

WIRELINE WORKSHOP

ATV STRUCTURE LOG

WELL ID: **ZND05**

WRT TRUE NORTH

COMPANY: NORTHAM PLATINUM LIMITED

COUNTRY: SOUTH AFRICA

PROVINCE: LIMPOPO

RUN ID: ONE

FIELD: NORTHAM PLATINUM MINE

CONTRACTOR: WIRELINE WORKSHOP CC

LOG DATE: MAY 2019

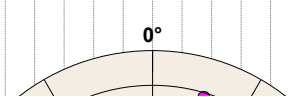
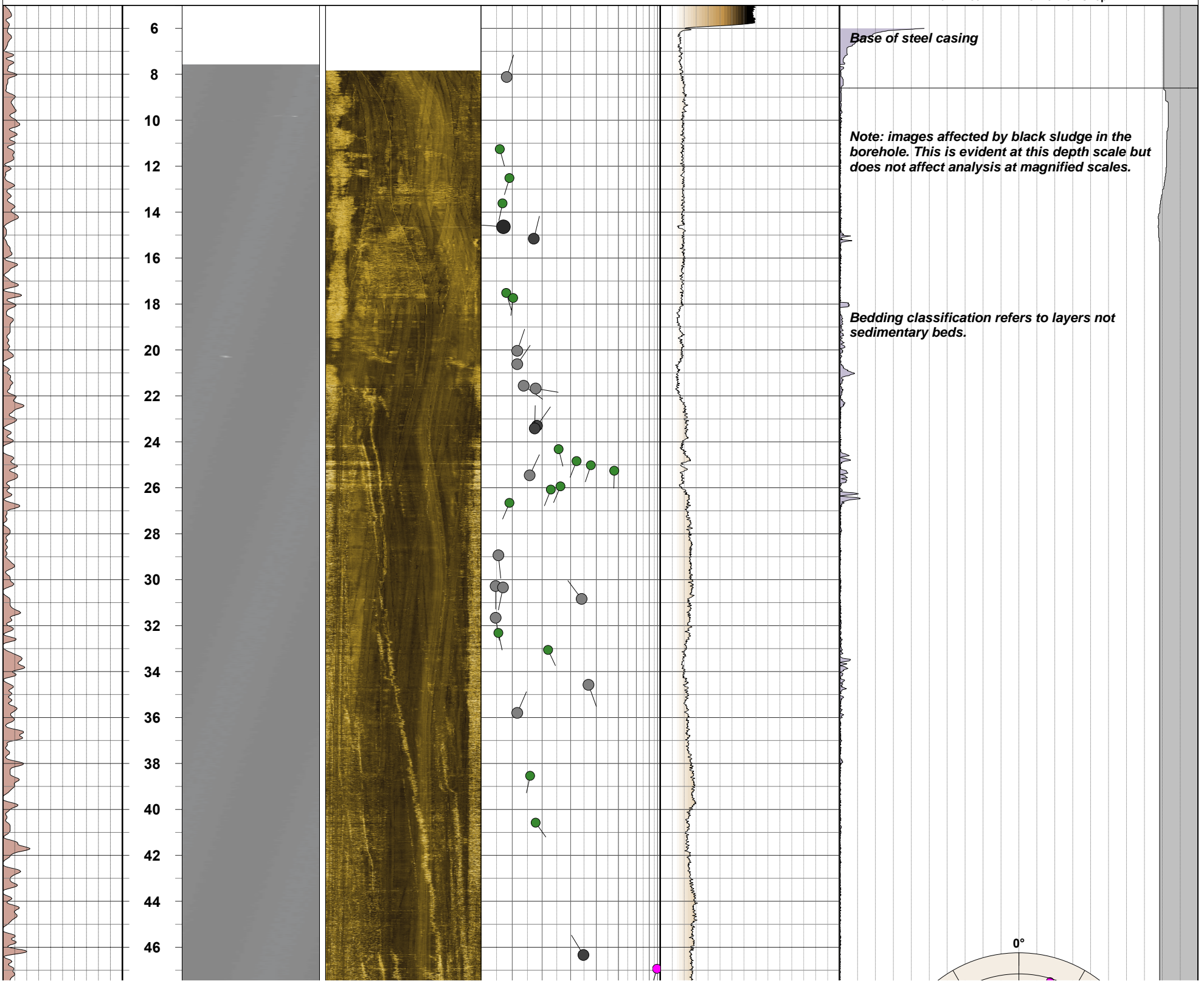
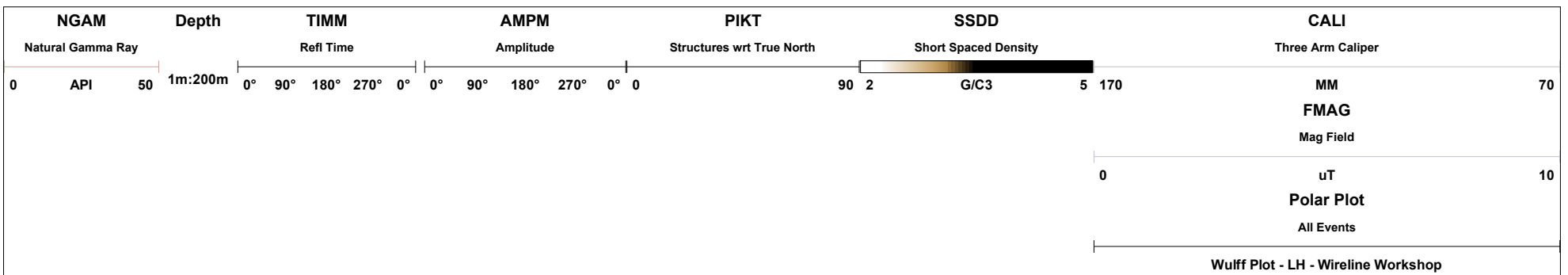
WWS JOB REF: 729



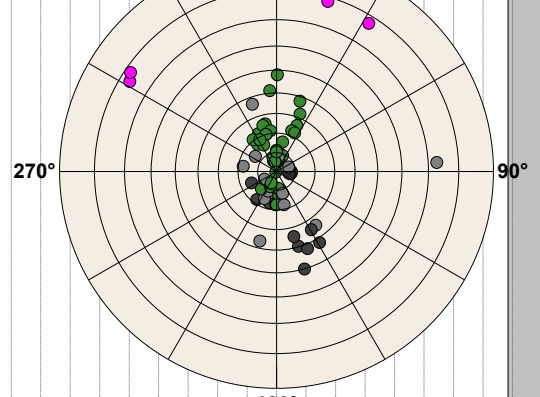
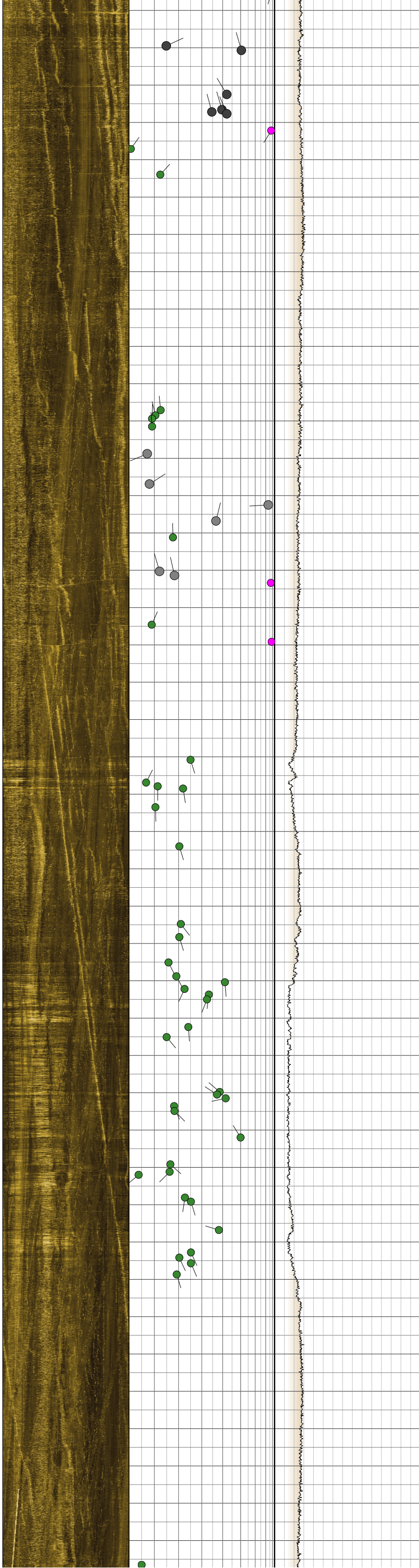
Drill depth 1:	6.00 m.	Logger depth 1:	1585.00 m.	OH bit size 1:	4 inch	Fluid level:	538 metres
Drill depth 2:	1586.00 m.	Logger depth 2:		OH bit size 2:	NQ 76.4mm.	Fluid type:	Water and black oil
Drill depth 3:		Logger depth 3:		OH bit size 3:		Fluid weight:	1.00
Casing size 1:	NXC	Casing depth 1:	6.00 m.	Ops duration:	4 days	Surface datum:	Ground level
Casing size 2:		Casing depth 2:		Logger:	AM / WG	First run:	Full geotech suite
Casing size 3:		Max rec temp:	52 deg C.	Witness:	C v Jaarsveld	Other logs:	Caliper

- Comment 1: *Image quality affected by oily sludge. Logged to 1,580 metres to avoid sludge at TD.*
- Comment 2: *Log characterised by mostly competent rocks with a few large open fractures,*
- Comment 3: *Some layering visible on the optical image.*
- Comment 4: *The structure log is correctly to be with respect to True North. Mag declination of -16.58 applied.*

- Sedimentary bed
- Minor or non-continuous fracture
- Significant fracture
- Significant open fracture
- Intermediate fracture
- Layer or boundary
- Cemented fracture, vein
- Drilling-induced tensile fracture



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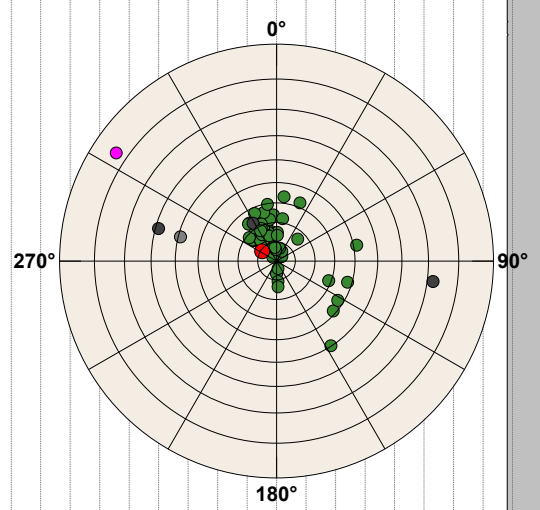
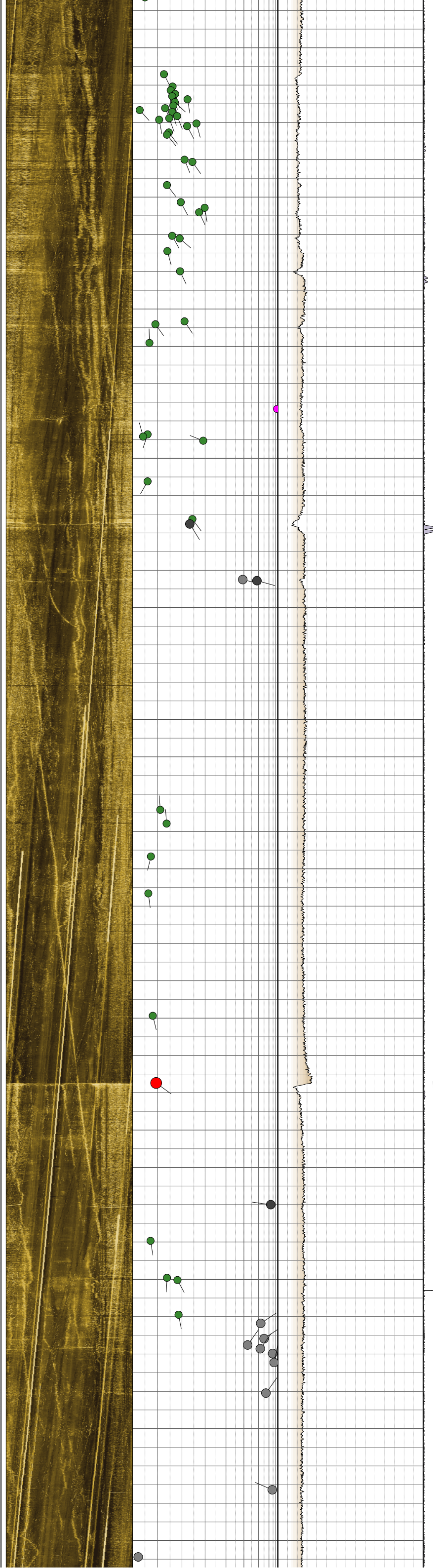


Mean	Counts	Dip[deg]	Azi[deg]
● (Green)	69	2.48	167.87
● (Black)	1	7.25	274.83
● (Grey)	10	29.31	347.69
● (Pink)	18	4.69	21.53
● (Pink)	4	74.36	161.14

Layering visible on OTV image (not on ATV).

OTV image smeared by grease on borehole wall.

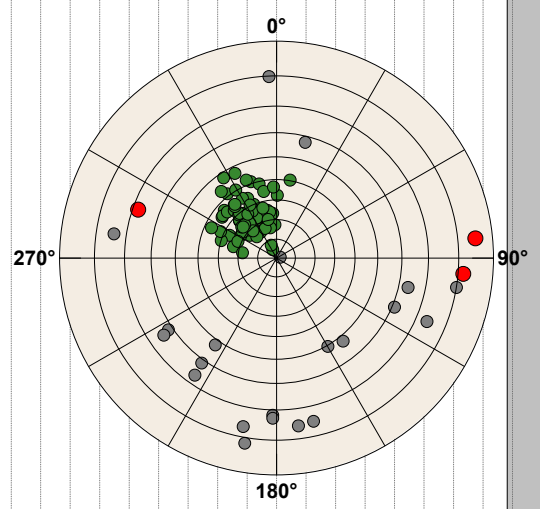
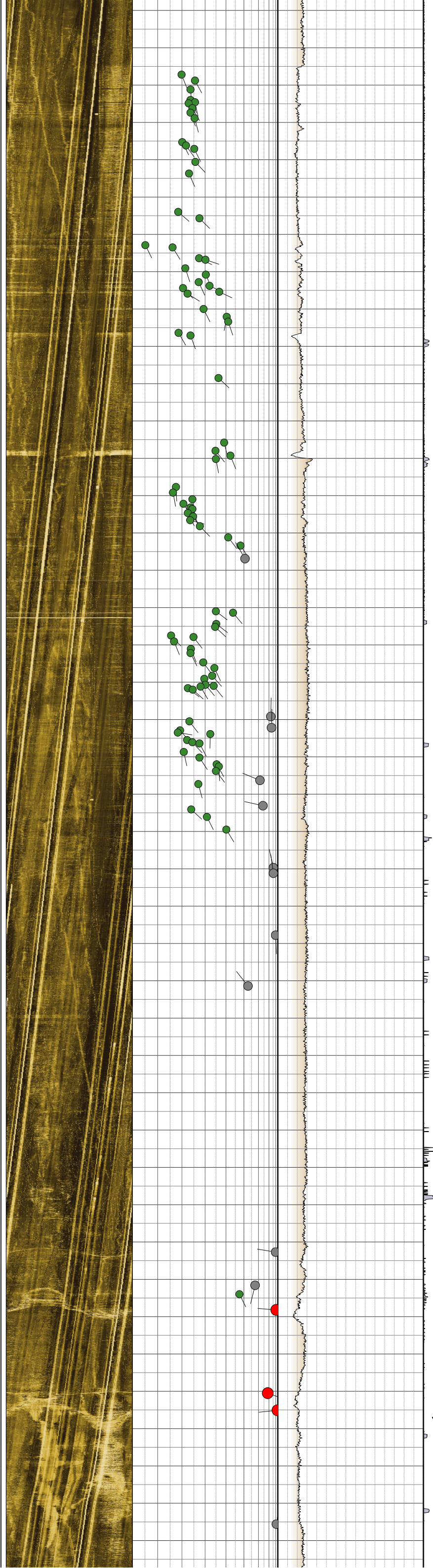
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Mean	Counts	Dip[deg]	Azi[deg]
●	71	12.90	163.12
●	65	12.36	168.25
●	1	83.55	124.10
●	3	59.69	109.23
●	1	49.27	104.44
●	1	9.42	125.97

Water entering borehole column.

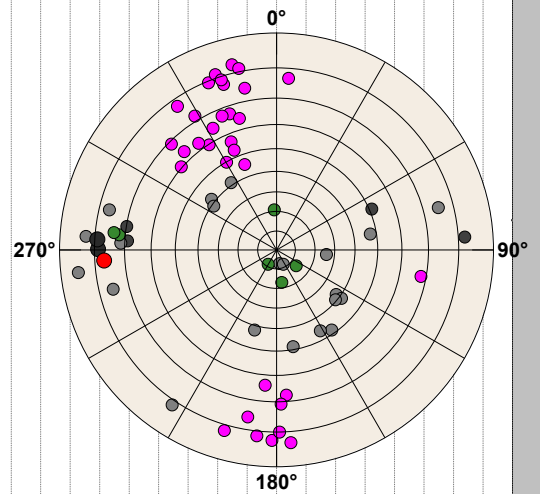
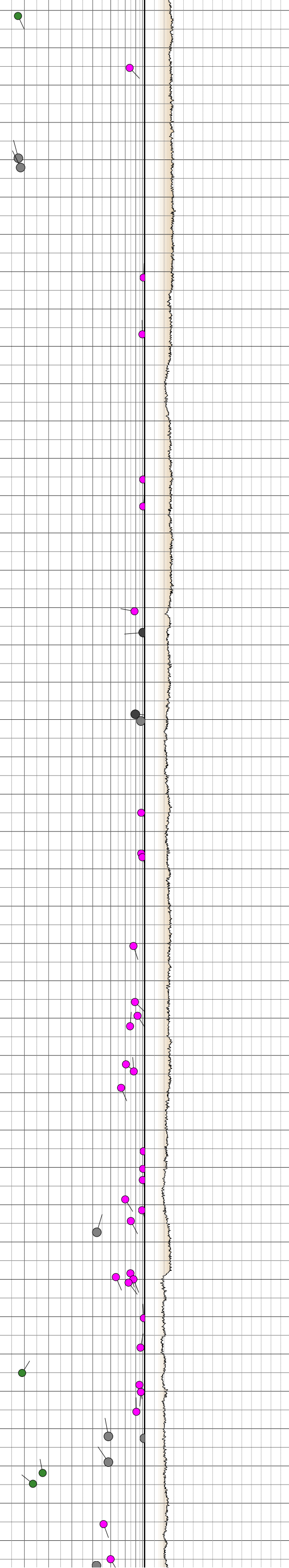
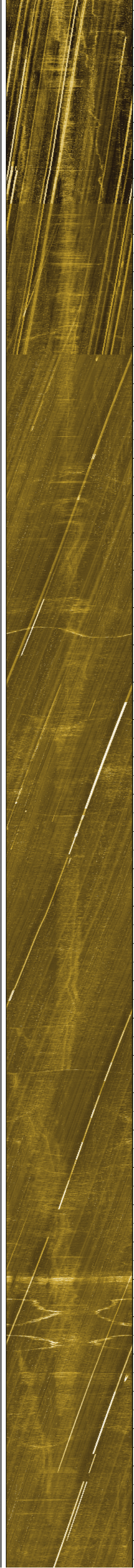
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Mean	Counts	Dip[deg]	Azi[deg]
●	110	26.42	145.65
●	86	26.06	147.74
●	21	66.05	2.62
●	3	87.53	95.60

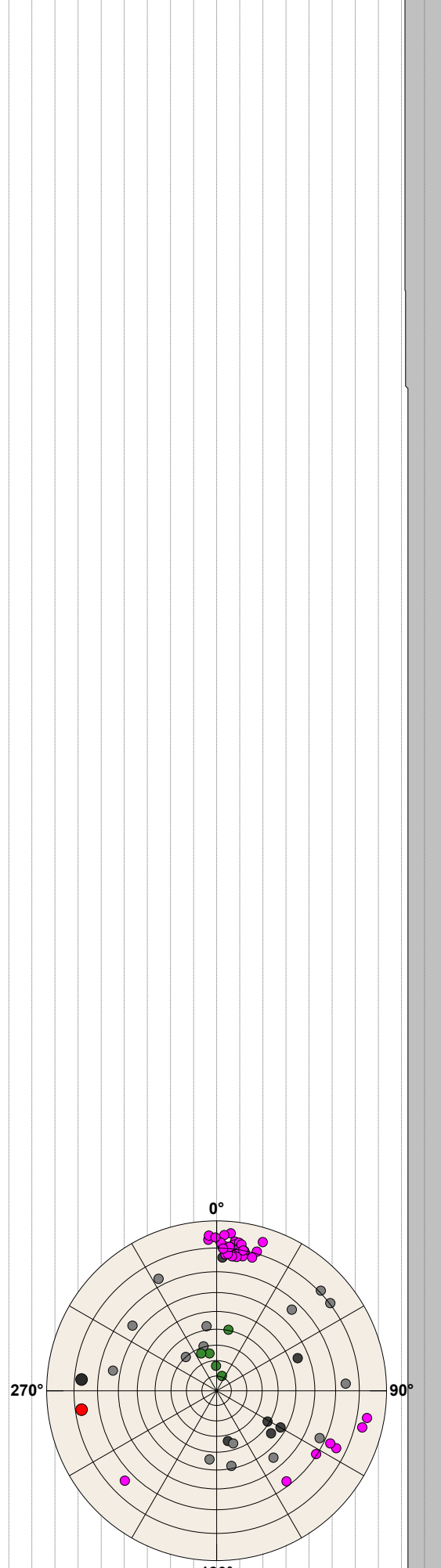
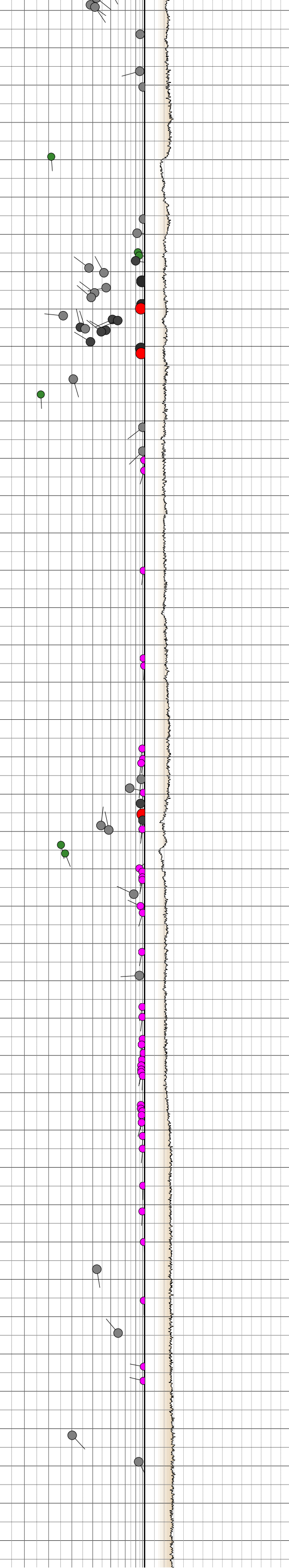
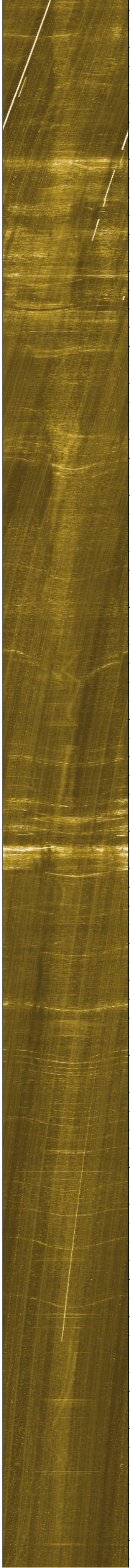
Steeply dipping open fracture.

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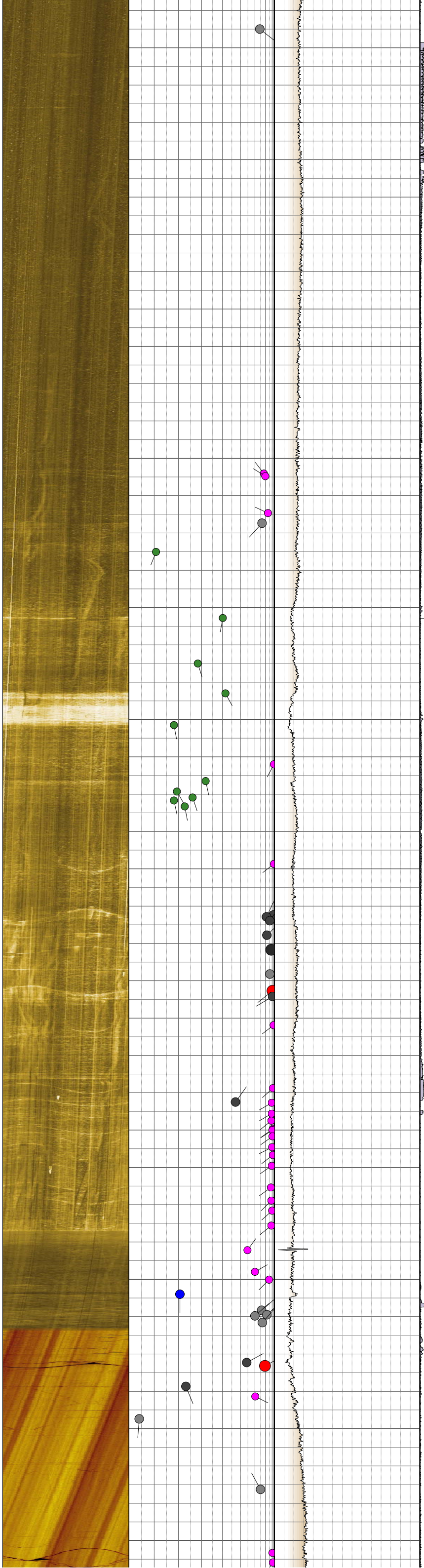
Mean	Counts	Dip[deg]	Azi[deg]
● (magenta)	67	75.75	146.70
● (grey)	33	77.16	162.64
● (black)	21	35.58	303.13
● (dark grey)	4	88.70	88.31
● (green)	6	11.39	80.50
● (black)	2	79.17	91.99
● (red)	1	77.23	86.41

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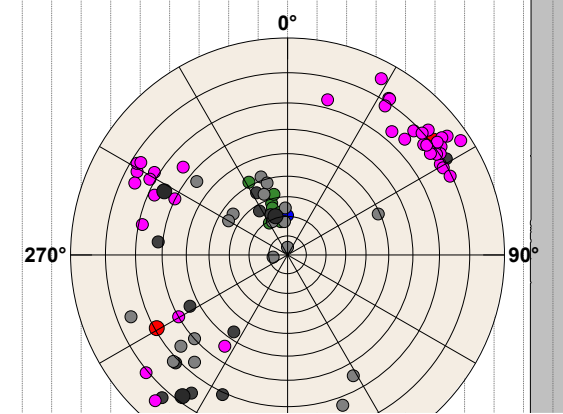
Mean	Counts	Dip[deg]	Azi[deg]
●	74	78.98	184.88
●	7	42.52	308.22
●	16	72.63	162.51
●	1	77.18	94.88
●	2	88.59	46.28
●	5	23.20	177.44
●	43	82.06	185.59

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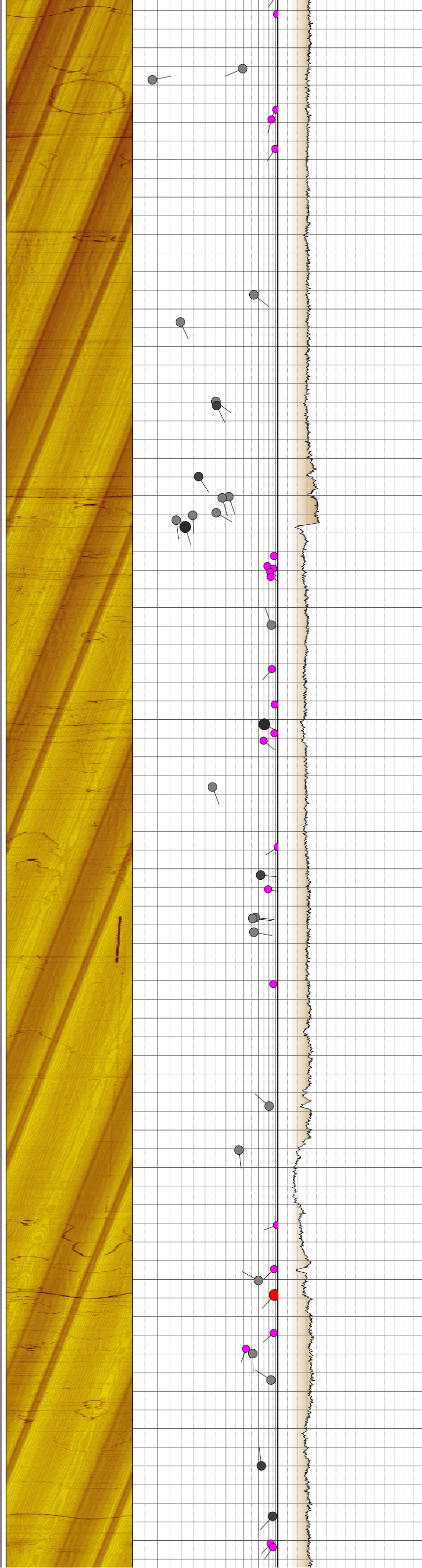


*Fluid level.
Image in clean water (introduced) is of better
quality.*

ATV below, OTV above.



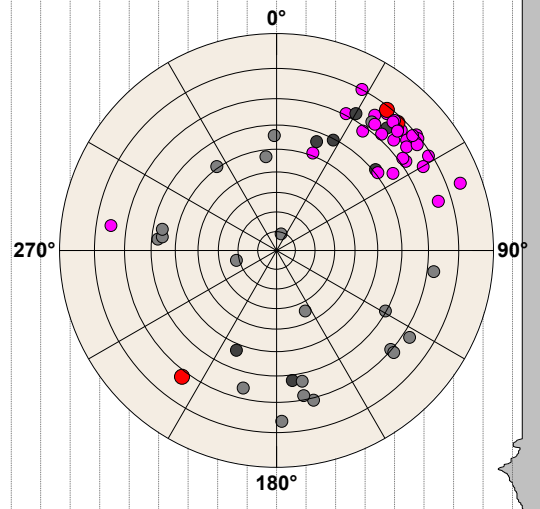
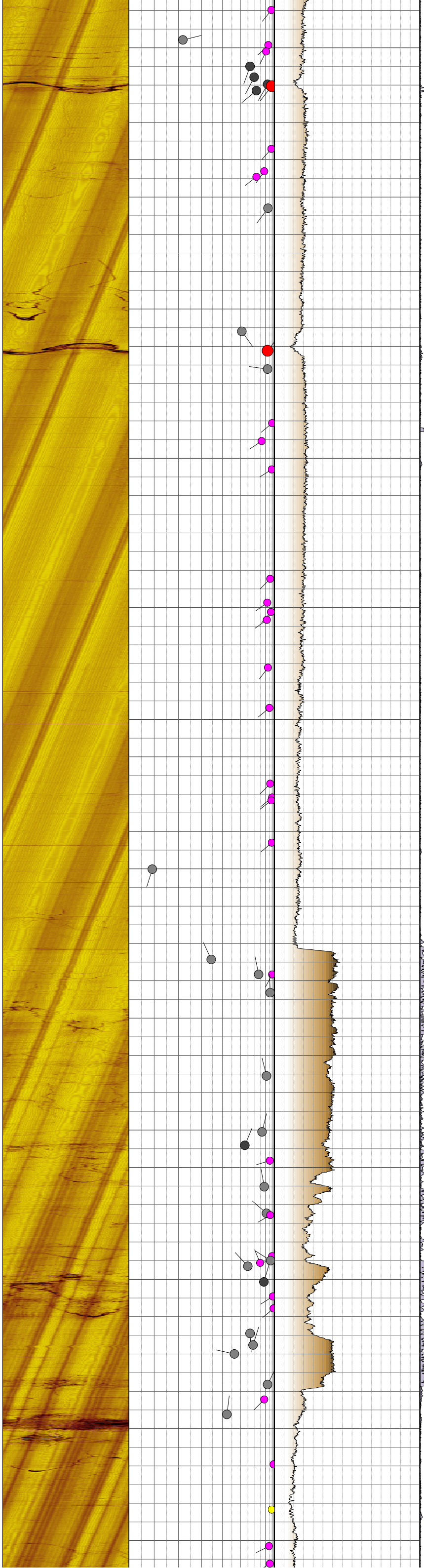
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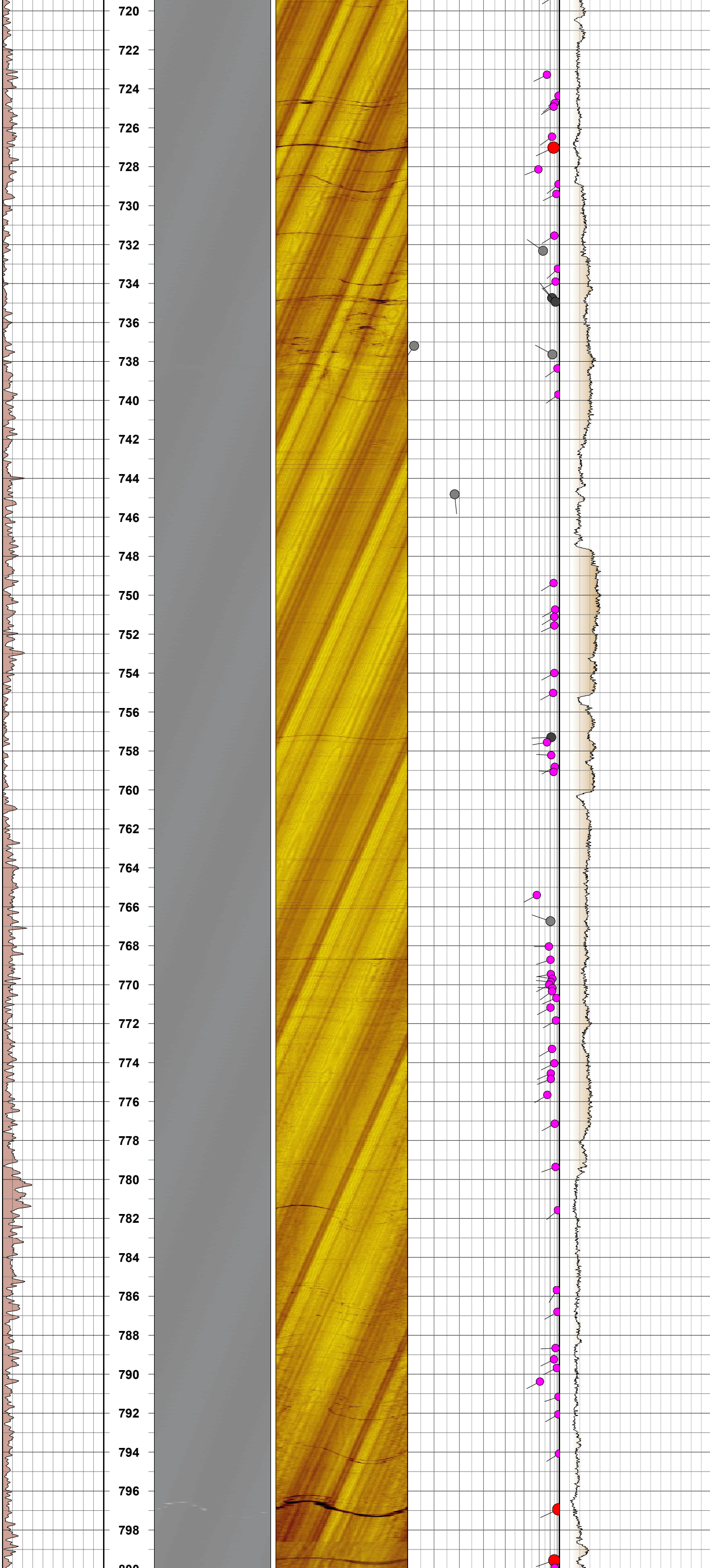
180°

Mean	Counts	Dip[deg]	Azi[deg]
●	82	88.47	52.96
●	8	25.48	161.91
●	38	86.77	236.18
●	11	61.08	52.81
●	3	41.48	114.24
●	19	23.92	125.46
●	2	84.03	56.21
●	1	20.58	179.97

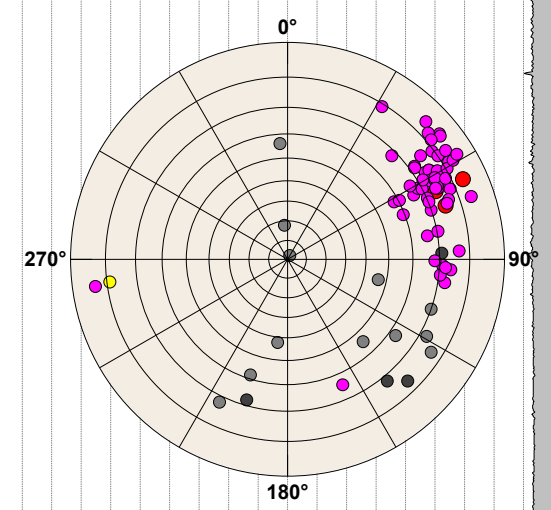
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Mean	Counts	Dip[deg]	Azi[deg]
●	59	76.15	223.17
●	29	74.70	228.26
●	3	87.88	219.55
●	7	74.96	209.36



Major open fracture, aligned with current stress tensor.



Mean	Counts	Dip[deg]	Azi[deg]
● (pink)	81	74.19	246.38
● (grey)	12	50.27	315.41
● (black)	4	69.56	316.89
● (yellow)	1	79.12	82.71
● (red)	3	77.53	247.29

Steeply dipping open fracture.

Major geotechnical event.