Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY	EXCELSIOR MINING ARIZONA
WELL ID	NSM-006
FIELD	NORTH STAR GUNNISON PROJECT
COUNTY	COCHISE STATE ARIZONA

TYPE OF LOGS: ACOUSTIC TELEVIEWER
MORE: CALIPER

LOCATION
N: 32.08328
W: 110.04409

SEC TWP RGE

OTHER SERVICES
4 RX SONIC
GAMMA
TEMP/FLUID RES

PERMANENT DATUM		ELEVATION	4839 FT
LOG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	
DRILLING MEAS. FROM			

K.B.
D.F.
G.L.

DATE	09-13-14	TYPE FLUID IN HOLE	MUD
RUN No	3	MUD WEIGHT	N/A
TYPE LOG	ACOUSTIC TELEVIEWER	VISCOSITY	N/A
DEPTH-DRILLER	1217.0 FT	LEVEL	~ 273.2 FT
DEPTH-LOGGER	1217.7 FT	MAX. REC. TEMP.	28.7 DEG C
BTM LOGGED INTERVAL	1219.1 FT	IMAGE ORIENTED TO:	MAGNETIC NORTH
TOP LOGGED INTERVAL	529.0 FT	SAMPLE INTERVAL	0.0123 FT
DRILLER / RIG#	GODBE	LOGGING TRUCK	TRUCK #300
RECORDED BY / Logging Eng.	E. BEAM	TOOL STRING/SN	ALT ABI-40 SN 3520
WITNESSED BY	ANDY - EXCELSIOR	LOG TIME:ON SITE/OFF SITE	4:15 PM

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	?	SURFACE	529 FT	HWT		SURFACE	529 FT
2	HQ	529 FT	TOTAL DEPTH				
3							

COMMENTS:

.

Tool Summary:

Date	09-14-14	**Date**	09-14-14	**Date**	09-14-14		
Run No.	1	**Run No.**	2	**Run No.**	3		
Tool Model	MSI COMBO TOOL	**Tool Model**	ALT 4 RX SONIC	**Tool Model**	ALT ABI-40		
Tool SN	4953	**Tool SN**	4572	**Tool SN**	3520		
From	SURFACE	**From**	520.0 FT	**From**	531.3 FT		
To	1217.7 FT	**To**	1219.8 FT	**To**	1219.1 FT		
Recorded By	E. BEAM	**Recorded By**	E. BEAM	**Recorded By**	E. BEAM		
Truck No	300	**Truck No**	300	**Truck No**	300		
Operation Check	09-12-14	**Operation Check**	09-12-14	**Operation Check**	09-12-14		
Calibration Check	09-12-14	**Calibration Check**	N/A	**Calibration Check**	N/A		
Time Logged	4:45 PM	**Time Logged**	6:30 PM	**Time Logged**	7:45 PM		

Date		**Date**		**Date**			
Run No.	4	**Run No.**	5	**Run No.**	6		
Tool Model		**Tool Model**		**Tool Model**			
Tool SN		**Tool SN**		**Tool SN**			
From		**From**		**From**			
To		**To**		**To**			
Recorded By		**Recorded By**		**Recorded By**			
Truck No		**Truck No**		**Truck No**			
Operation Check		**Operation Check**		**Operation Check**			
Calibration Check		**Calibration Check**		**Calibration Check**			
Time Logged		**Time Logged**		**Time Logged**			

Additional Comments:

Caliper Arms Used: 3" ARMS **Calibration Points:** 4" & 8"

Disclaimer:

All interpretations of log data are opinions based on inferences from electrical or other measurements. We do not guarantee the accuracy or correctness of any interpretations or recommendations and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our employees or agents. These interpretations are also subject to our general terms and conditions set out in our current Service Invoice.

Major Lithology

- Lost Core
- Brecciated Quartz Vein
- Hornfels
- Biotite hornfels
- Conglomerate
- Dolomite
- Dolomite, crenulated
- Dolomite partiallly marbleized
- Dolomite mixed with shale interbeds
- Dolomite mixed di tactite
- Limestone
- Limestone with shale beds
- Limestone partially marbleized
- Marble
- Quartzite
- Quartz
- Alluvium
- Quartz Monzonite
- Garnetite
- Tactite
- Schist
- Shale
- Siltstone

Acoustic Image Features Legend

- Moderate Fracture/Joint
- Major Open Joint / Fracture
- Partially Open Joint / Fracture
- Minor Structure
- Vein
- Broken Zone
- Fault/Shear Zone
- Bedding / Banding
- Fault w/Gouge
- Sedimentary Contact
- Intrusive Contact
- Foliation

Breakouts/Near Vertical Joints/Tensile Fxs & Broken/Breccia Zones Legend

- Broken Zone / Undifferentiated
- Major Breakout
- Breccia or Conglomerate

Broken Zone / Undifferentiated
Major Breakout
Minor Breakout
Tensile Fracture
Open NVJnt
Filled NVJnt
Large Vugs/Vesicles (> 6")
Medium Vugs/Vesicles (2-6")
Small Vugs/Vesicles (< 2")
Conglomerate - sand matrix supported
Conglomerate - mud matrix supported
Conglomerate - clast supported

NSM-006 ABI40 Summary_~531.3' to ~1219.4'

Depth 1in:1ft

Centralized TT — Oriented Mag North — 0° 90° 180° 270° 0°

Cent TT_524.6'-551.0' — Non Oriented, Rot'd by -92.5 Deg — 0° 90° 180° 270° 0°

Caliper — 2 Inches 7

Max-Acoustic Caliper — 2 Inches 7

Ave-Acoustic Caliper — 2 Inches 7

Enlargements

Ave-Acoustic Caliper #1 — 2 Inches 7

Amplitude-NM — Oriented Mag North — 0° 90° 180° 270° 0°

Amplitude_524.6'-551.0' — Non-Oriented, Rot'd -92.5 deg — 0° 90° 180° 270° 0°

Amplitude-Static — Oriented Mag North — 0° 90° 180° 270° 0°

Amp-High Pass — Oriented Mag North — 0° 90° 180° 270° 0°

ARI — 0 900

Picks — DIPA — 0° 90° 180° 270° 0°

NVJts — 0° 90° 180° 270° 0°

Bx

3-D View — 0°

Mag Field — 40 uT 60

Gravity — 0.8 G 1.2

Tadpoles — DIPT — 0 90

Tilt — 0 Deg 8

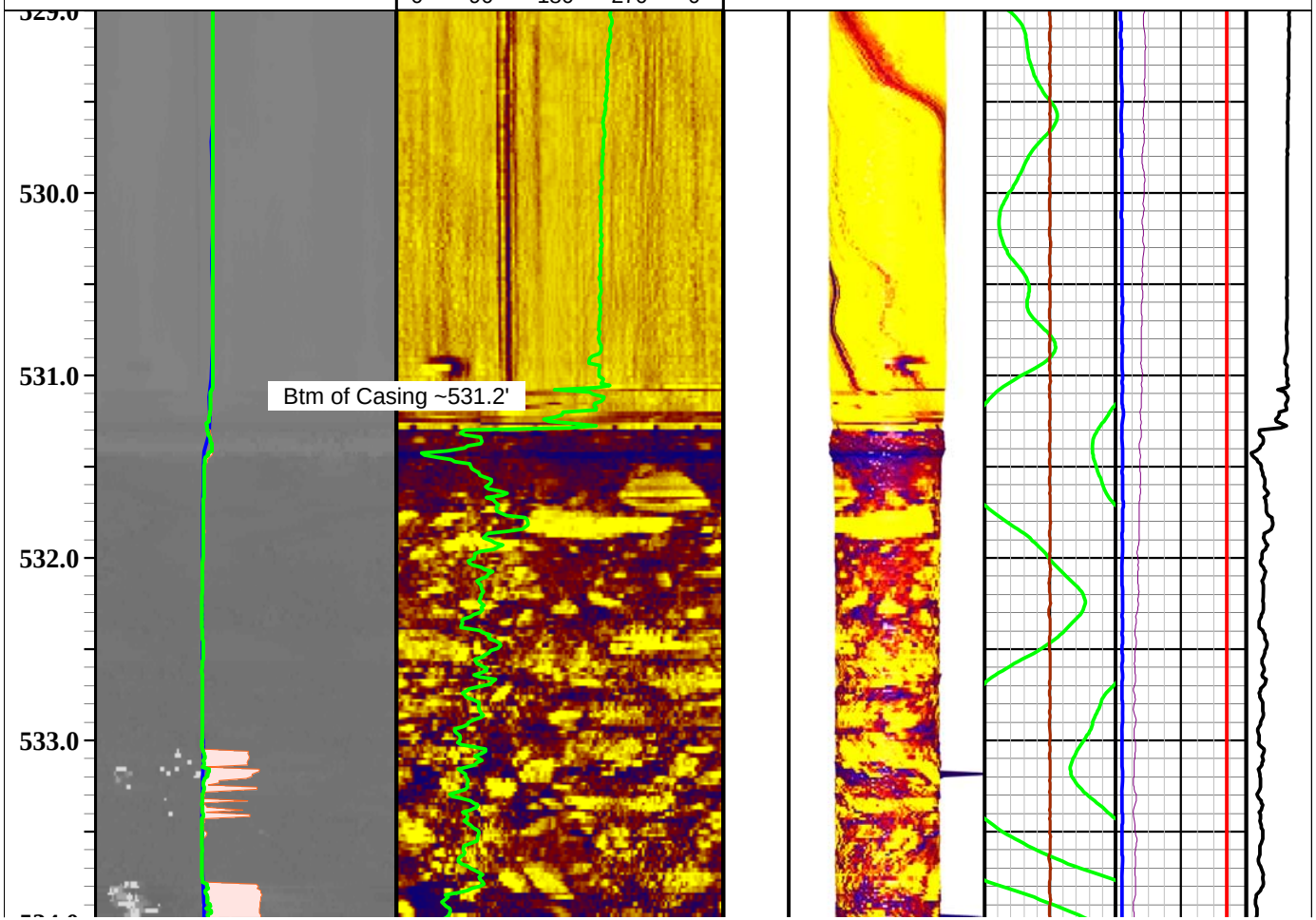
Azi-Edited — 0 360

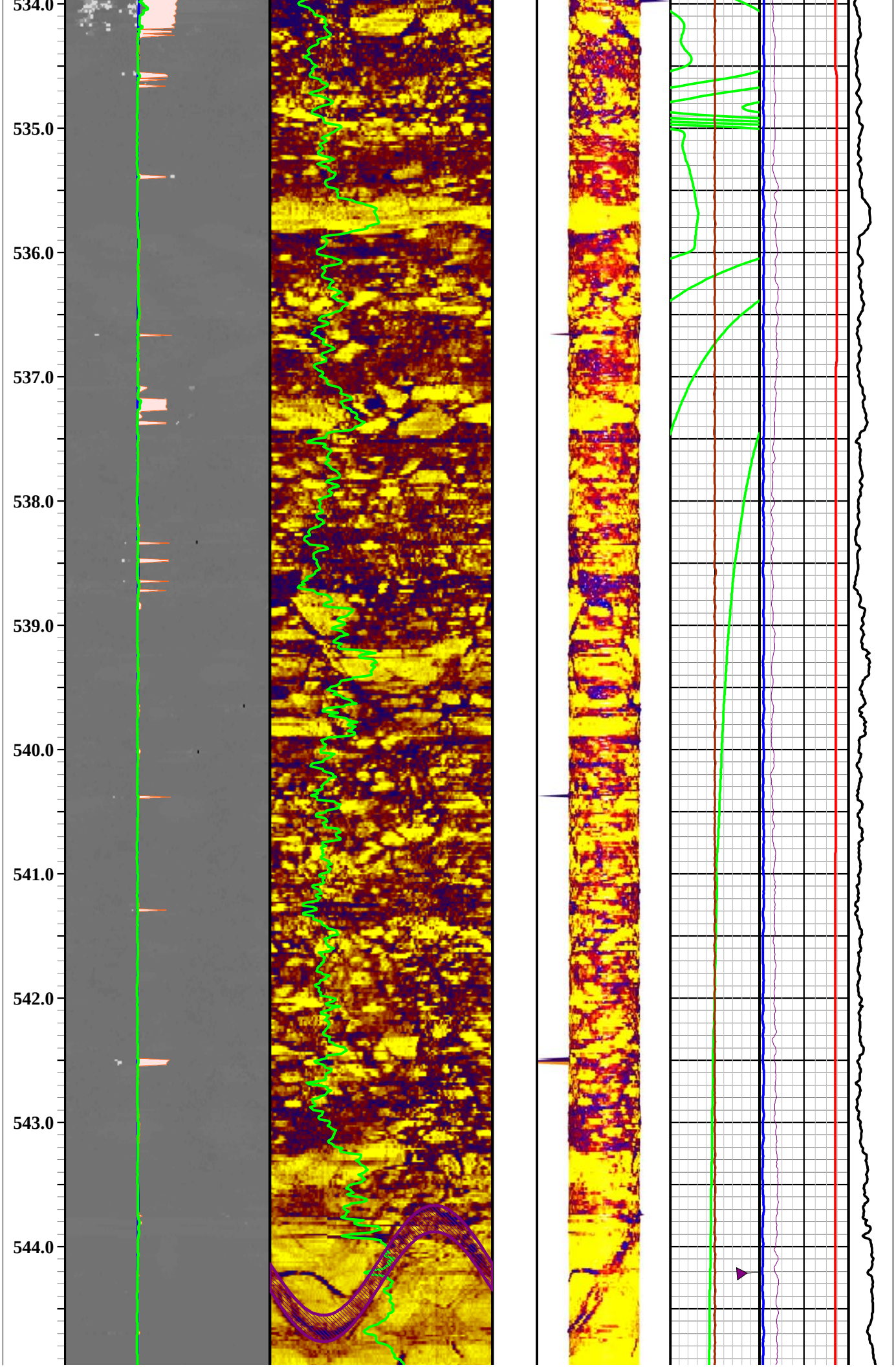
RBR

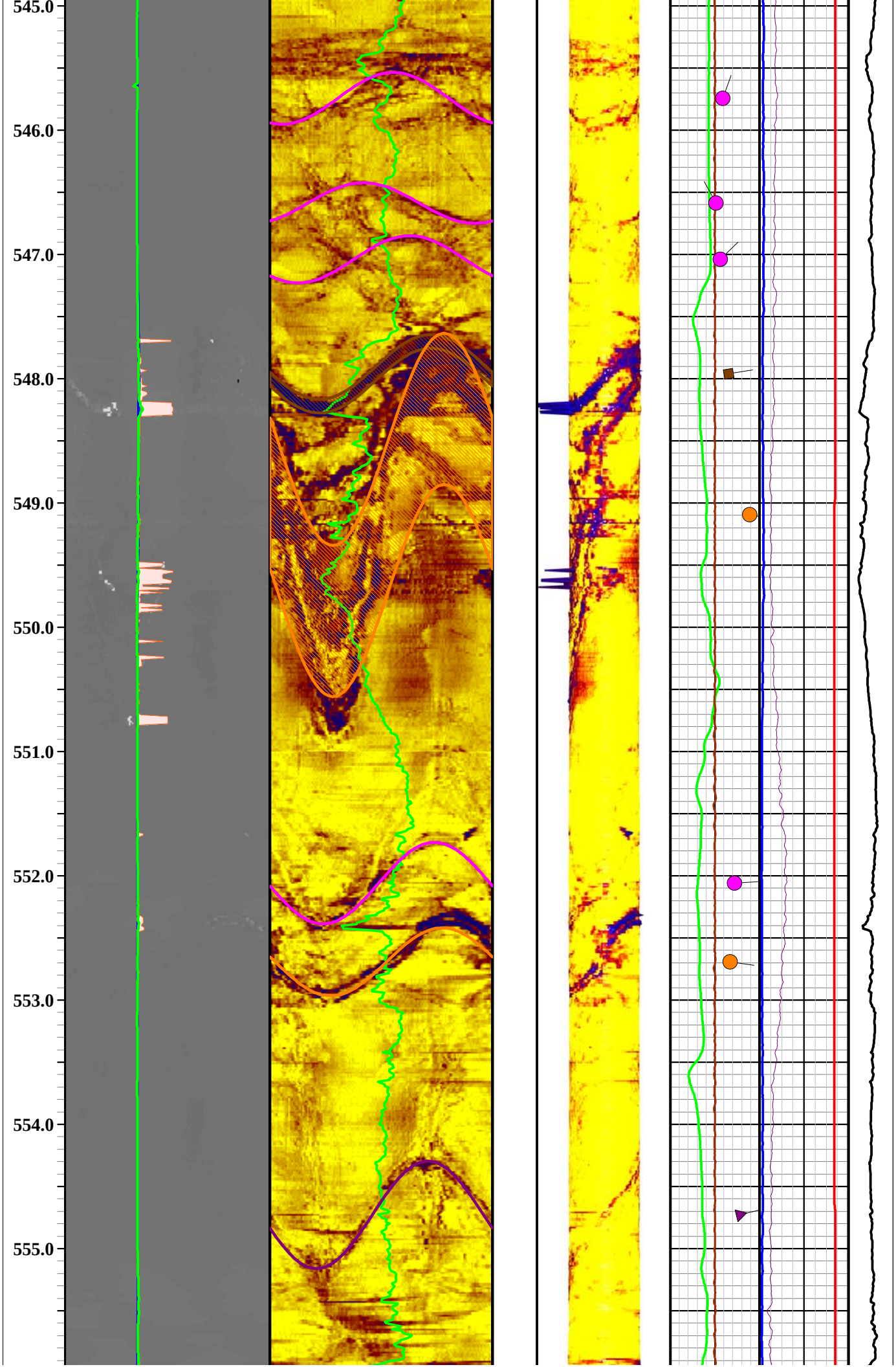
Lith

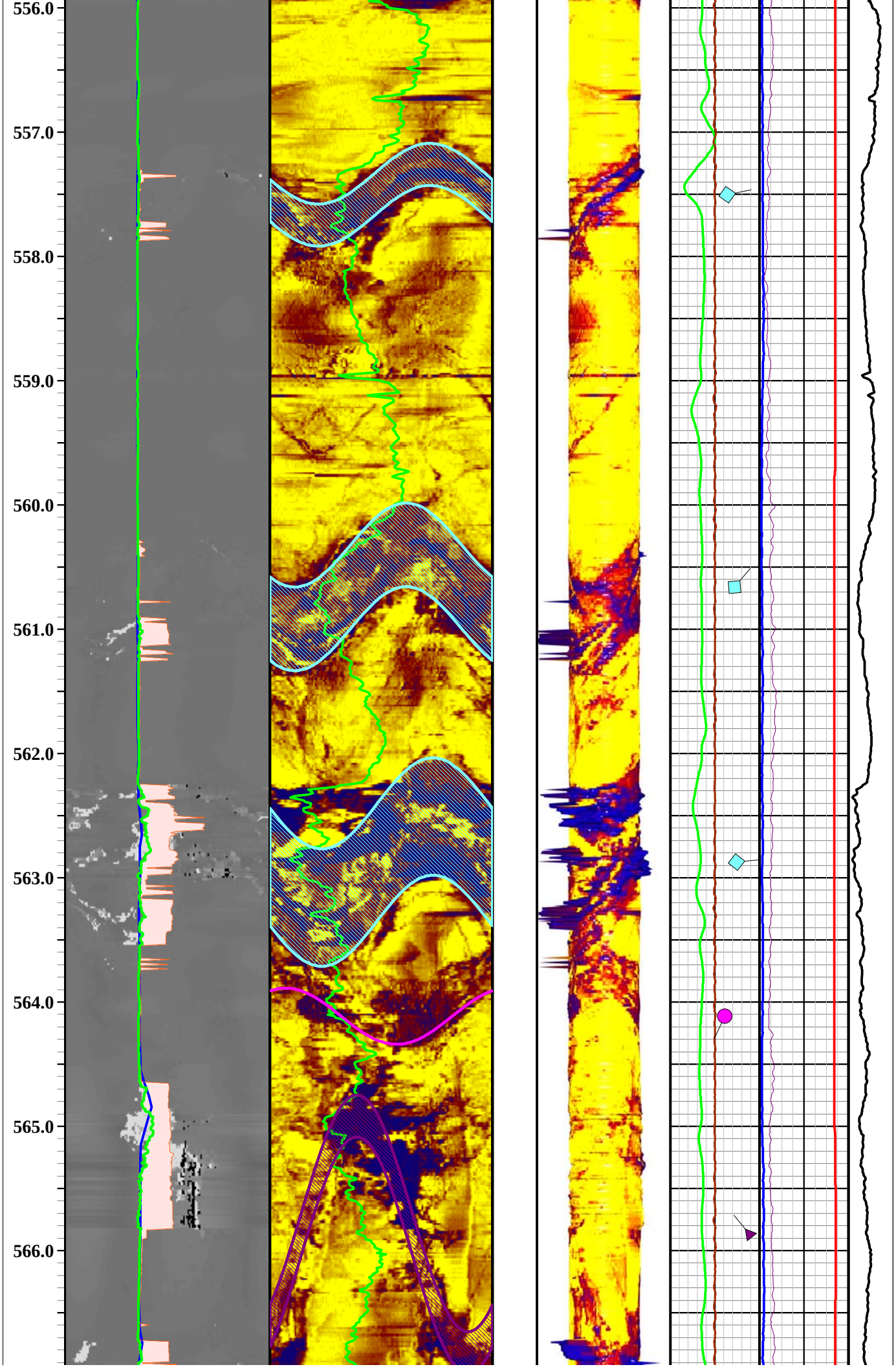
Desc

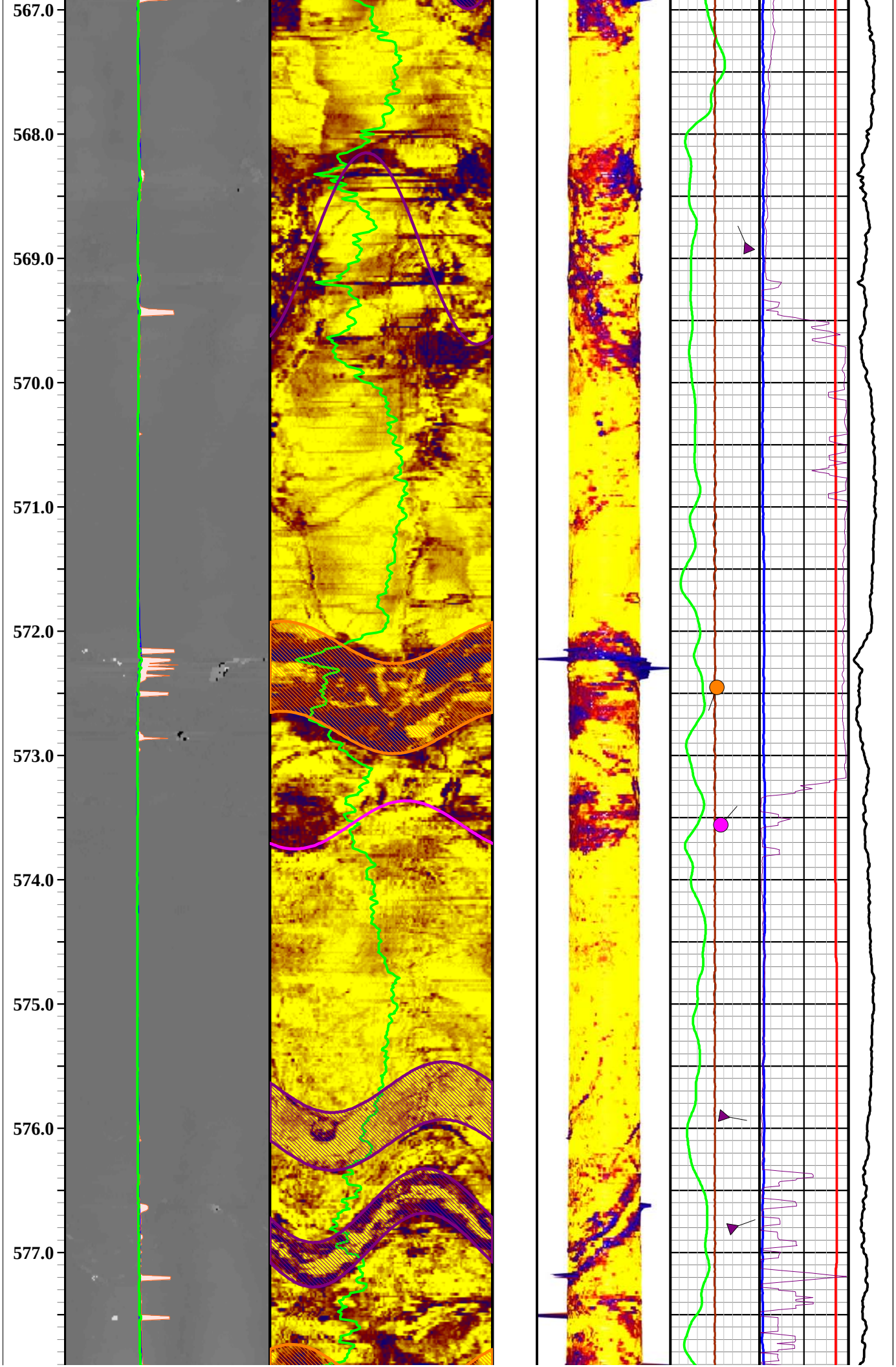
Hard

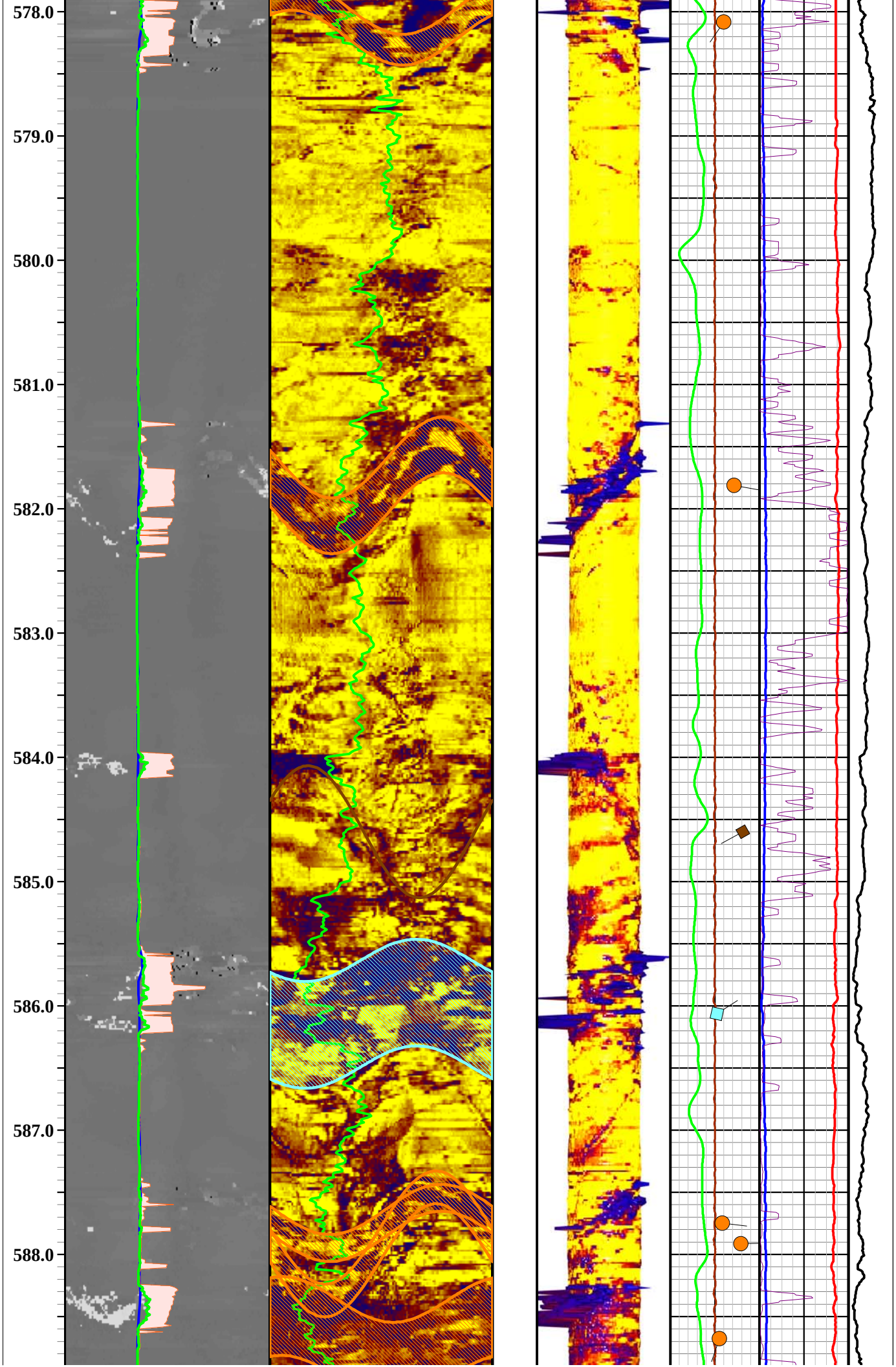


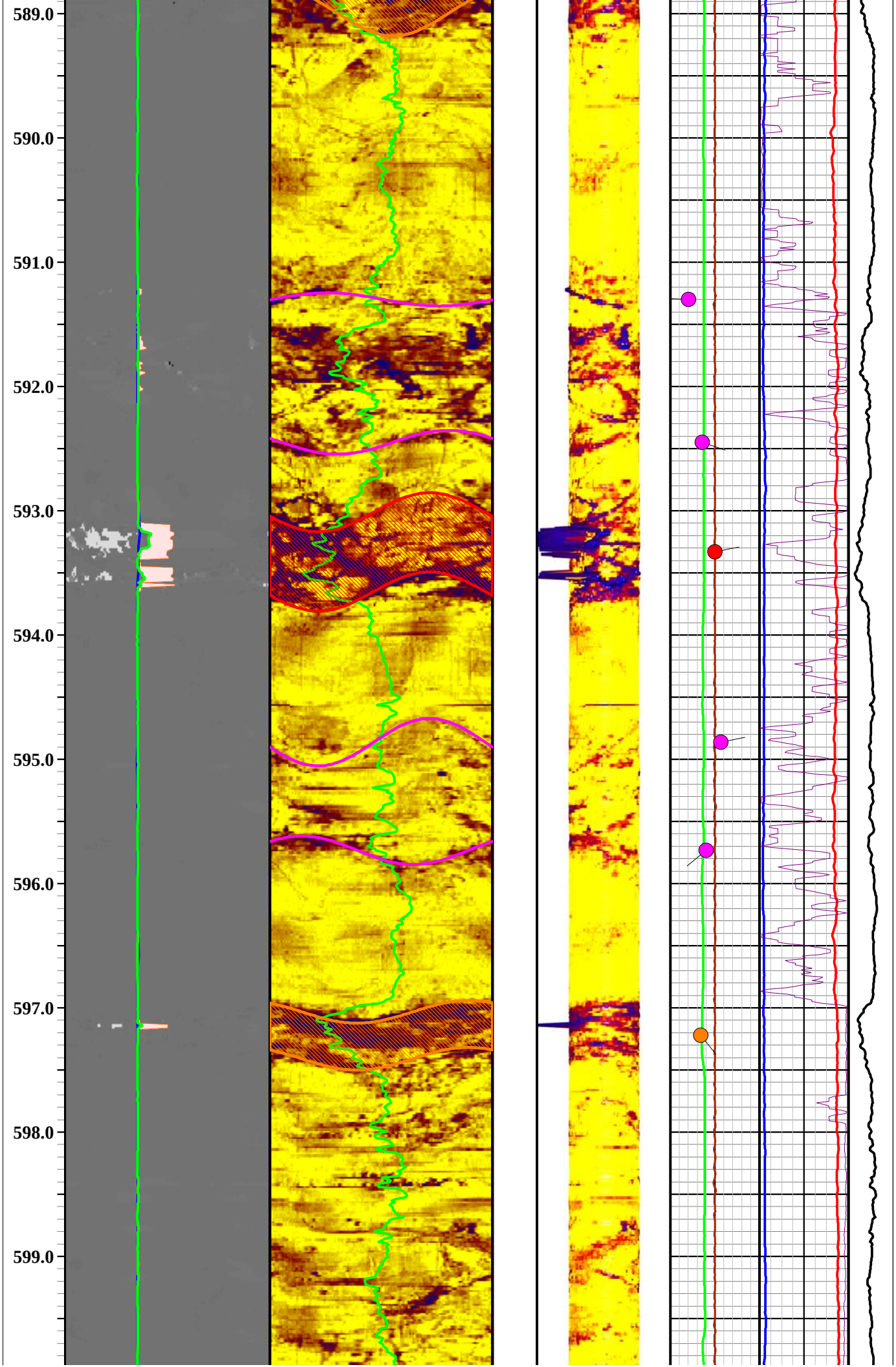

534.0
535.0
536.0
537.0
538.0
539.0
540.0
541.0
542.0
543.0
544.0

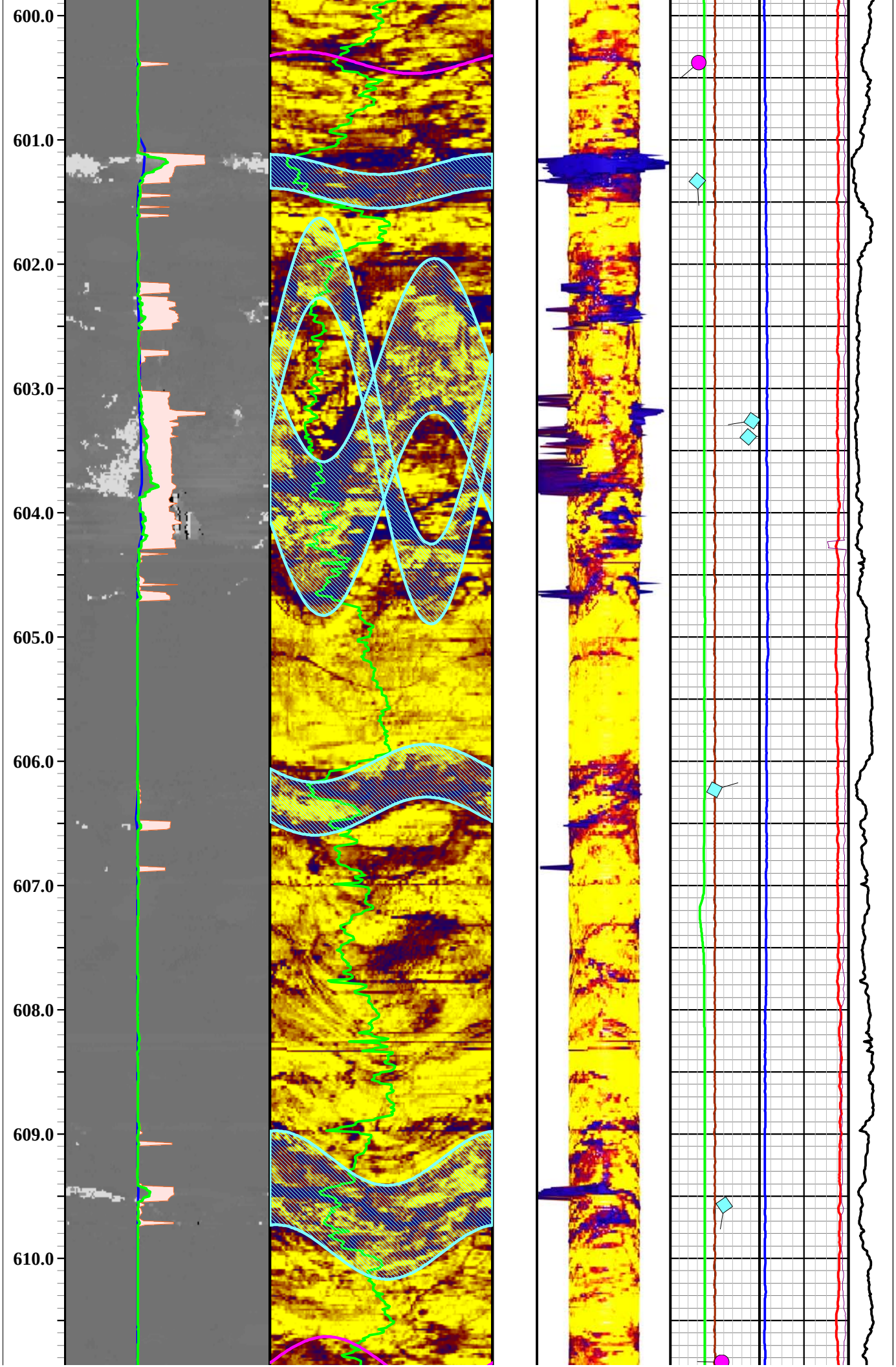

545.0
546.0
547.0
548.0
549.0
550.0
551.0
552.0
553.0
554.0
555.0

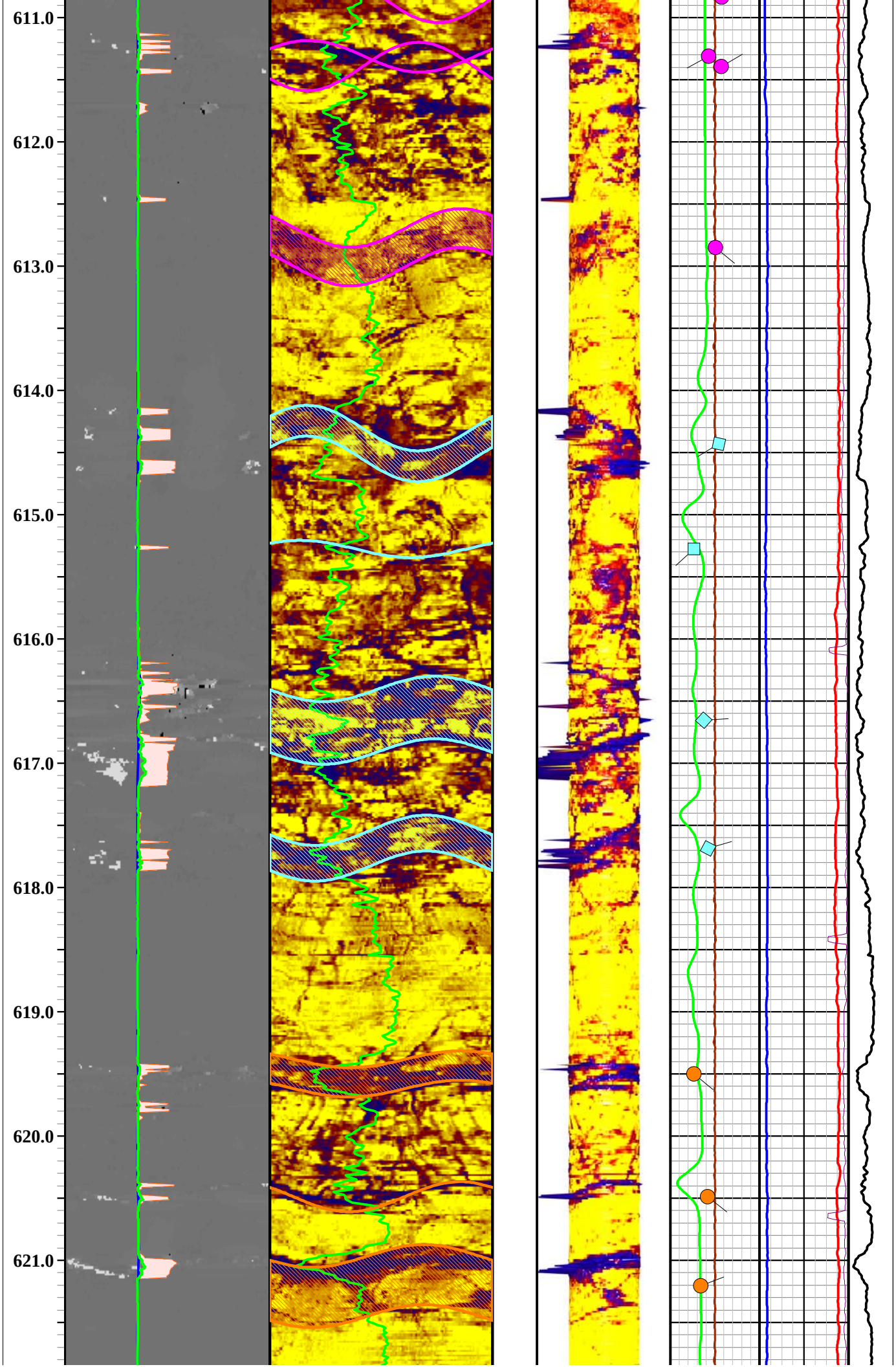

556.0
557.0
558.0
559.0
560.0
561.0
562.0
563.0
564.0
565.0
566.0

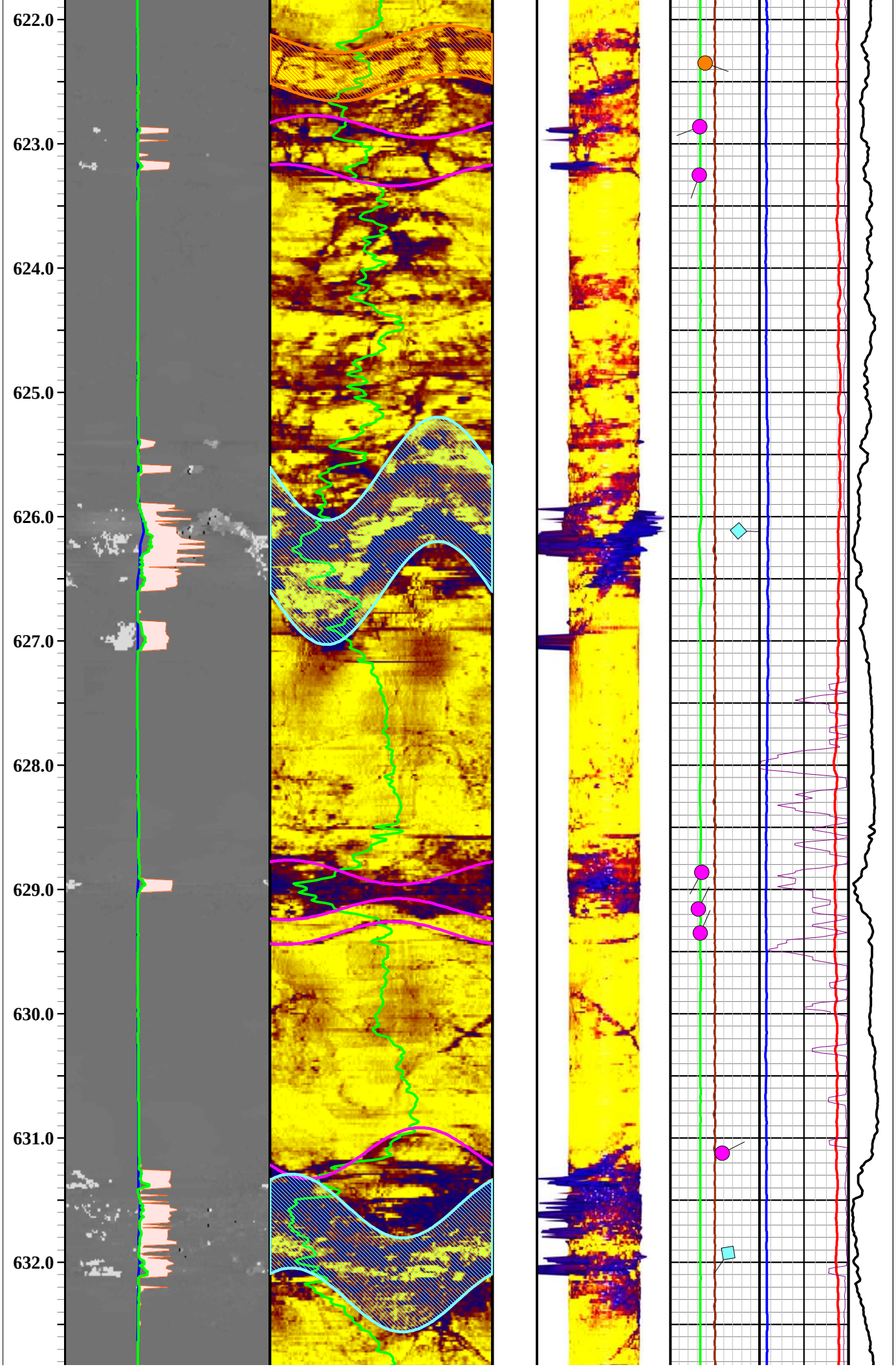

567.0
568.0
569.0
570.0
571.0
572.0
573.0
574.0
575.0
576.0
577.0

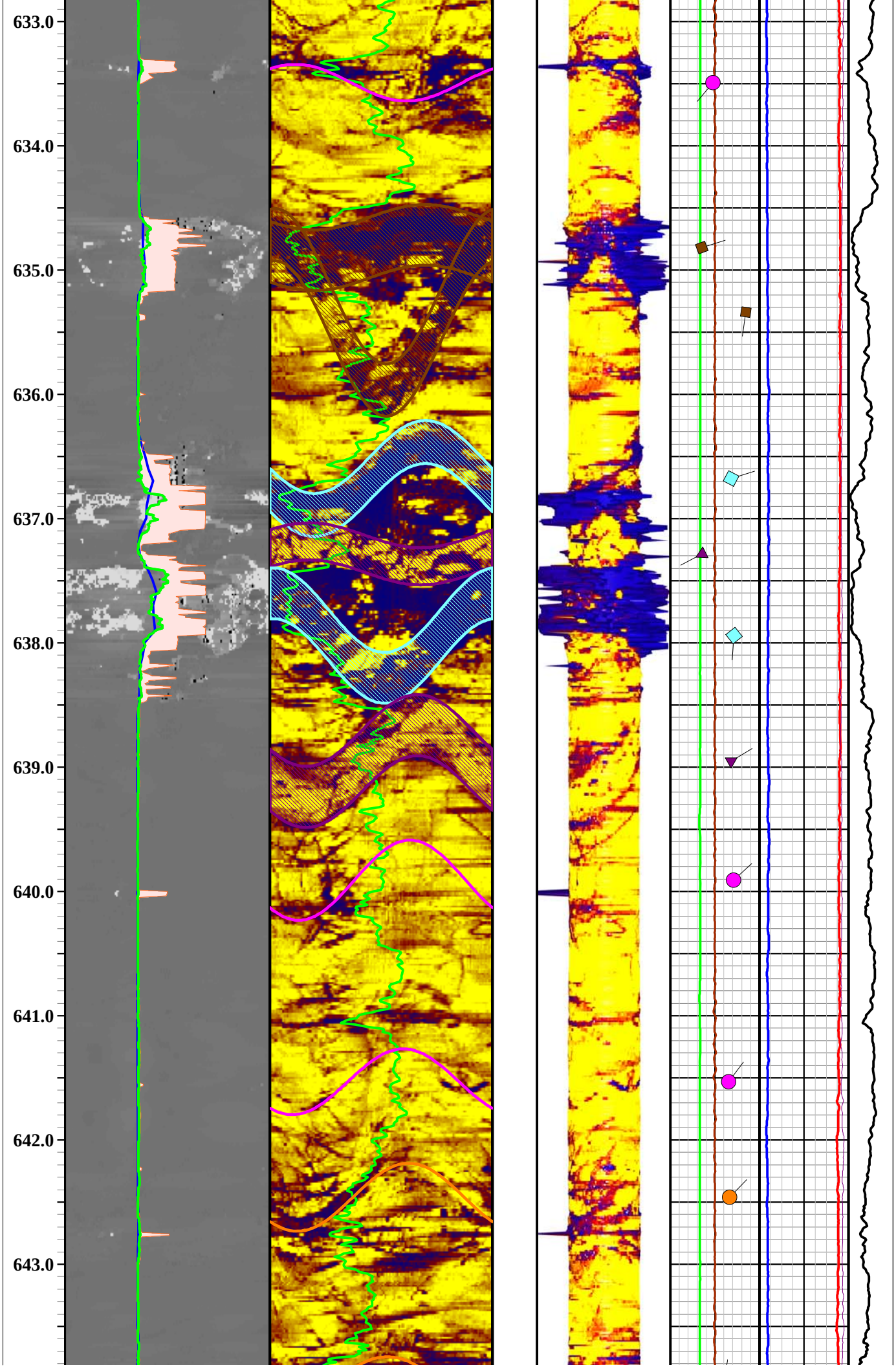

578.0
579.0
580.0
581.0
582.0
583.0
584.0
585.0
586.0
587.0
588.0

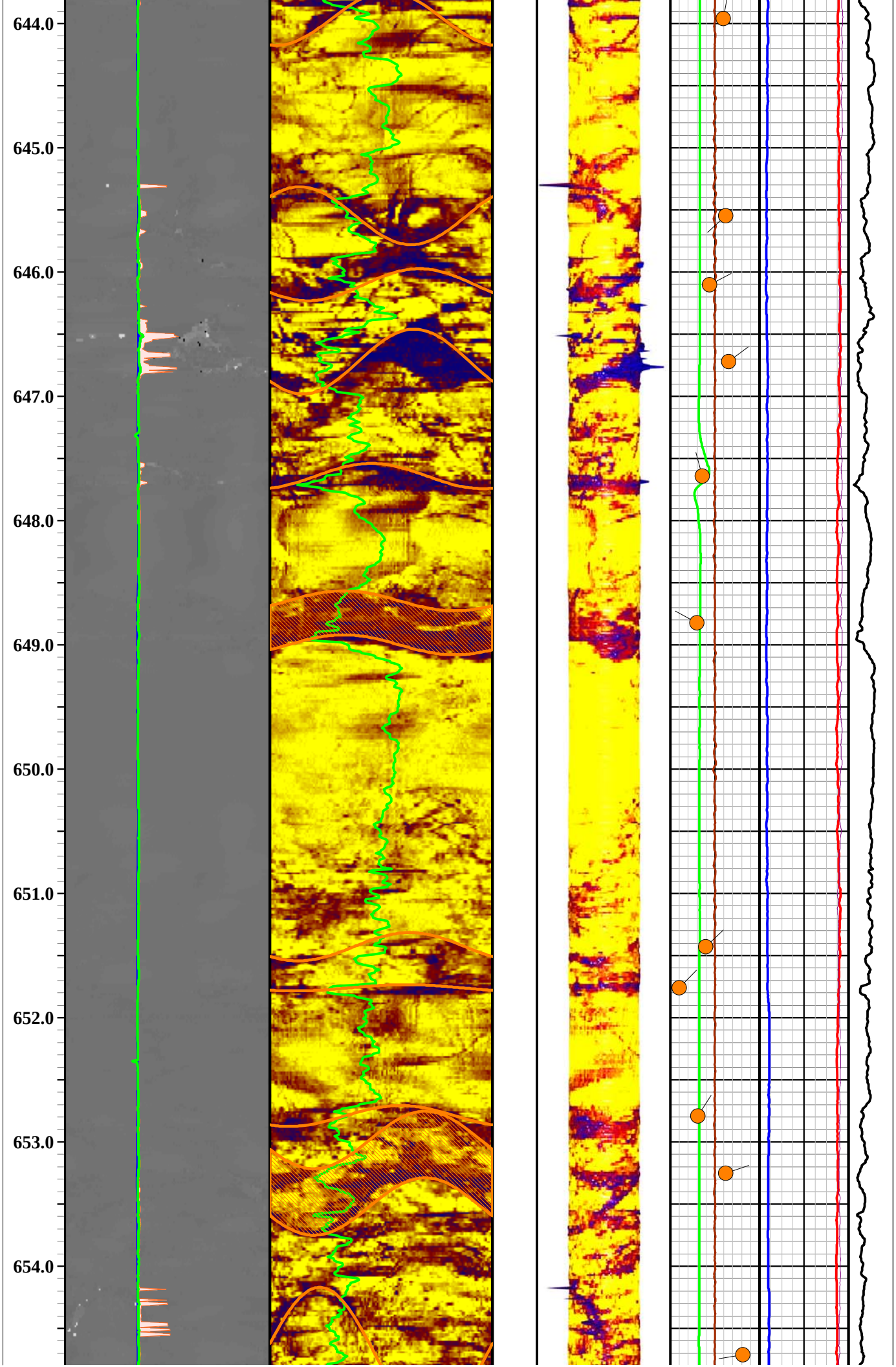

589.0
590.0
591.0
592.0
593.0
594.0
595.0
596.0
597.0
598.0
599.0

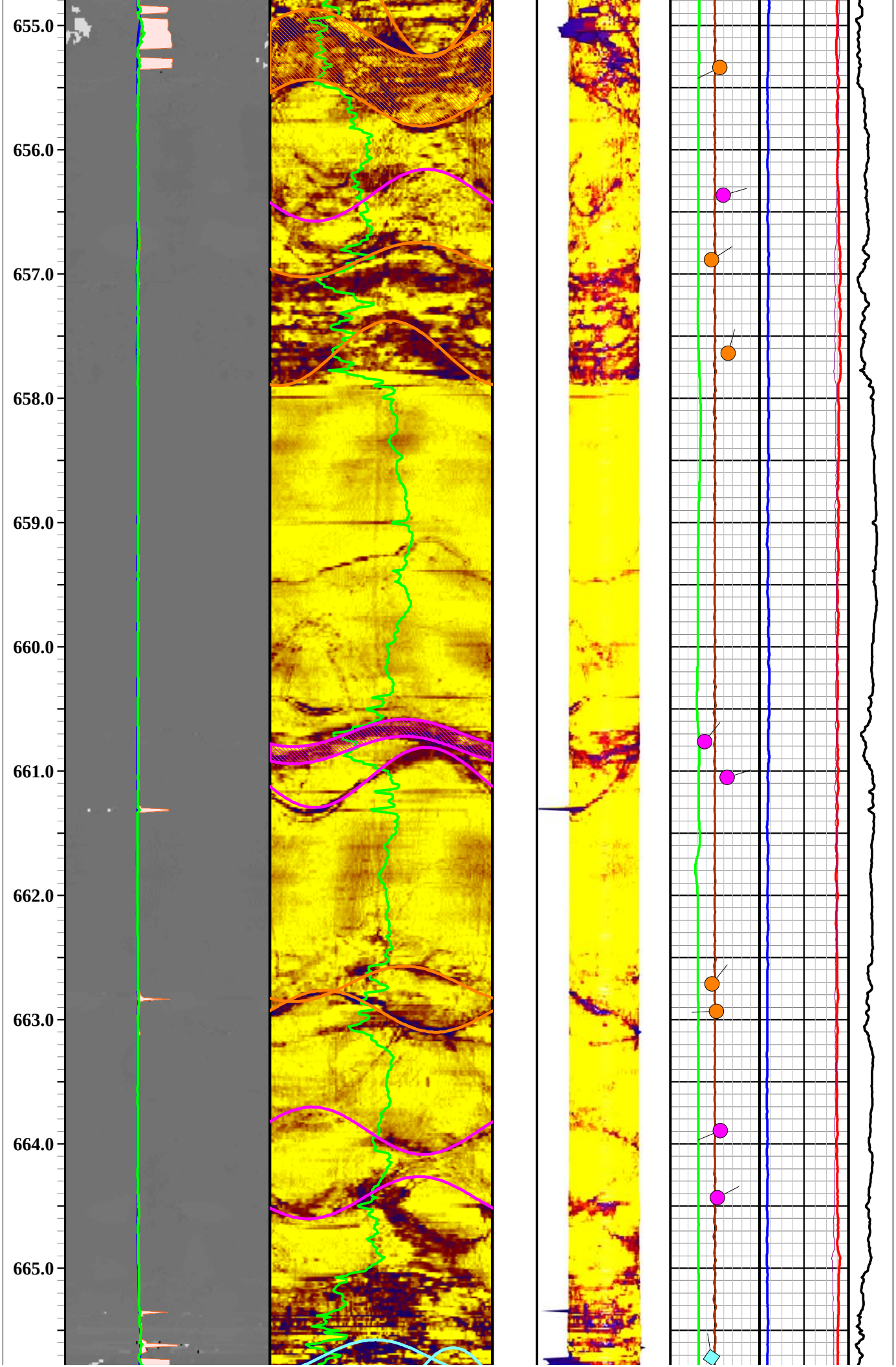

600.0
601.0
602.0
603.0
604.0
605.0
606.0
607.0
608.0
609.0
610.0

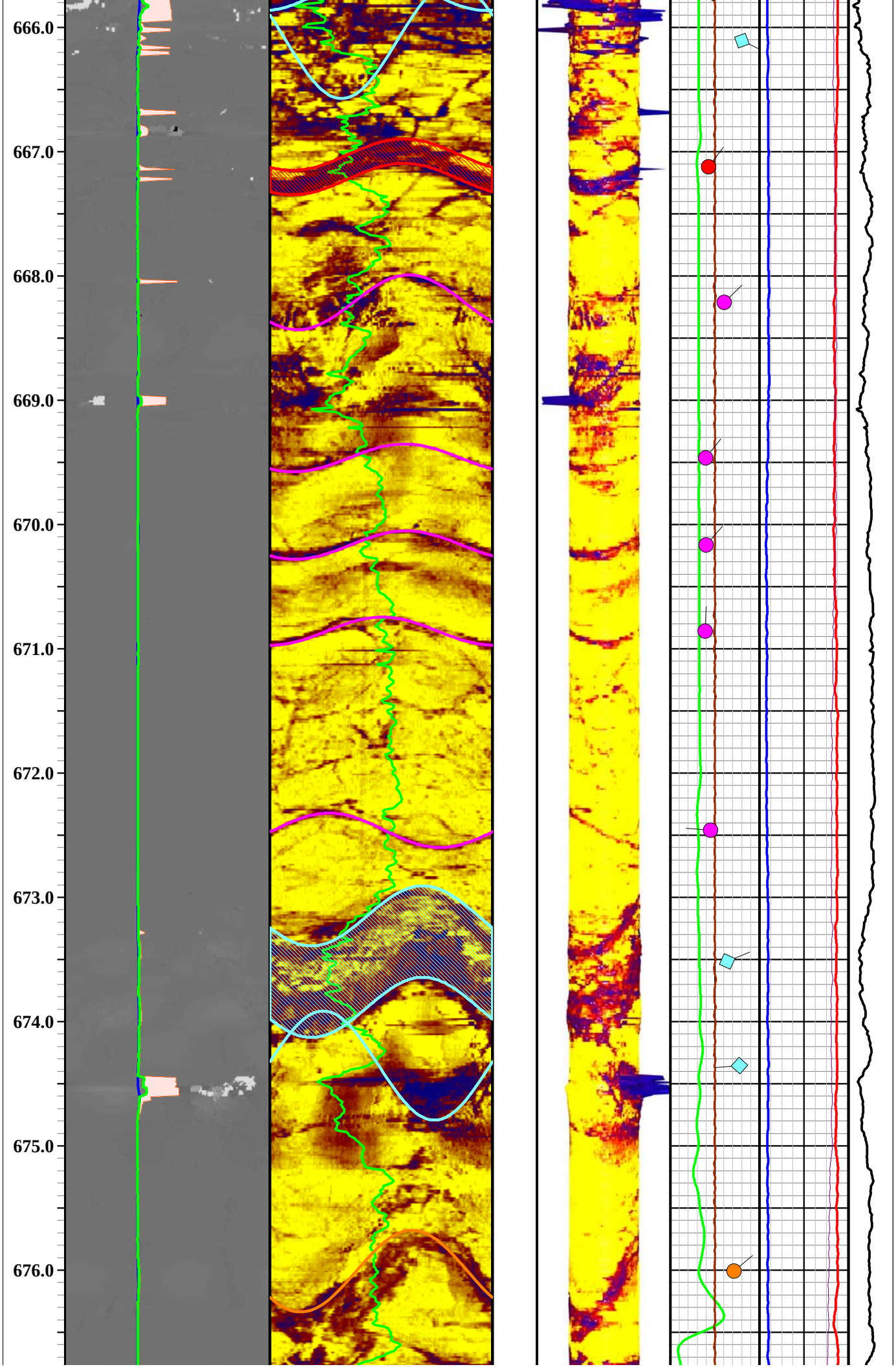

611.0
612.0
613.0
614.0
615.0
616.0
617.0
618.0
619.0
620.0
621.0

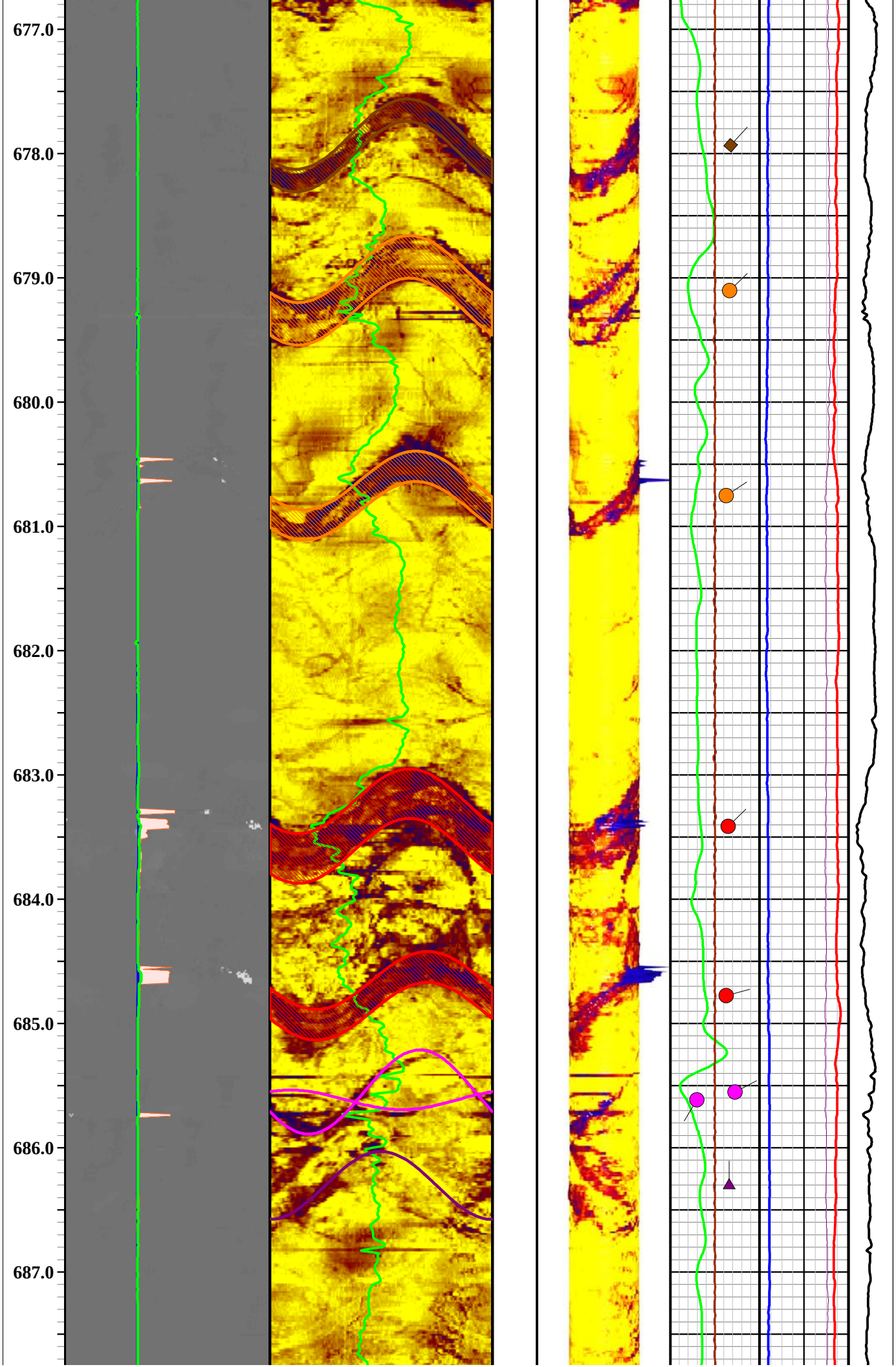

622.0
623.0
624.0
625.0
626.0
627.0
628.0
629.0
630.0
631.0
632.0

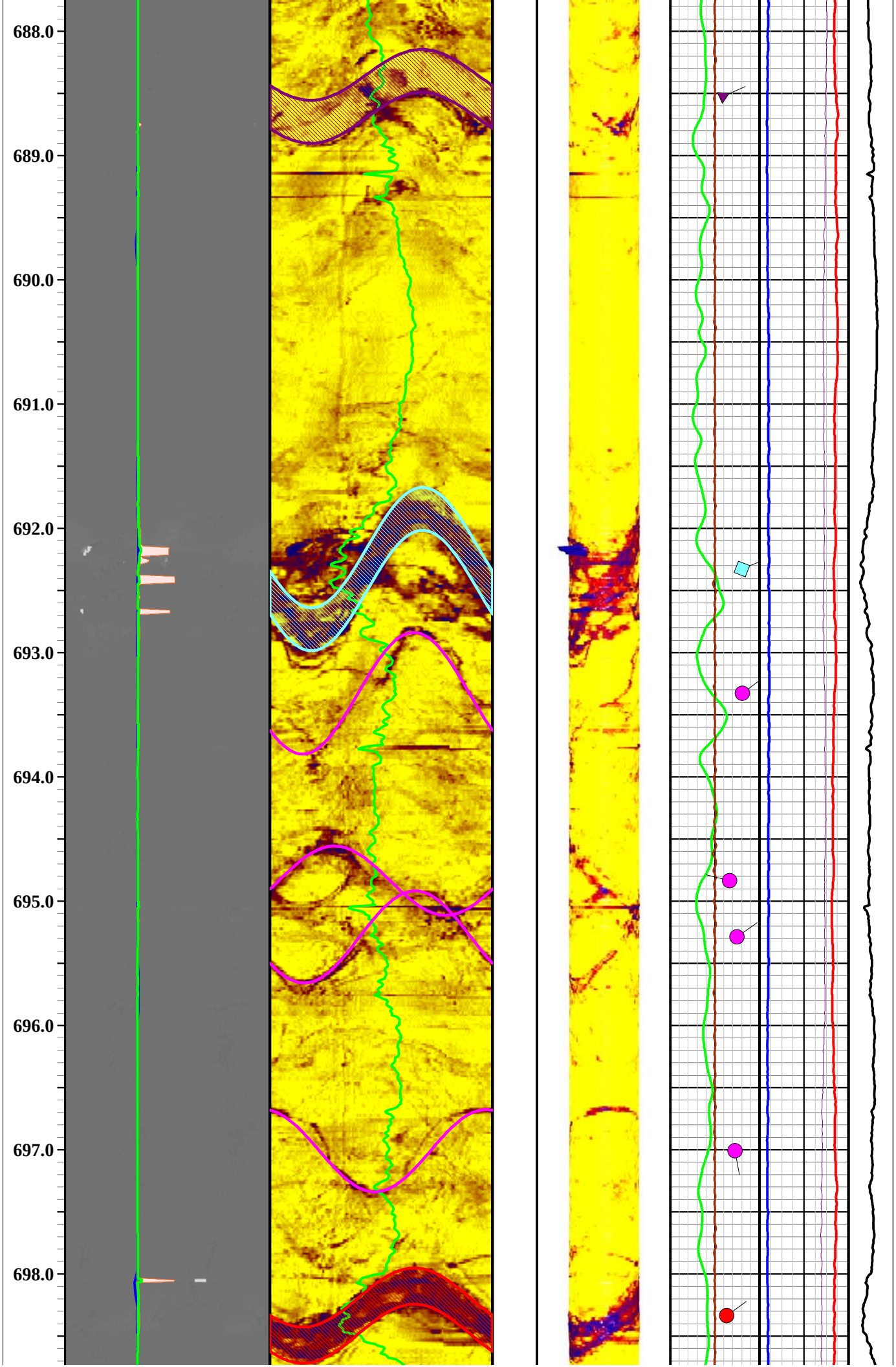

633.0
634.0
635.0
636.0
637.0
638.0
639.0
640.0
641.0
642.0
643.0

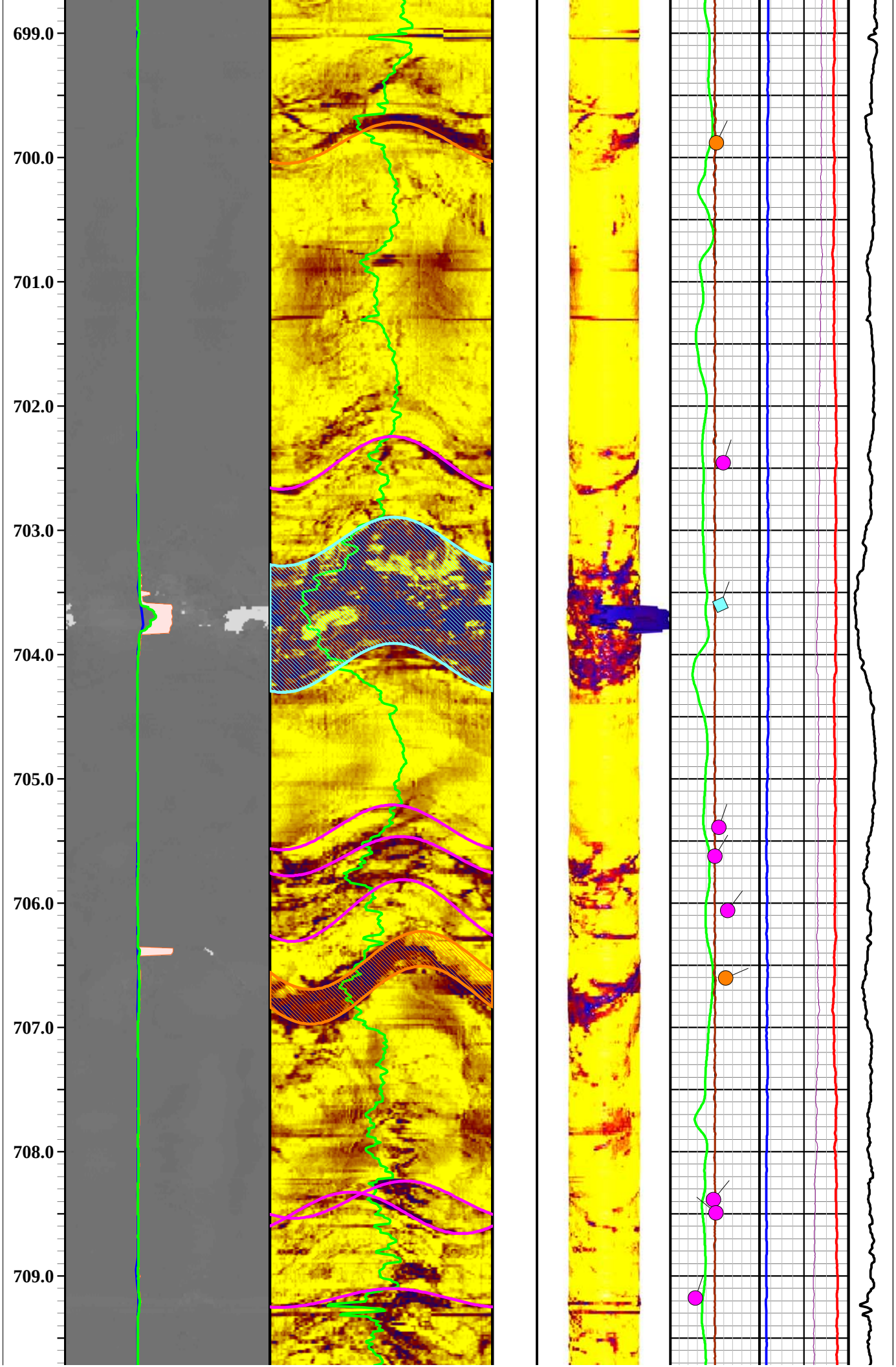

644.0
645.0
646.0
647.0
648.0
649.0
650.0
651.0
652.0
653.0
654.0

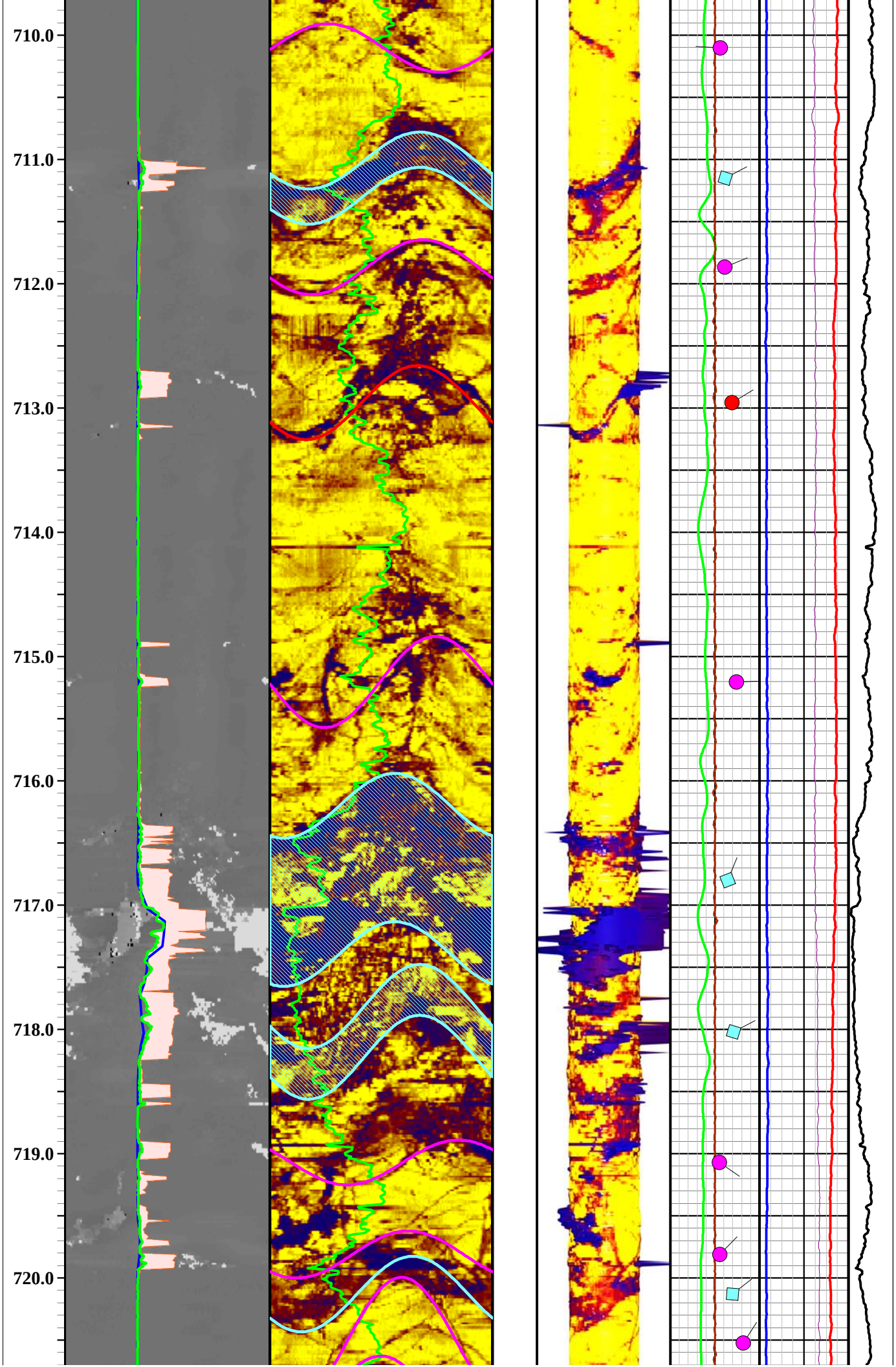

655.0
656.0
657.0
658.0
659.0
660.0
661.0
662.0
663.0
664.0
665.0

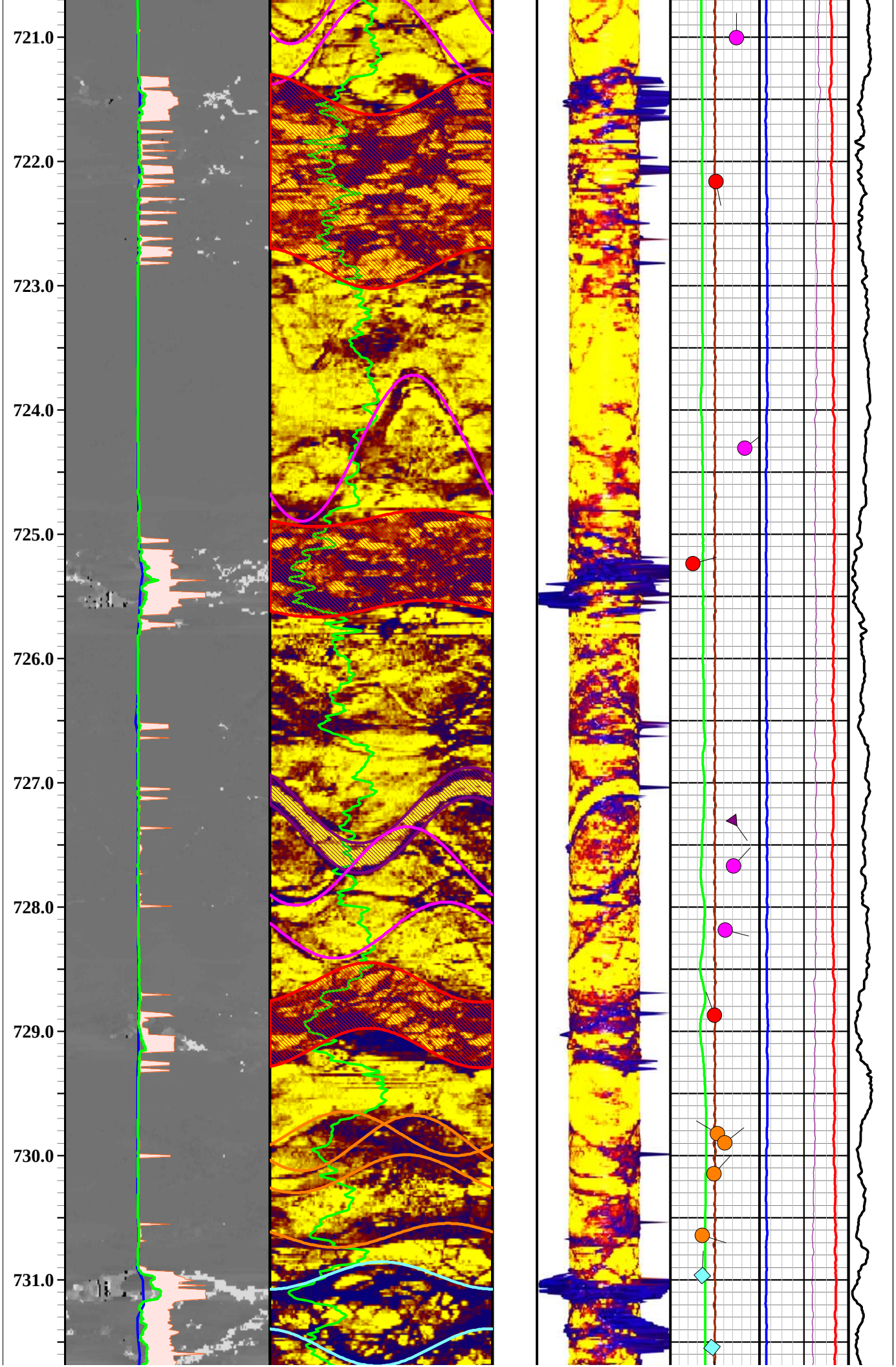

666.0
667.0
668.0
669.0
670.0
671.0
672.0
673.0
674.0
675.0
676.0

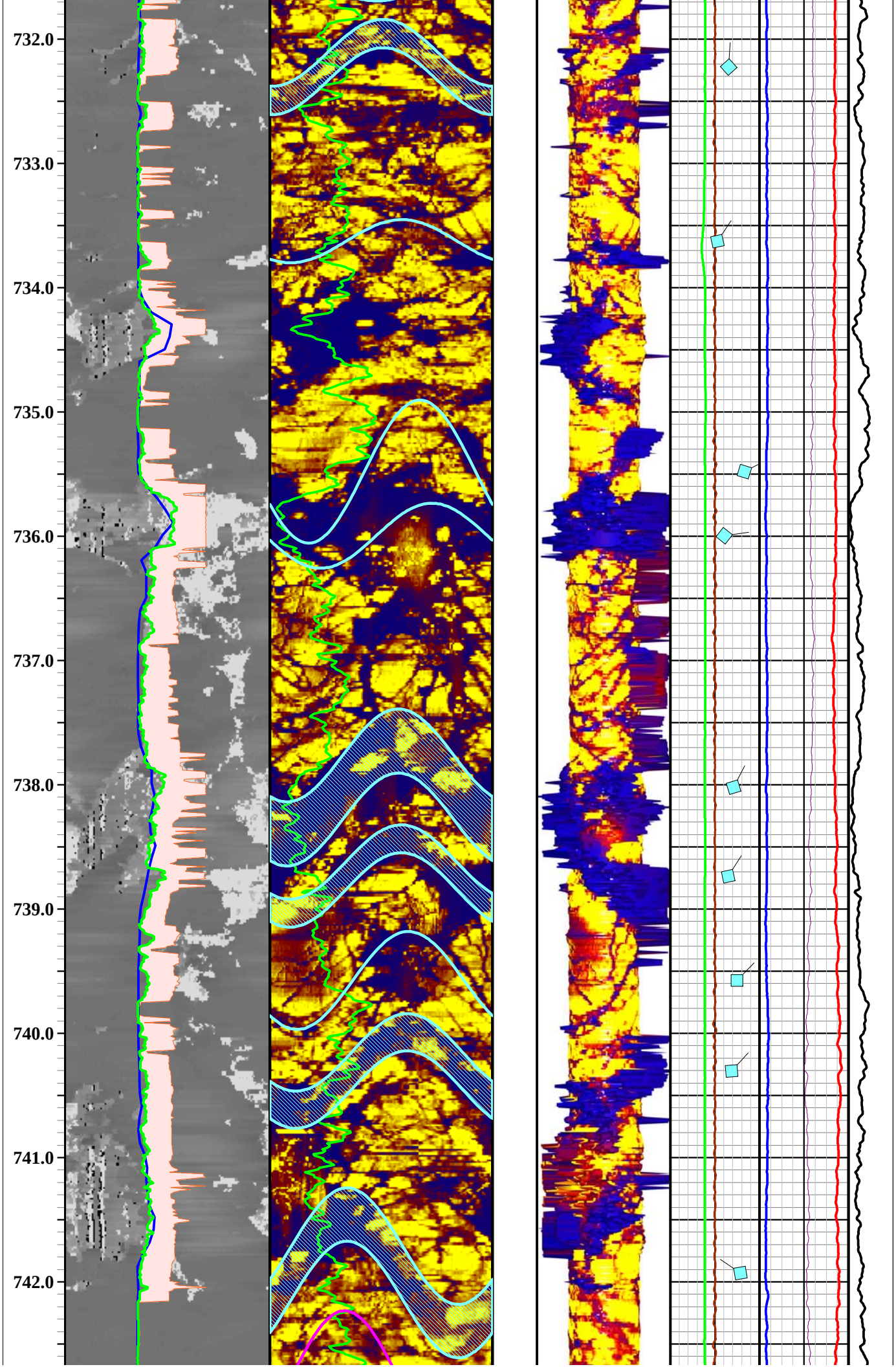

677.0
678.0
679.0
680.0
681.0
682.0
683.0
684.0
685.0
686.0
687.0

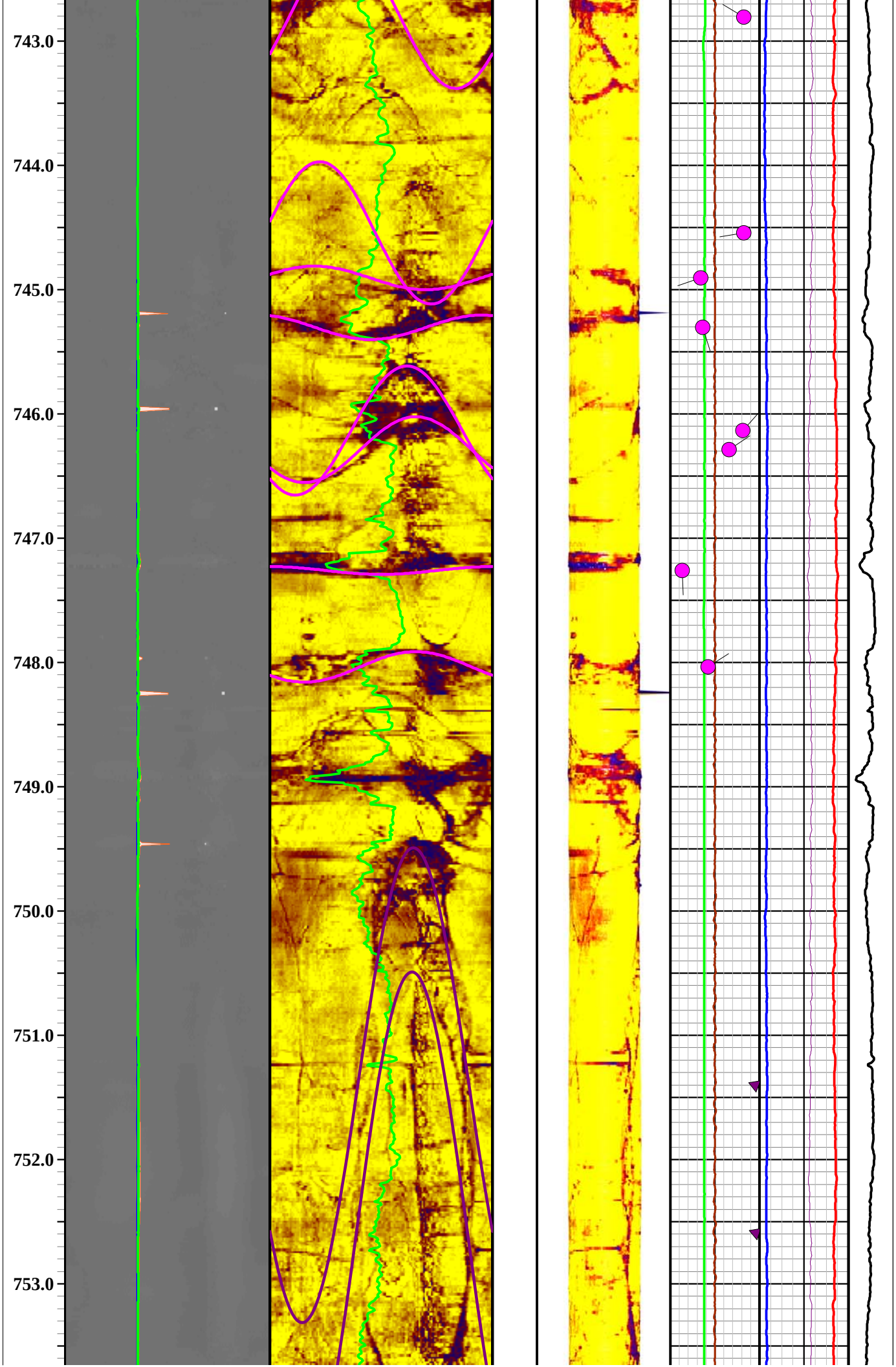

688.0
689.0
690.0
691.0
692.0
693.0
694.0
695.0
696.0
697.0
698.0

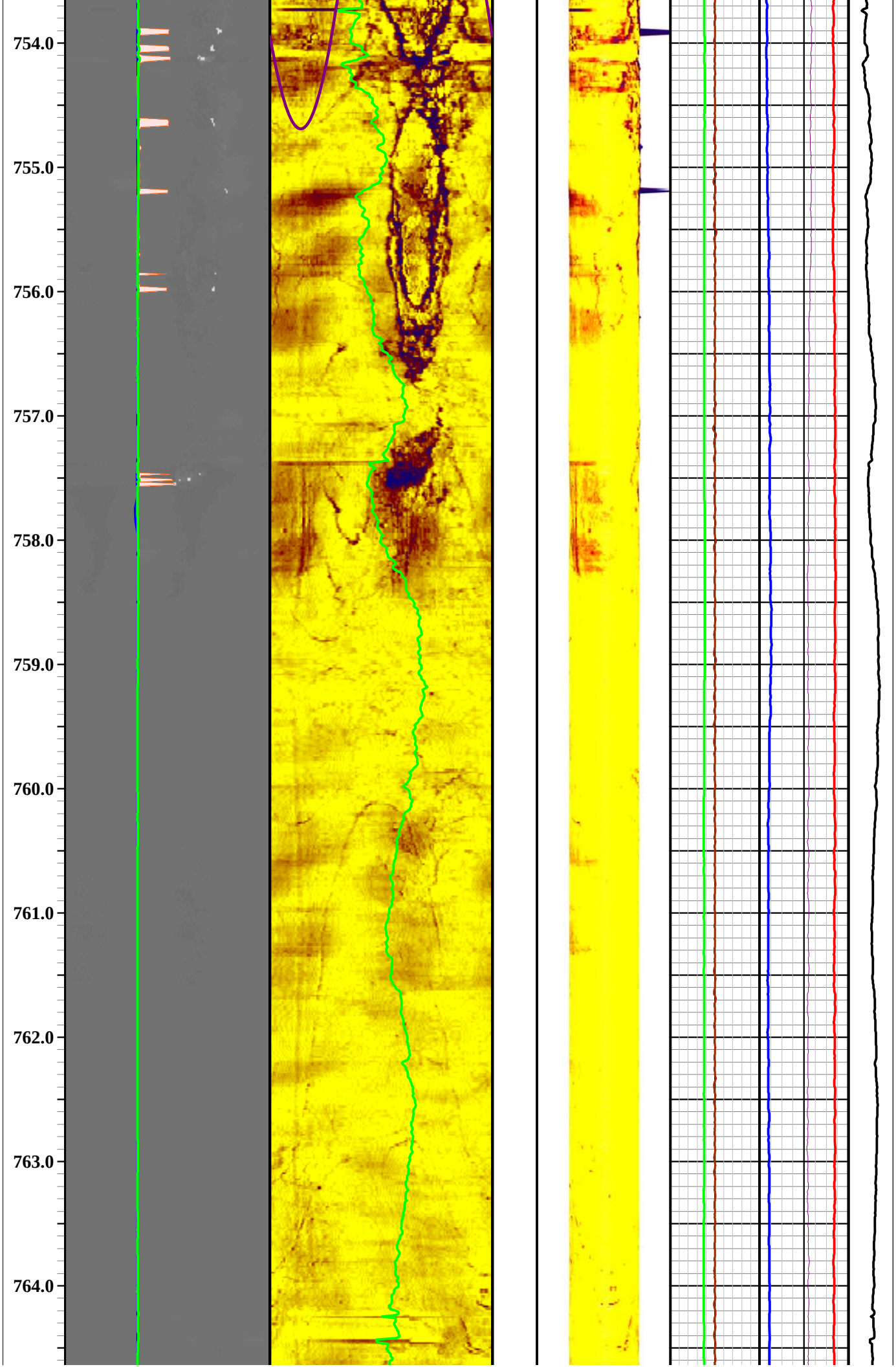

699.0
700.0
701.0
702.0
703.0
704.0
705.0
706.0
707.0
708.0
709.0

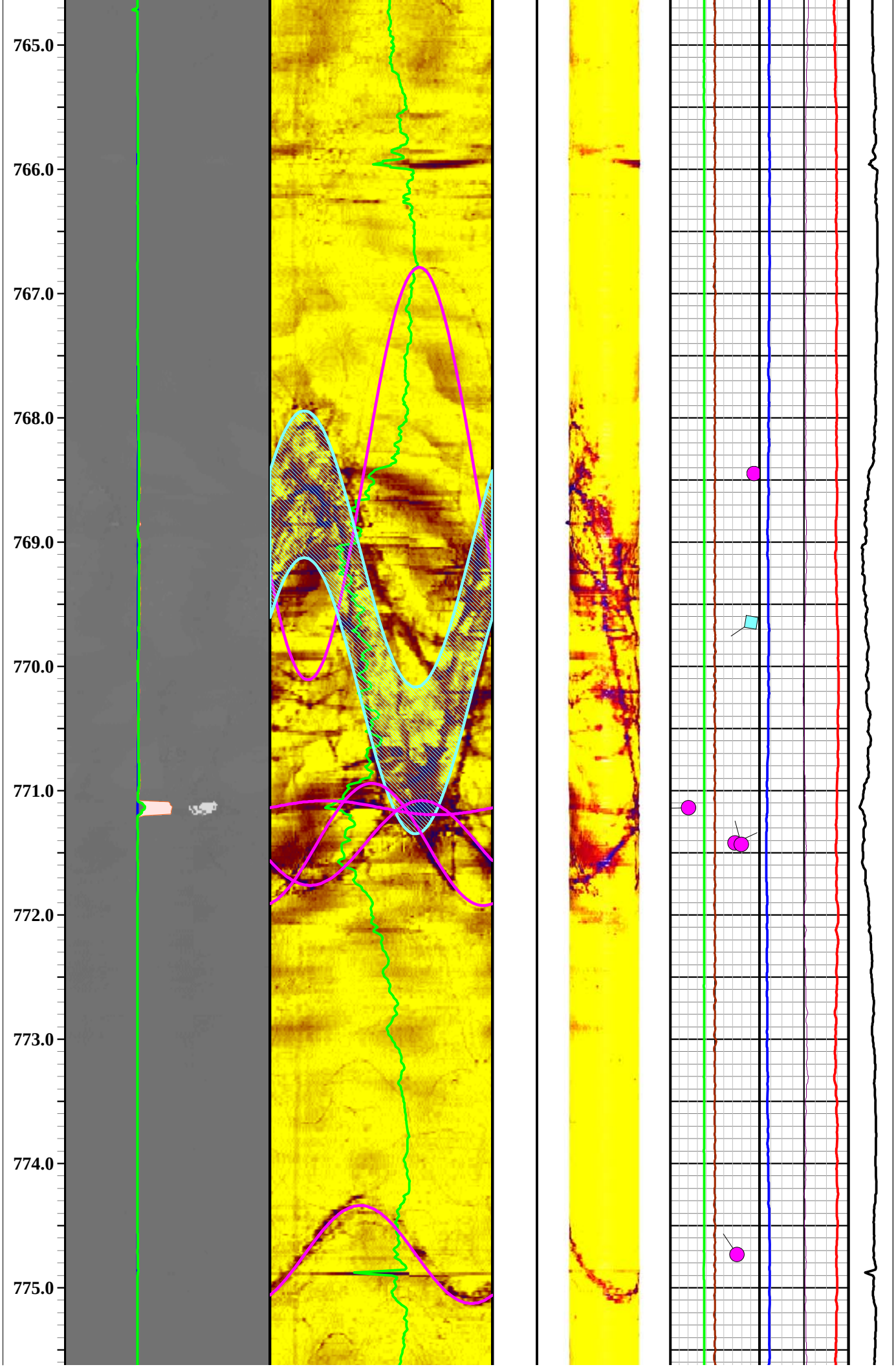

710.0
711.0
712.0
713.0
714.0
715.0
716.0
717.0
718.0
719.0
720.0

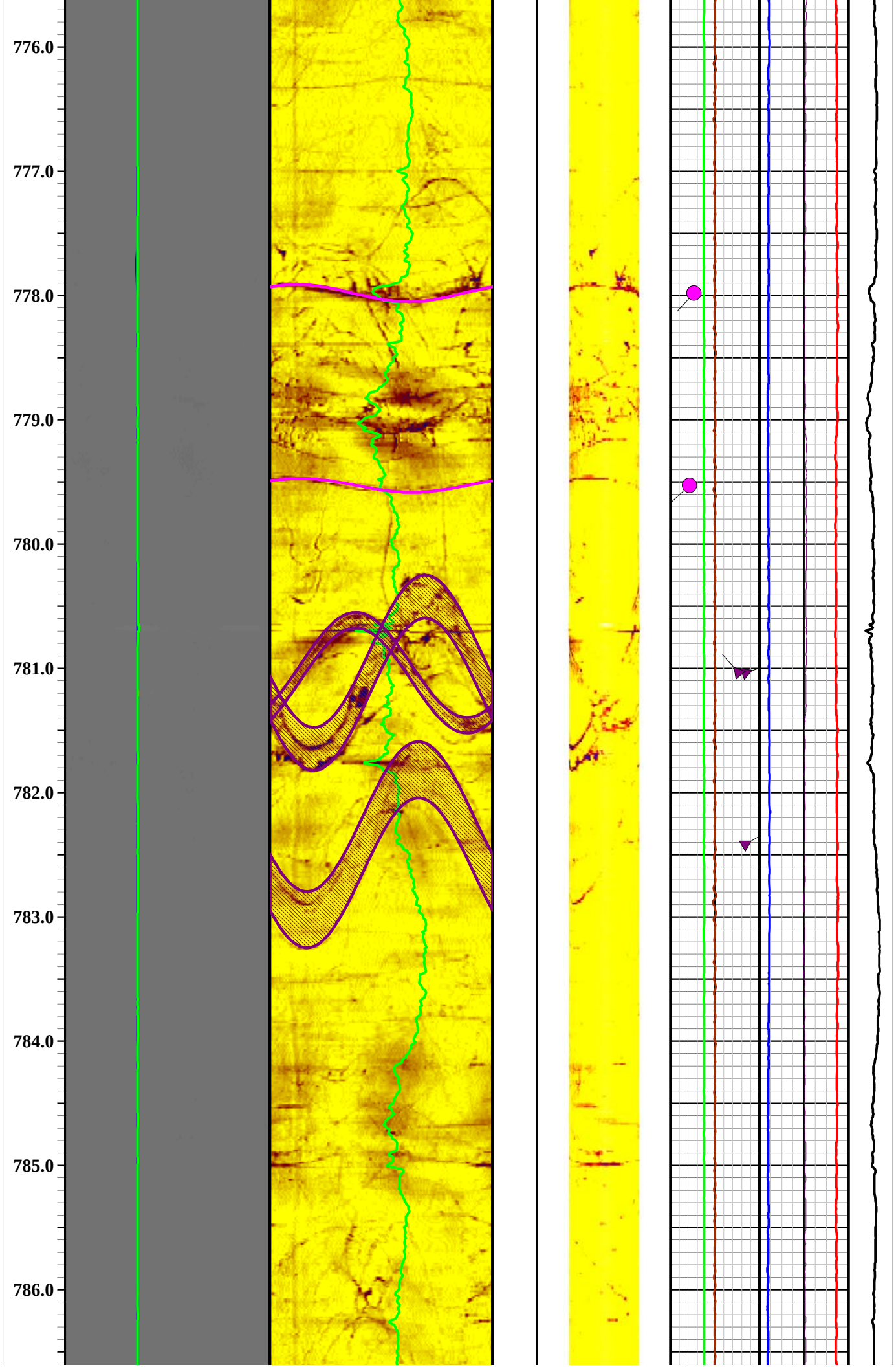

721.0
722.0
723.0
724.0
725.0
726.0
727.0
728.0
729.0
730.0
731.0

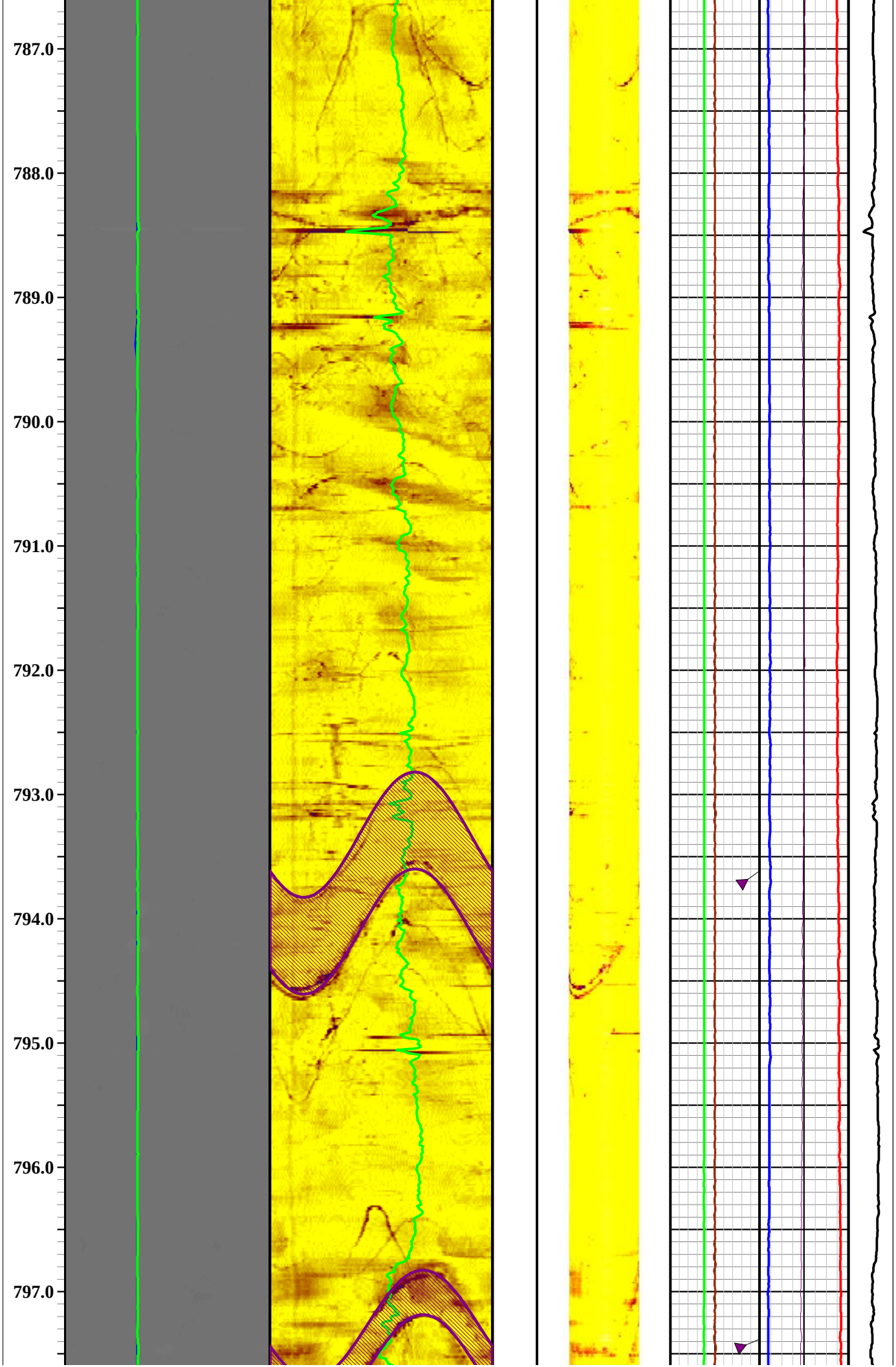

732.0
733.0
734.0
735.0
736.0
737.0
738.0
739.0
740.0
741.0
742.0

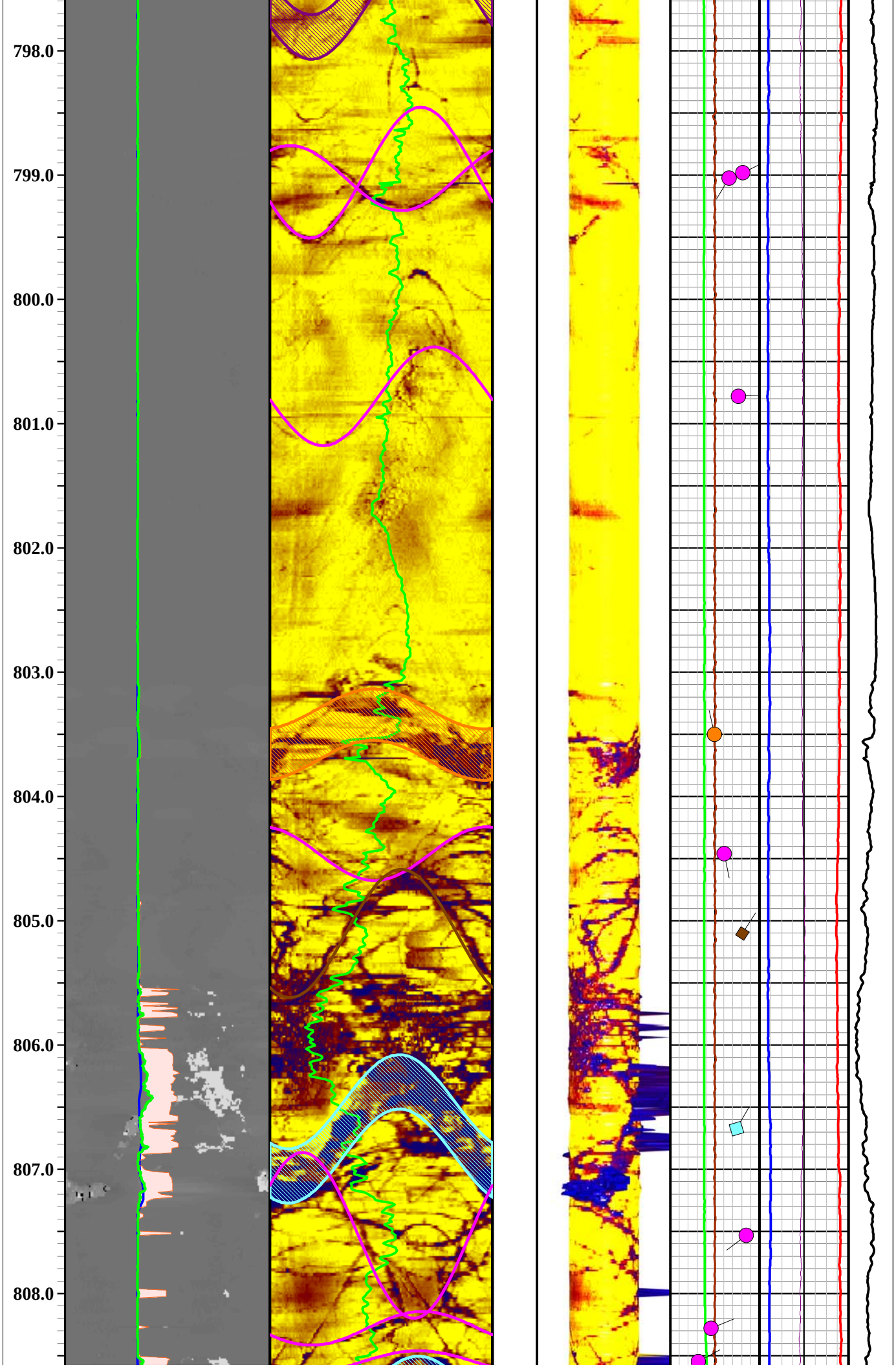

743.0
744.0
745.0
746.0
747.0
748.0
749.0
750.0
751.0
752.0
753.0

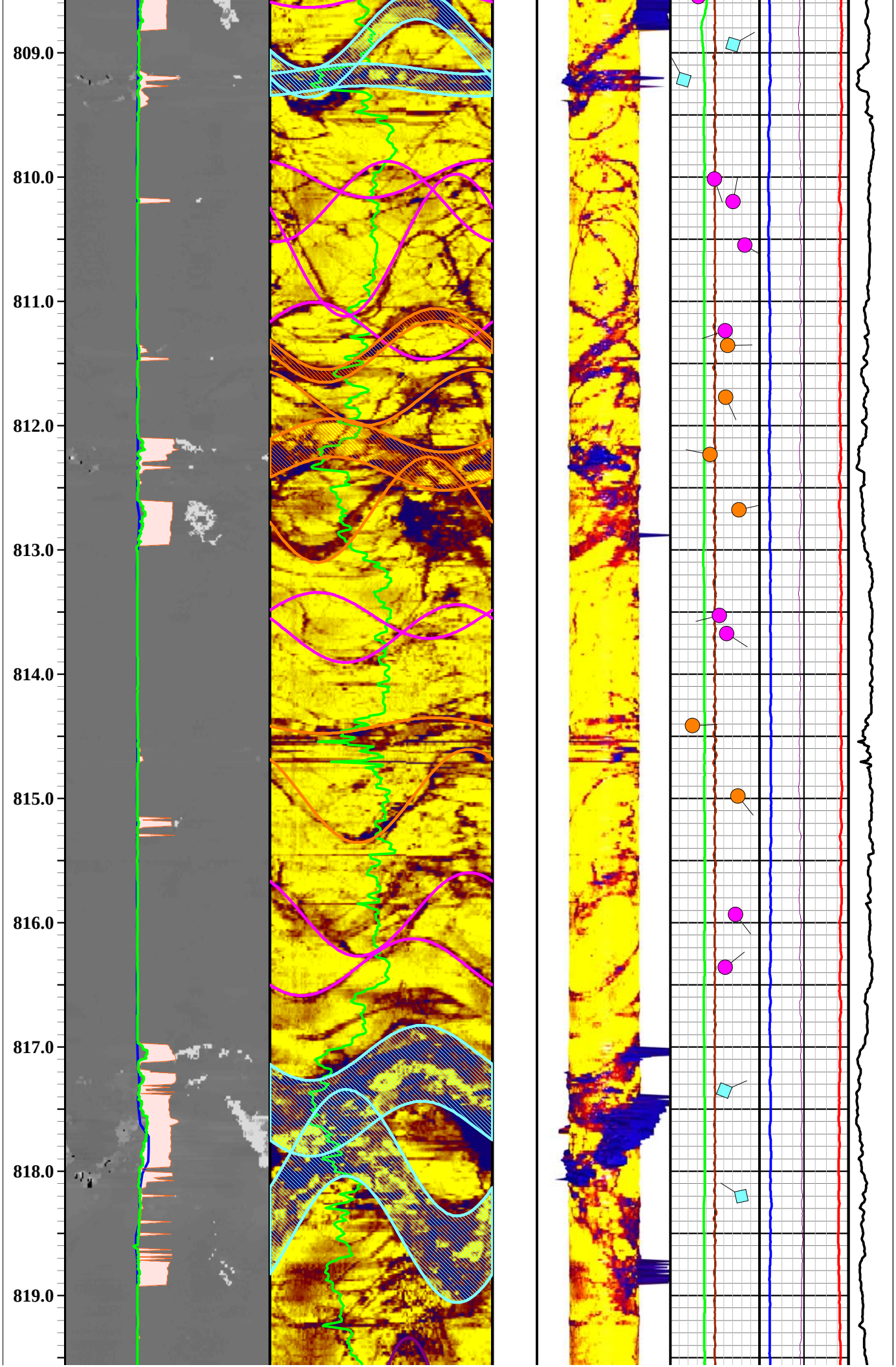

754.0
755.0
756.0
757.0
758.0
759.0
760.0
761.0
762.0
763.0
764.0

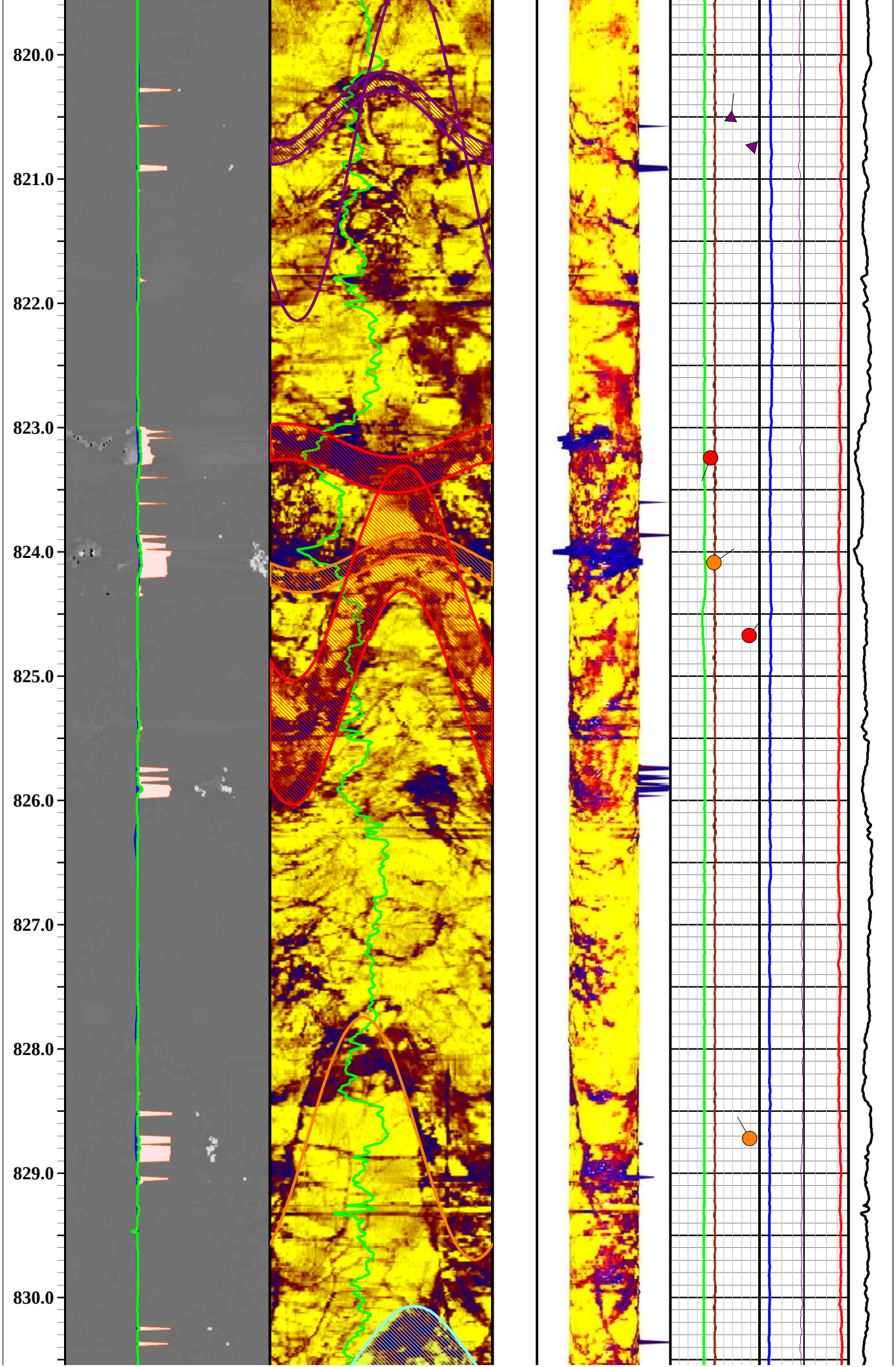

765.0
766.0
767.0
768.0
769.0
770.0
771.0
772.0
773.0
774.0
775.0

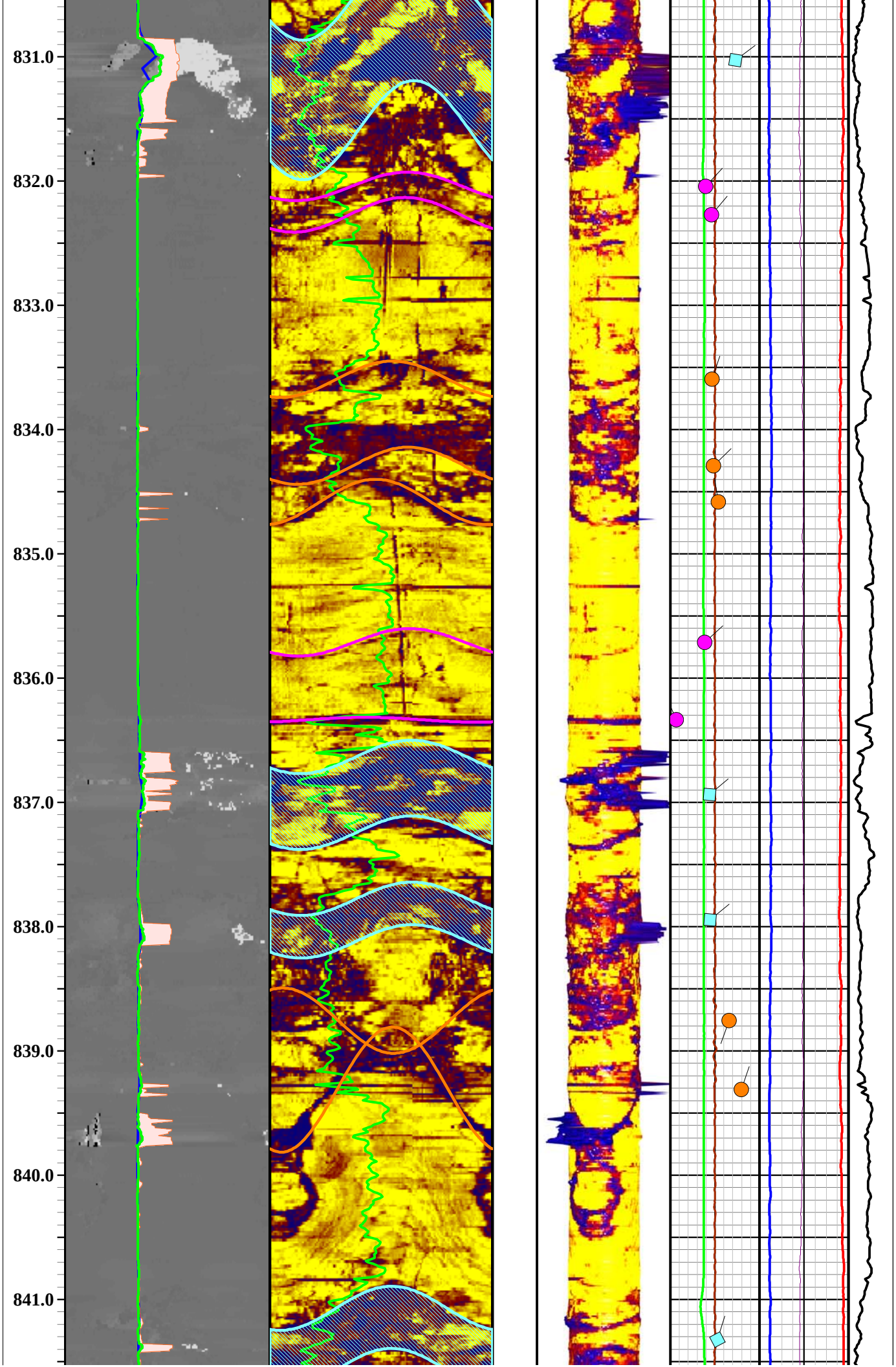

776.0
777.0
778.0
779.0
780.0
781.0
782.0
783.0
784.0
785.0
786.0

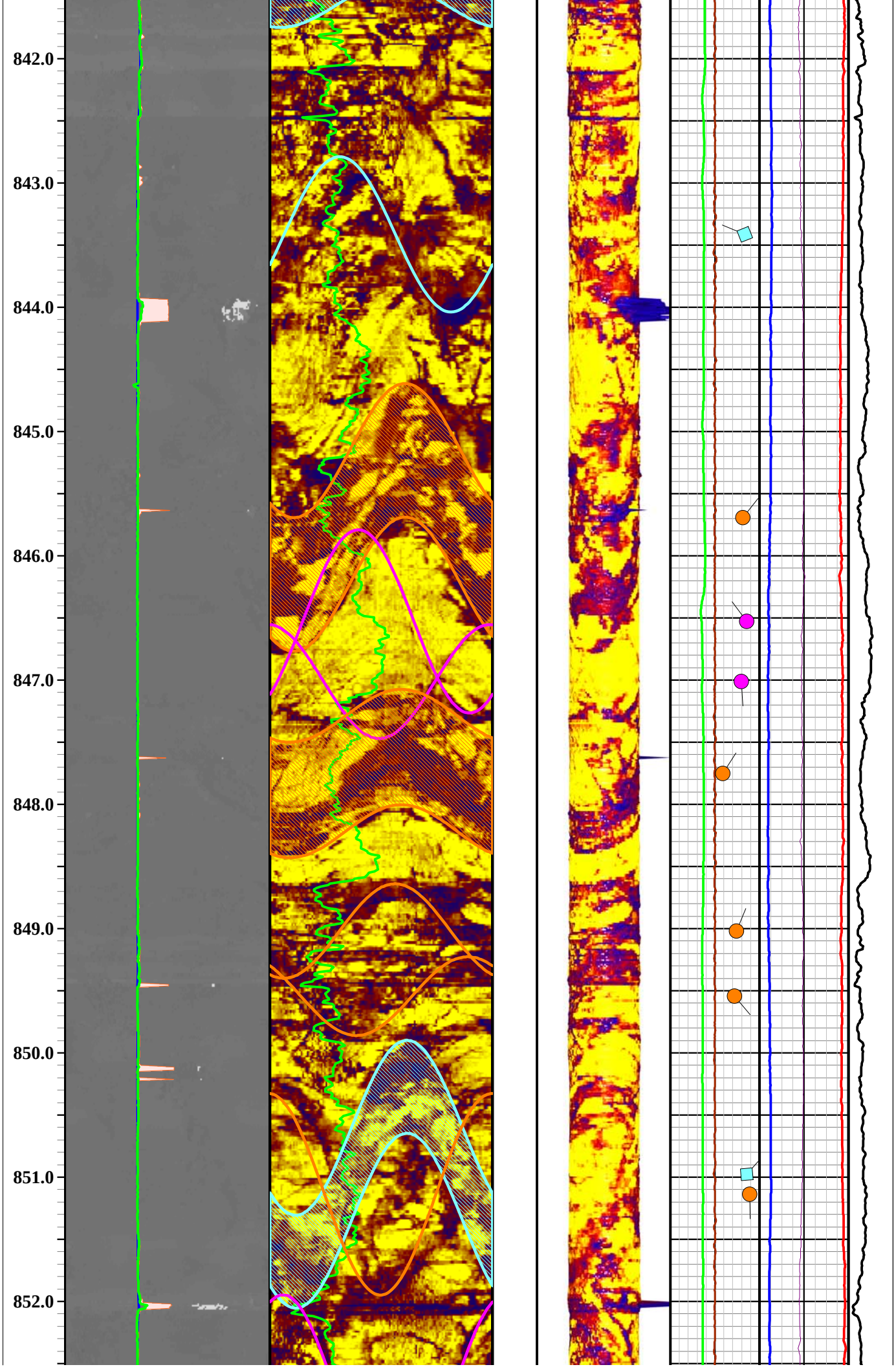

787.0
788.0
789.0
790.0
791.0
792.0
793.0
794.0
795.0
796.0
797.0

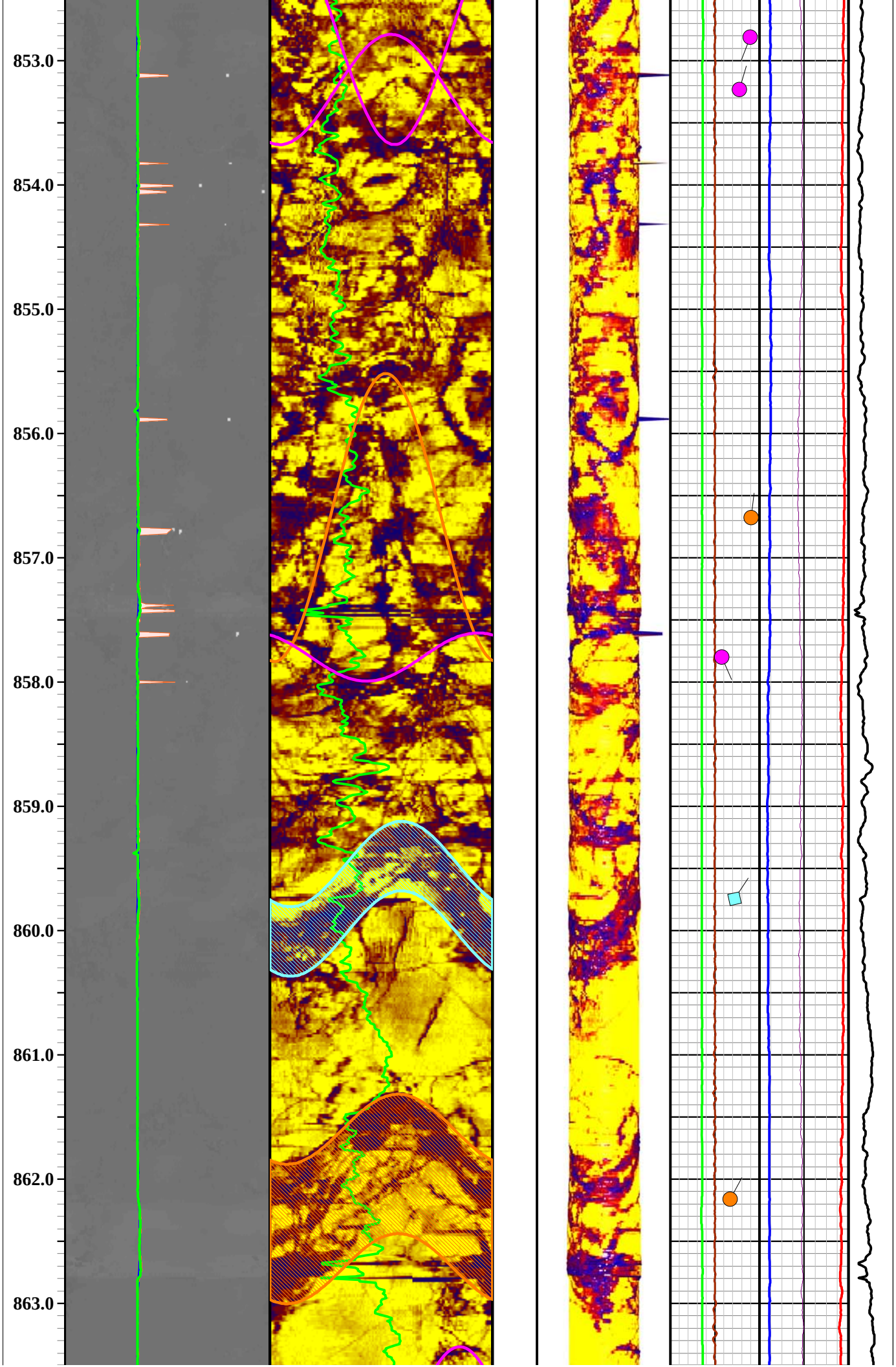

798.0
799.0
800.0
801.0
802.0
803.0
804.0
805.0
806.0
807.0
808.0

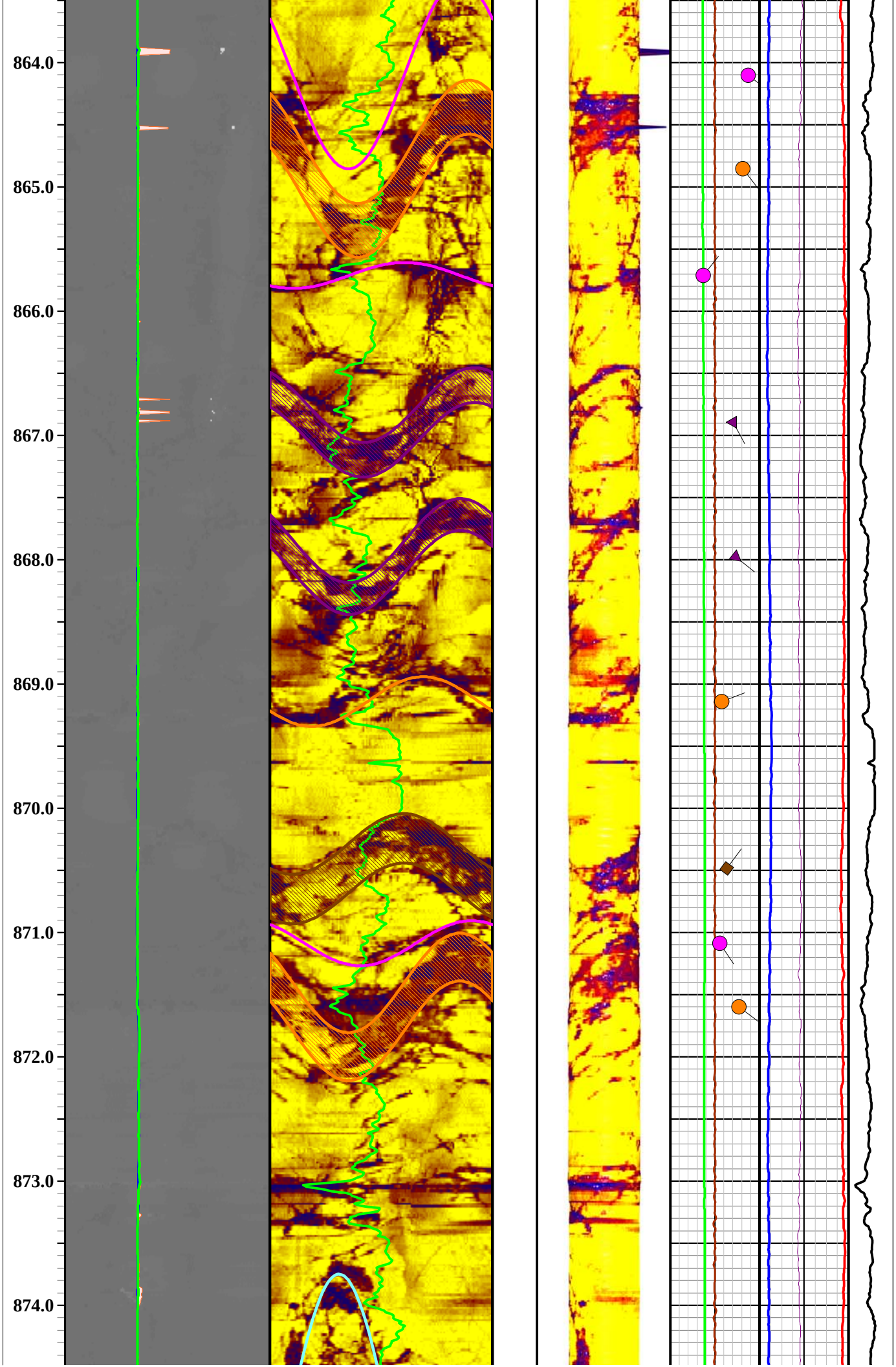

809.0
810.0
811.0
812.0
813.0
814.0
815.0
816.0
817.0
818.0
819.0

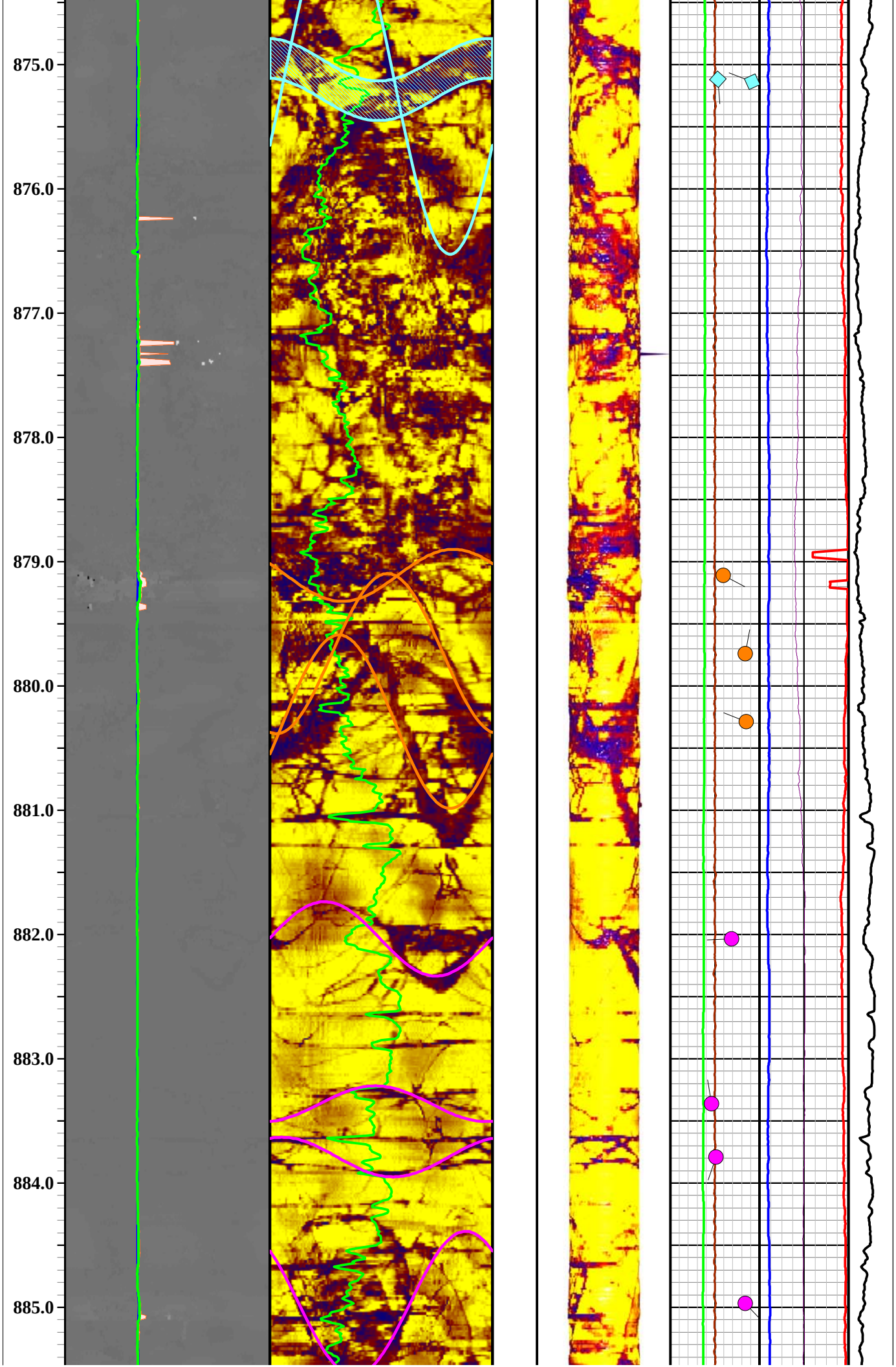

820.0
821.0
822.0
823.0
824.0
825.0
826.0
827.0
828.0
829.0
830.0

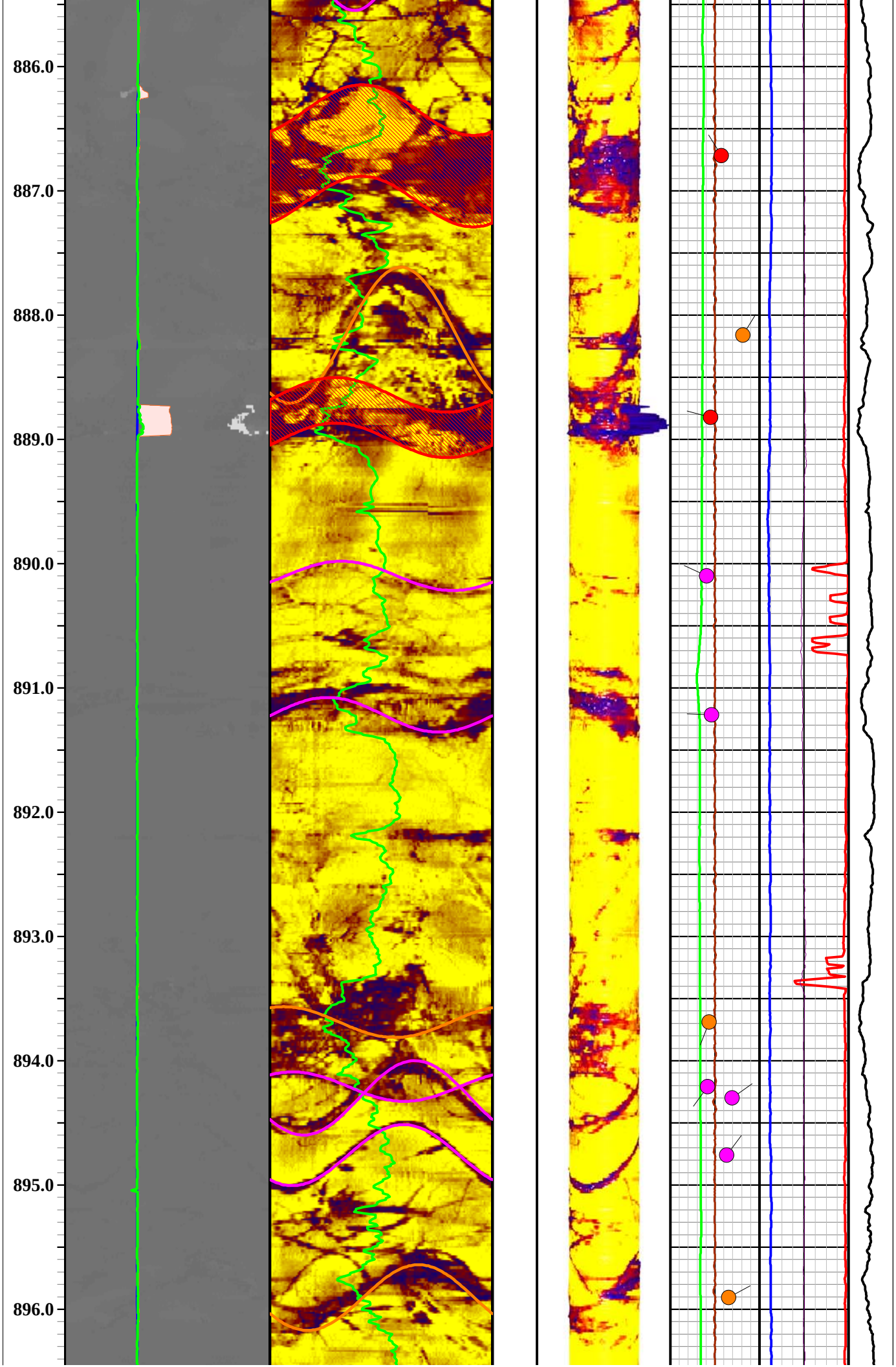

831.0
832.0
833.0
834.0
835.0
836.0
837.0
838.0
839.0
840.0
841.0

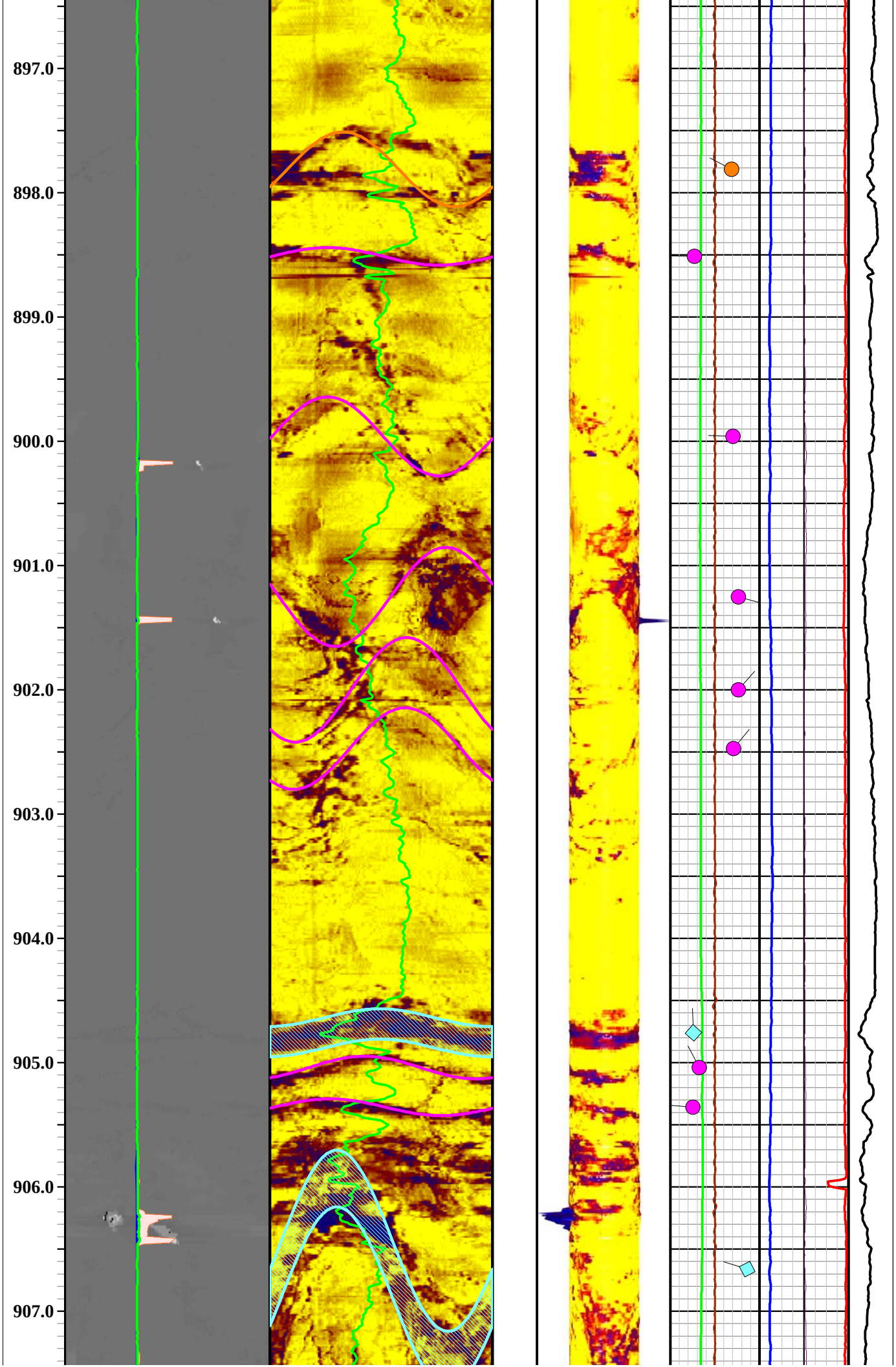

842.0
843.0
844.0
845.0
846.0
847.0
848.0
849.0
850.0
851.0
852.0

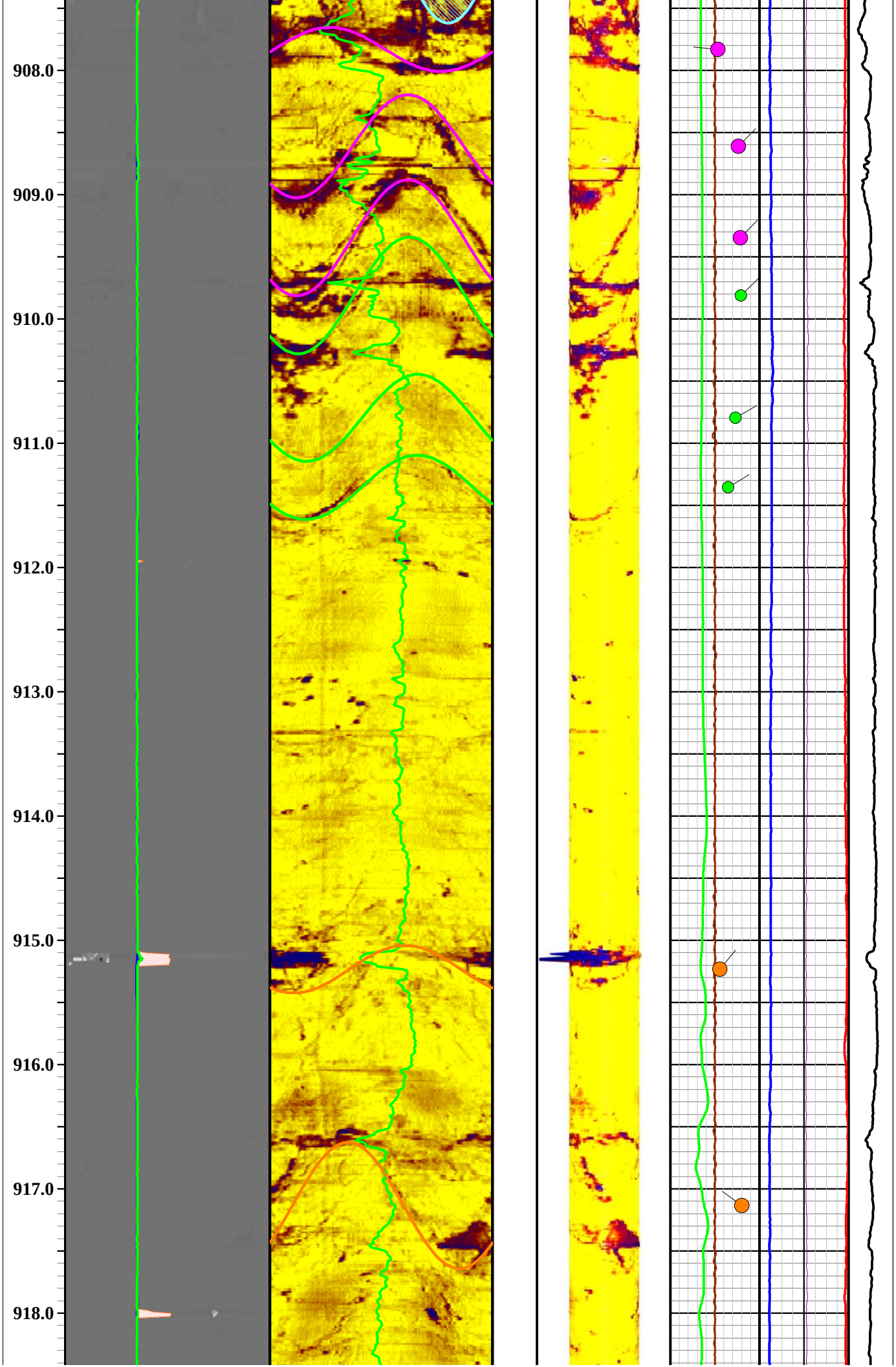

853.0
854.0
855.0
856.0
857.0
858.0
859.0
860.0
861.0
862.0
863.0

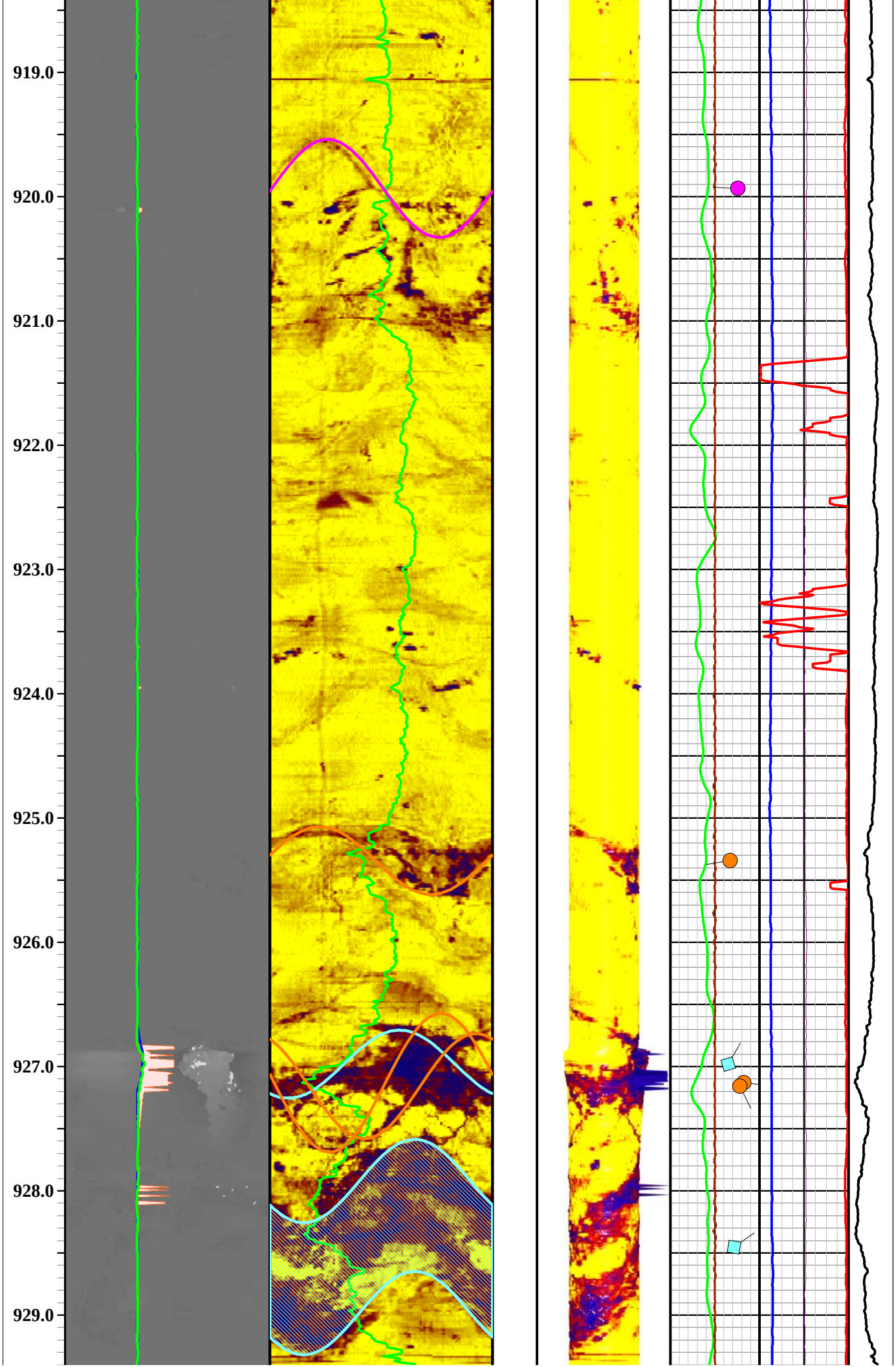

864.0
865.0
866.0
867.0
868.0
869.0
870.0
871.0
872.0
873.0
874.0

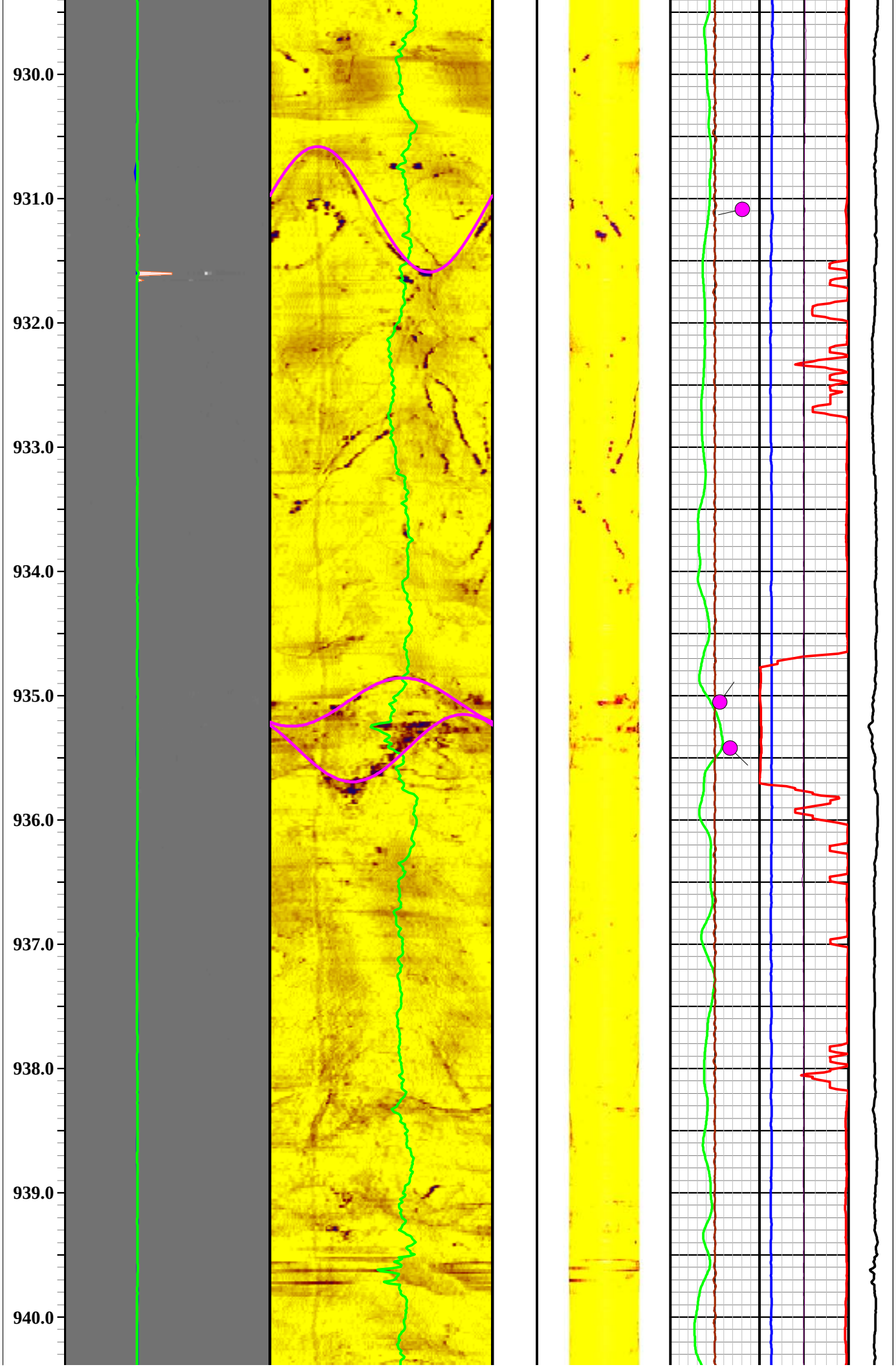

875.0
876.0
877.0
878.0
879.0
880.0
881.0
882.0
883.0
884.0
885.0

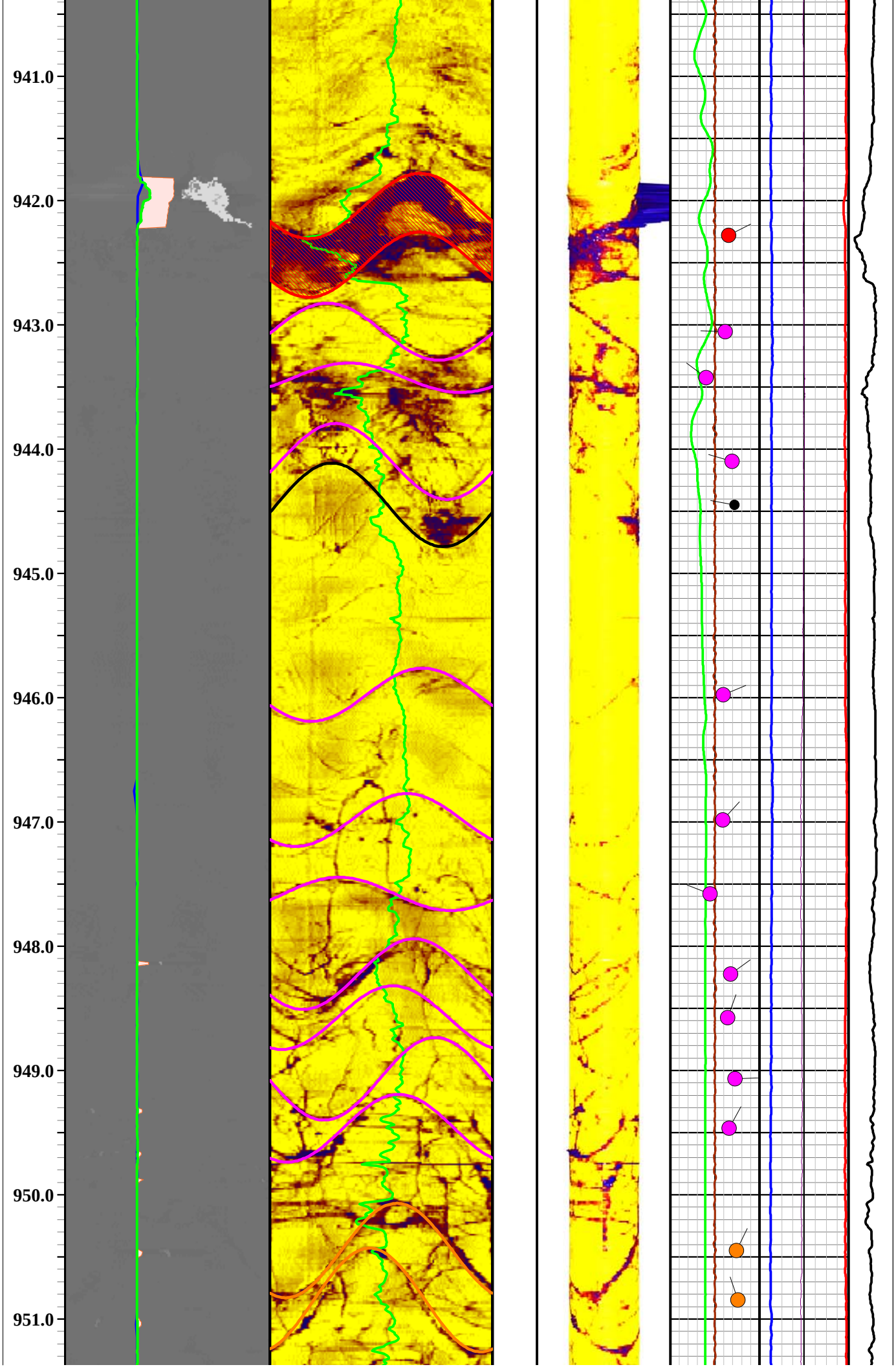

886.0
887.0
888.0
889.0
890.0
891.0
892.0
893.0
894.0
895.0
896.0

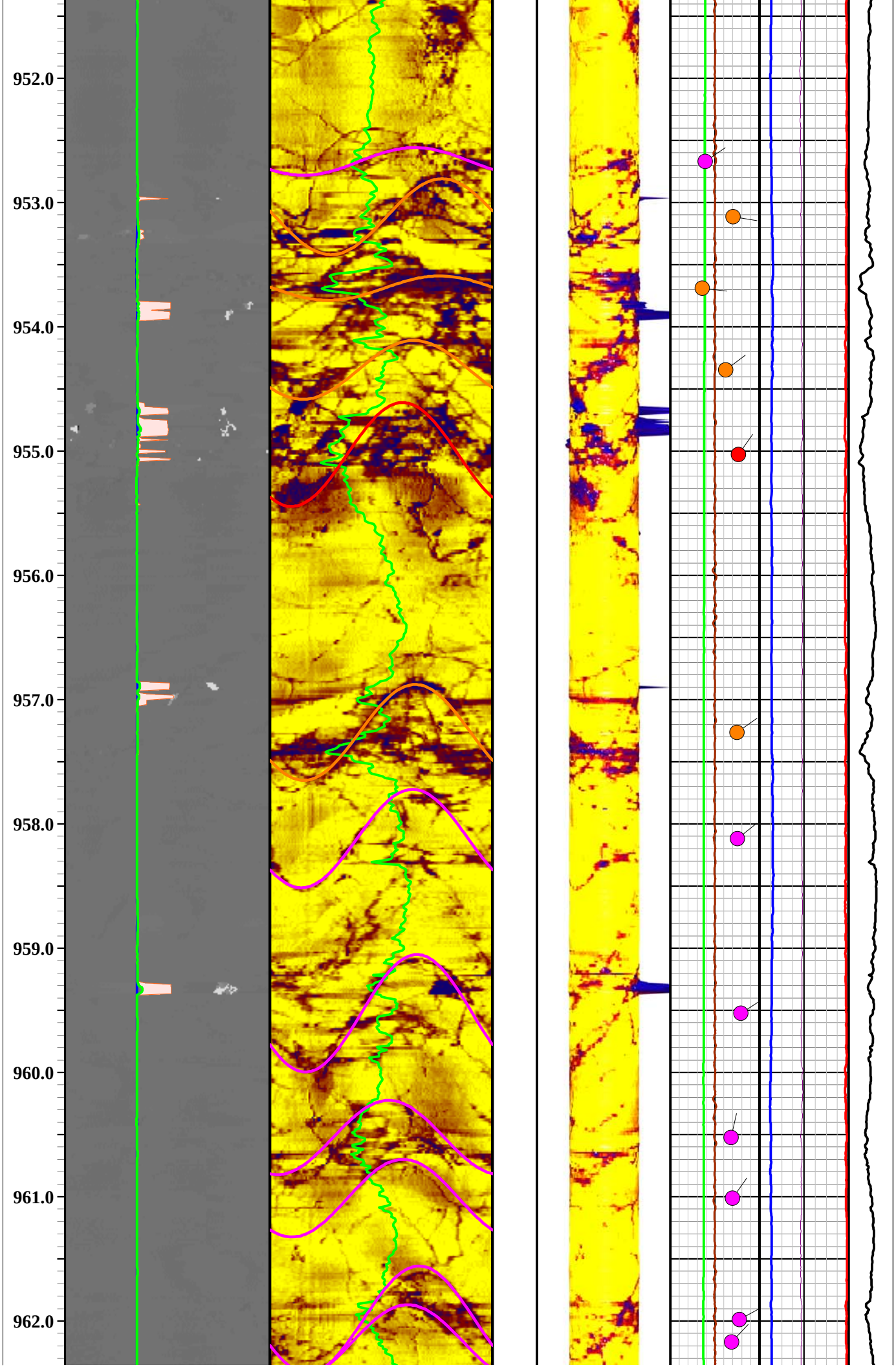

897.0
898.0
899.0
900.0
901.0
902.0
903.0
904.0
905.0
906.0
907.0

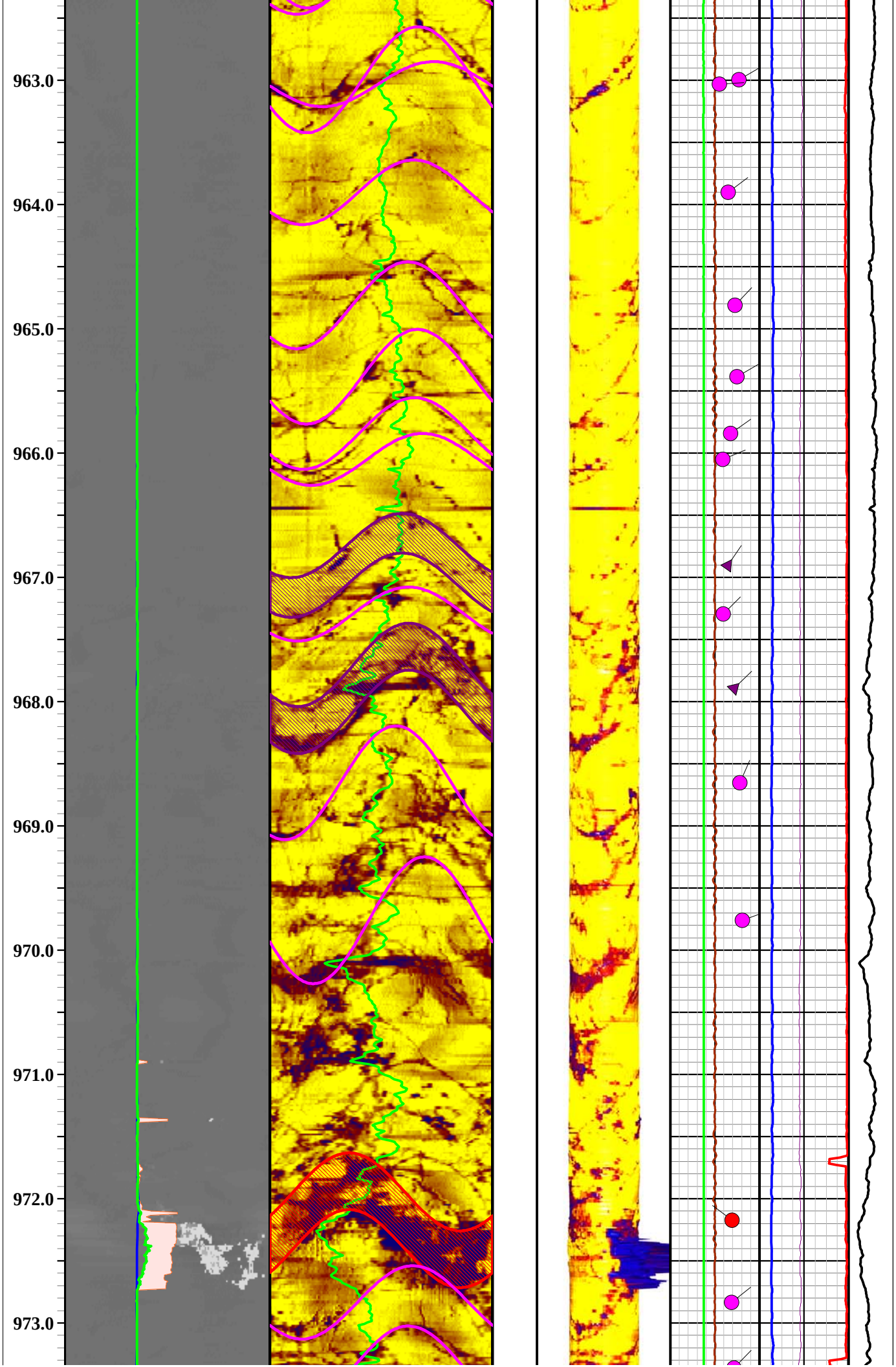

908.0
909.0
910.0
911.0
912.0
913.0
914.0
915.0
916.0
917.0
918.0

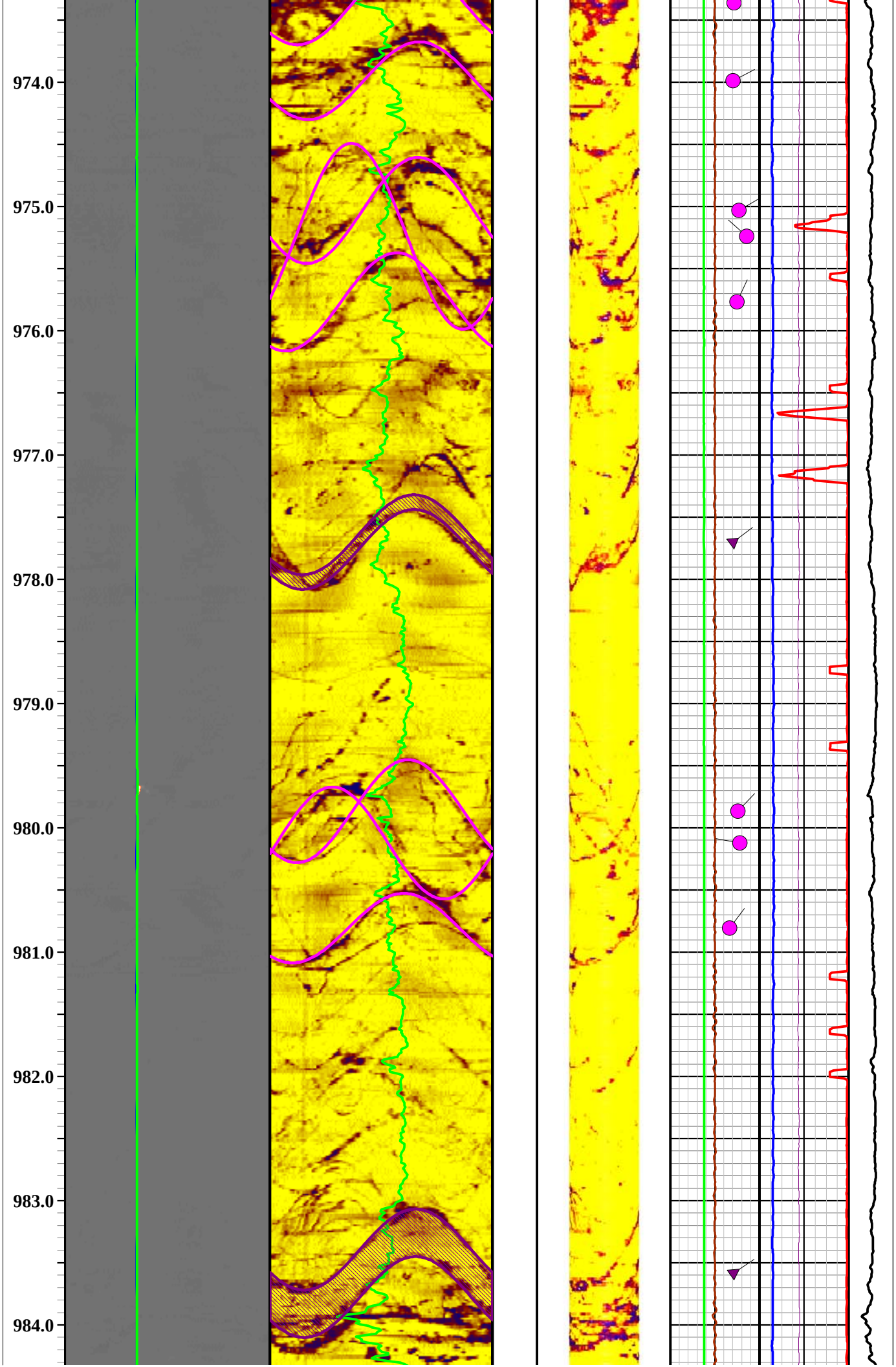

919.0
920.0
921.0
922.0
923.0
924.0
925.0
926.0
927.0
928.0
929.0

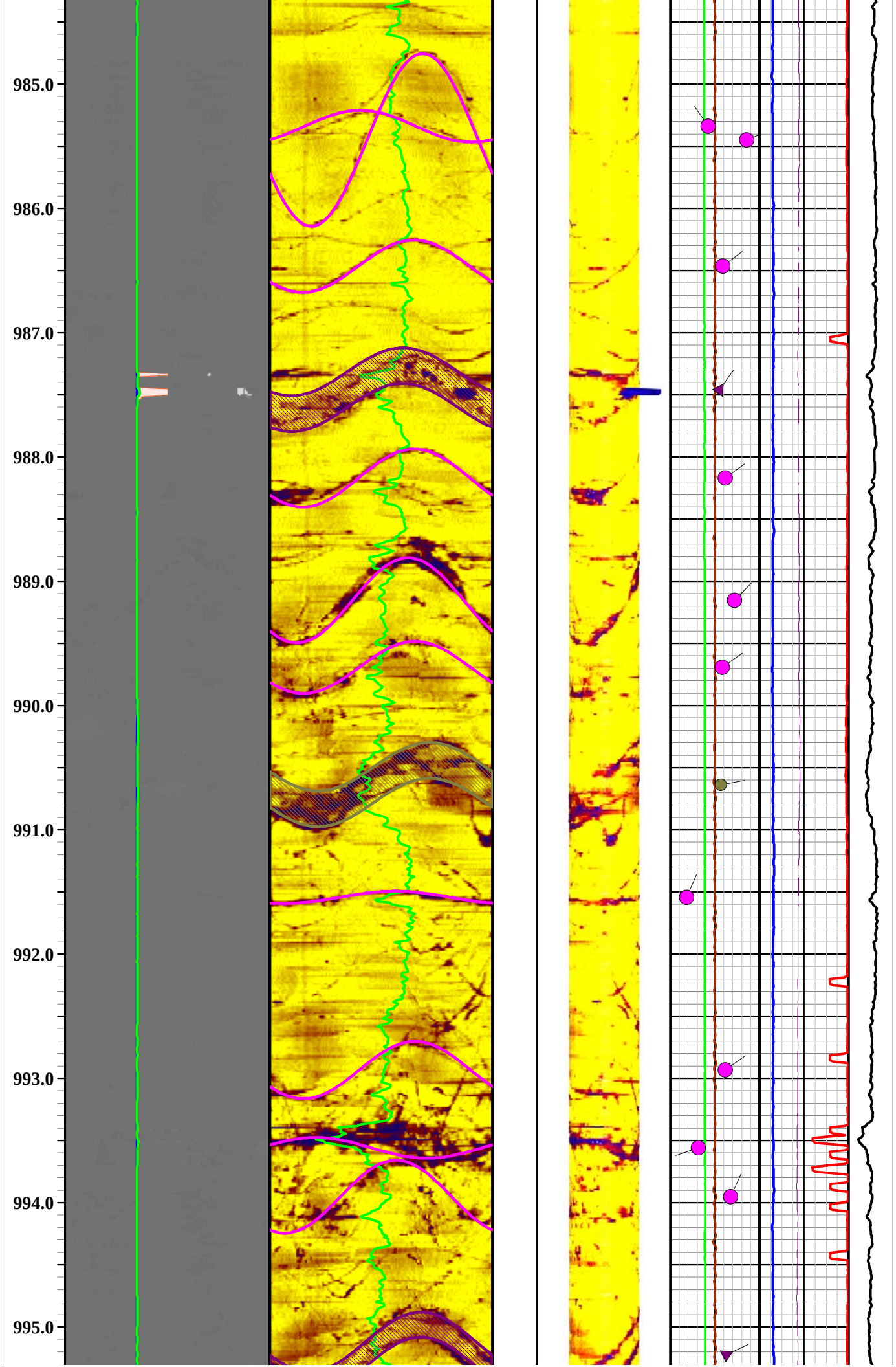

930.0
931.0
932.0
933.0
934.0
935.0
936.0
937.0
938.0
939.0
940.0

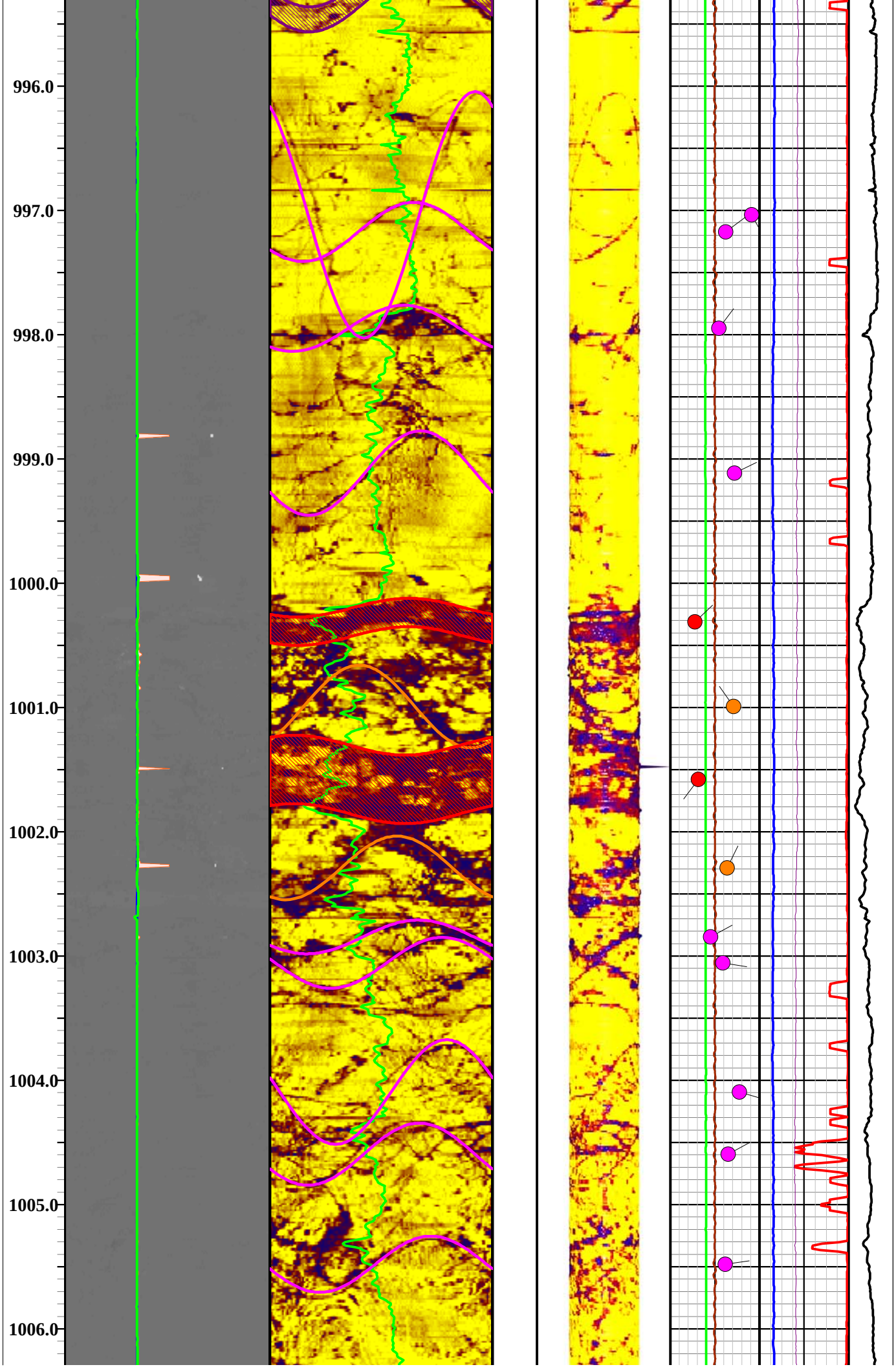

941.0
942.0
943.0
944.0
945.0
946.0
947.0
948.0
949.0
950.0
951.0

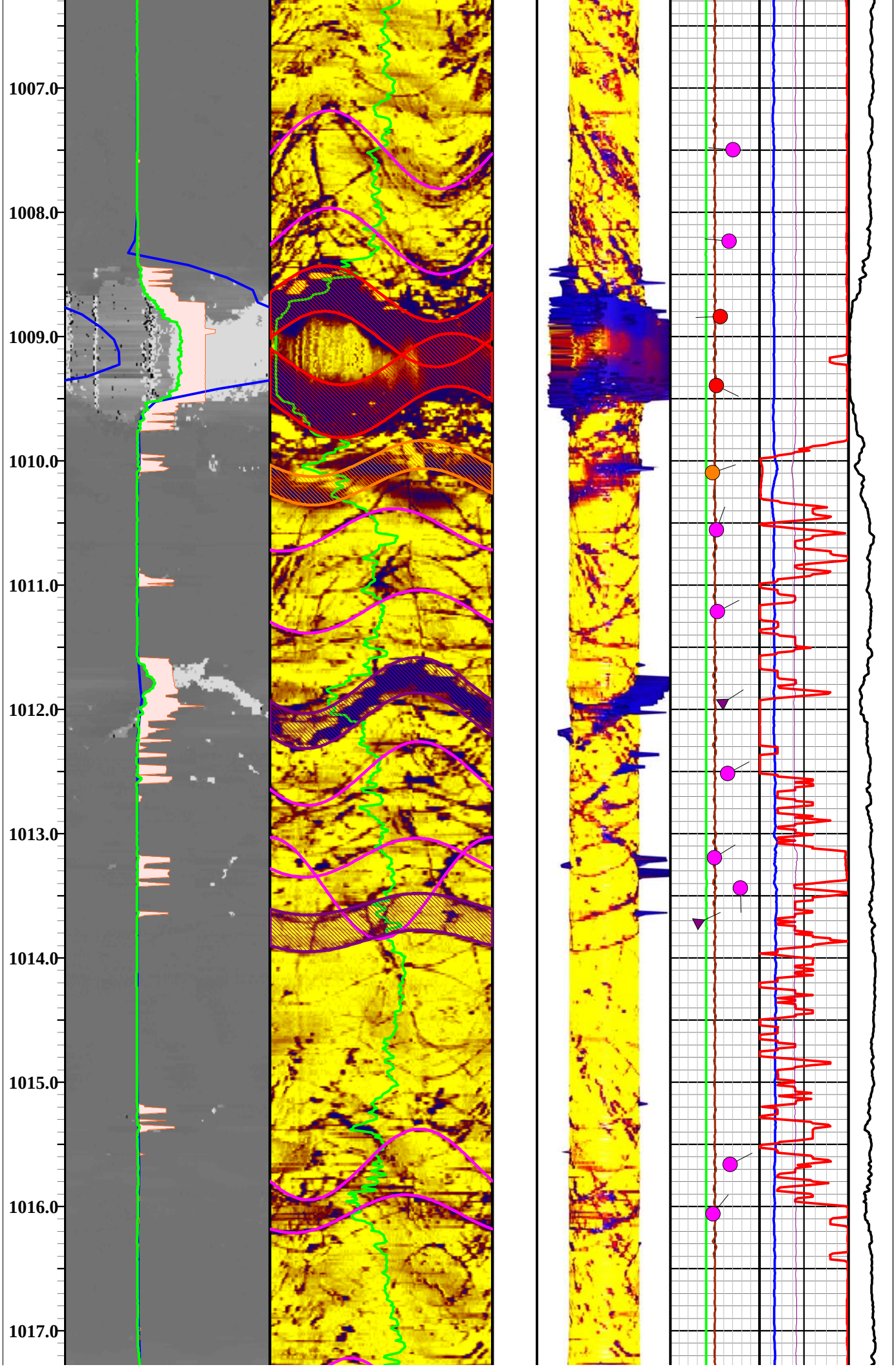

952.0
953.0
954.0
955.0
956.0
957.0
958.0
959.0
960.0
961.0
962.0

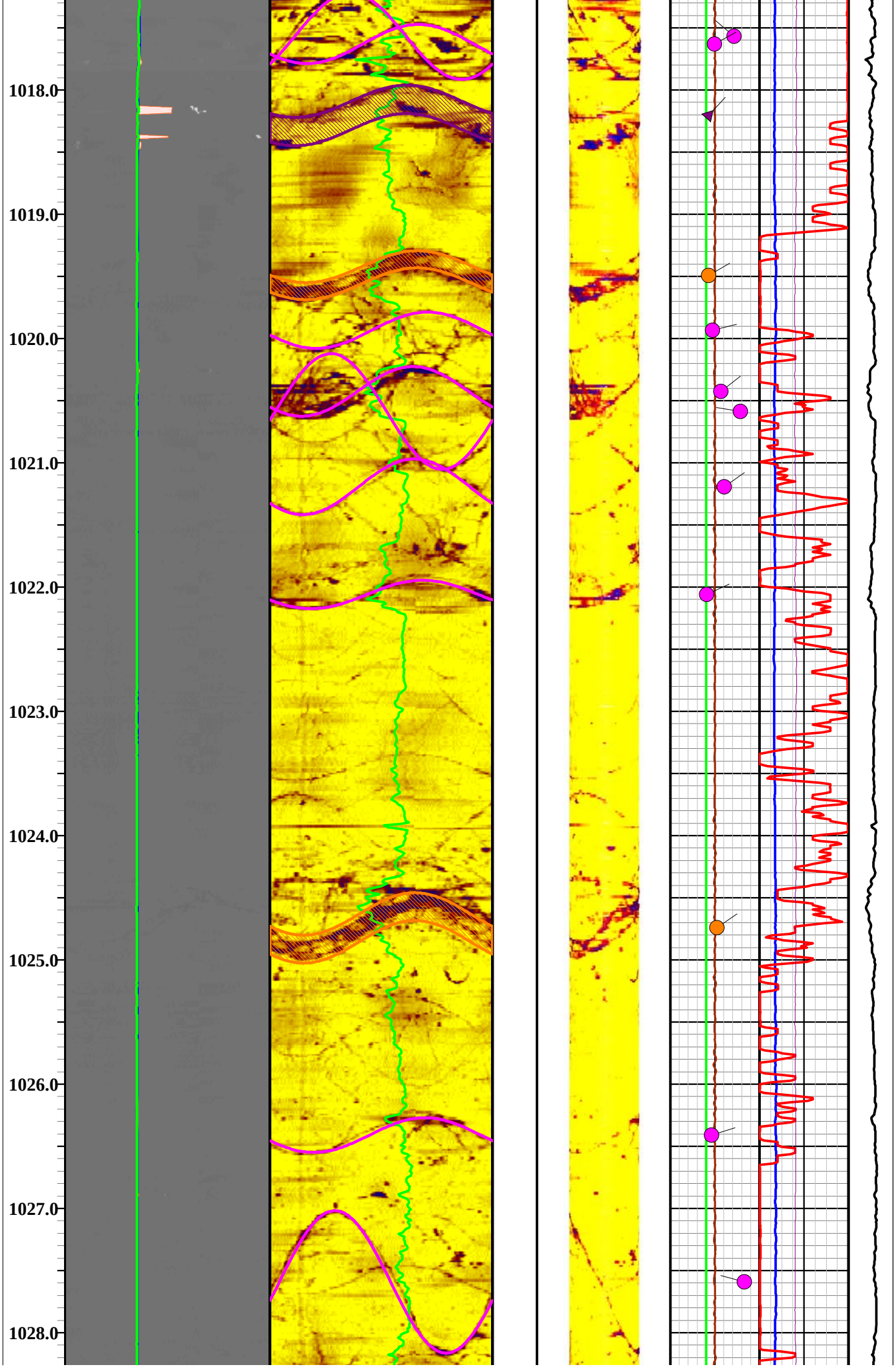

963.0
964.0
965.0
966.0
967.0
968.0
969.0
970.0
971.0
972.0
973.0

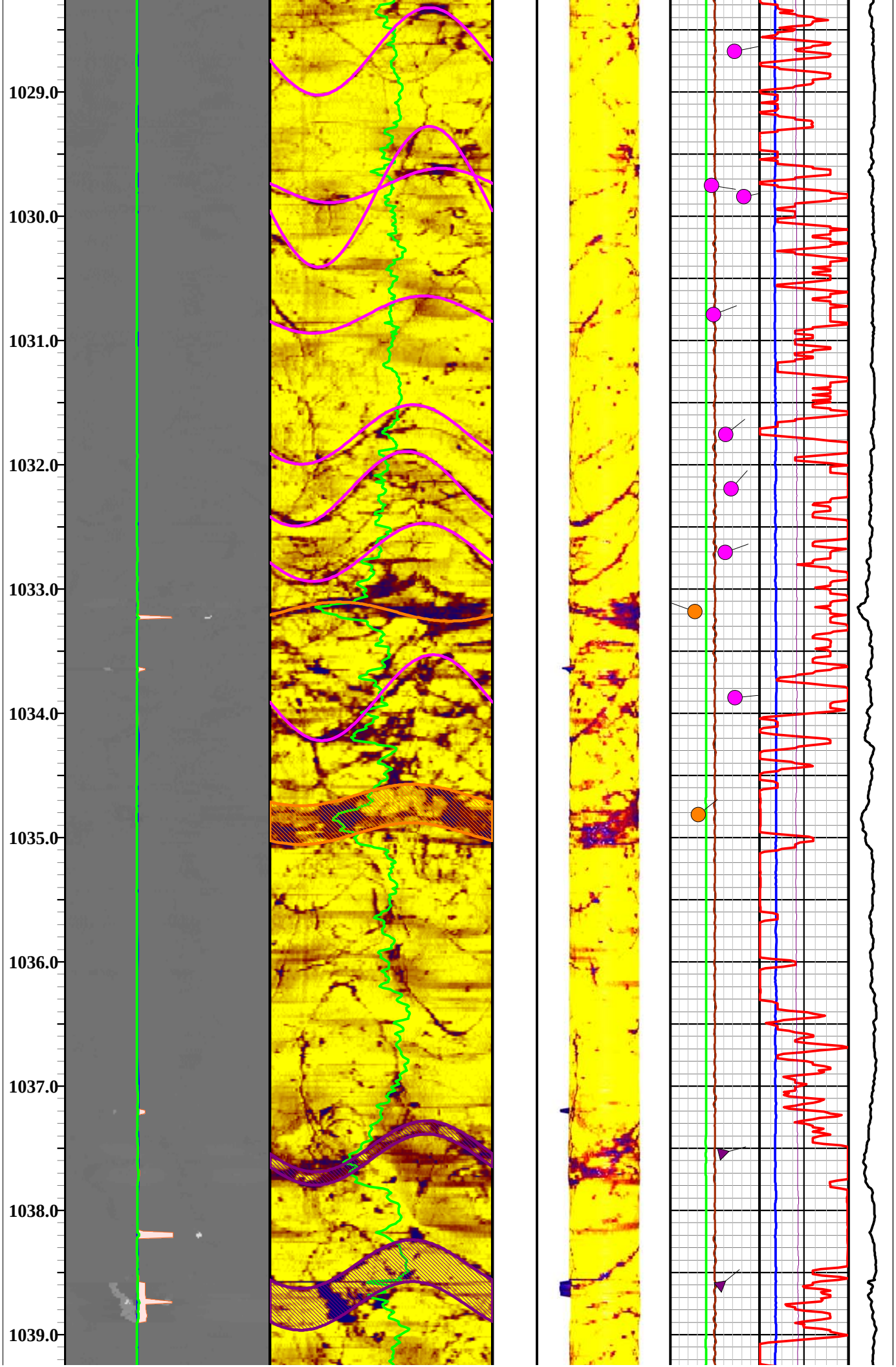

974.0
975.0
976.0
977.0
978.0
979.0
980.0
981.0
982.0
983.0
984.0

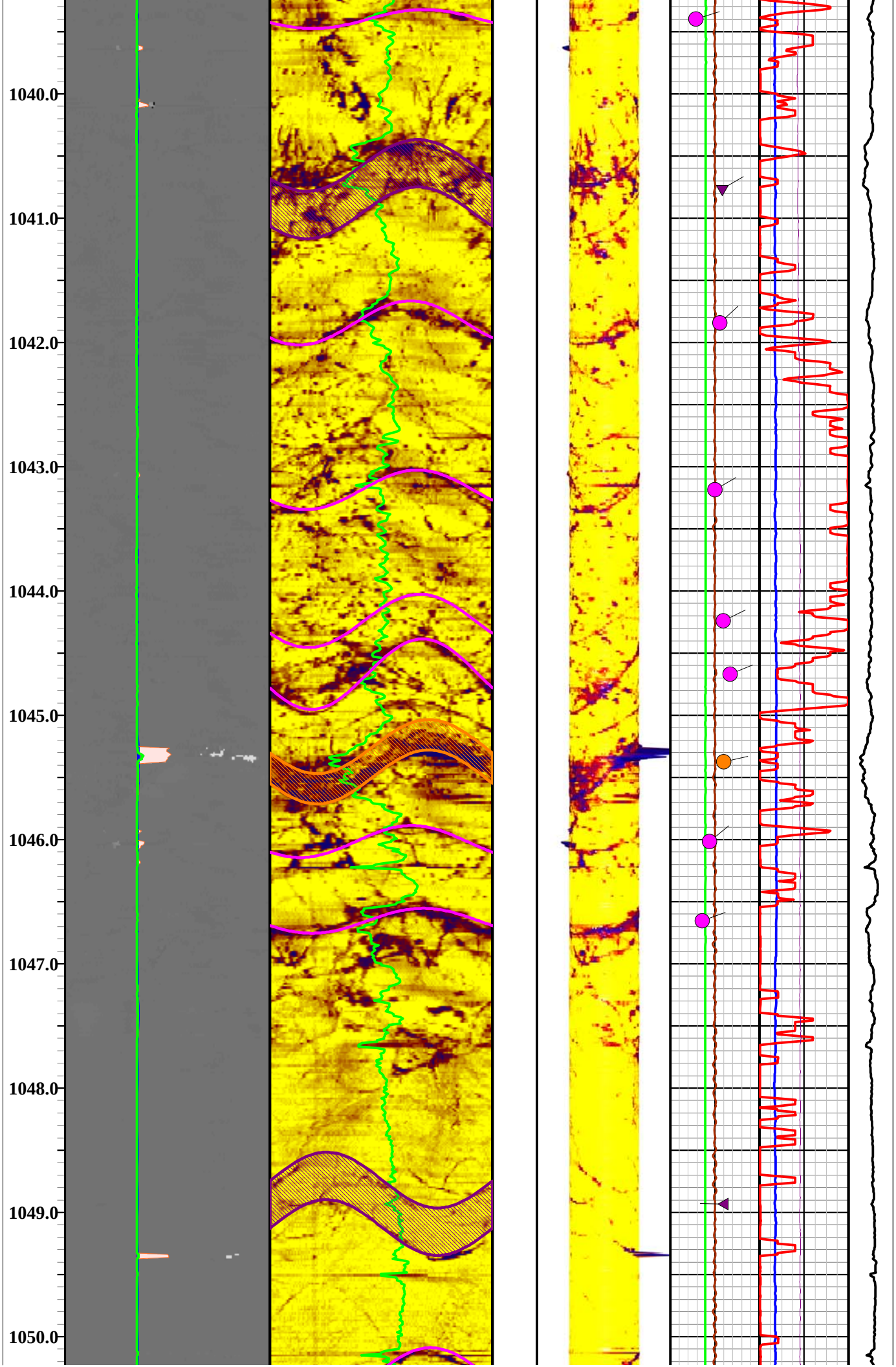

985.0
986.0
987.0
988.0
989.0
990.0
991.0
992.0
993.0
994.0
995.0

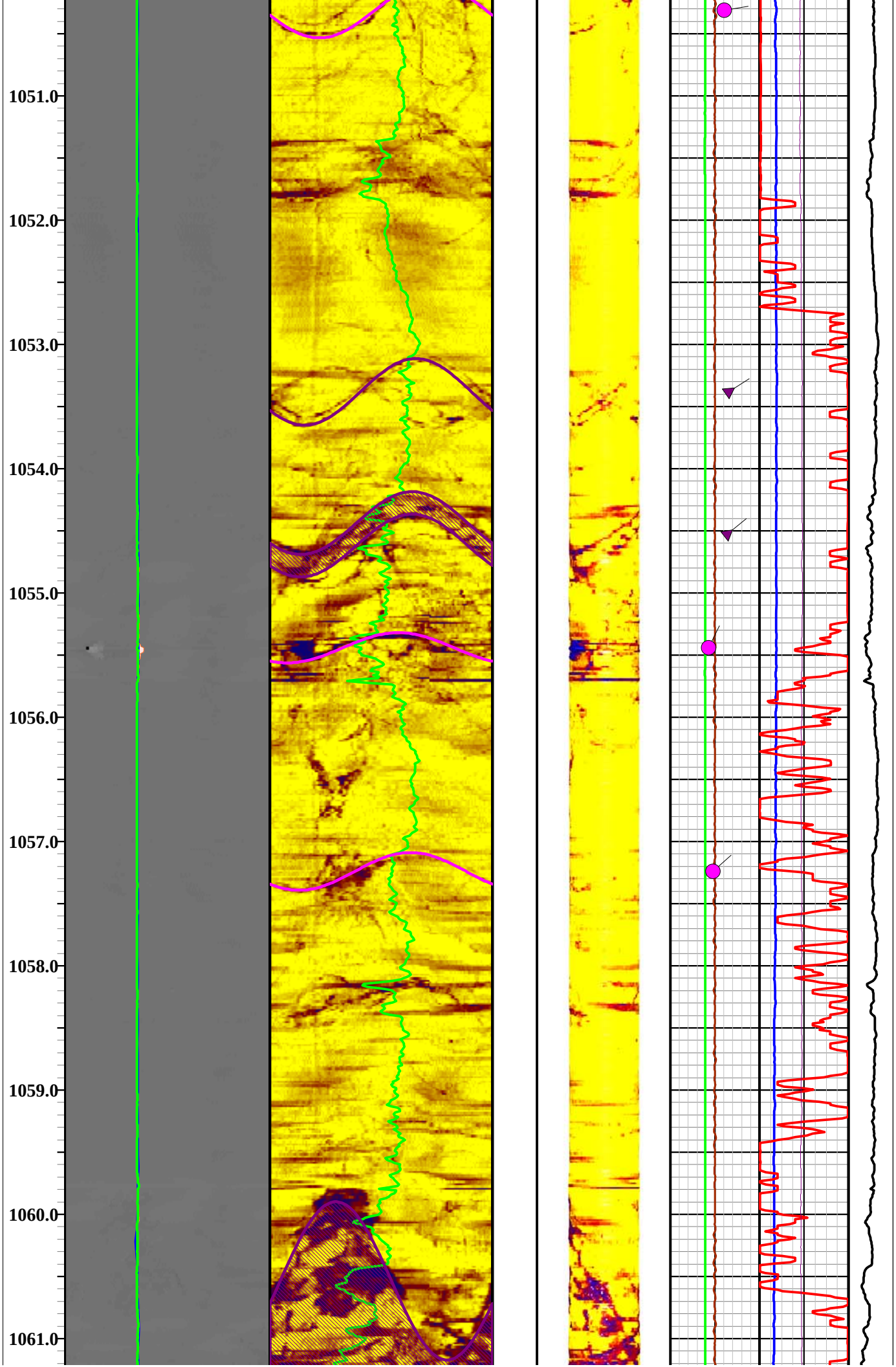

996.0
997.0
998.0
999.0
1000.0
1001.0
1002.0
1003.0
1004.0
1005.0
1006.0

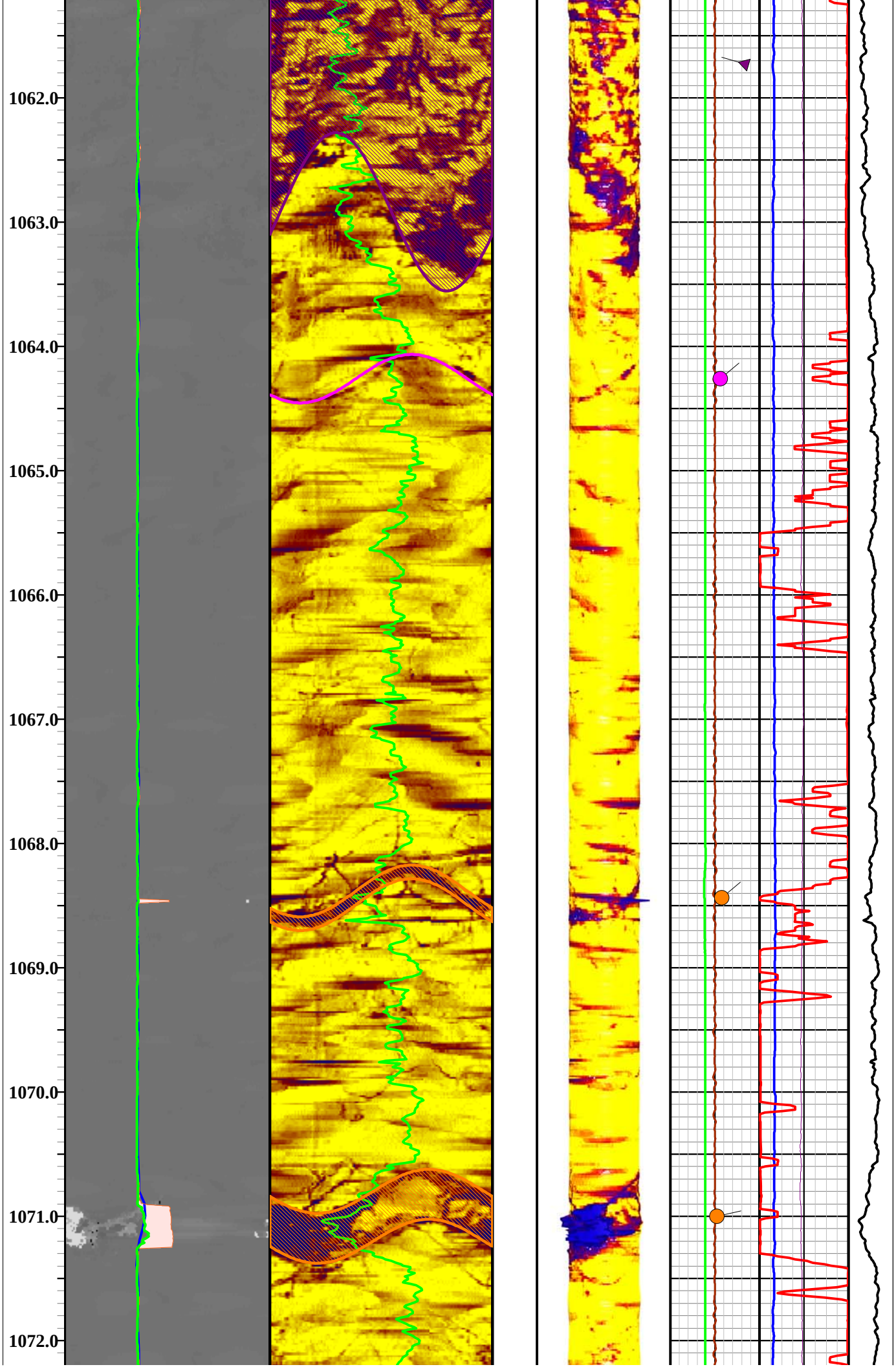

1007.0
1008.0
1009.0
1010.0
1011.0
1012.0
1013.0
1014.0
1015.0
1016.0
1017.0

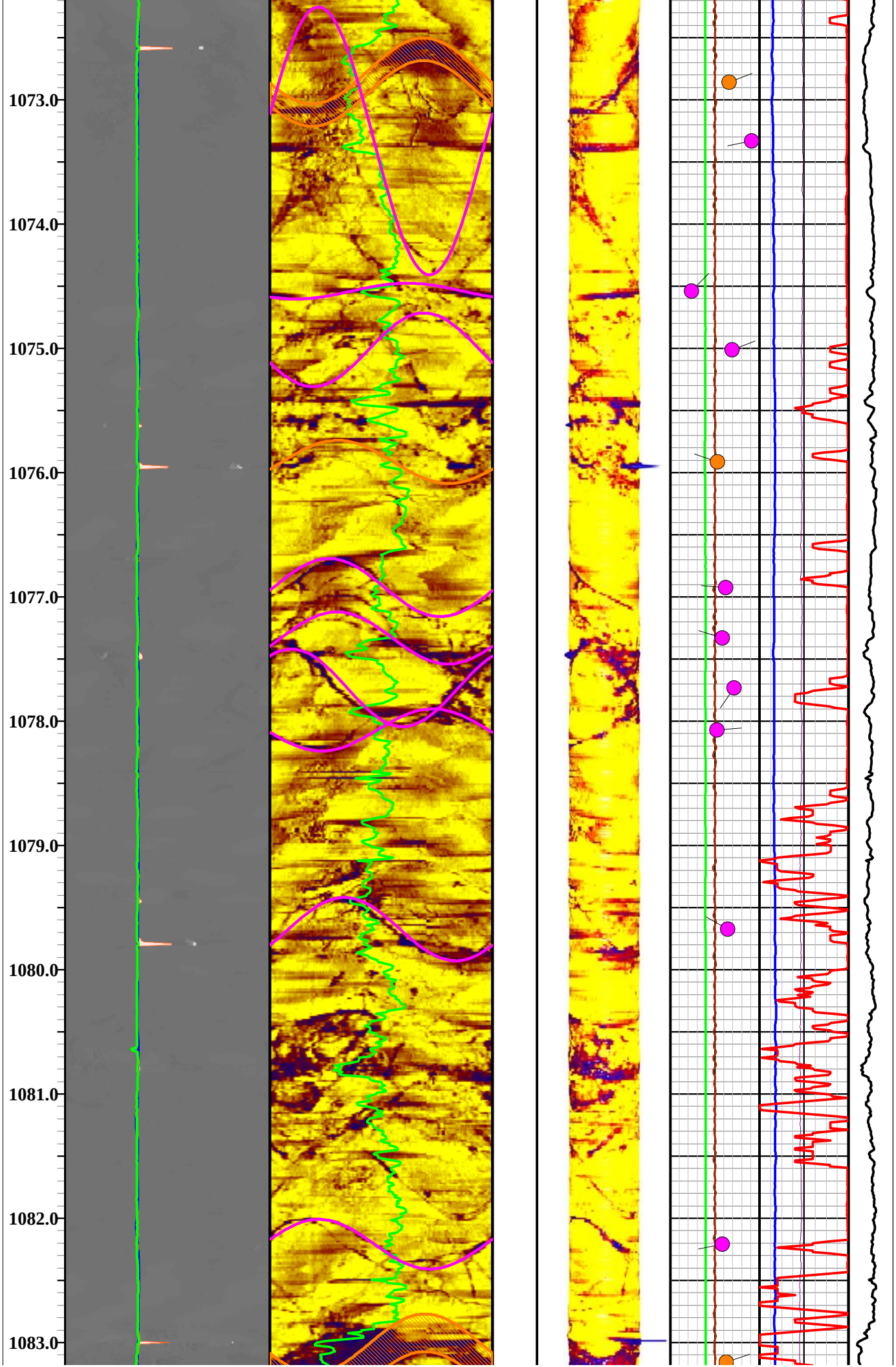

1018.0
1019.0
1020.0
1021.0
1022.0
1023.0
1024.0
1025.0
1026.0
1027.0
1028.0

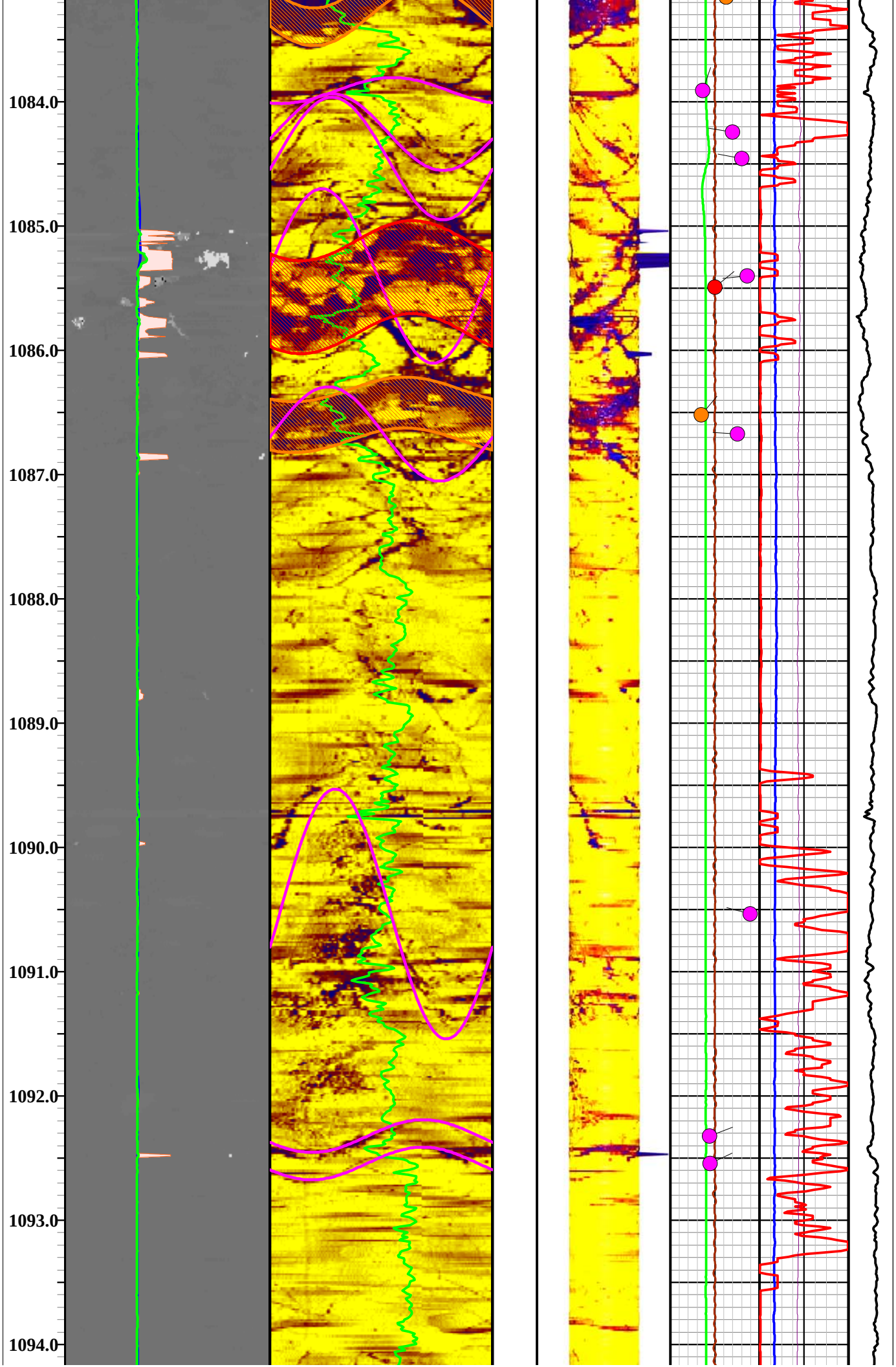

1029.0
1030.0
1031.0
1032.0
1033.0
1034.0
1035.0
1036.0
1037.0
1038.0
1039.0

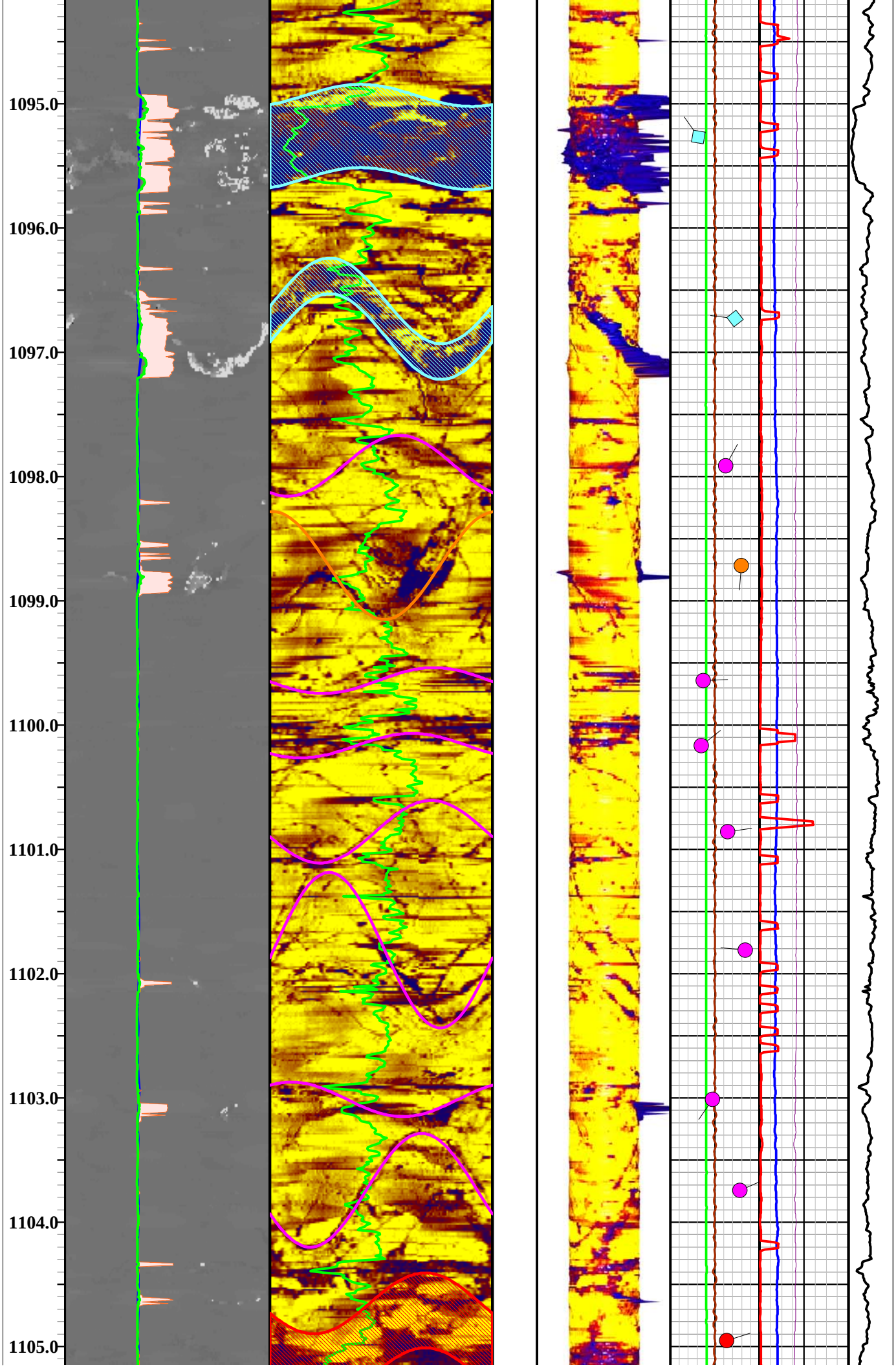

1040.0
1041.0
1042.0
1043.0
1044.0
1045.0
1046.0
1047.0
1048.0
1049.0
1050.0

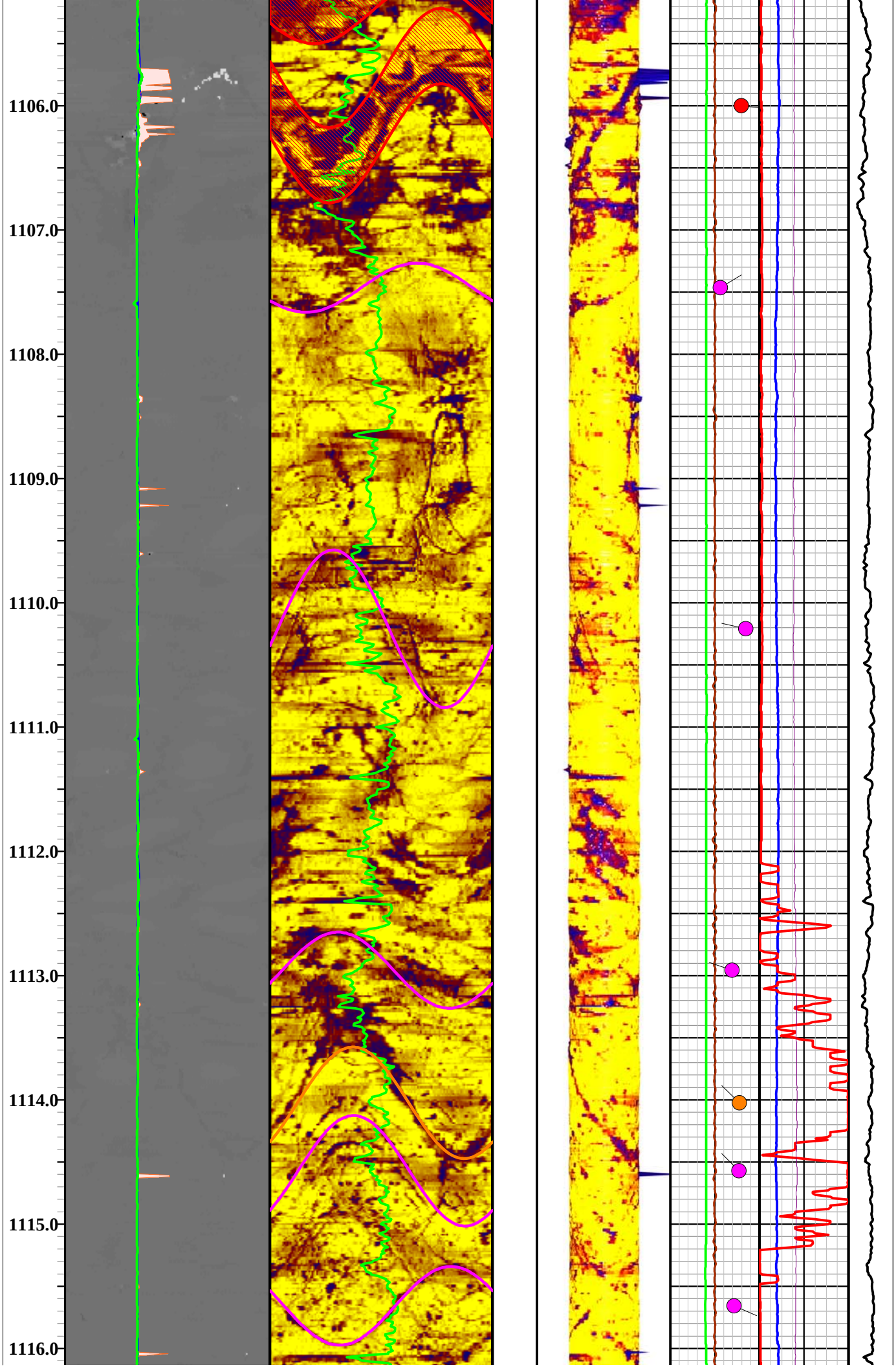

1051.0
1052.0
1053.0
1054.0
1055.0
1056.0
1057.0
1058.0
1059.0
1060.0
1061.0

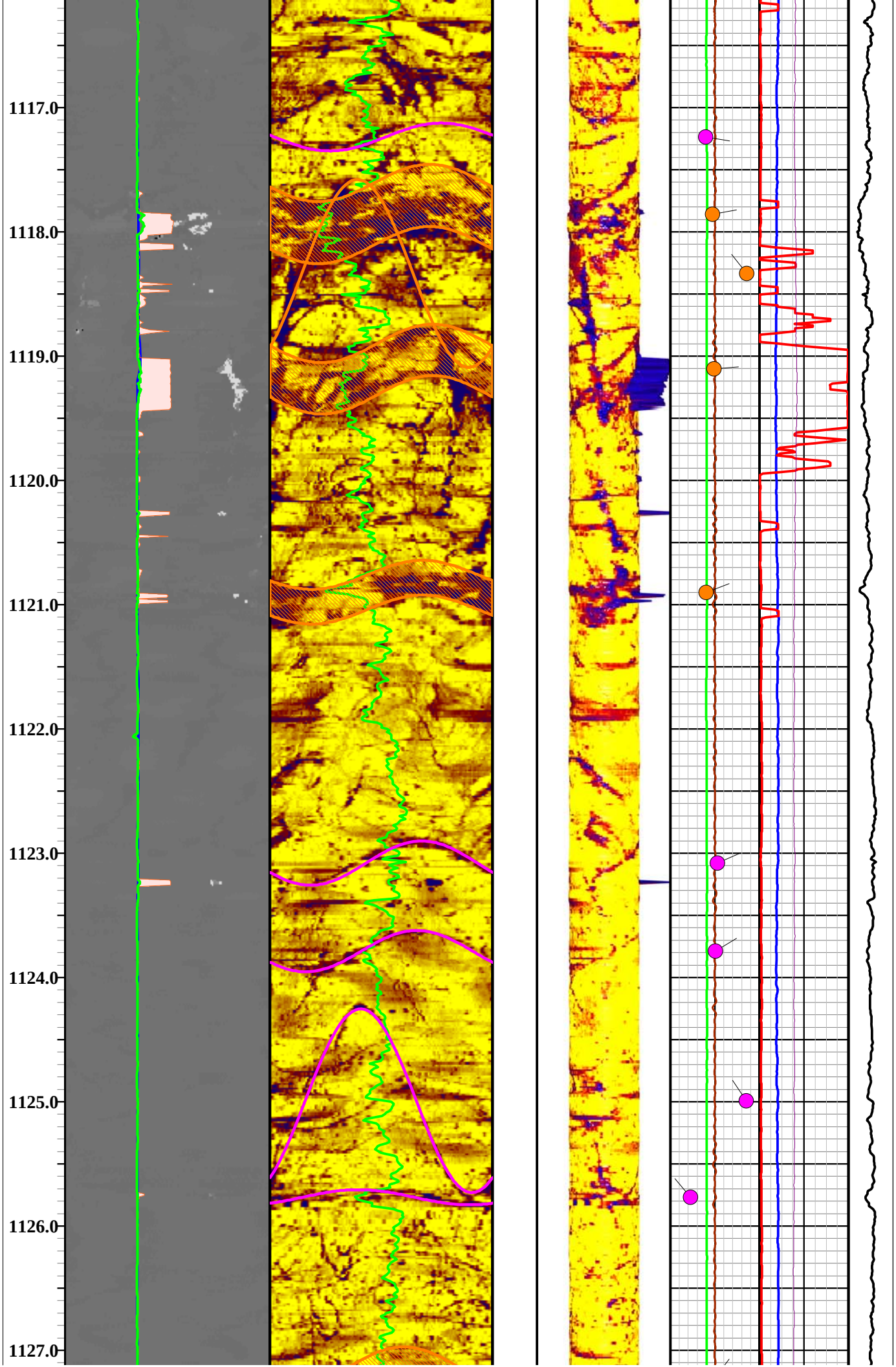

1062.0
1063.0
1064.0
1065.0
1066.0
1067.0
1068.0
1069.0
1070.0
1071.0
1072.0

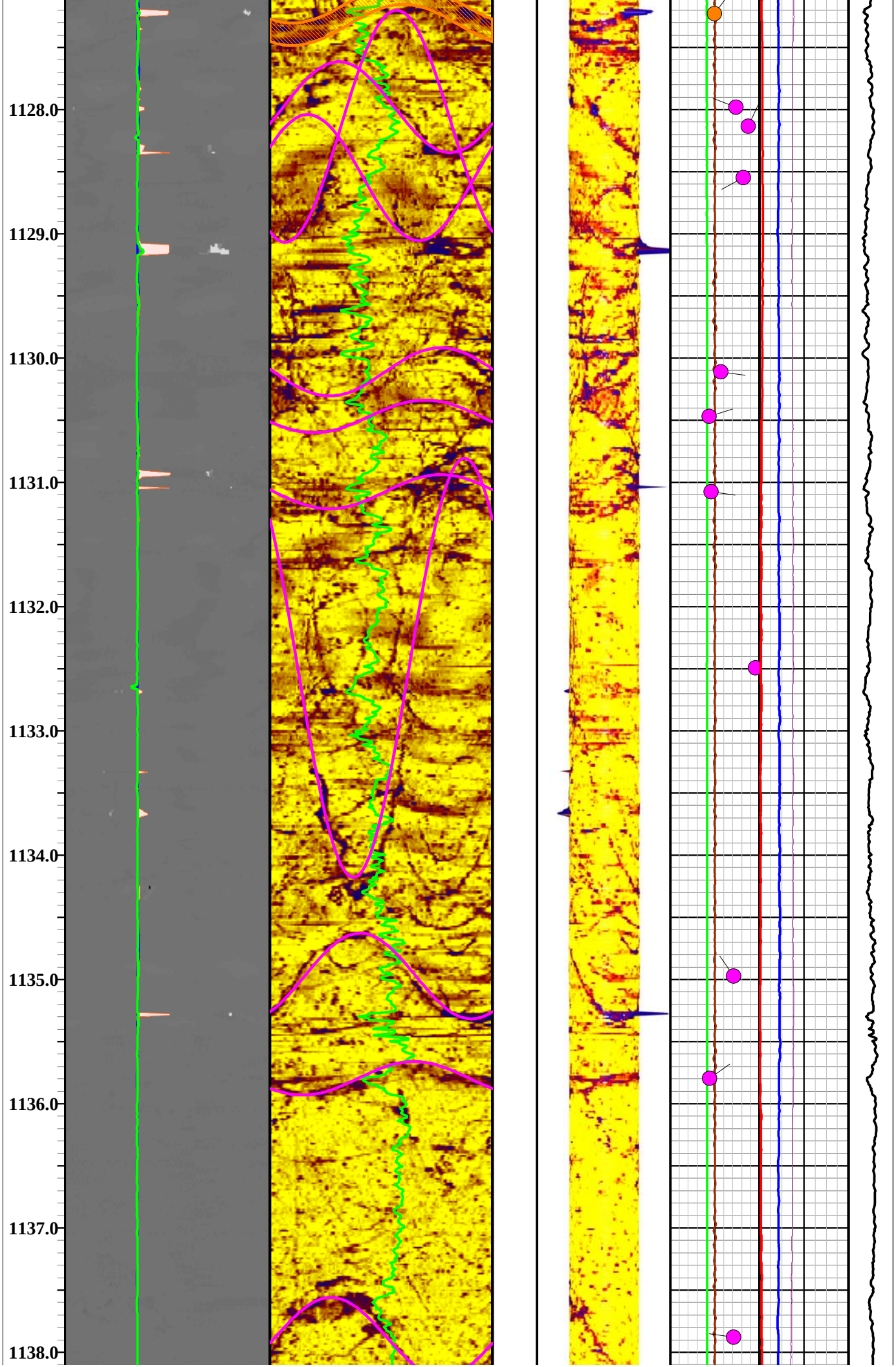

1073.0
1074.0
1075.0
1076.0
1077.0
1078.0
1079.0
1080.0
1081.0
1082.0
1083.0

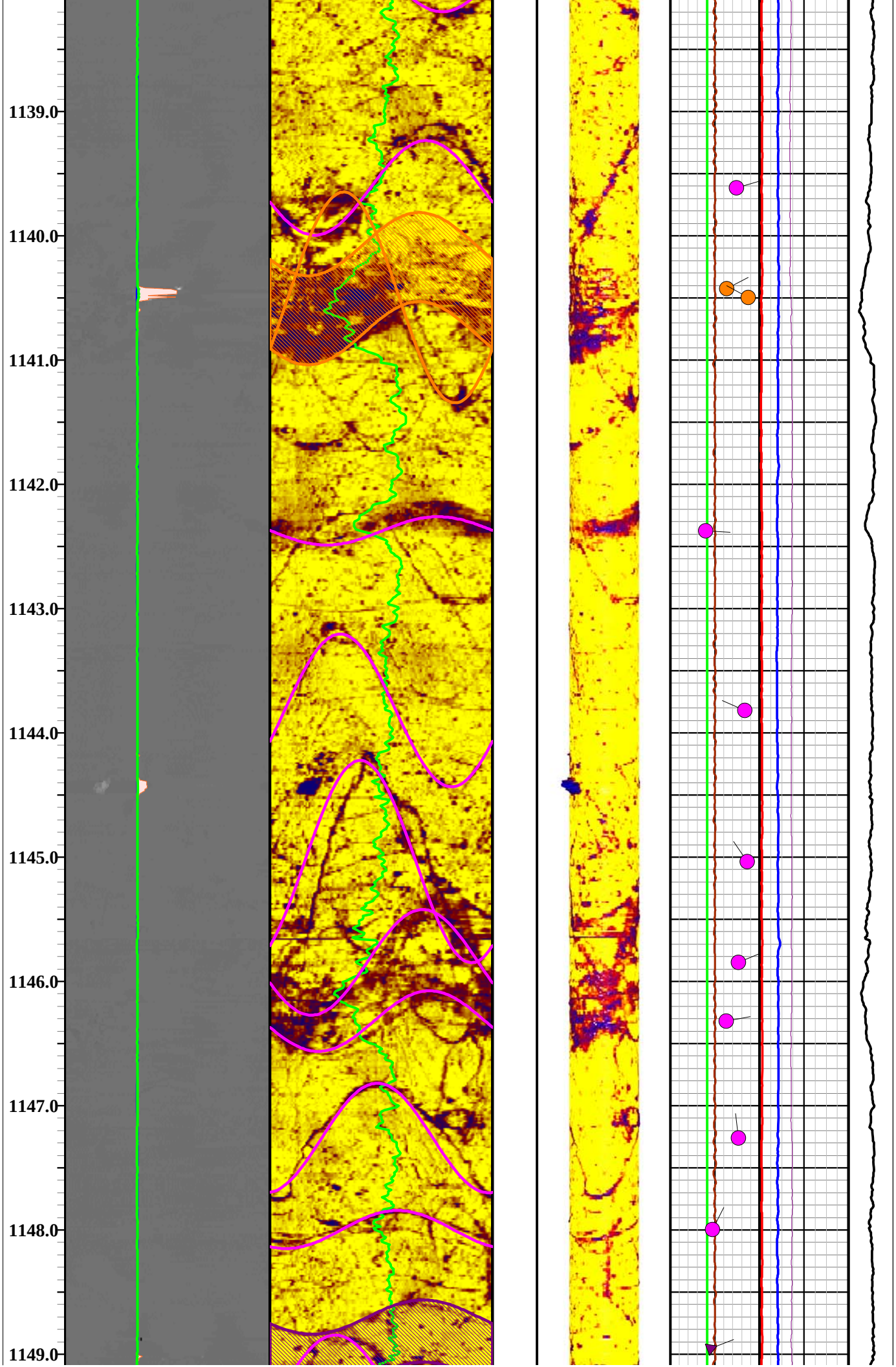

1084.0
1085.0
1086.0
1087.0
1088.0
1089.0
1090.0
1091.0
1092.0
1093.0
1094.0

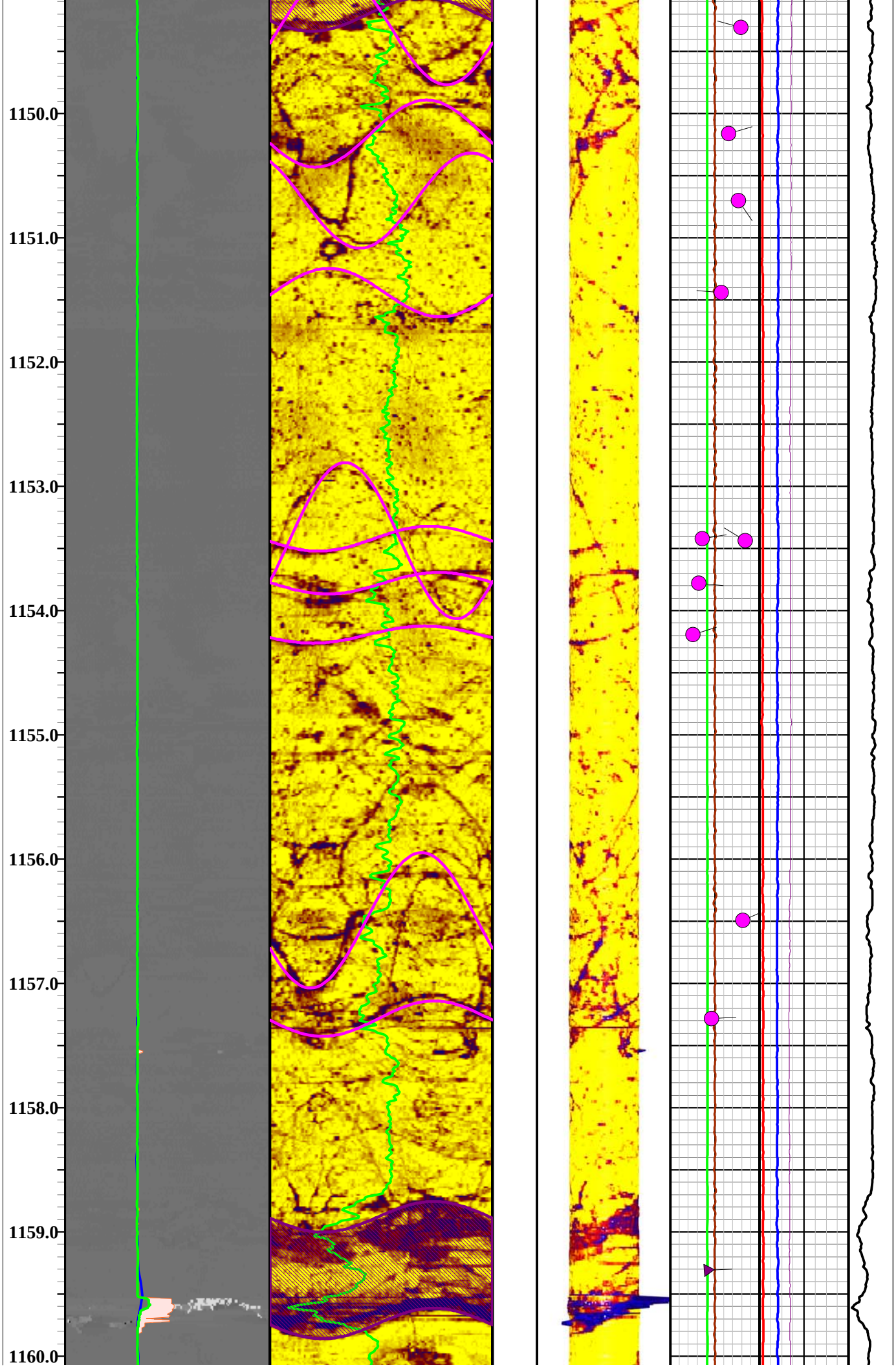

1095.0
1096.0
1097.0
1098.0
1099.0
1100.0
1101.0
1102.0
1103.0
1104.0
1105.0

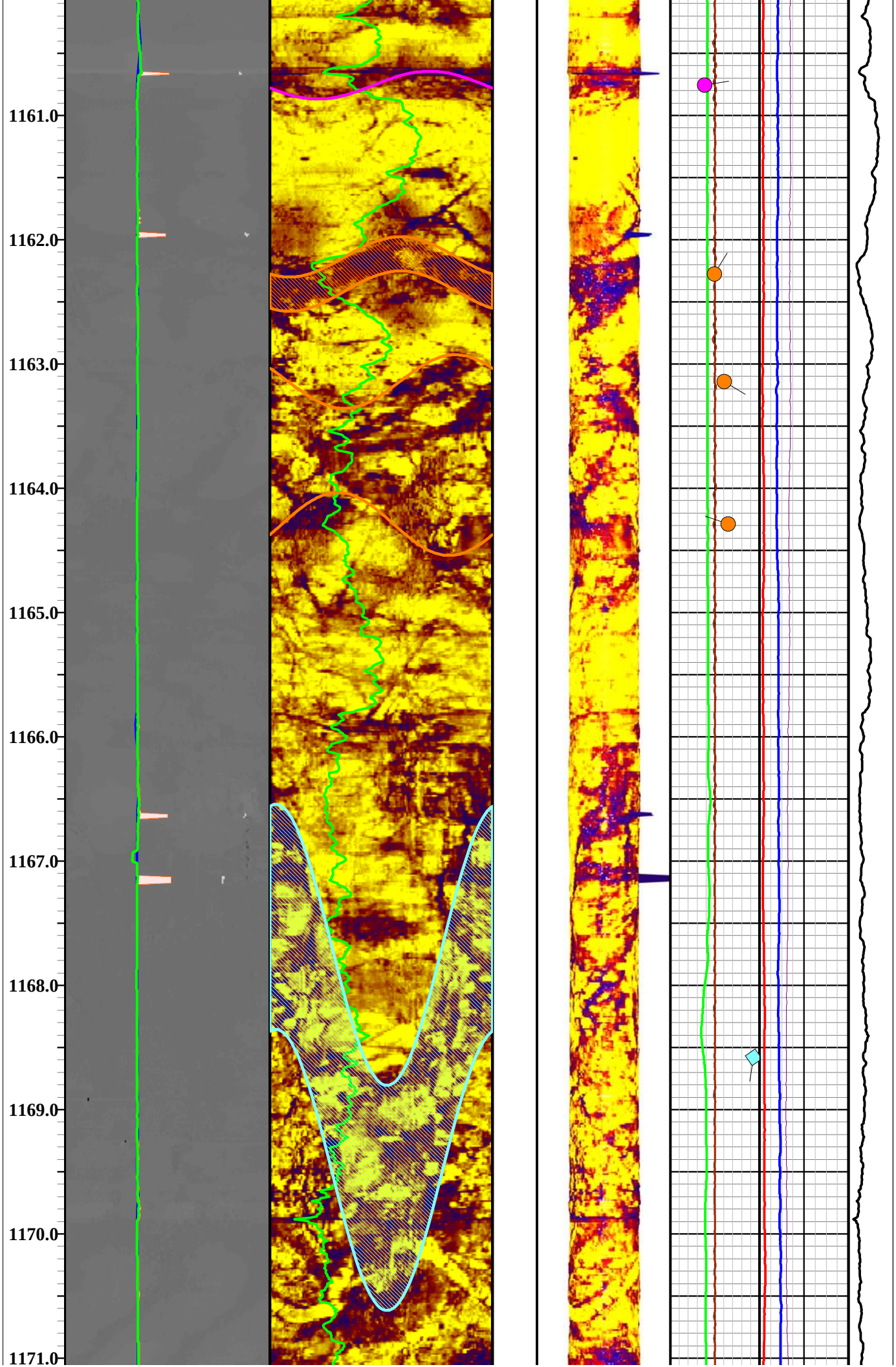

1106.0
1107.0
1108.0
1109.0
1110.0
1111.0
1112.0
1113.0
1114.0
1115.0
1116.0

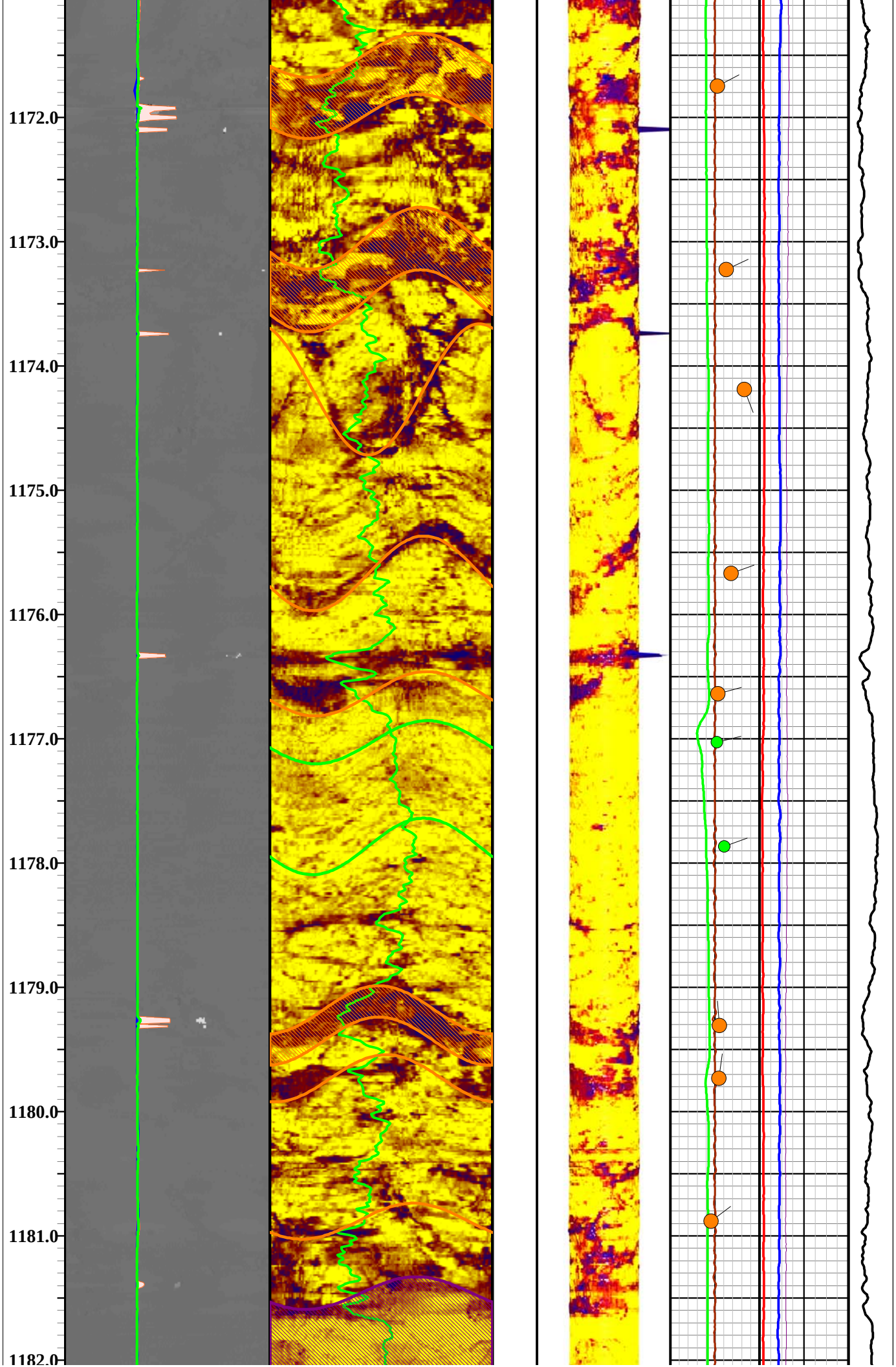

1117.0
1118.0
1119.0
1120.0
1121.0
1122.0
1123.0
1124.0
1125.0
1126.0
1127.0

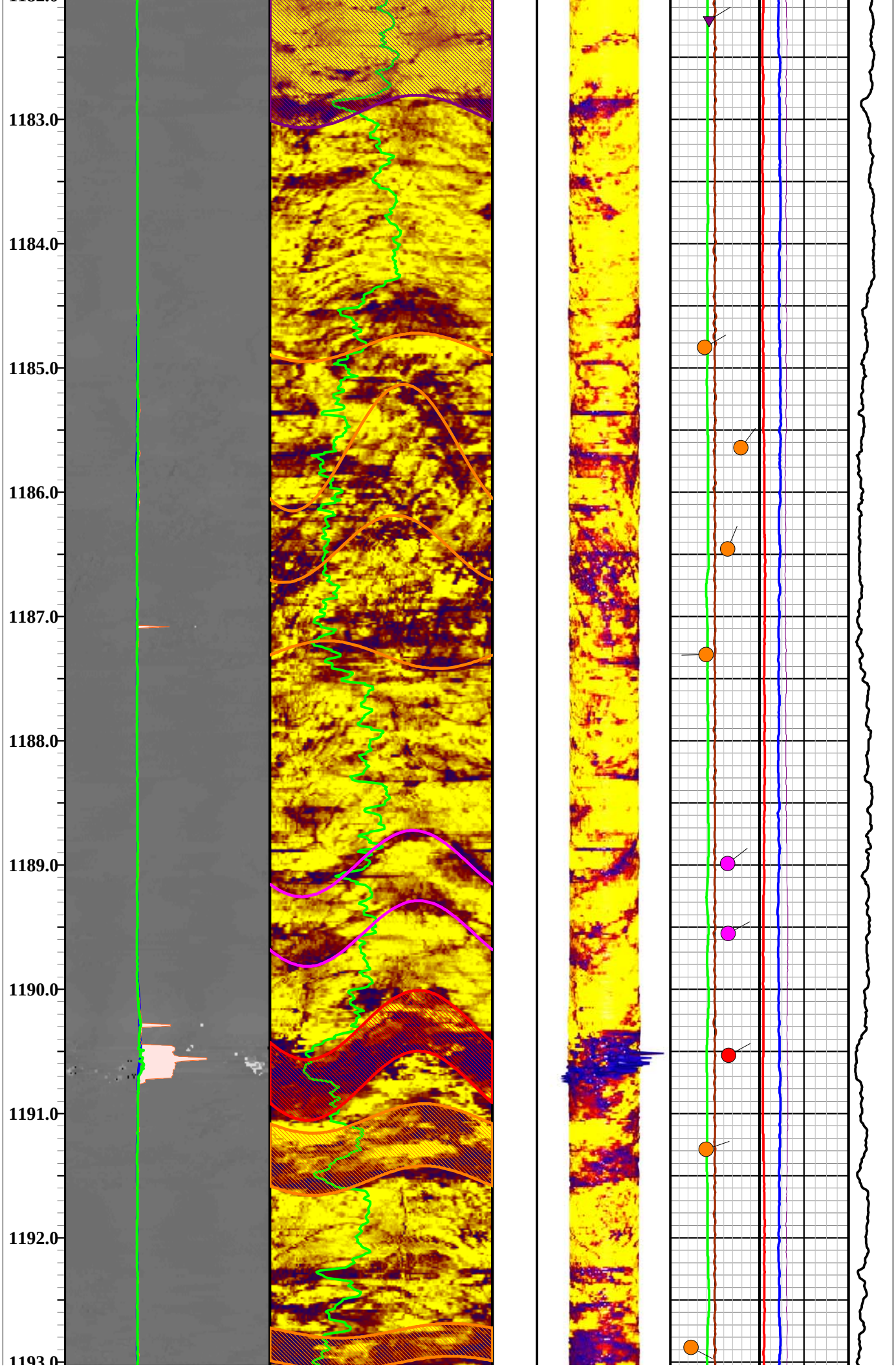

1128.0
1129.0
1130.0
1131.0
1132.0
1133.0
1134.0
1135.0
1136.0
1137.0
1138.0

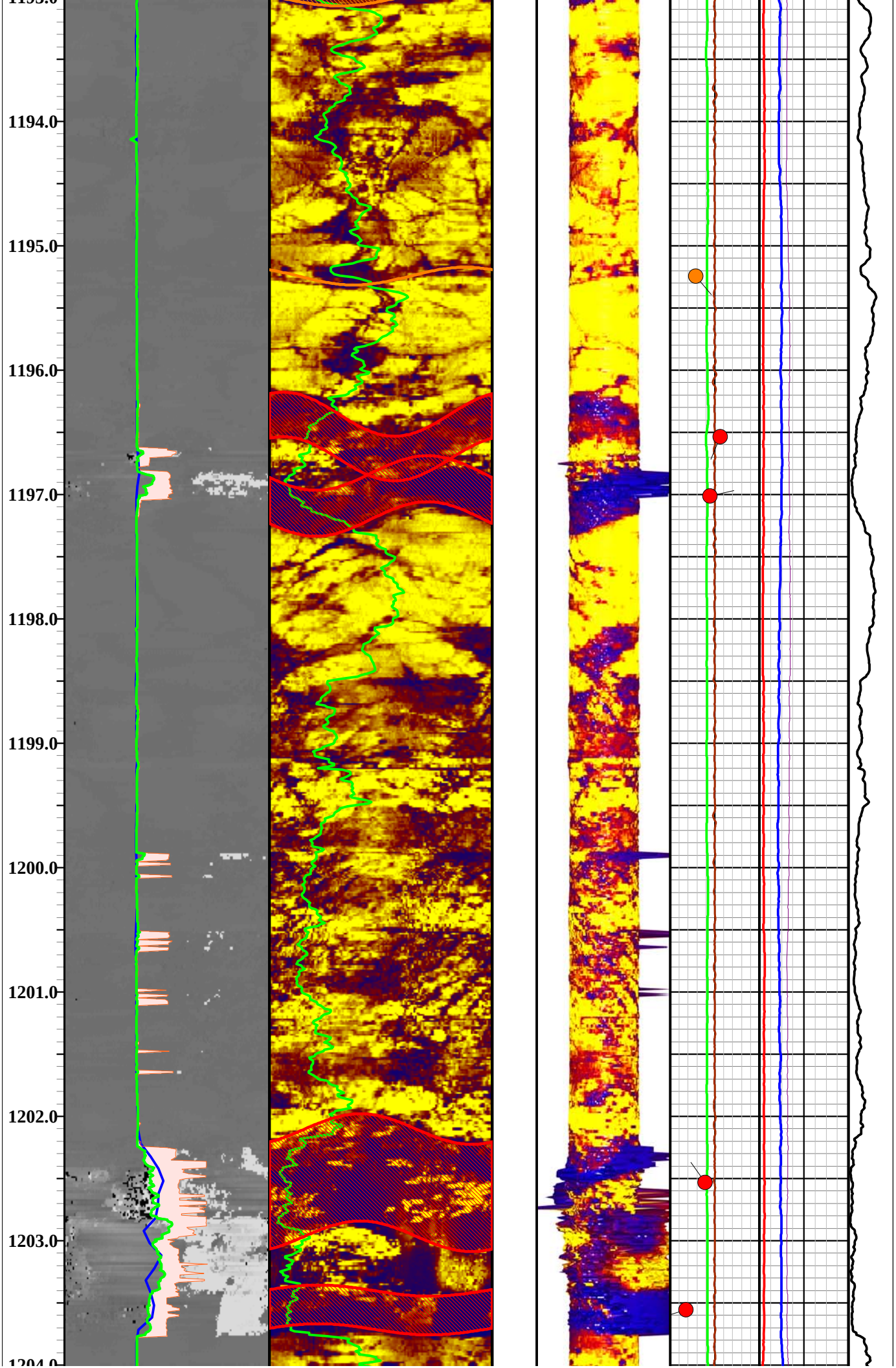

1139.0
1140.0
1141.0
1142.0
1143.0
1144.0
1145.0
1146.0
1147.0
1148.0
1149.0

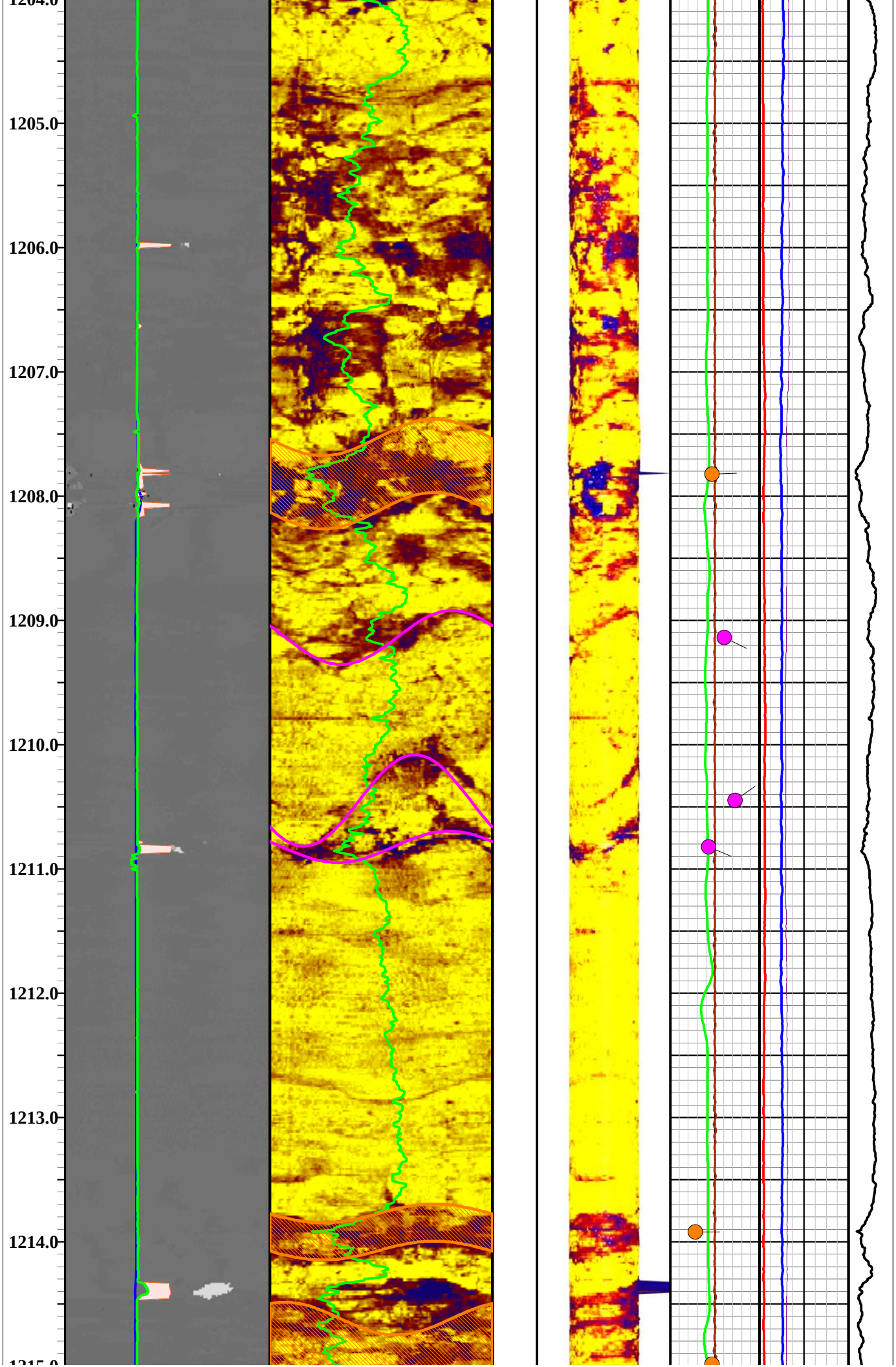

1150.0
1151.0
1152.0
1153.0
1154.0
1155.0
1156.0
1157.0
1158.0
1159.0
1160.0

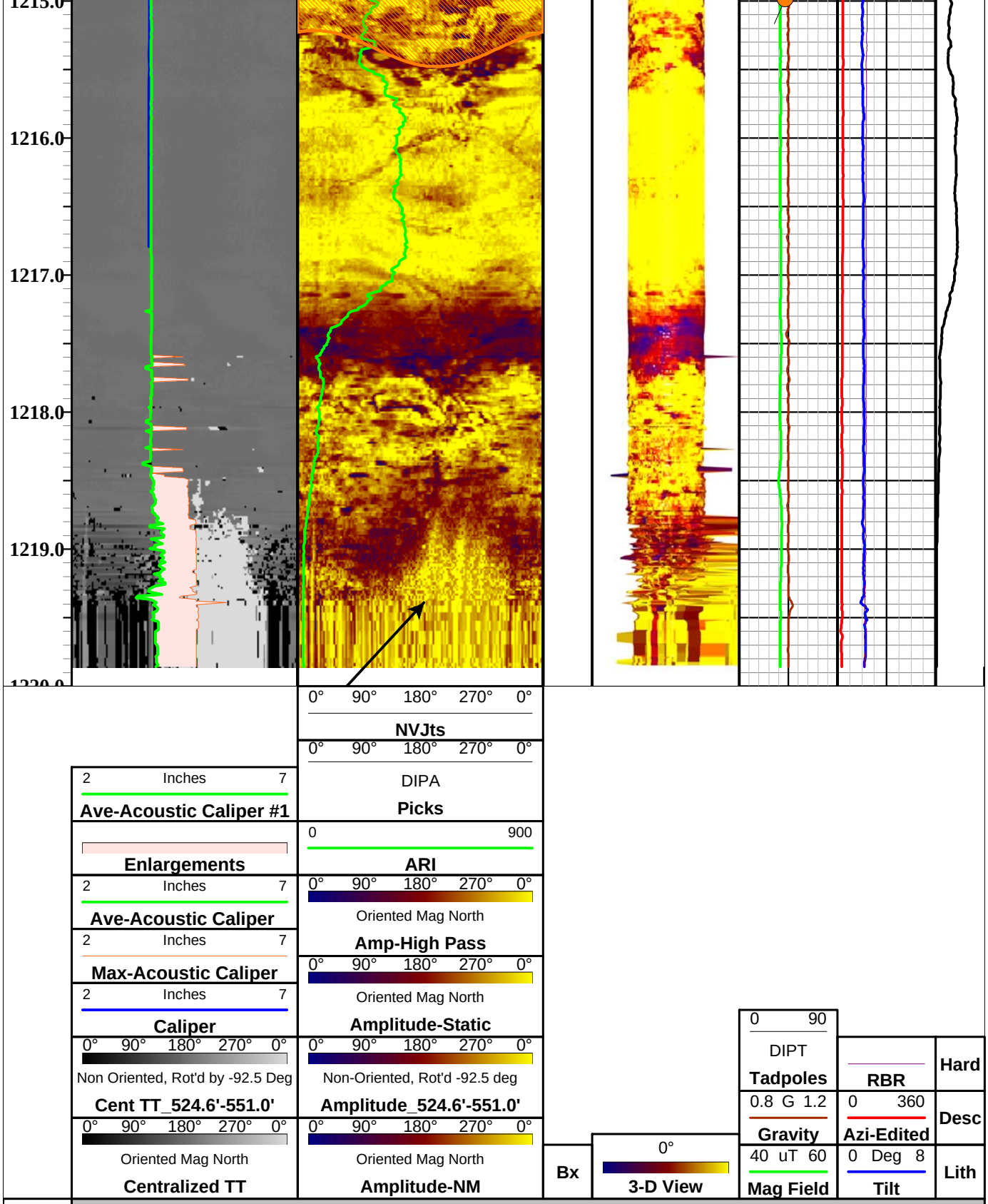

1161.0
1162.0
1163.0
1164.0
1165.0
1166.0
1167.0
1168.0
1169.0
1170.0
1171.0


1172.0
1173.0
1174.0
1175.0
1176.0
1177.0
1178.0
1179.0
1180.0
1181.0
1182.0


1183.0
1184.0
1185.0
1186.0
1187.0
1188.0
1189.0
1190.0
1191.0
1192.0
1193.0


1194.0
1195.0
1196.0
1197.0
1198.0
1199.0
1200.0
1201.0
1202.0
1203.0
1204.0


1204.0
1205.0
1206.0
1207.0
1208.0
1209.0
1210.0
1211.0
1212.0
1213.0
1214.0
1215.0



ABI Legend

Mnemonics	Description
Centralized TT	2D plot of acoustic image travel time with probe position centralized. Oriented to magnetic north and plotted from left to right N-E-S-W-N.
Cent TT_ 524.6'-551.0'	2D plot of the acoustic travel time image non-oriented, centralized and rotated by -92.5 deg to correct for magnetic affect in proximity of steel casing. Plotted from left

524.6'-551.0'	-92.5 deg to correct for magnetic affect in proximity of steel casing. Plotted from left to right N-E-S-W-N.
Caliper	3-arm mechanical caliper of hole diameter plotted from 2 to 7 inches (blue line).
Max-Acoustic Caliper	Maximum acoustic caliper of hole diameter calculated from Travel Time data and plotted as orange line from 2 to 7 inches.
Ave-Acoustic Caliper	Average acoustic caliper of hole diameter calculated from Travel Time data and plotted as bright green line from 2 to 7 inches.
Enlargements	Pink shaded zone between Avg-Acoustic Caliper and Max-Acoustic Caliper calculated from Travel Time data showing borehole enlargment.
Amplitude-NM	2D plot of unfiltered acoustic image amplitude oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled off.
Amplitude_ 524.6'-551.0'	2D plot of acoustic image non-oriented and rotated by -92.5 deg to correct for magnetic affect in proximity of steel casing. Plotted from left to right N-E-S-W-N.
Amplitude-Static	2D plot of acoustic image amplitude with Static normalization filter oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled on.
Amp-High Pass	2D plot of acoustic image amplitude with High Pass normalization filter oriented to magnetic north. Plotted from left to right N-E-S-W-N. Image toggled on.
ARI	Acoustic Reflectance Index or relative rock hardness from ABI Amplitude log. Plotted 0 (soft) to 900 (harder) as green line.
Picks	Planar strucutral features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header) DIPA = dip apparent hole axis.
NVJts	Near Vertical (near parallel to hole axis) joint/fracture features picked on acoustic borehole image shown as colored sinusoid (color designation shown on header).
Bx	Apparent Breccia or Congomerate zones and Vugs/Vesicles/Cavities.
3-D View	3D cylindrical projection of ABI image using Centralized TT log for hole shape looking from North.
Tadpole	Tadpole plot of the ABI feature picks (fractures and bedding planes); plotted from 0 to 90 dip - see legend above. DIPT = True orientation; features corrected for hole deviation.
Mag Field	Total magnetic field strength as measured by fluxgate magnetometer in OBI or ABI deviation sensor - plotted 40-60 uT (green line).
Gravity	Total gravity (probe acceleration) as measured by 3-axis accelerometers in ABI deviation sensor - plotted 0.8-1.2 g (brown line).
Azi-Edited	Direction of tool tilt plotted 0 to 360 deg; edited for anomalous magnetic influence - represents borehole deviation direction (red line).
Tilt	Tool tilt (vertical = 0 and horizontal = 90) plotted 0 to 8 deg; represents borehole deviation tilt from vertical (blue line).
RBR	Relative bearing - azimuth of the probe marker position to Magnetic North measured clockwise (thin purple line).
Lith	Major/principal lithology based on field geologic descriptions provided by Excelsior staff.
Desc	Major/principal field geologic descriptions provided by Excelsior staff
Hard	Apparent rock harness from ARI used to silhouette lithology.

Mnemonics prepared by Robert E. Crowder
Version 9-14-14

ABI-40 Acoustic Borehole Imager - SN 3520

Probe Top = Depth Ref.

Four Conductor MSI Probe Top

APS Probe Orientation Sensor
3-Axis Magnetometer
3-Axis Accellerometer

Probe Length = 1.70 m or 5.58 ft

Probe Weight = 7.0 kg or 15.4 lbs

Distance from Acoustic Image Window to Orientation Sensor = 1.2 m or 4 ft

Inclination Accuracy = +/- 0.5 deg
Azimuth Accuracy = +/- 1.0 deg

Beam Width = 3 mm

Frequency = 1.2 MHz

Temperature Range: 0 - 70 Deg C (32 - 158 Deg F)
Pressure Range: 0 - 200 bar (0 - 2900 psi)

Run Centralized with External Bow Spring Centralizers

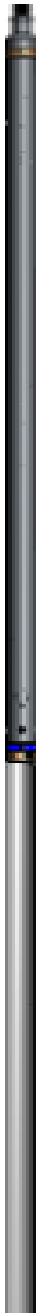
Can only be logged in fluid filled holes

ABI Imaging Window

1.6" or 40 mm Diameter

MSI Gamma-Caliper-Temperature-Fluid Resistivity SN 4953

Probe Top = Depth Ref.



Single Conductor MSI Probe Top

Probe Length = 2.59 m or 8.5 ft
Probe Weight = 6.80 kg or 15.0 lbs

Natural Gamma and Caliper can only be collected logging up hole.

Fluid Temperature/Resistivity can only be collected logging down hole.

Temperature Rating: 70 Deg C (158 Deg F)
Presure Rating: 200 bar (2900 psi)

Natural Gamma Ray = 0.76 m (29.75 in)

3-Arm Caliper = 1.44 m (56.75 in)

Distance from tool top: 2.20 m (86.5 in)

Available Arm Sizes: 3", 9", and 15"

TFR (Temperature/Fluid Resistivity) = 0.39 m (15.5 in)

1.375" or 34.9 mm Diameter

Southwest Exploration Services, LLC
borehole geophysics & video services

Company	EXCELSIOR MINING ARIZONA
Well	NSM-006
Field	NORTH STAR GUNNISON PROJECT
County	COCHISE
State	ARIZONA

Final Acoustic Televiewer Summary