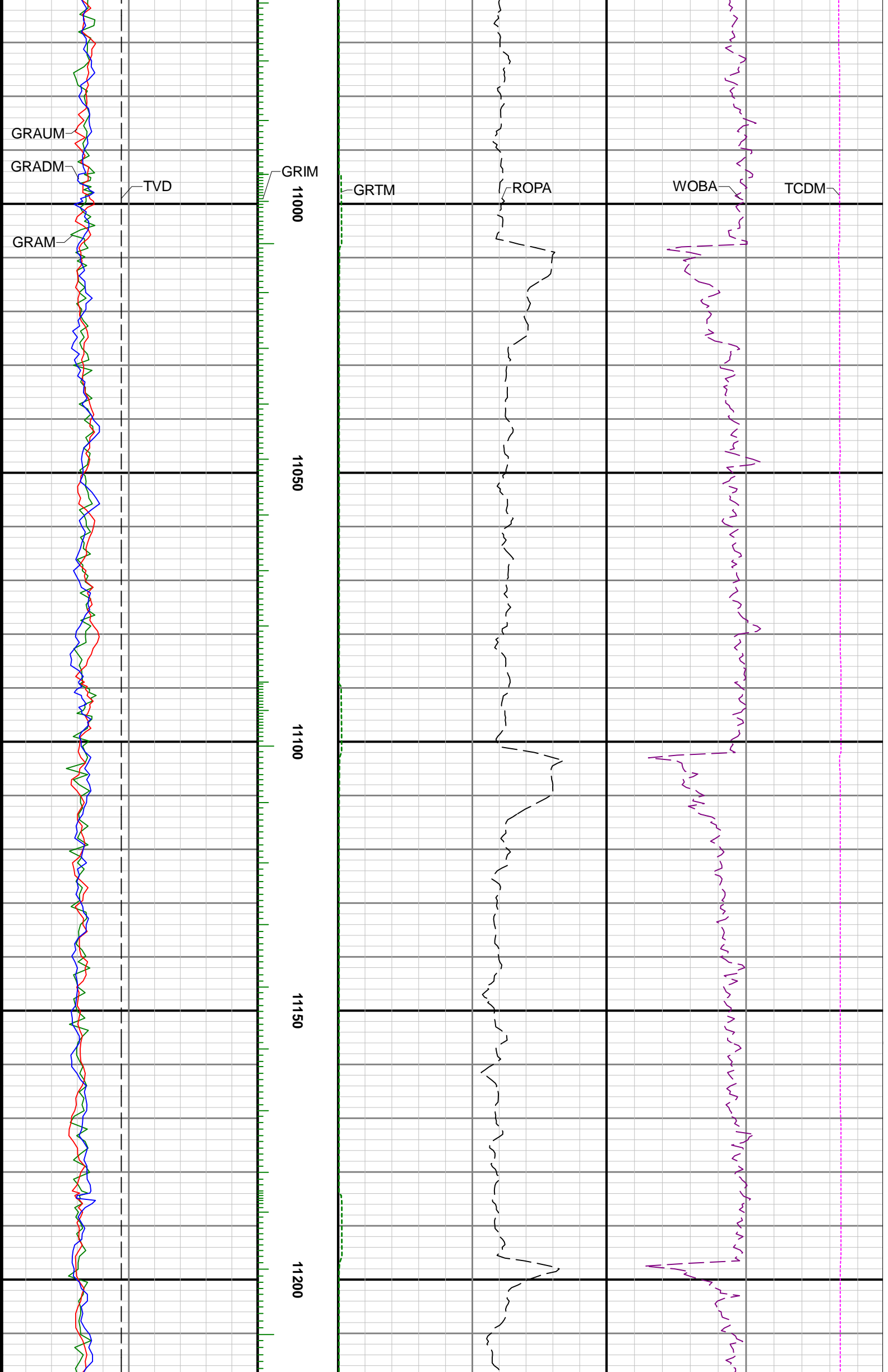


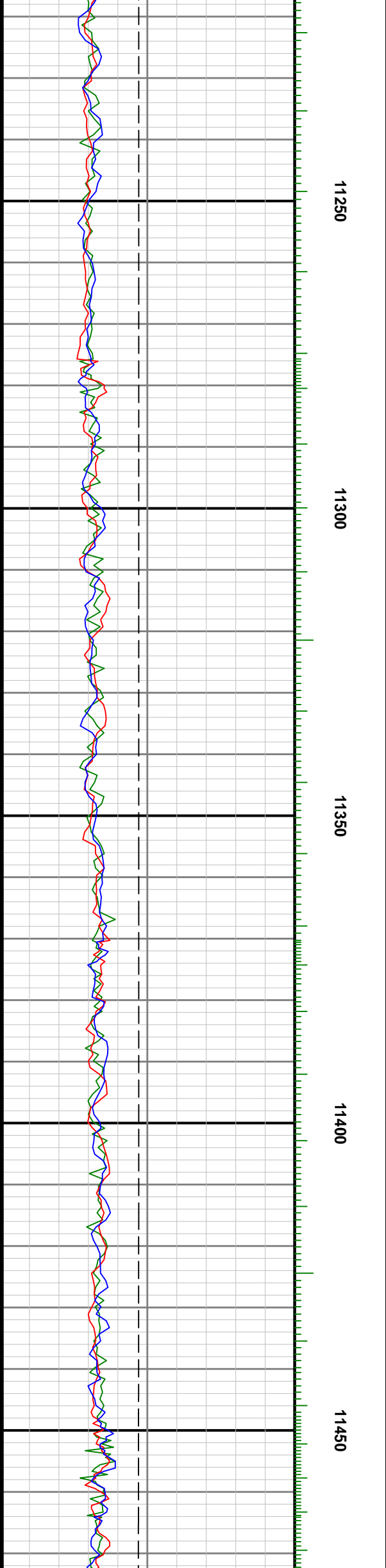
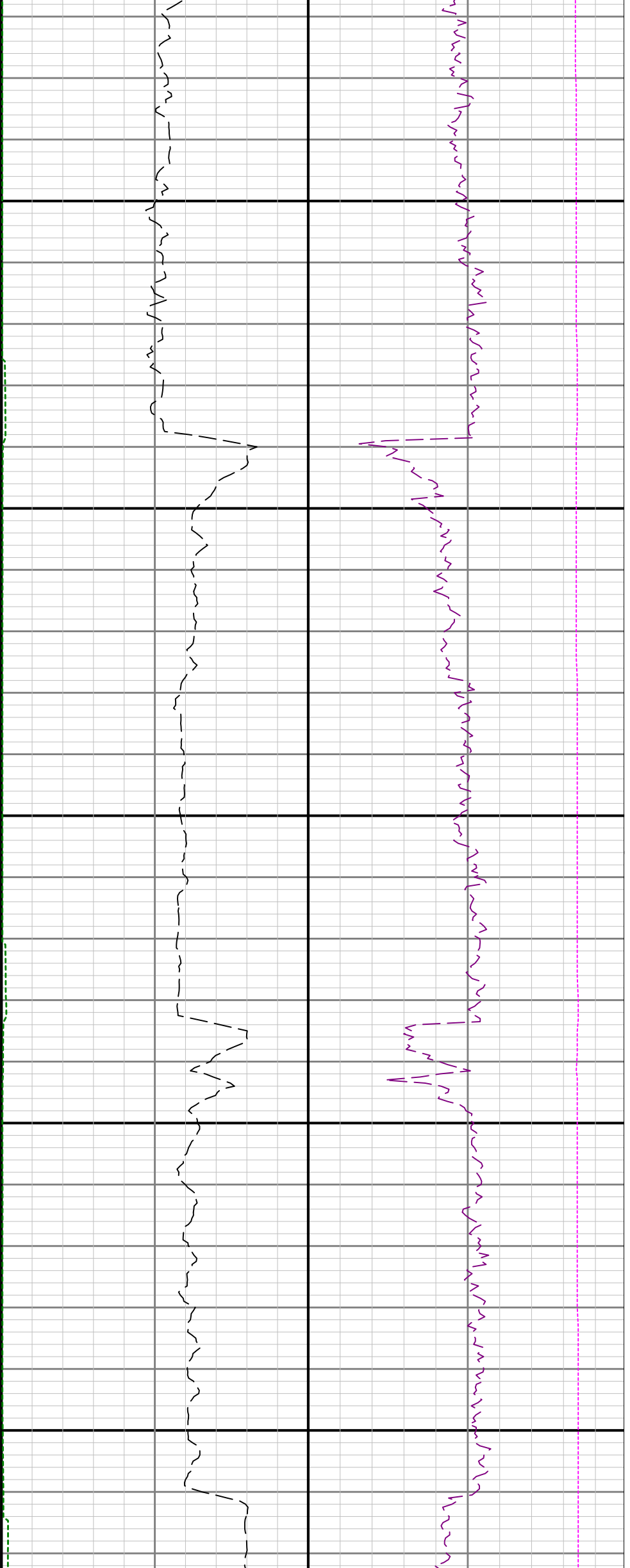


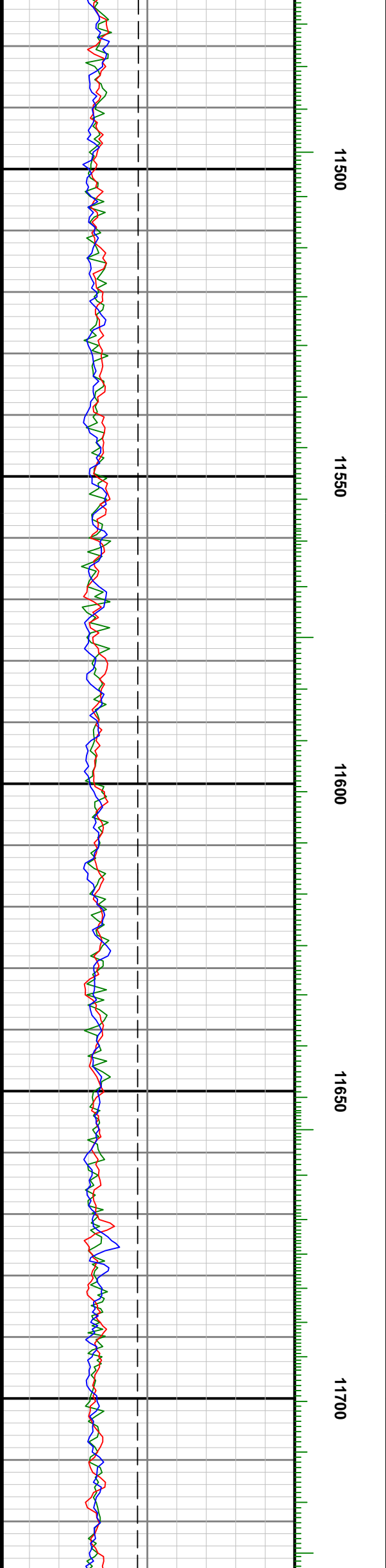
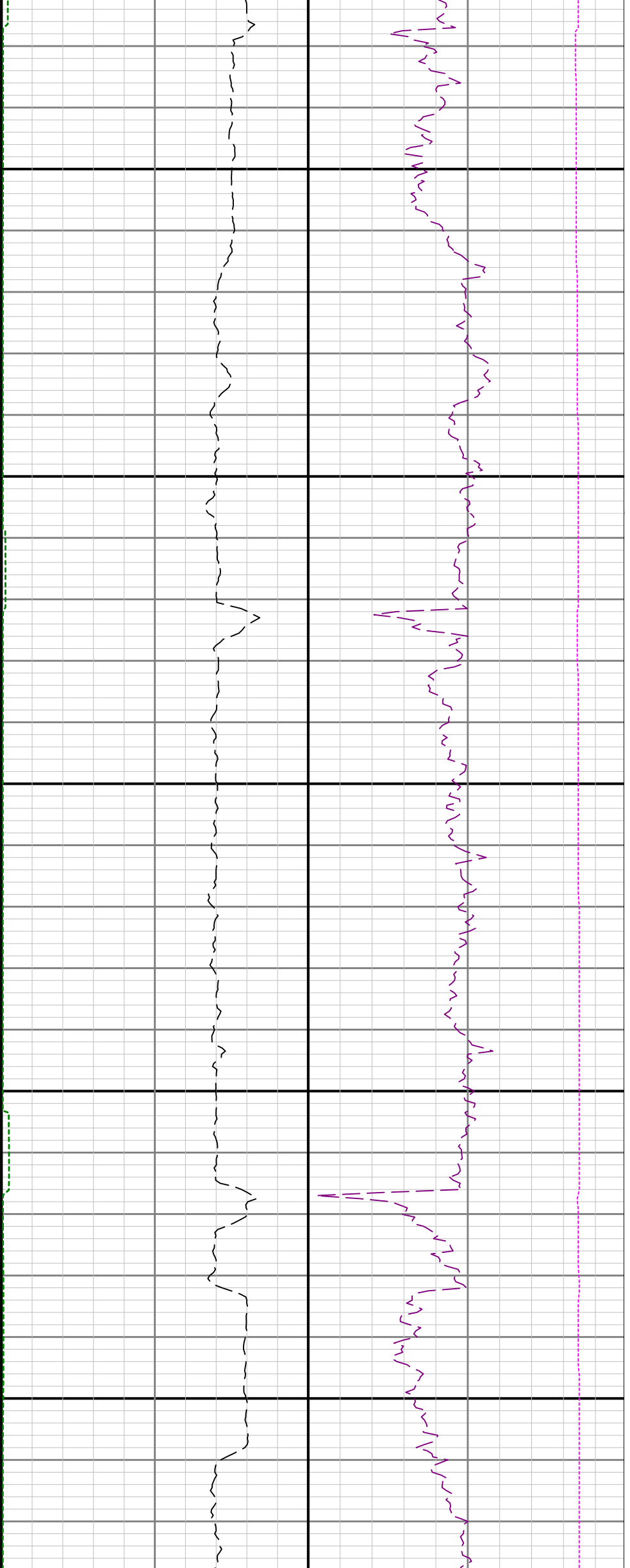


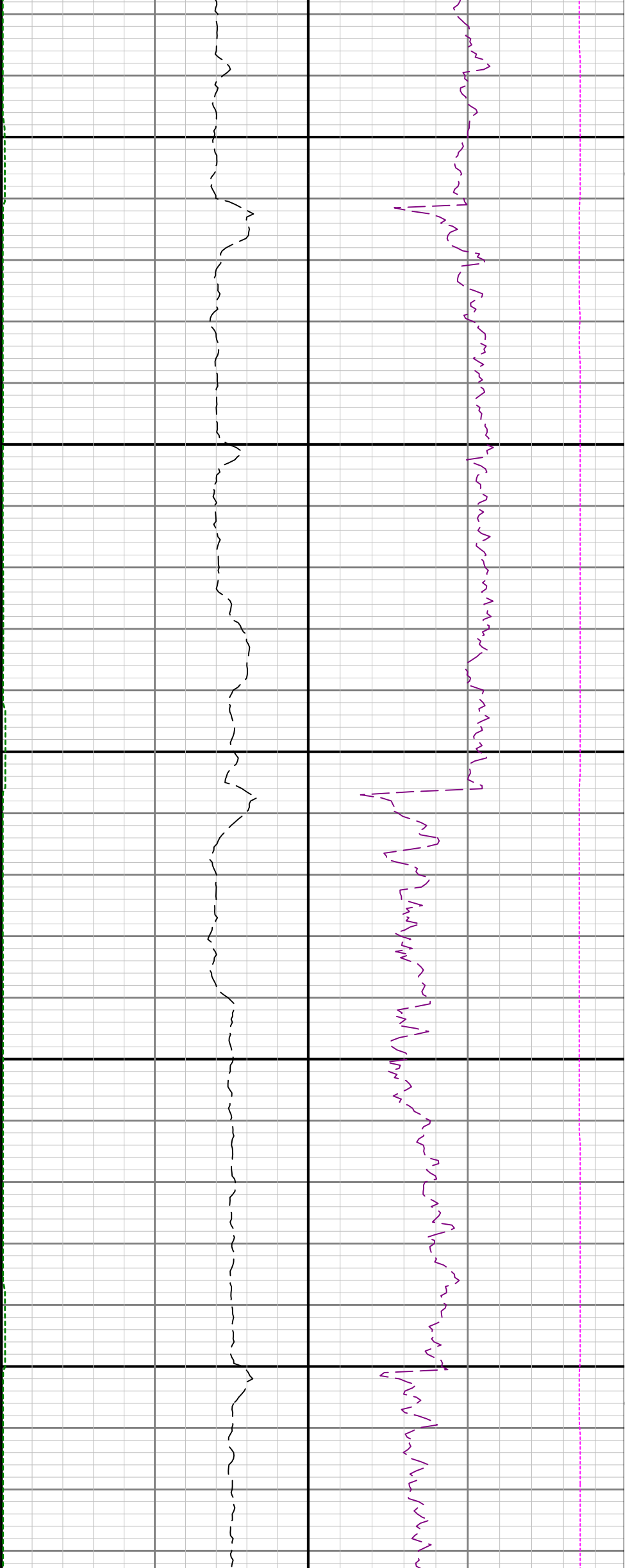












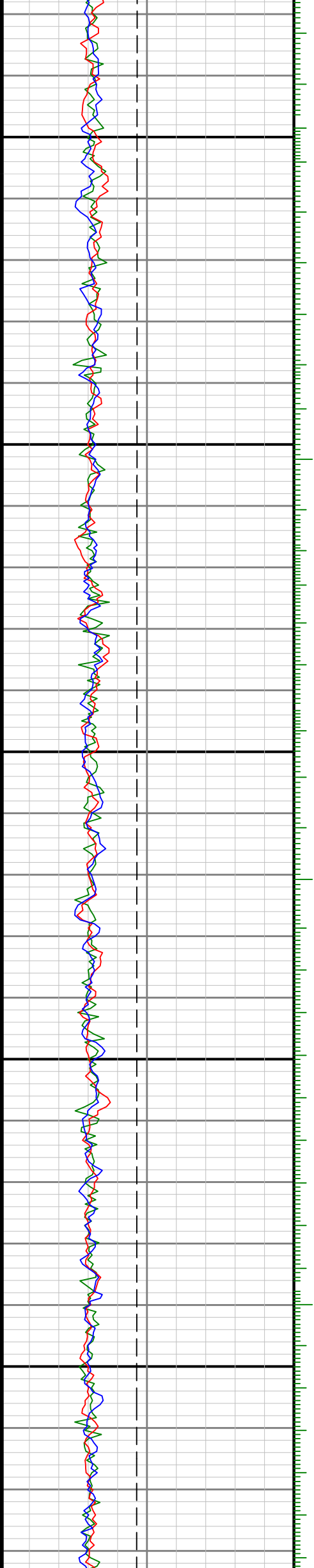
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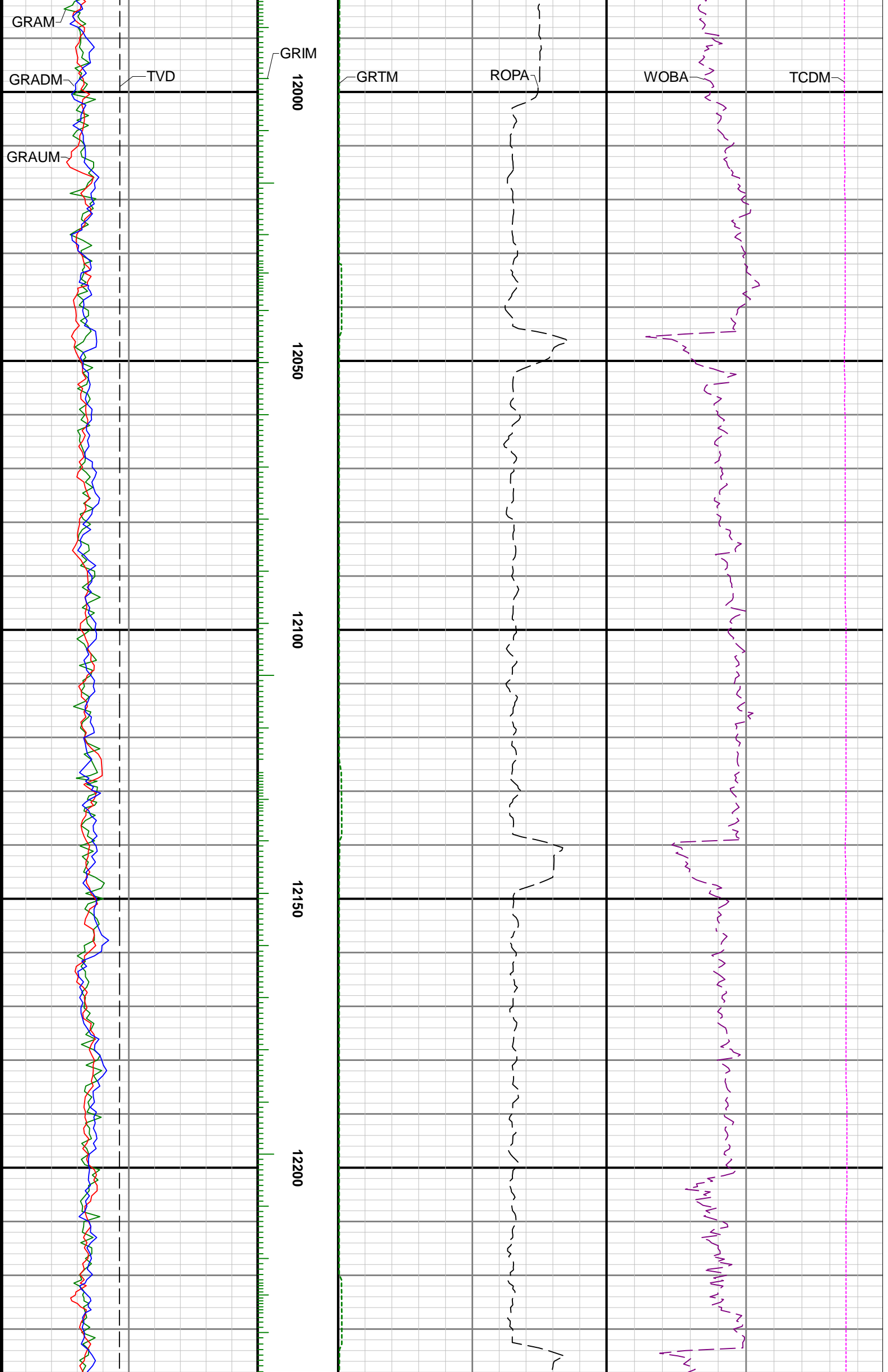
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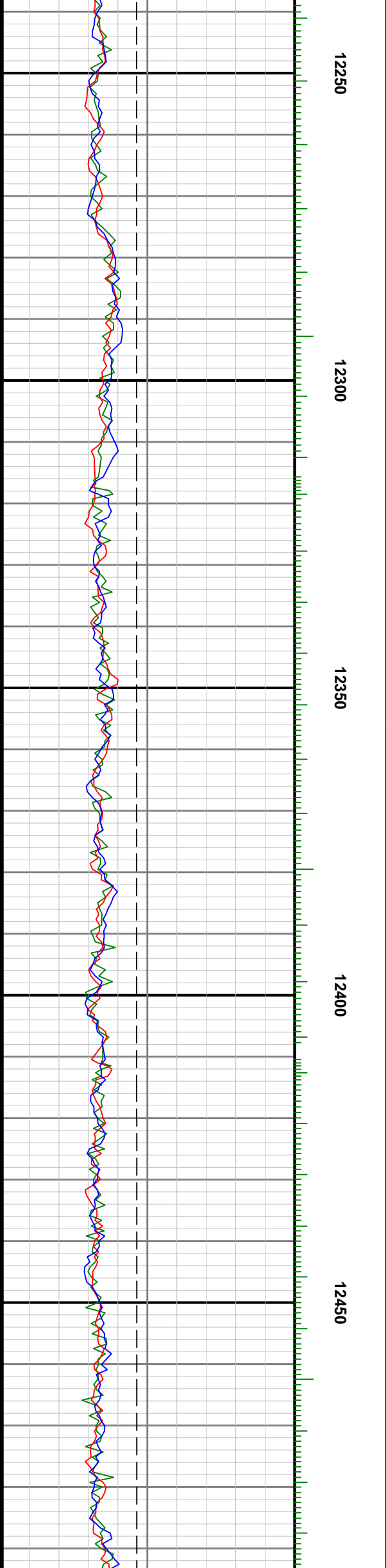
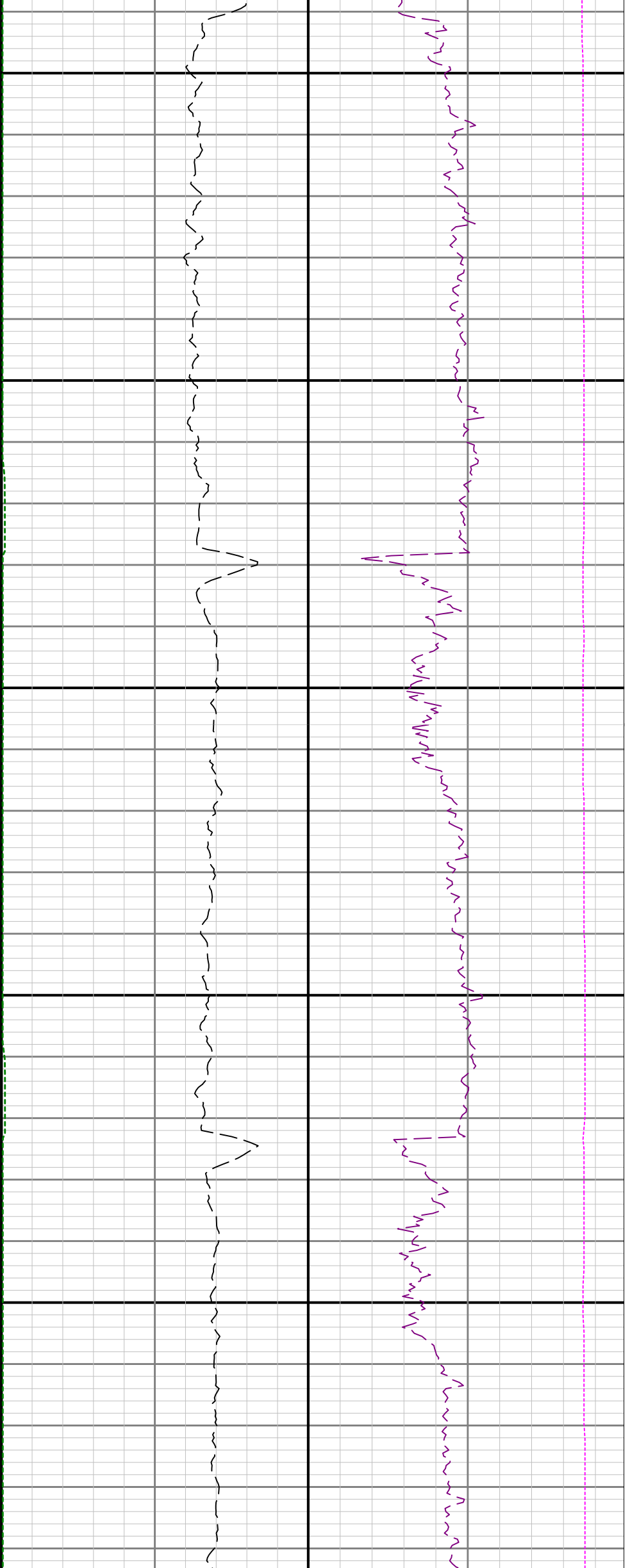
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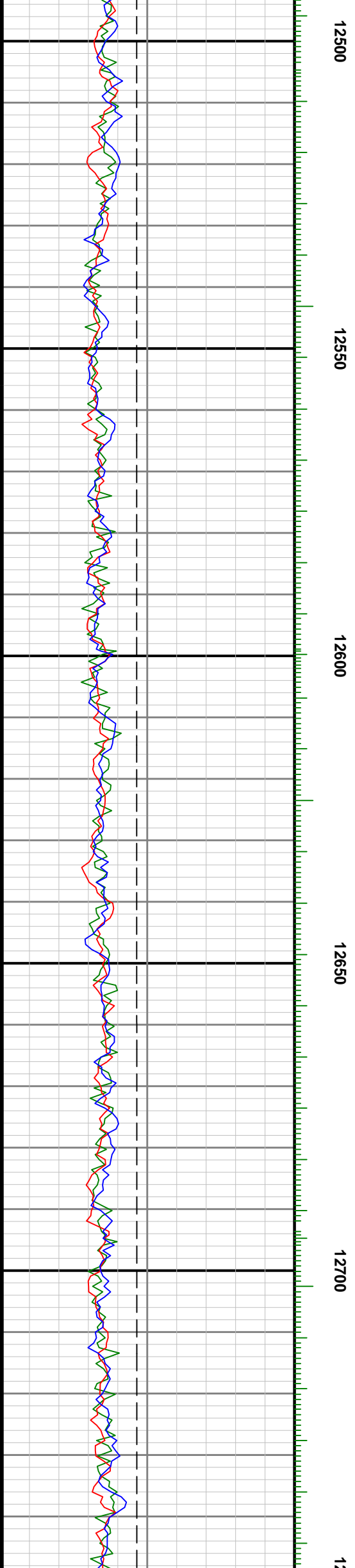
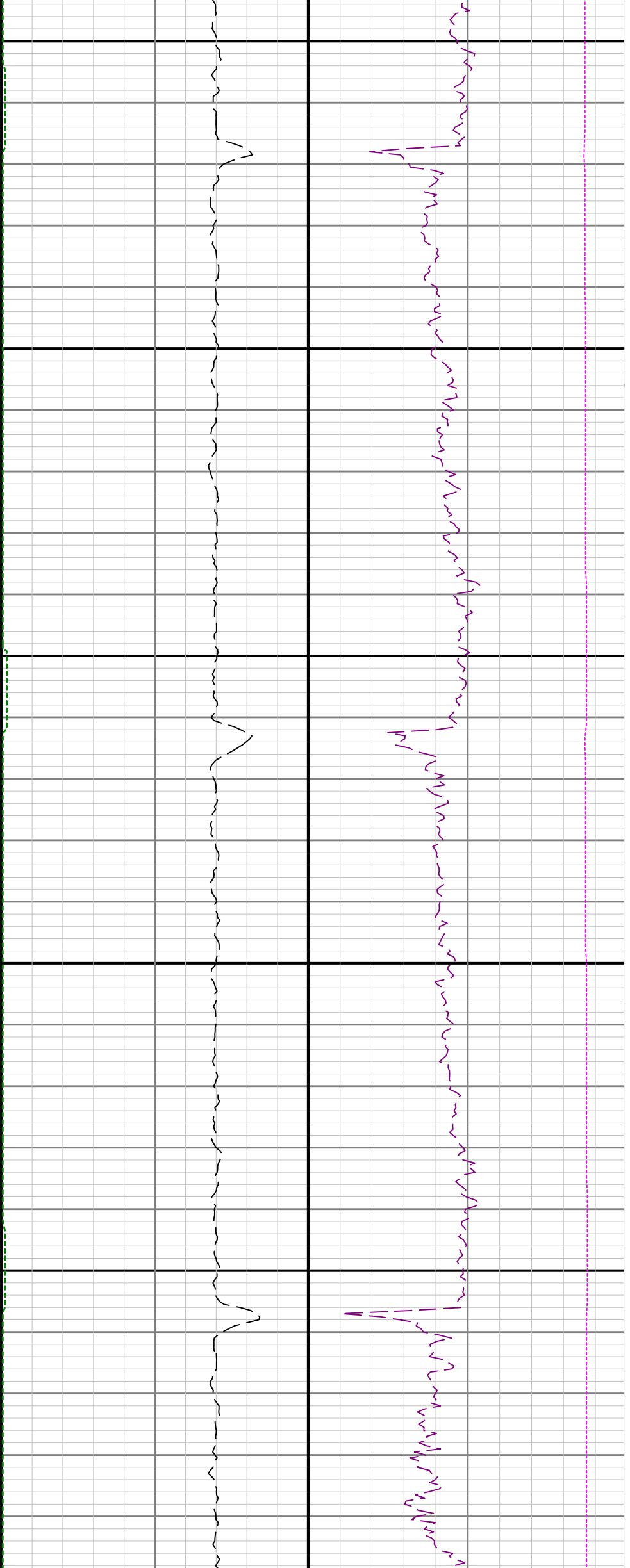
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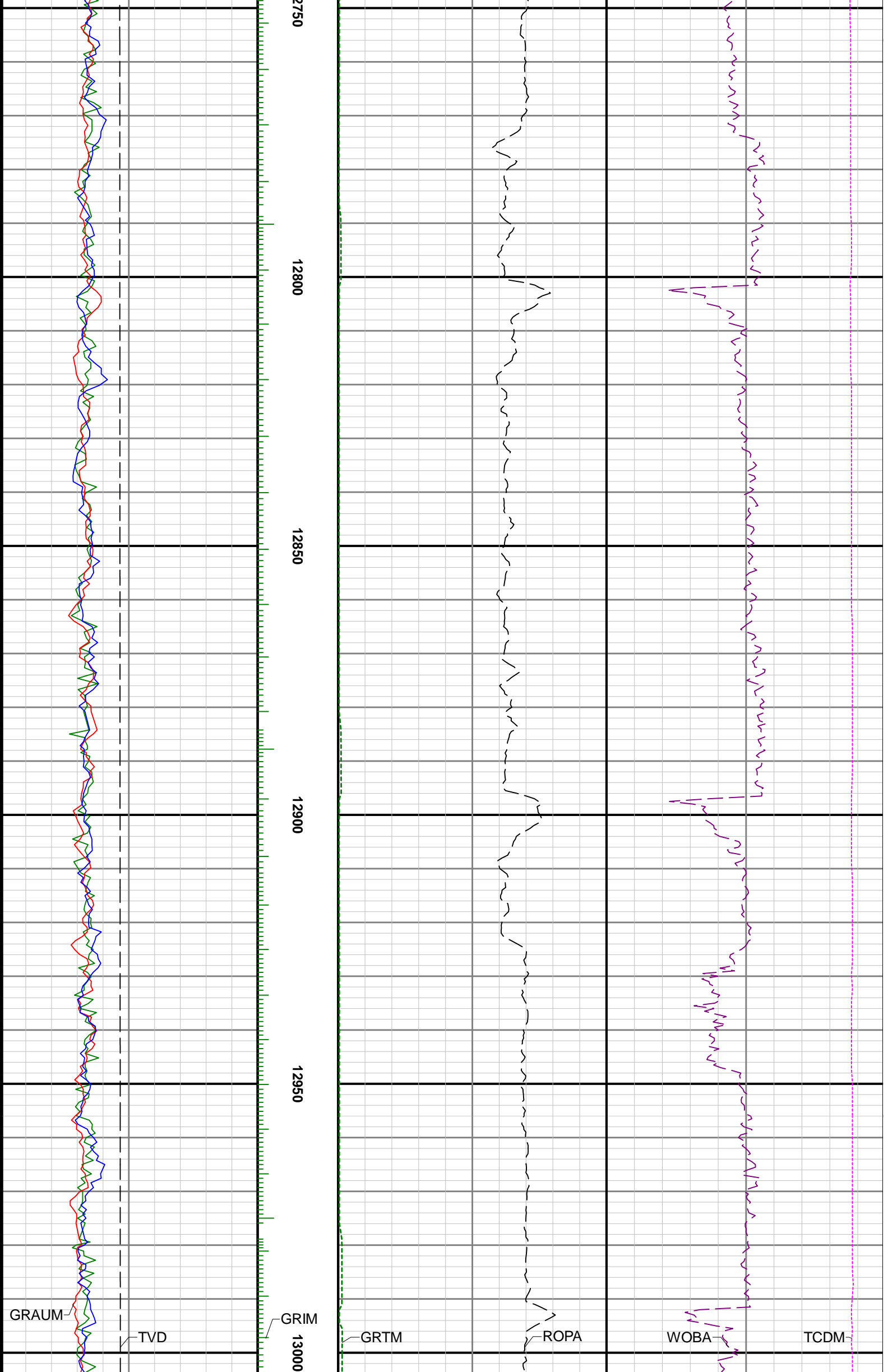
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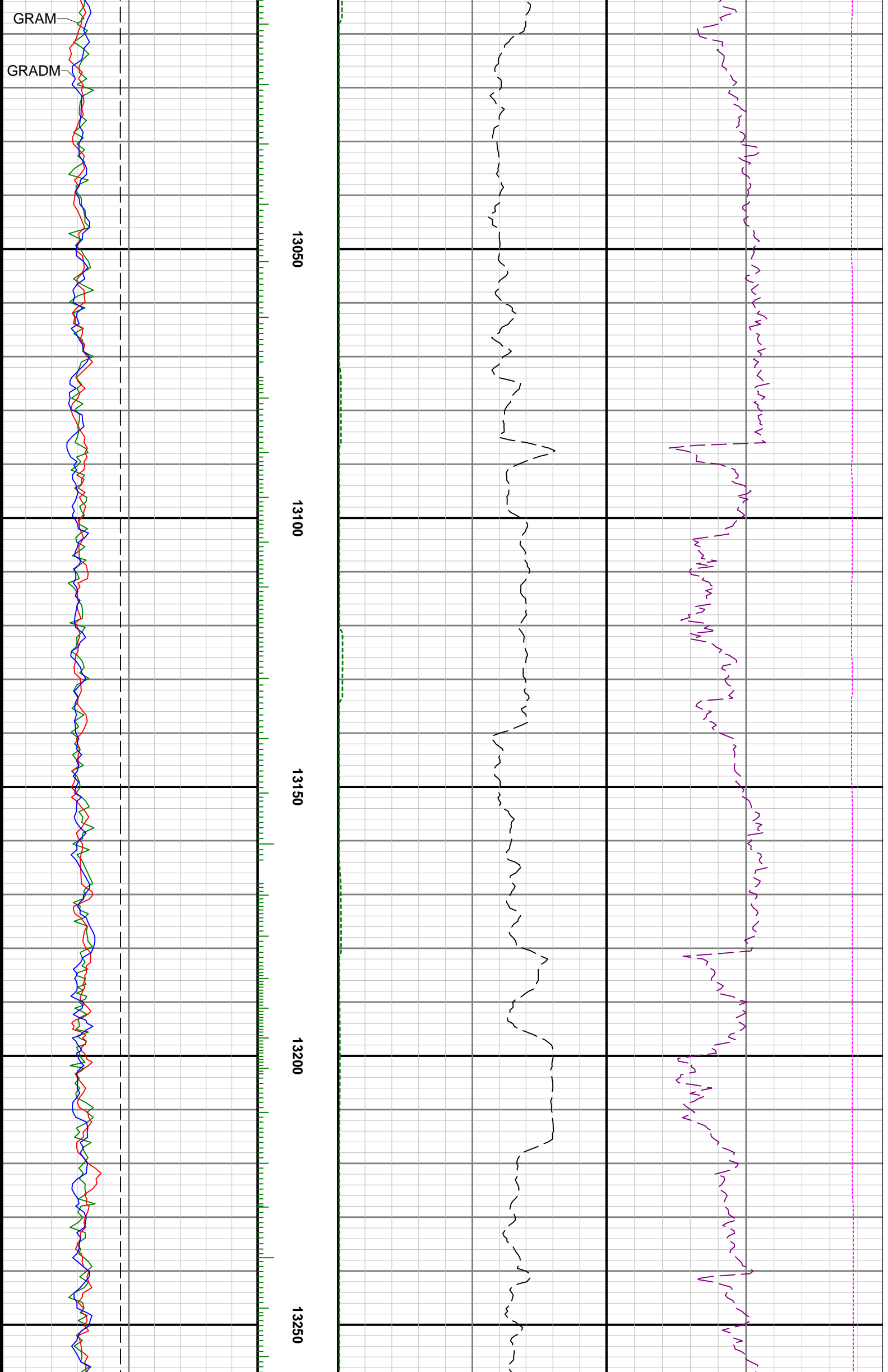


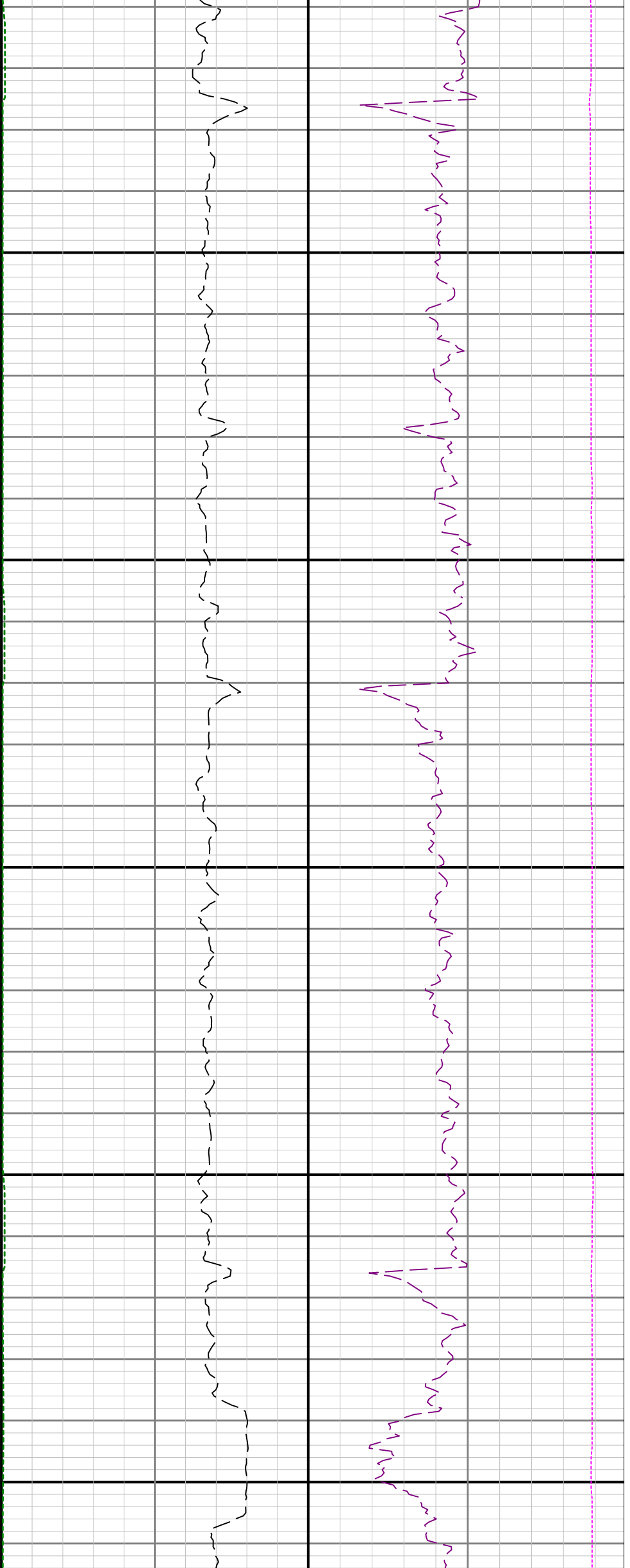












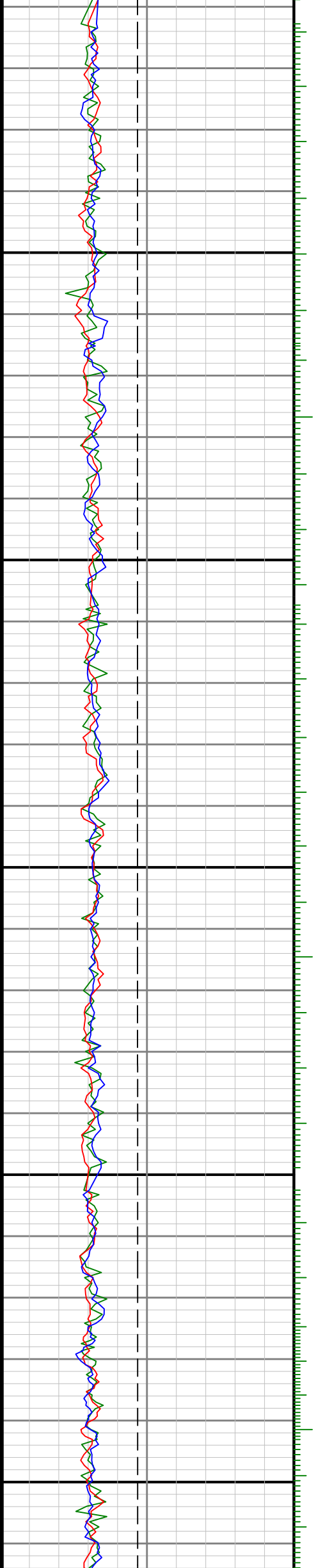
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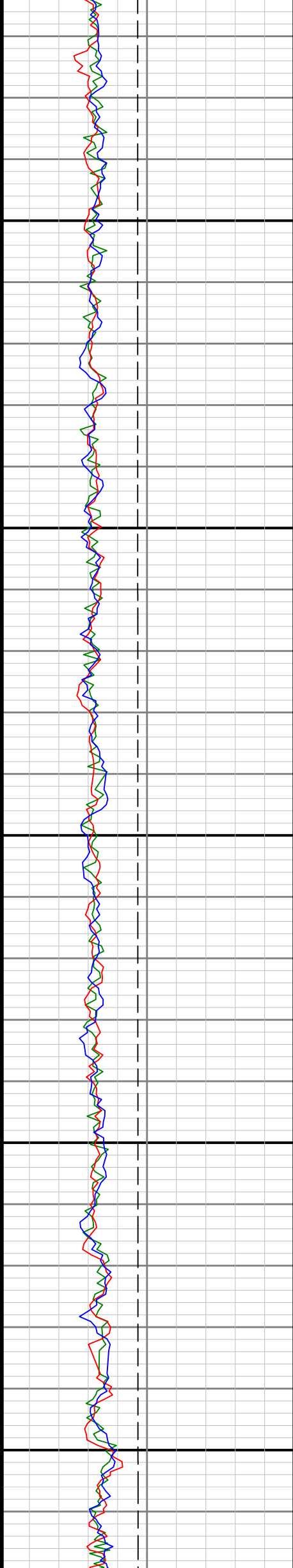
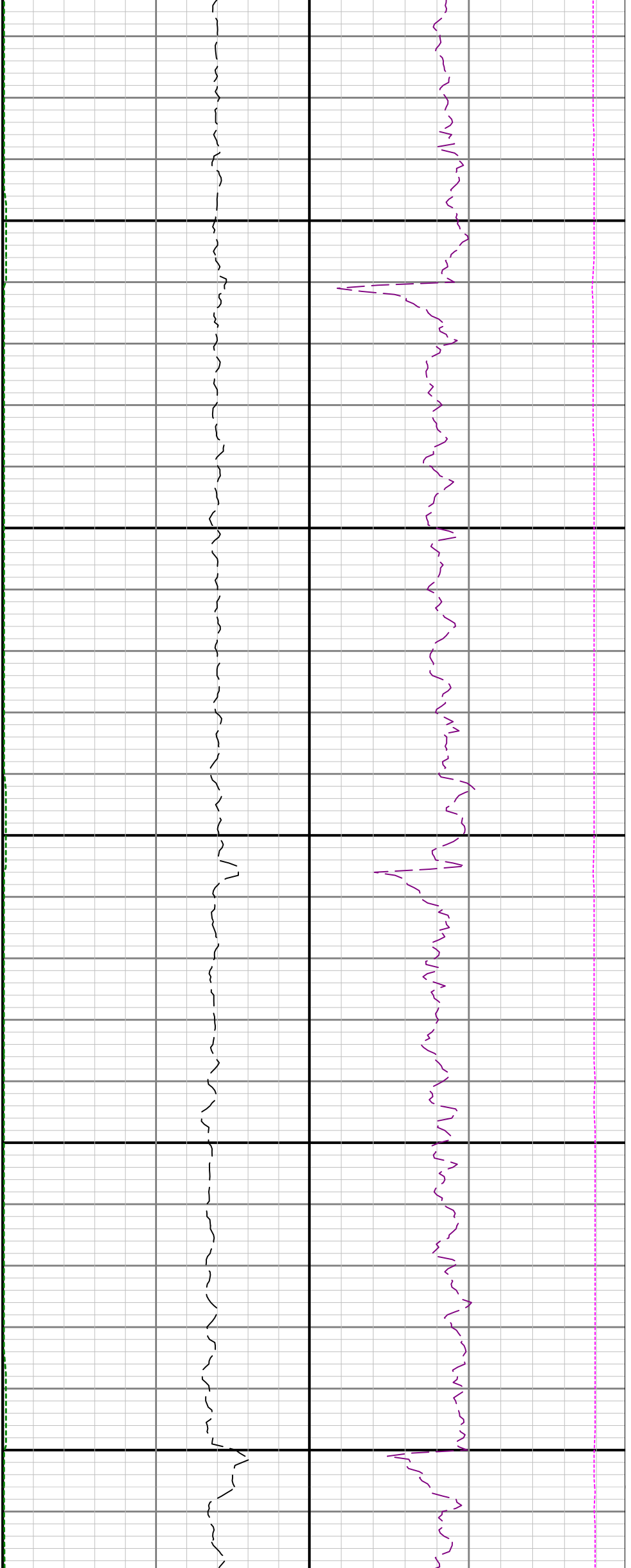
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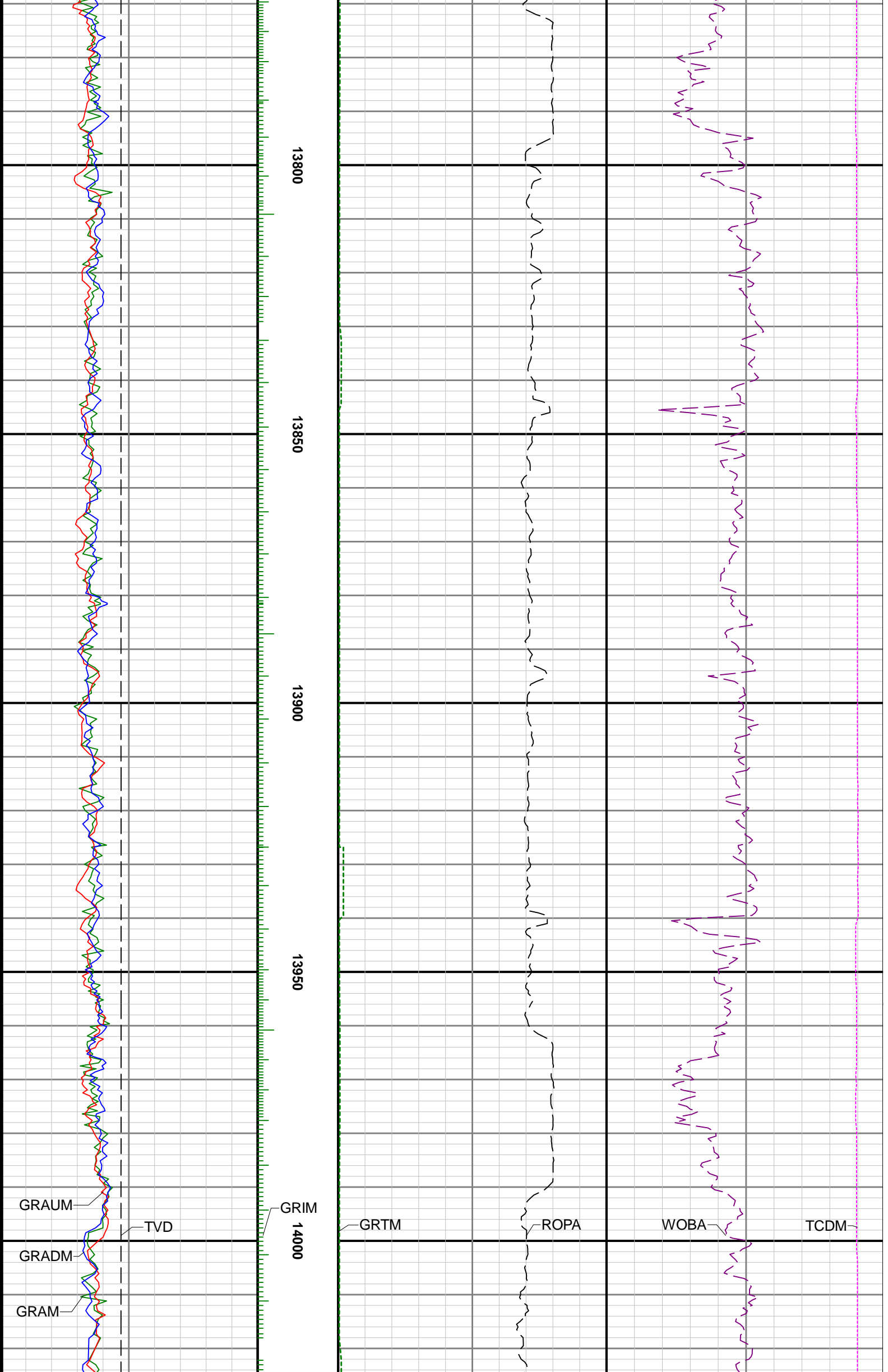
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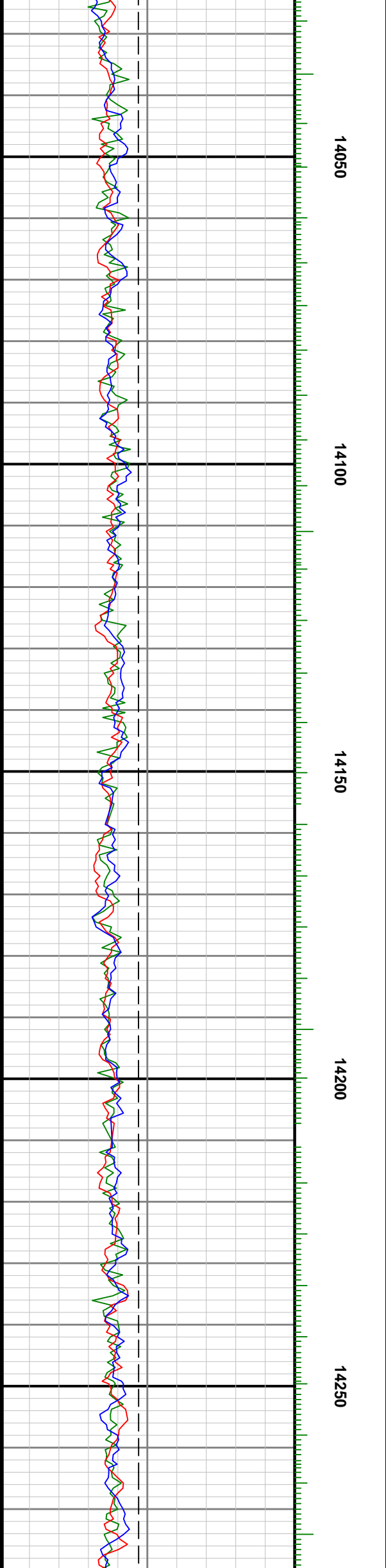
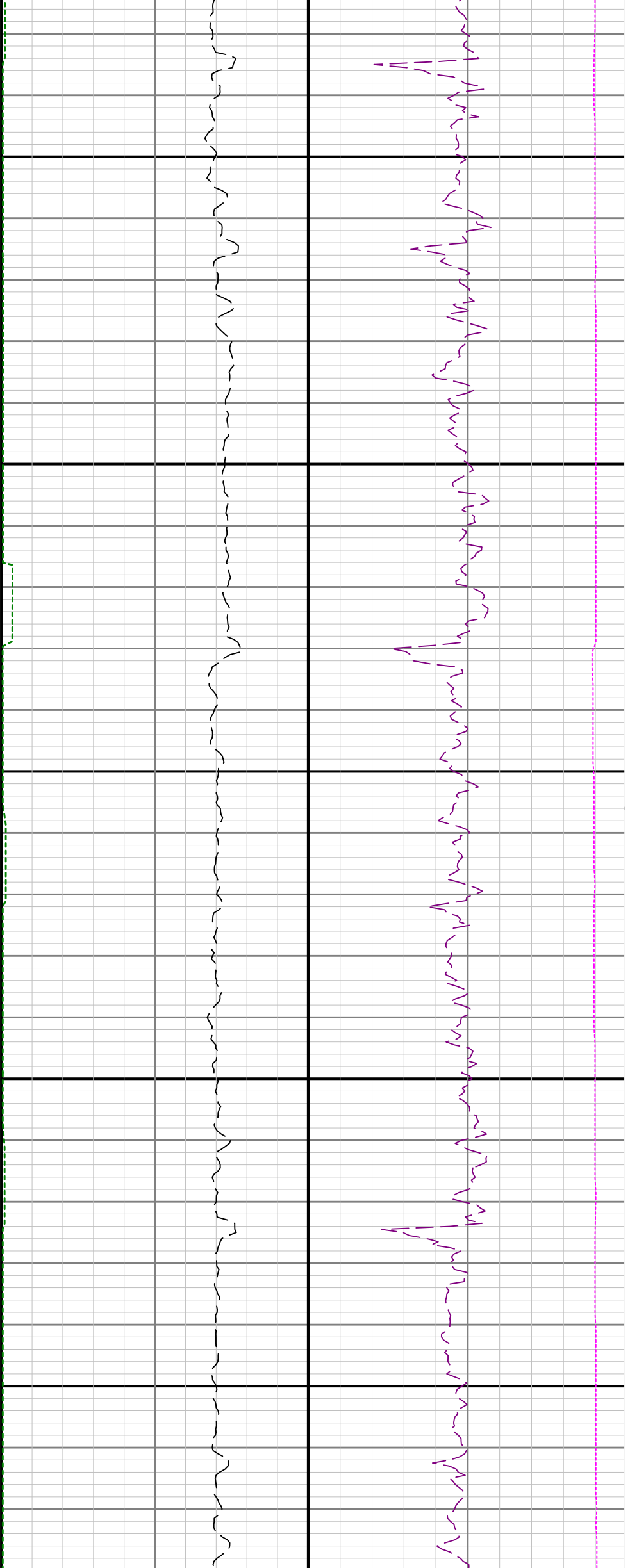
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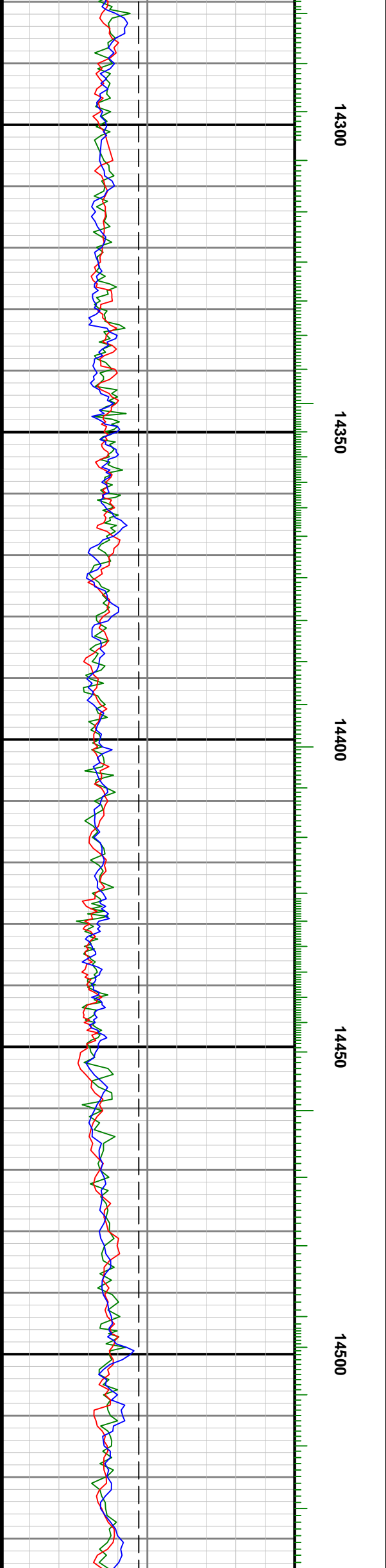
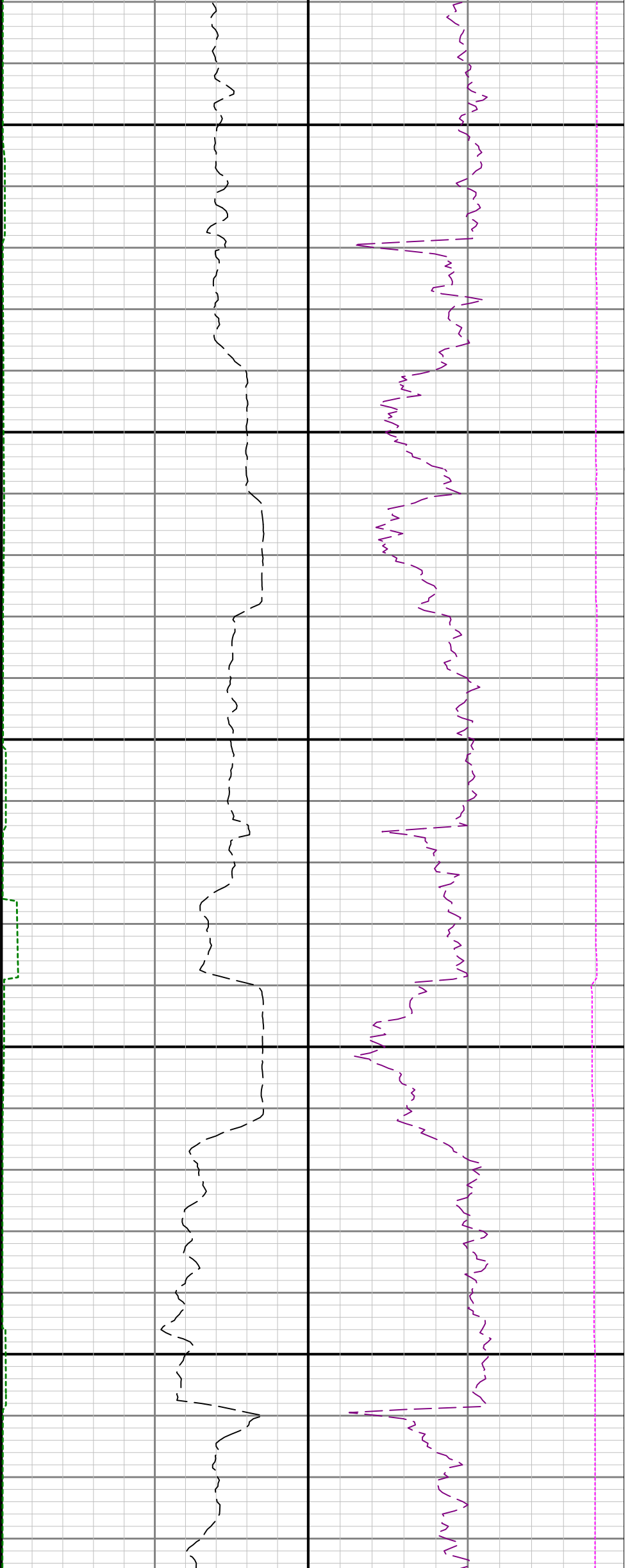
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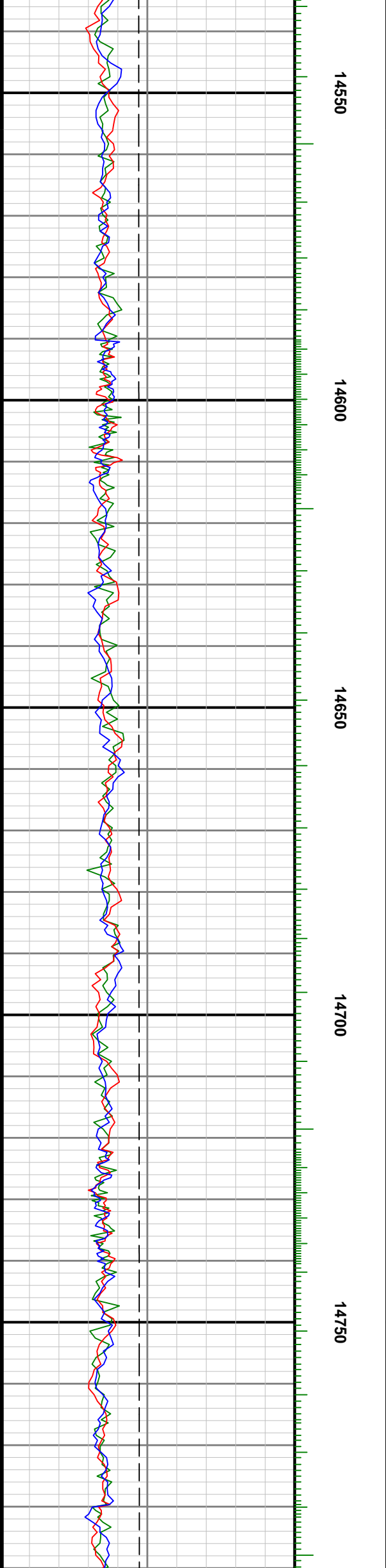
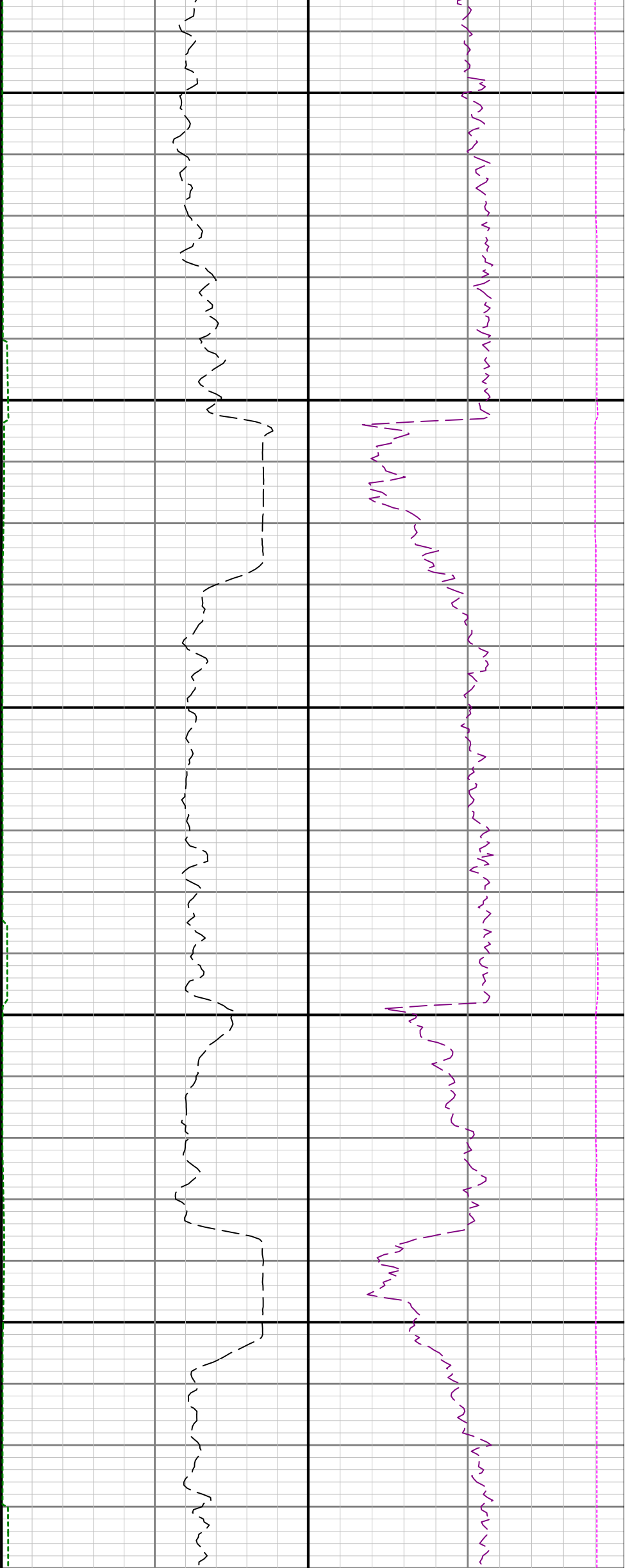


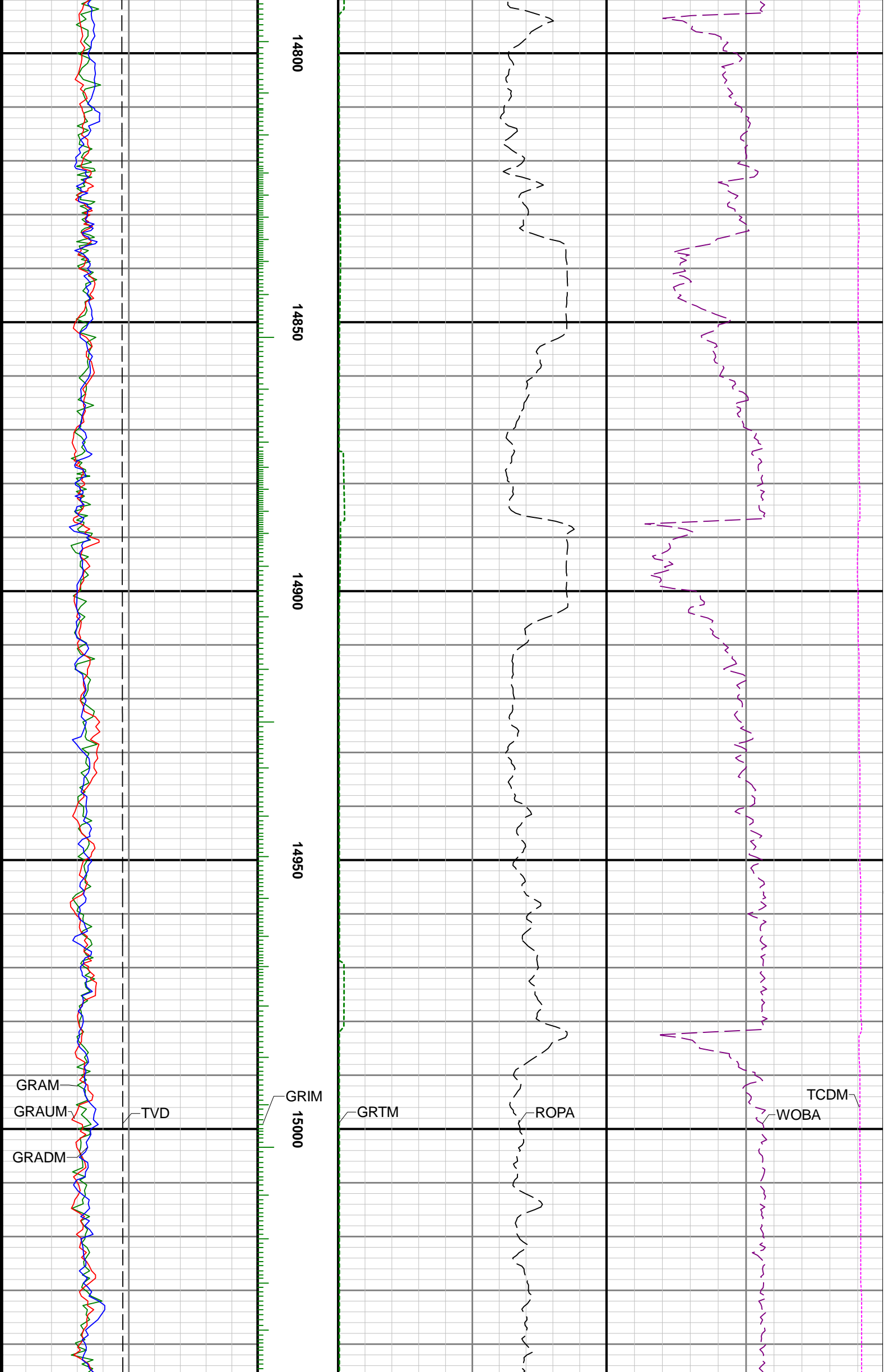


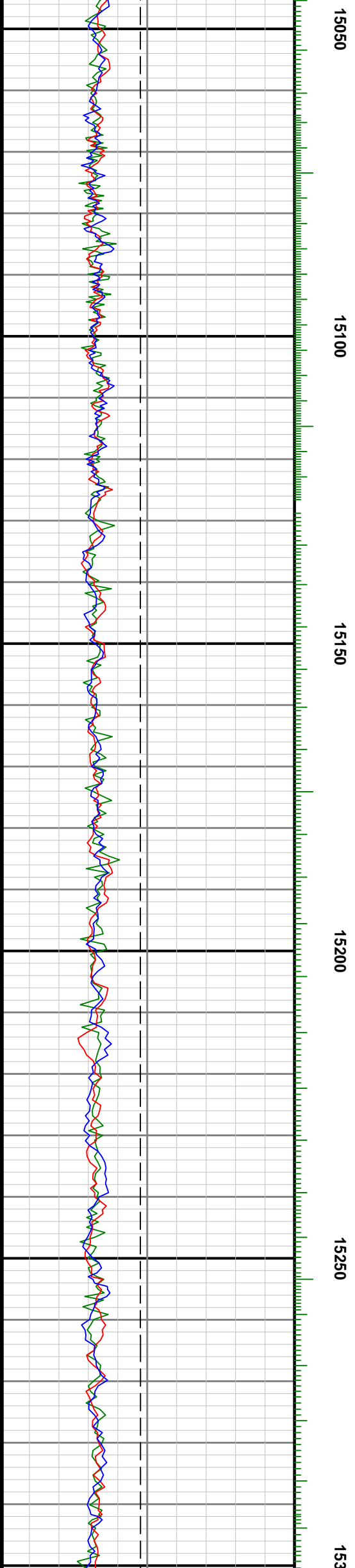
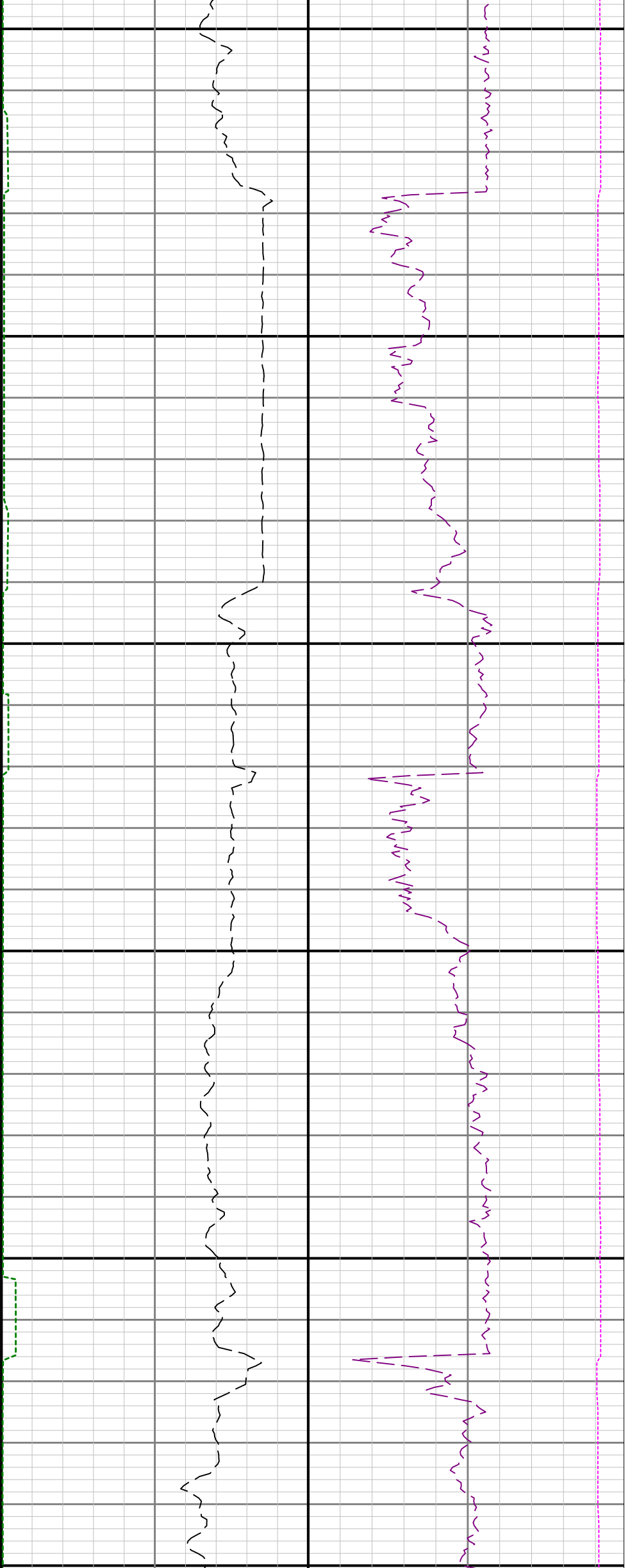


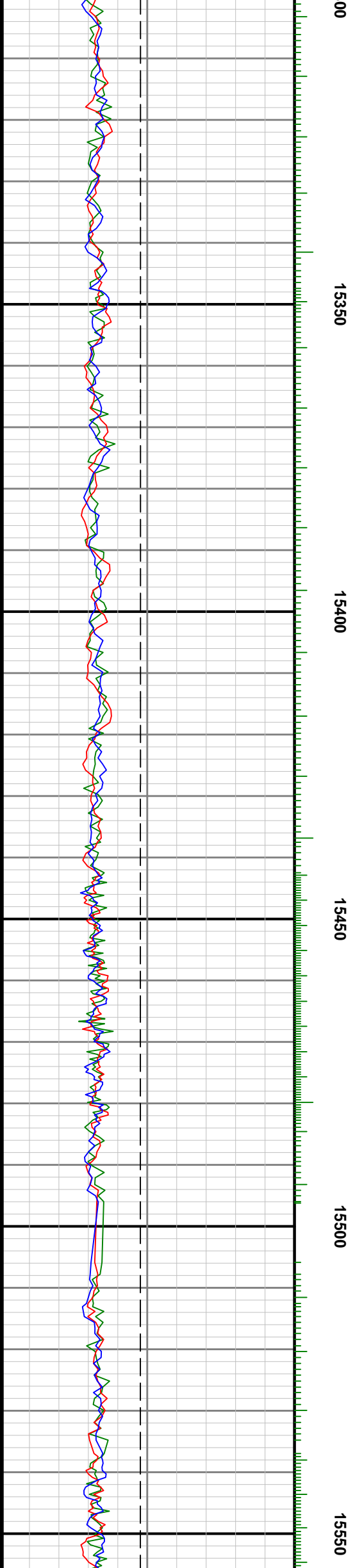
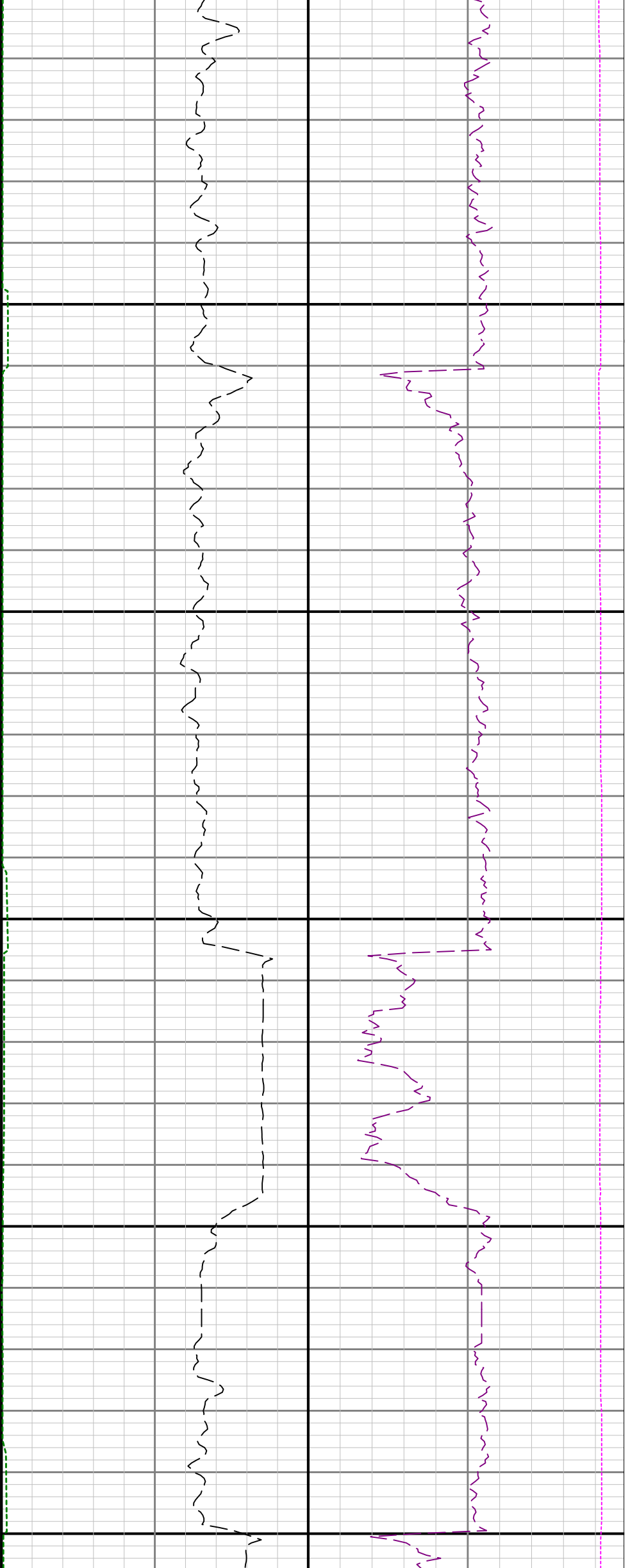


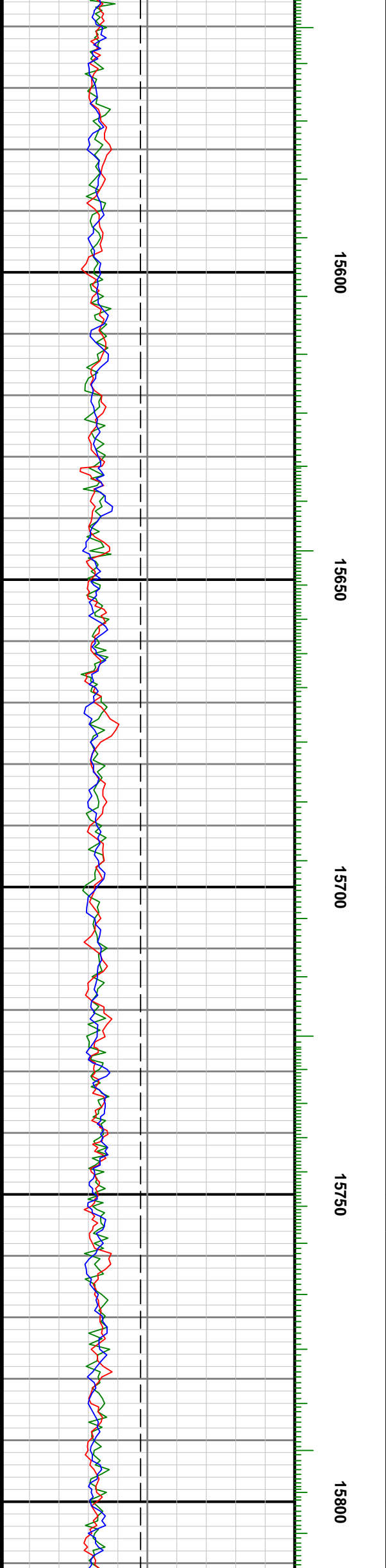
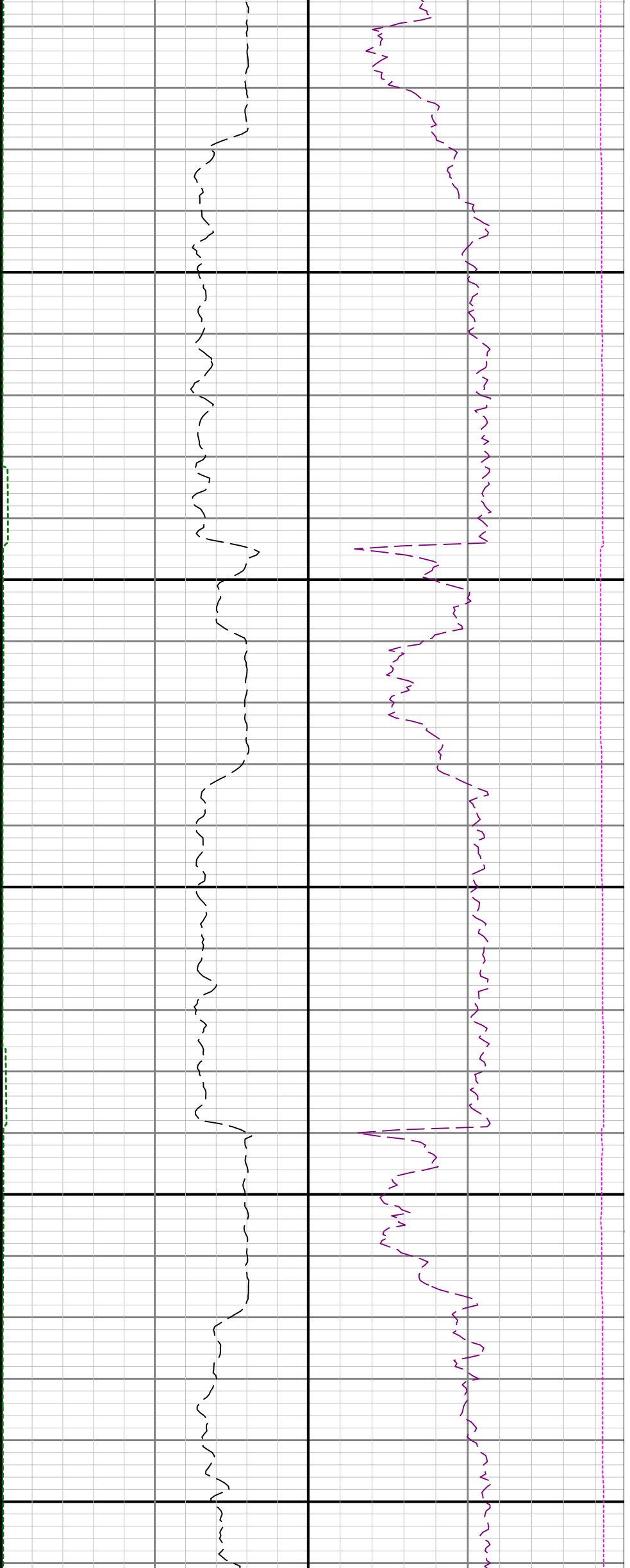


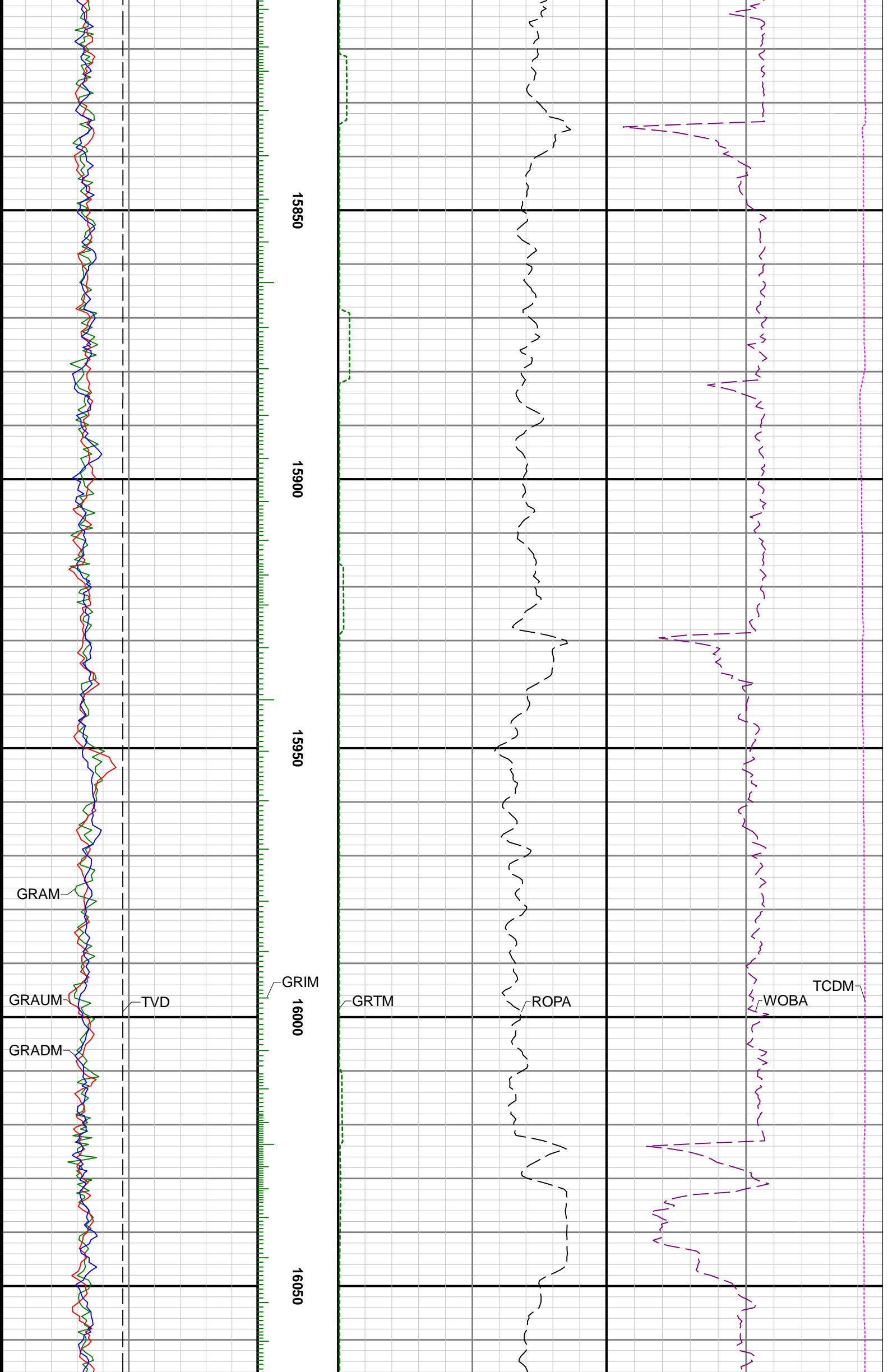


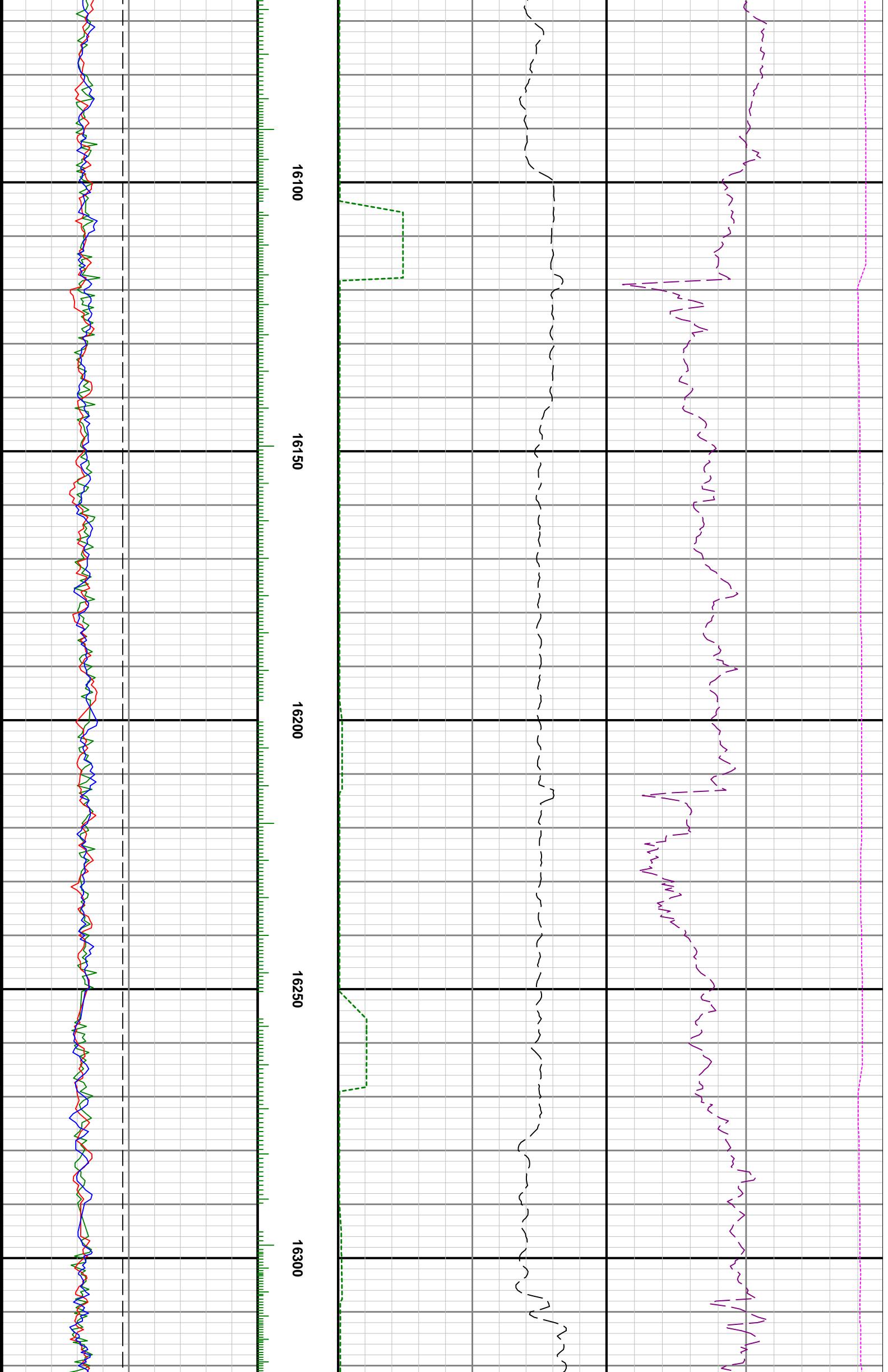


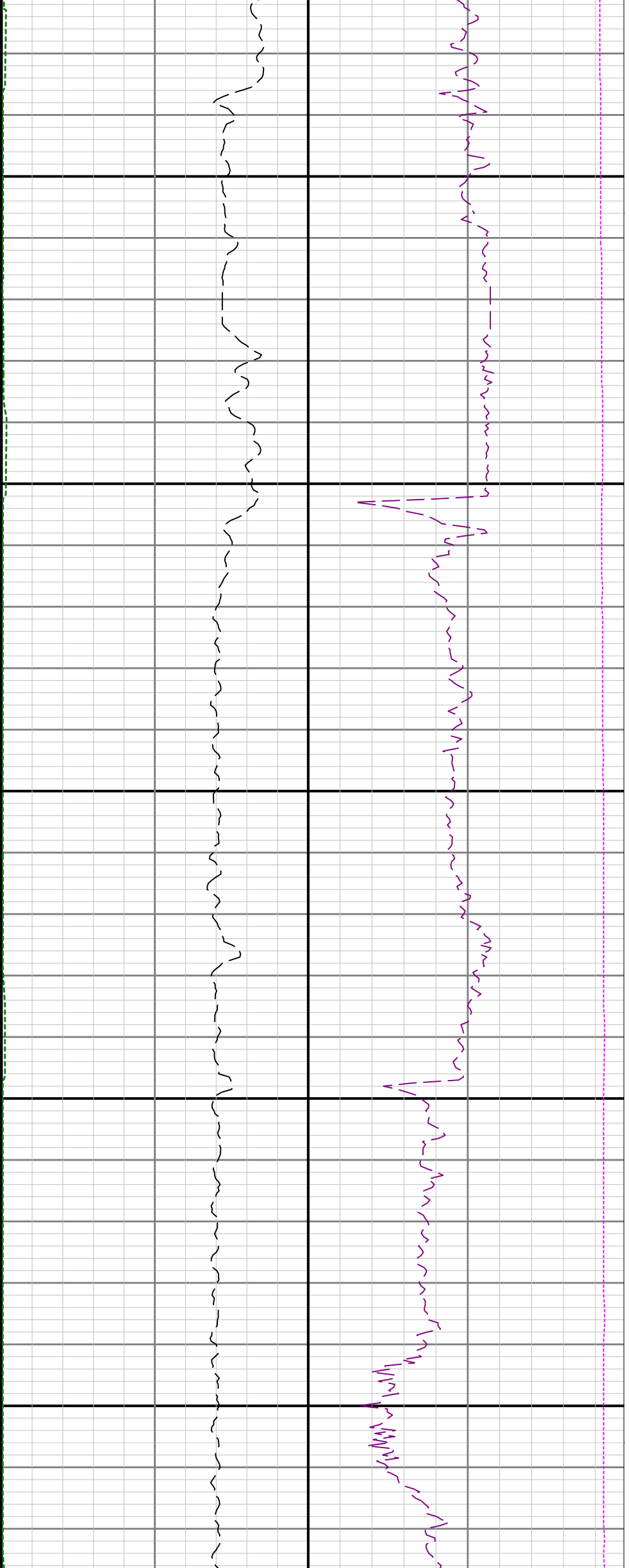












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