

GeoEast 特色解释技术

反演系列

题目：测井数据预处理—异常值剔除、曲线拼接及校正

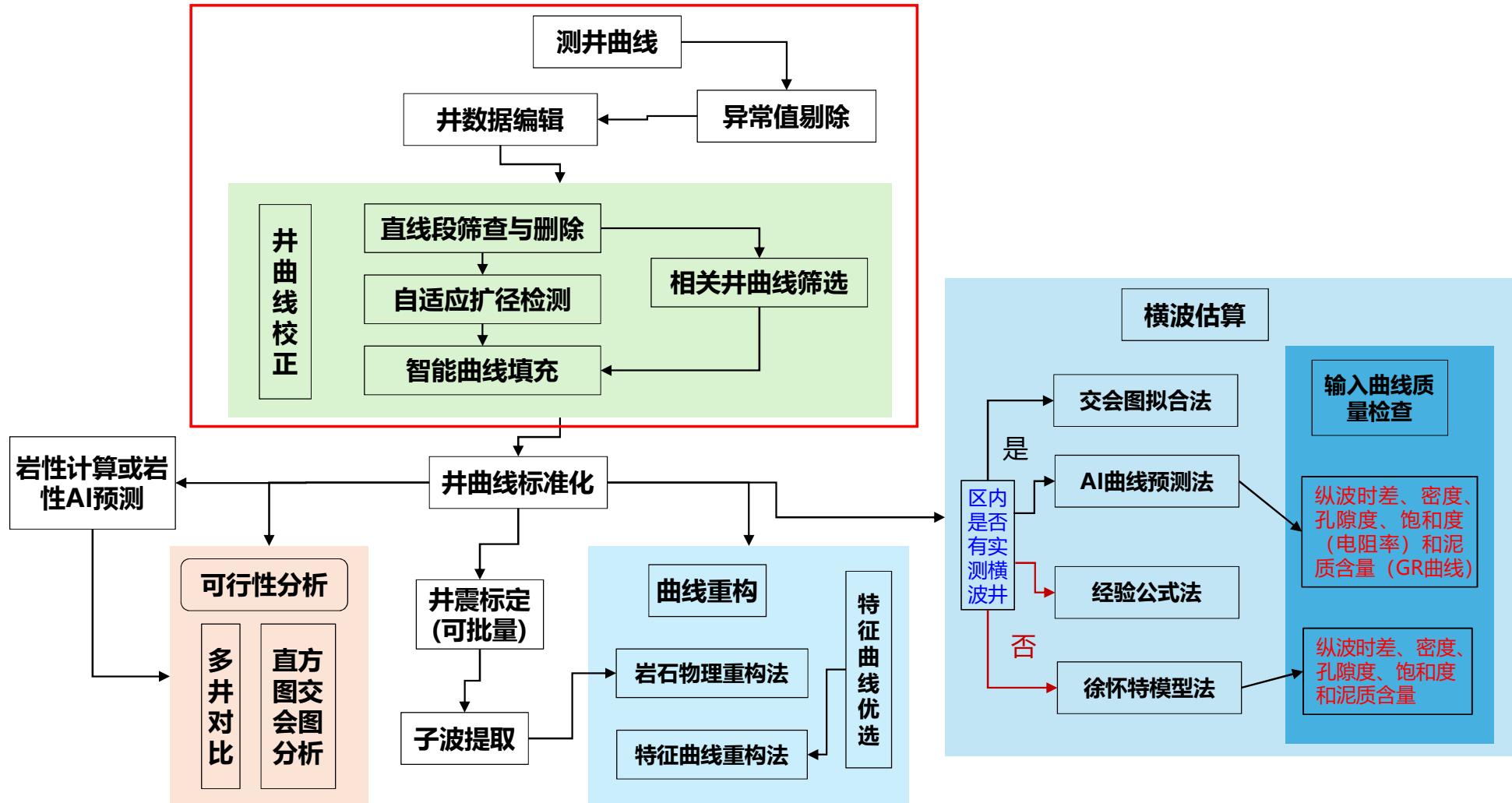
汇报人： 李静叶

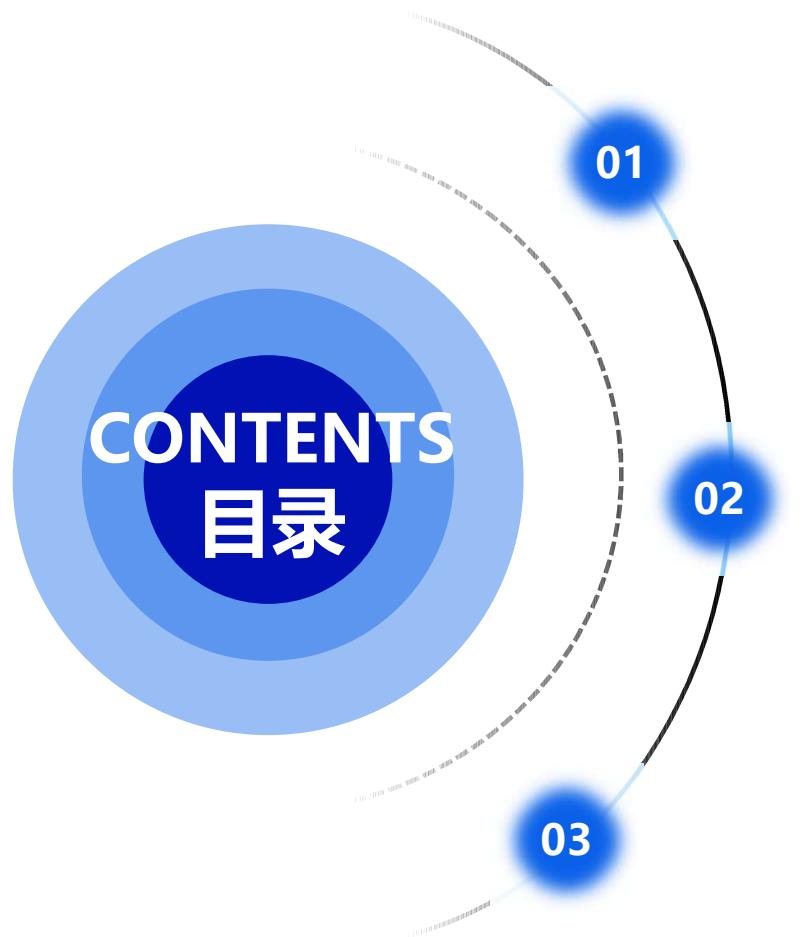
会议时间：2026年1月13日16:00 – 16:30

GeoEast



测井数据预处理——推荐流程图





异常值剔除

曲线拼接

井曲线校正



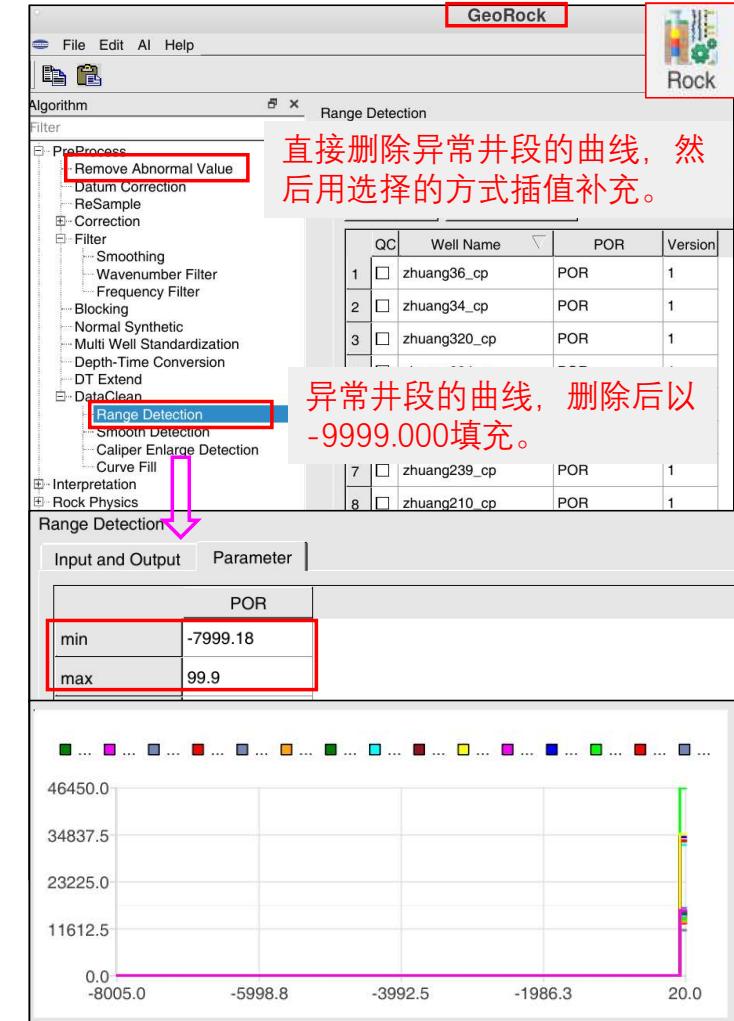
一、异常值剔除

Well Look for: POR in Log Name ✓ Real-time □ Exact Match

Count: 41 Filter:

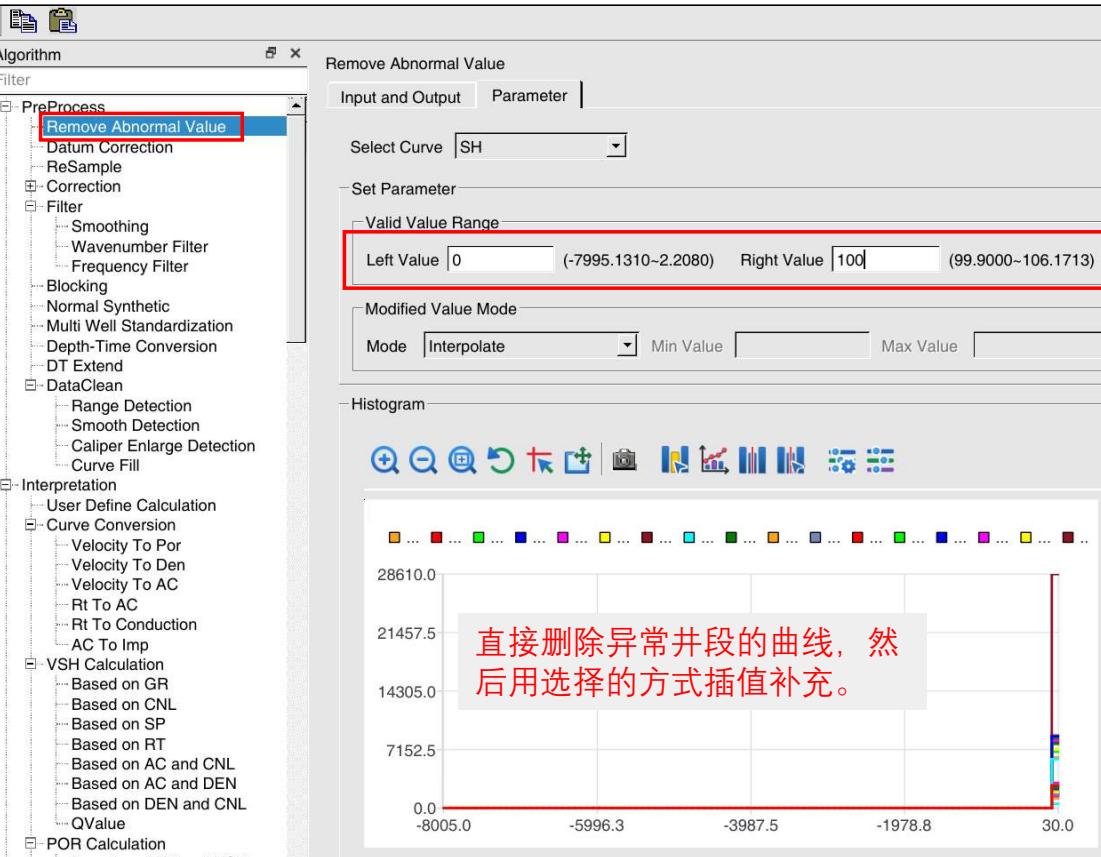
	Well Name	Log Name	Log Type	Version	Range	Interval	Domain	Sample Count	Curve Min Value	Curve Max Value
1	pantan1_cp	POR	POR	1	0.103 ~ 5806.73	0.125	Depth	46454	0.001	11.357
2	zhuang114_cp	POR	POR	1	0 ~ 1901.13	0.125	Depth	15210	0	22.225
3	ning42_cp	POR	POR	1	0.1 ~ 1678.97	0.125	Depth	13432	0	20.8954
4	ning8_cp	POR	POR	1	0 ~ 1950	0.125	Depth	15601	0	22.651
5	zhuang112_cp	POR	POR	1	0 ~ 1839.88	0.125	Depth	14720	0	19.315
6	zhuang27_cp	POR	POR	1	0 ~ 1980	0.125	Depth	15841	0	99.9
7	zhuang111_cp	POR	POR	1	0.1 ~ 1960.85	0.125	Depth	15687	-7999.1797	22.9406
8	pou43_cp	POR	POR	1	0.075 ~ 1959.95	0.125	Depth	15680	-5999.3598	22.7422
9	zhuang110_cp	POR	POR	1	489.325 ~ 1921.2	0.125	Depth	11456	0.001	23.9866
10	hetan28_cp	POR	POR	1	0.1 ~ 4176.85	0.125	Depth	33415	0	14.5586
11	ning41_cp	POR	POR	1	0.05 ~ 1783.8	0.125	Depth	14271	0	27.1138
12	zhuang36_cp	POR	POR	1	0.05 ~ 1868.92	0.125	Depth	14952	0	22.9854
13	zhuang115_cp	POR	POR	1	0.1 ~ 1919.35	0.125	Depth	15355	0	21.459
14	zhuang113_cp	POR	POR	1	0.05 ~ 1969.42	0.125	Depth	15756	0	22.9878
15	zhuang29_cp	POR	POR	1	0 ~ 1929	0.125	Depth	15433	0	64.727
16	zhuang34_cp	POR	POR	1	0.05 ~ 1978.92	0.125	Depth	15832	0	20.744
17	long27-26_cp	POR	POR	1	0 ~ 4050.38	0.125	Depth	32404	0	12.13
18	ban92_cp	POR	POR	1	0.025 ~ 2059.78	0.125	Depth	16479	0.1	24.0806
19	long27-23_cp	POR	POR	1	0 ~ 4293.88	0.125	Depth	34352	0	7.904

在进行其他处理之前首先剔除原始曲线中所包含的异常值。可以通过主控直接查看原始曲线的最大、最小值判断曲线是否存在异常值。

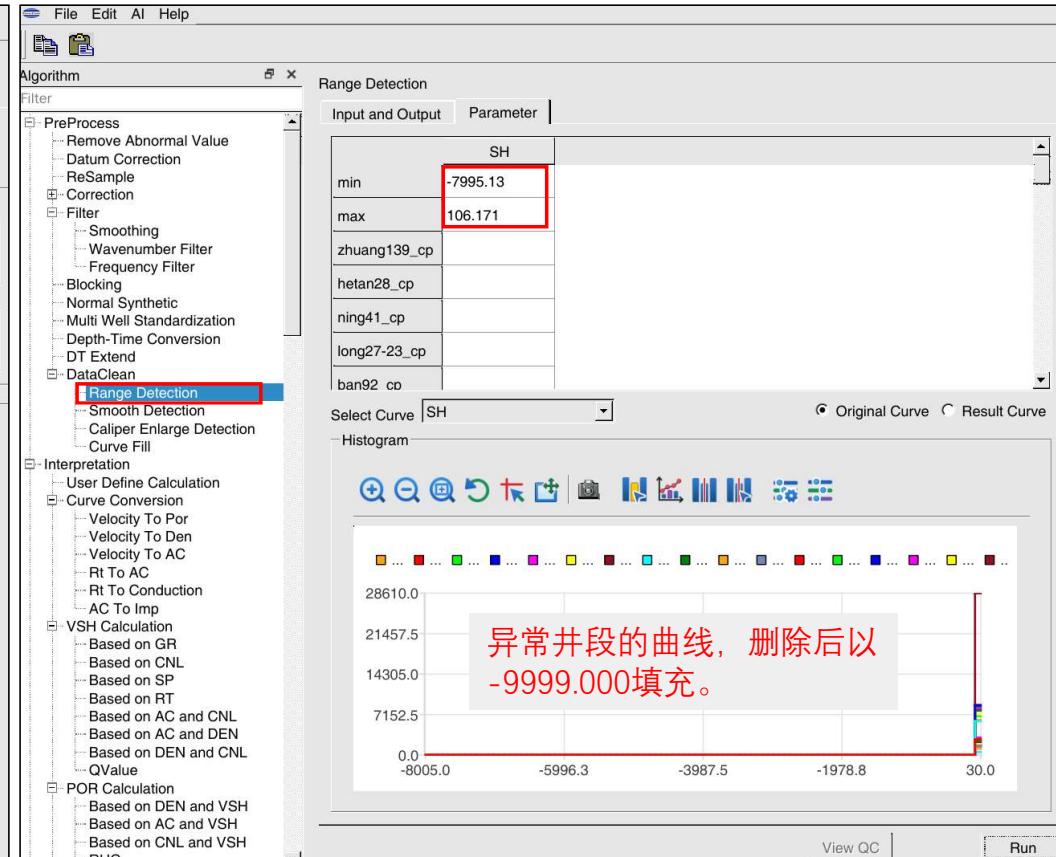




一、异常值剔除



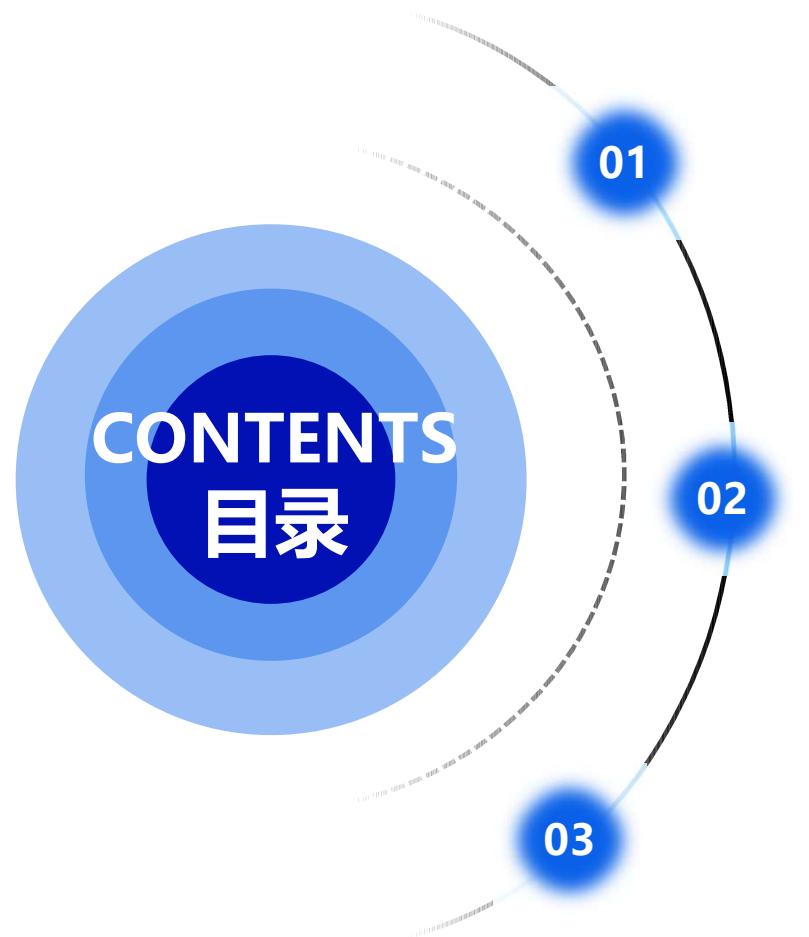
直接删除异常井段的曲线，然后用选择的方式插值补充。



异常井段的曲线，删除后以-9999.000填充。

用于少量异常值断续存在的情况

用于大量异常值连续存在的情况，后续可以采用人工智能进行曲线补偿



异常值剔除

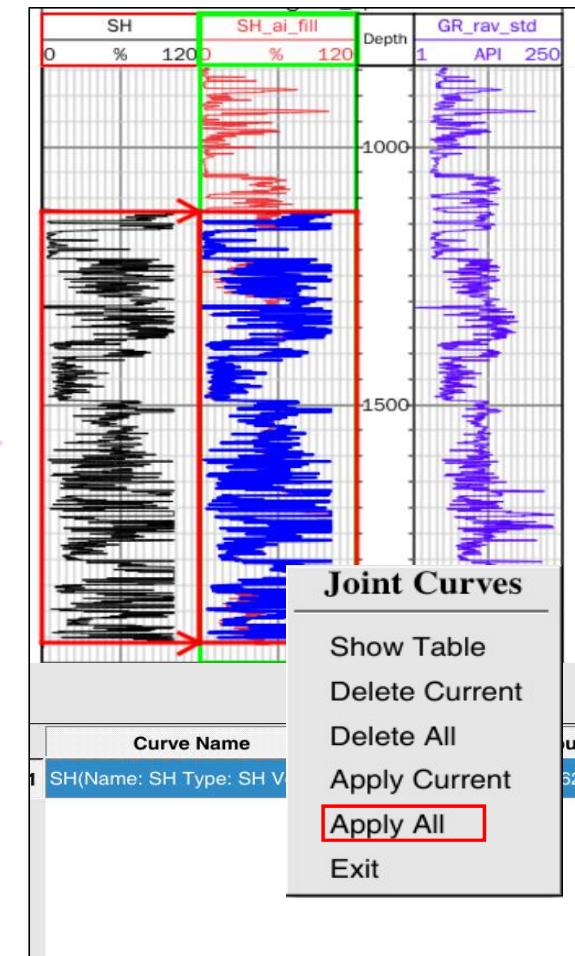
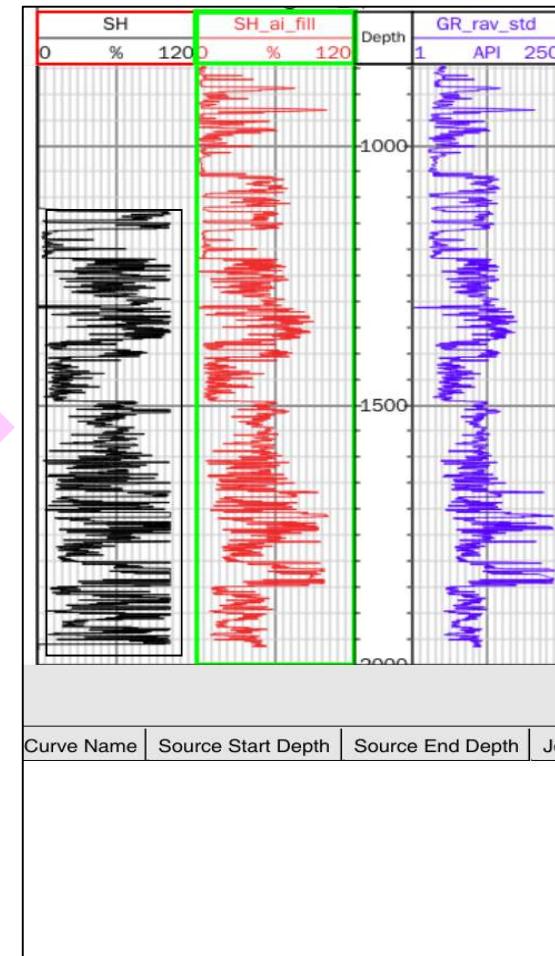
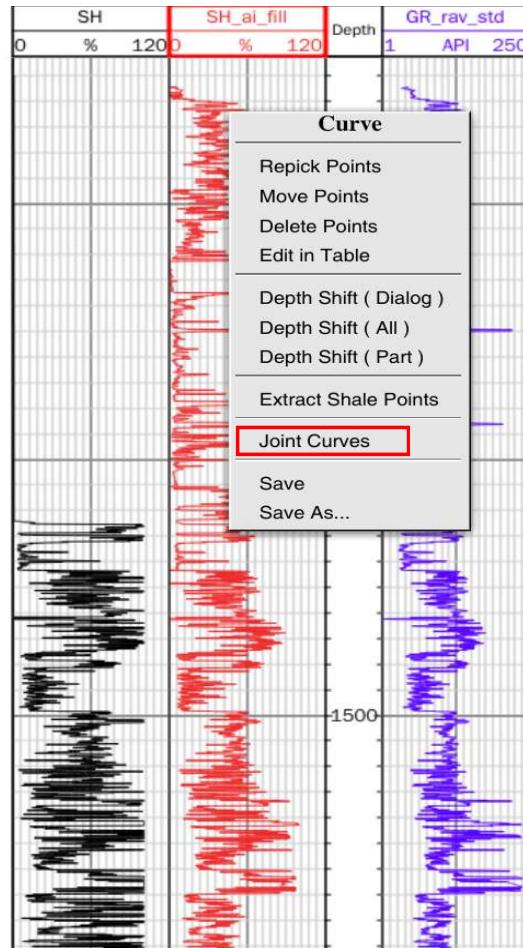
曲线拼接

井曲线校正



二、曲线拼接

1、单井曲线拼接



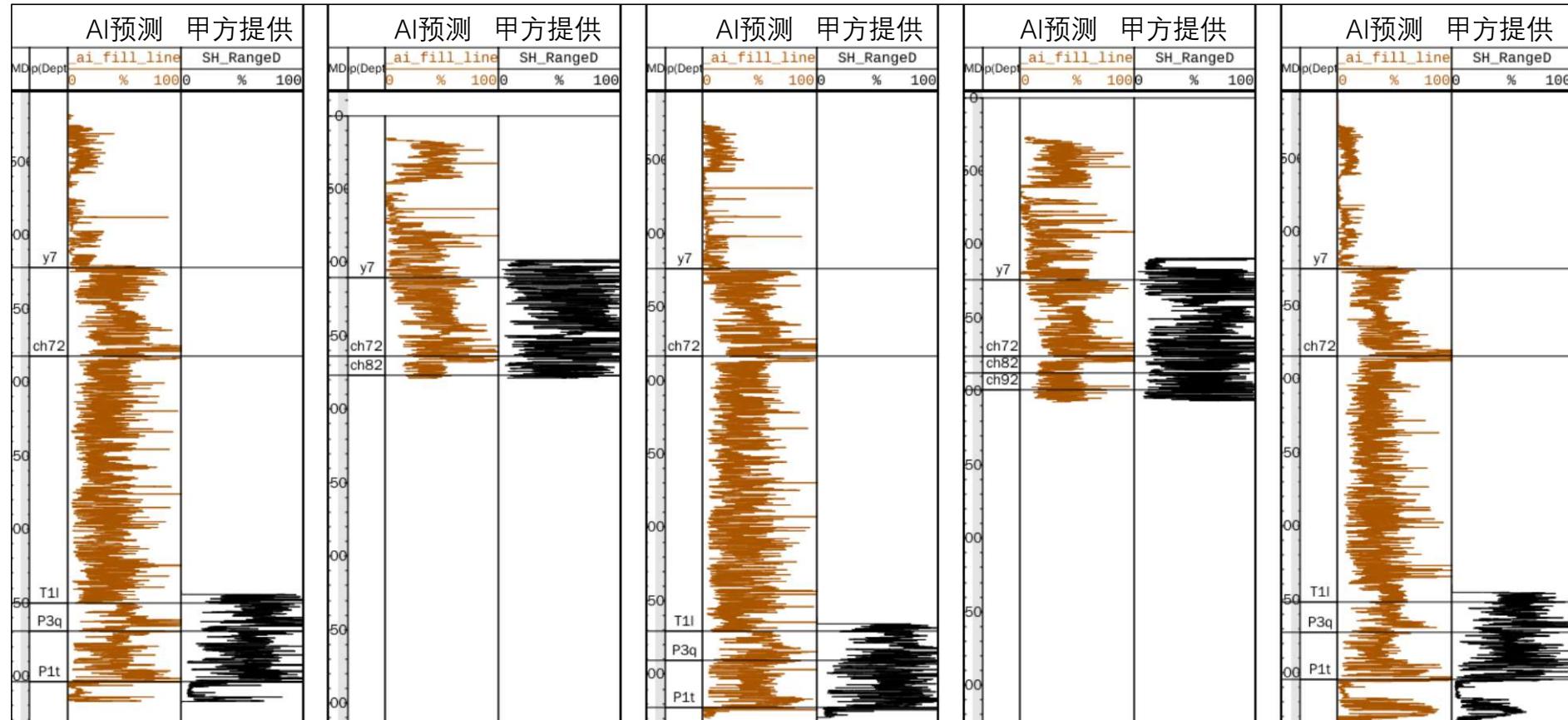


二、曲线拼接

2、多井批量曲线拼接



异常值批量剔除→曲线填充→光滑性检测→在计算器中进行逻辑运算





二、曲线拼接

2、多井批量曲线拼接

异常值批量剔除→曲线填充→光滑性检测→在计算器中进行逻辑运算

QC	Well N	Version	PP_IMP	Version
1	hetan28_cp	SH_RangeD	1	PP_IMP_ssi 1
2	ning41_cp	SH_RangeD	1	PP_IMP_ssi 1
3	long27-23...	SH_RangeD	1	PP_IMP_ssi 1
4	ban92_cp	SH_RangeD	1	PP_IMP_ssi 1
5	hetan14_cp	SH_RangeD	1	PP_IMP_ssi 1
6	long27-24...	SH_RangeD	1	PP_IMP_ssi 1
7	long27-26...	SH_RangeD	1	PP_IMP_ssi 1
8	ning8_cp	SH_RangeD	1	PP_IMP_ssi 1
9	ning42_cp	SH_RangeD	1	PP_IMP_ssi 1
10	zhuang11...	SH_RangeD	1	PP_IMP_ssi 6
11	ning5_cp	SH_RangeD	1	PP_IMP_ssi 1

曲线填充的目的是增加曲线的长度，使需要拼接的两条原始曲线拥有相同的起止深度，便于后续在计算器中进行计算。

填充模式选择均值或中值法插值就可以

Filling model

Regression Interpolate

Iterative Imputer

mean

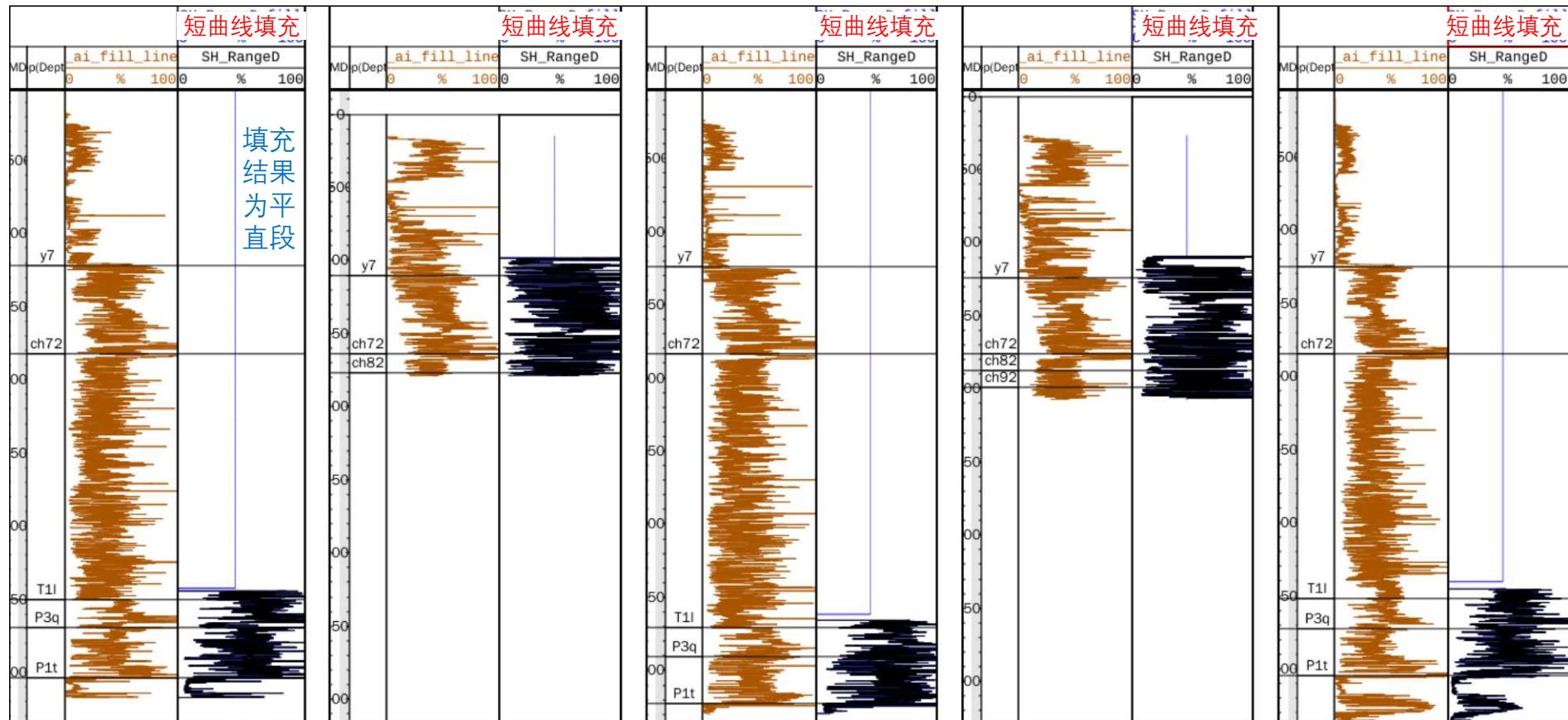
mean
median
most_frequent
ffill
bfill
linear



二、曲线拼接

2、多井批量曲线拼接

异常值批量剔除→**曲线填充**→光滑性检测→在计算器中进行逻辑运算

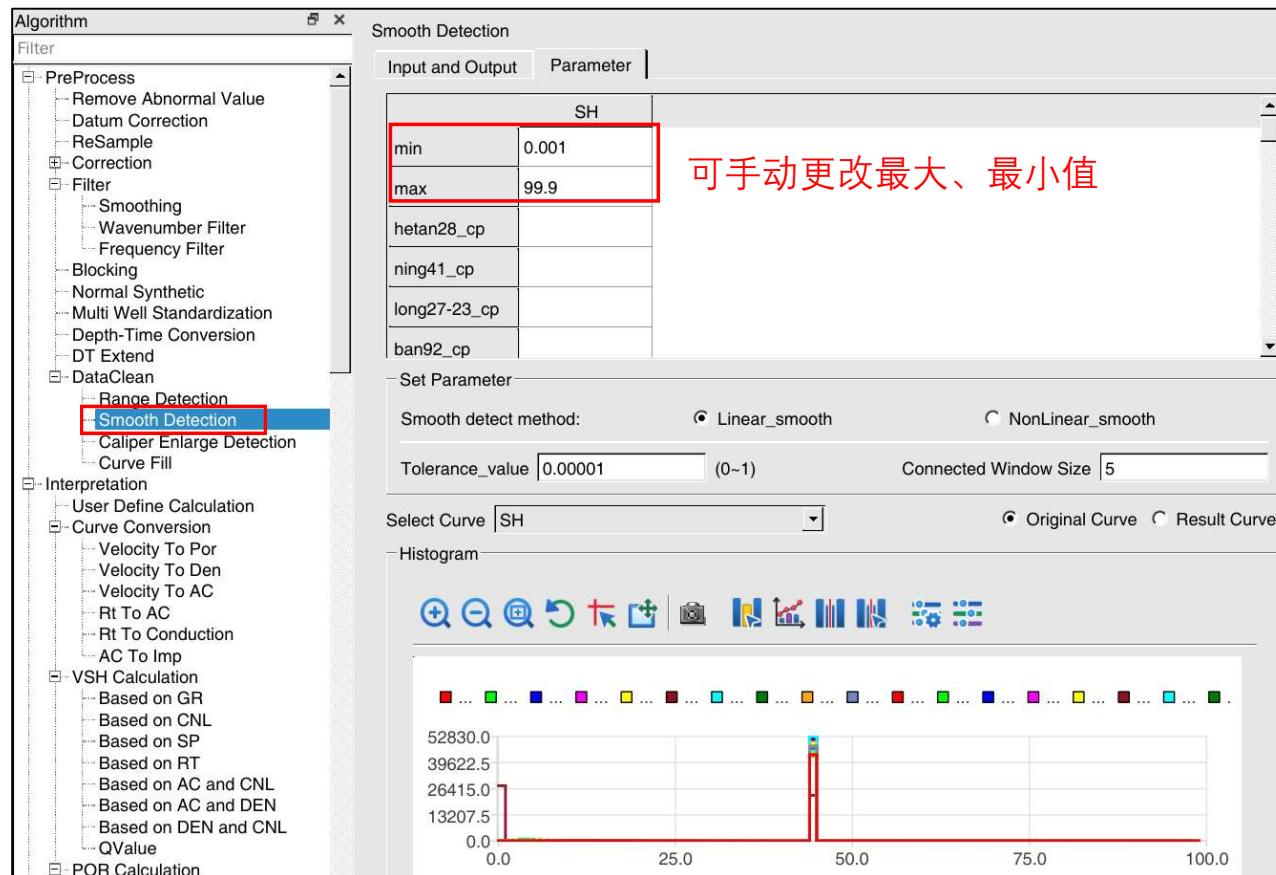




二、曲线拼接

2、多井批量曲线拼接

异常值批量剔除→曲线填充→光滑性检测→在计算器中进行逻辑运算



可手动更改最大、最小值

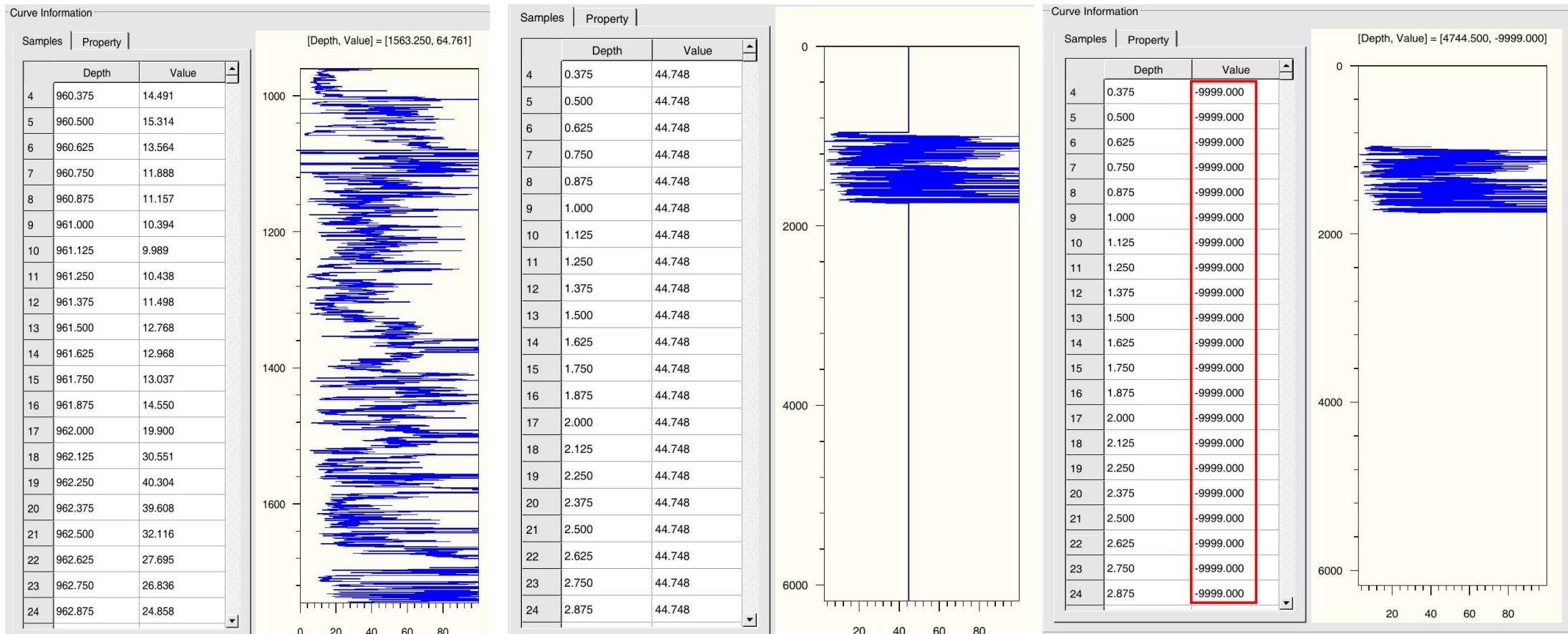
光滑性检测可以
自动识别曲线的平直
段，将其填充为-9999。
-9999与实际的
曲线值有了明显区别。



二、曲线拼接

2、多井批量曲线拼接

异常值批量剔除→曲线填充→光滑性检测→在计算器中进行逻辑运算





二、曲线拼接

2、多井批量曲线拼接

异常值批量剔除→曲线填充→光滑性检测→在计算器中进行逻辑运算

Expressions Calculator

Type: well log Survey: Set Input & Output Data ...

Data & Alias: Public Parameters:

Set Input & Output Well Log Curve Data

计算的起止深度为两条曲线的公共范围

Wells & Curves Curves Count: 2

We	Curve 1	Curve 2	Start Z	End Z
1	par SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	1273.48	OK
2	het SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100	OK
3	het SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100.1	OK
4	lon SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100	OK
5	lon SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100	OK
6	lon SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100	OK
7	bar SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	268.025	OK
8	nin SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	149.05	OK
9	nin SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	250.1	OK
10	Inin SH ai fill linear(V1)	SH RangeD fill2(V1)	100.1	OK

Alias Remark

1	C1	Data of Curve 1 column in table of Wells & Curves within t he windows of Set Input & Output Well Log Curve Data
2	C2	Data of Curve 2 column in table of Wells & Curves within t he windows of Set Input & Output Well Log Curve Data

Input Curves Count: 2

Result Name: SH_merge

Result Remark: Nature:Log Curve, Curve Type:SH, Version:auto set

Define Expressions:

Type	Expressions
1	if isNull(C2)
2	y = C1
3	else y = C2

Sigs & Functions:

- b isInf(r)
- b isNaN(r)
- b isNull(A)
- r log10(r)
- r loge(r)
- r max(r1, r2)
- r min(r1, r2)
- r pow(r1, r2)
- r sin(r)

Import Expressions ... Null Value Flag of Result: Y_NULL= -9999

Save Expressions Thread Number: 8 (1 ~ 16)

OK Apply Cancel Help

Expressions Calculator

Type: well log Survey: Set Input & Output Data ...

Data & Alias: Public Parameters:

Set Input & Output Well Log Curve Data

计算的起止深度为两条曲线的公共范围

Wells & Curves Curves Count: 2

We	Curve 1	Curve 2	Start Z	End Z
1	par SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	1273.48	OK
2	het SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100	OK
3	het SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100.1	OK
4	lon SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100	OK
5	lon SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100	OK
6	lon SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	100	OK
7	bar SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	268.025	OK
8	nin SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	149.05	OK
9	nin SH_ai_fill_linear(V1)	SH_RangeD_fill2(V1)	250.1	OK
10	Inin SH ai fill linear(V1)	SH RangeD fill2(V1)	100.1	OK

Alias Remark

1	C1	Data of Curve 1 column in table of Wells & Curves within t he windows of Set Input & Output Well Log Curve Data
2	C2	Data of Curve 2 column in table of Wells & Curves within t he windows of Set Input & Output Well Log Curve Data

Input Curves Count: 2

Result Name: SH_merge

Result Remark: Nature:Log Curve, Curve Type:SH, Version:auto set

Define Expressions:

Type	Expressions
1	if isNull(C2)
2	y = C1
3	else y = C2

Sigs & Functions:

- b isInf(r)
- b isNaN(r)
- b isNull(A)
- r log10(r)
- r loge(r)
- r max(r1, r2)
- r min(r1, r2)
- r pow(r1, r2)
- r sin(r)

Import Expressions ... Null Value Flag of Result: Y_NULL= -9999

Save Expressions Thread Number: 8 (1 ~ 16)

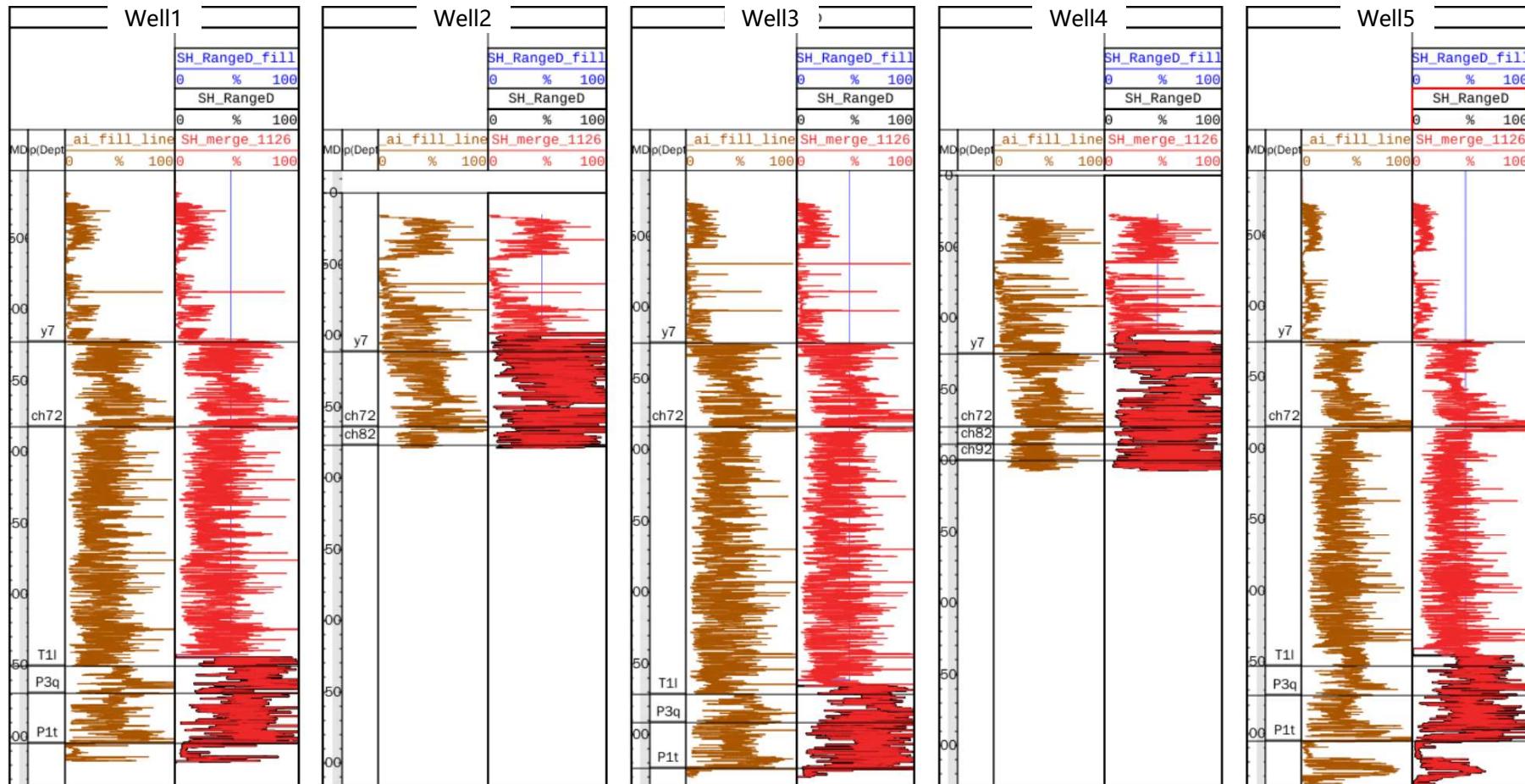
OK Apply Cancel Help

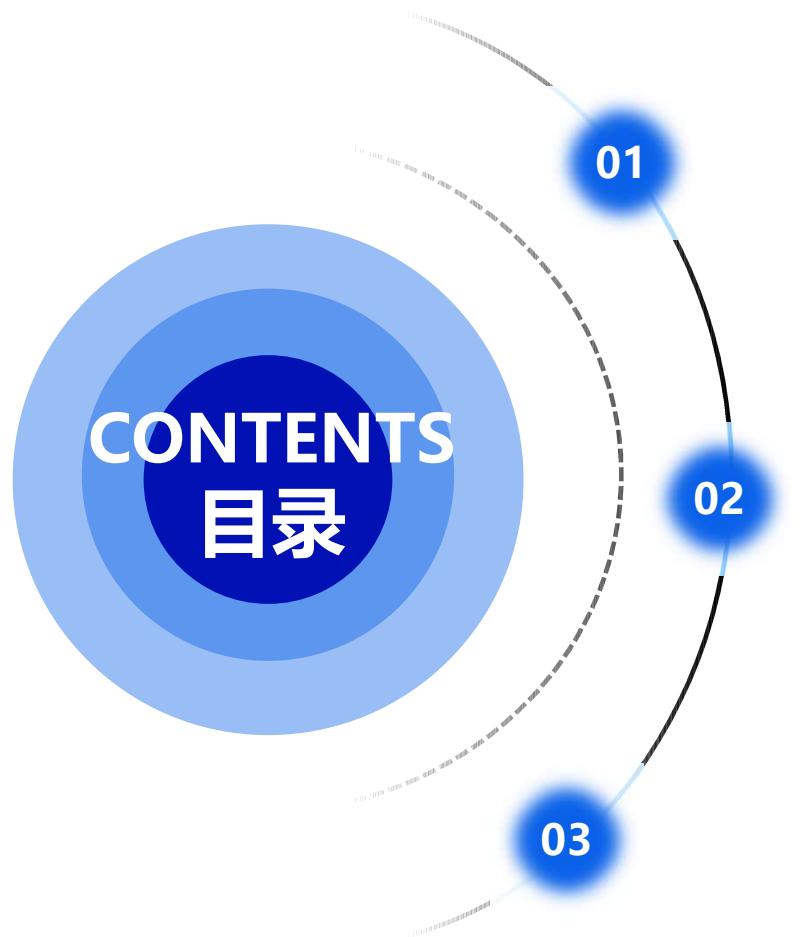


二、曲线拼接

2. 多井批量曲线拼接

异常值批量剔除→曲线填充→光滑性检测→在计算器中进行逻辑运算





异常值剔除

曲线拼接

井曲线校正

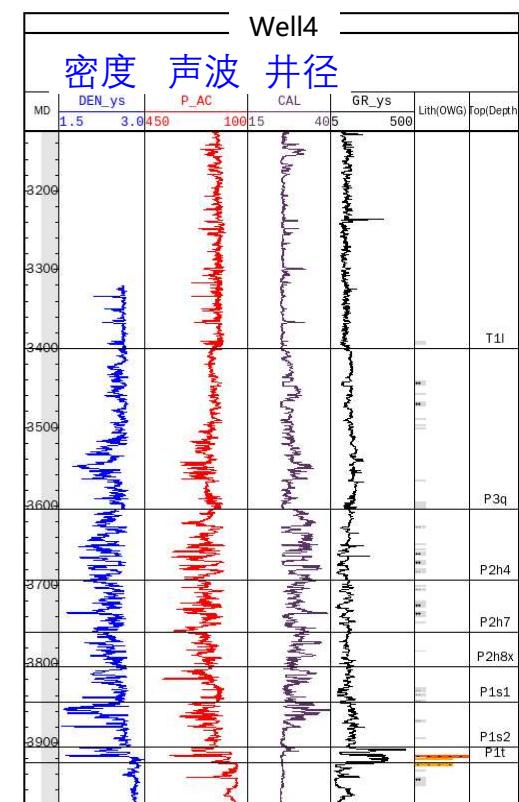
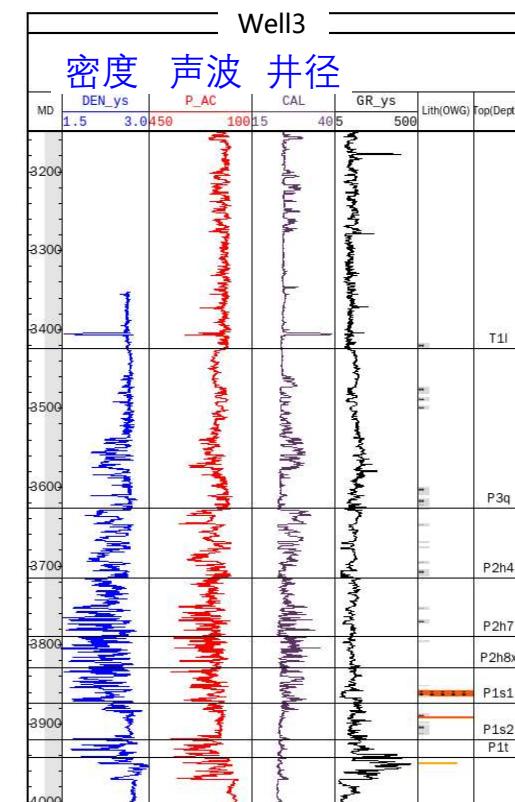
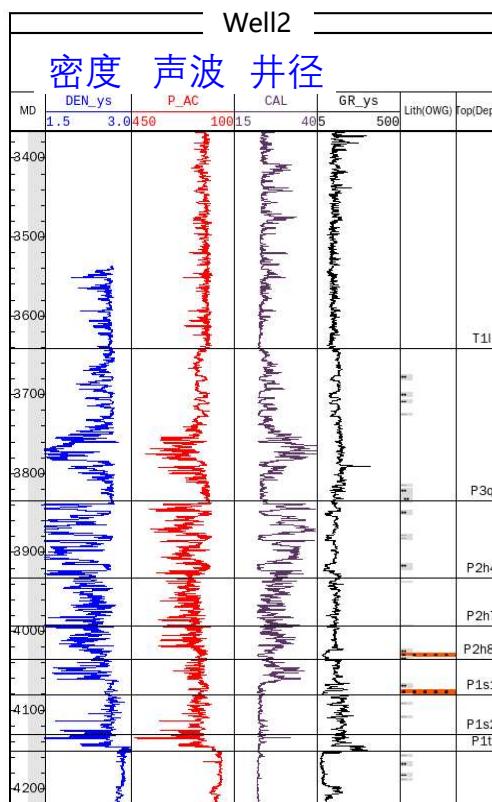
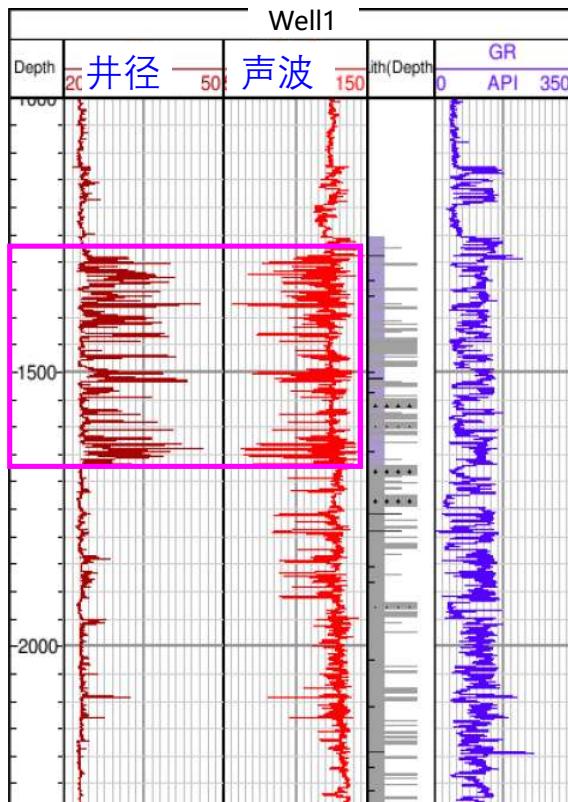


三、井曲线校正

1、常规井径校正方法（适用于砂泥岩地层）



在钻井过程中，井眼垮塌会引起测井曲线异常，需要对扩径曲线进行校正。





三、井曲线校正

1、常规井径校正方法（适用于砂泥岩地层）

Algorithm

Filter

- PreProcess
 - Remove Abnormal Value
 - Datum Correction
 - ReSample
- Correction
 - Condition
 - GR Borehole
 - AC Borehole**
 - DEN Borehole
 - Acoustic...
 - TVD Deviated Well Correction
 - SP Baseline Drift Correction
- Filter
 - Blocking
 - Normal Synthetic
 - Multi Well Standardization
 - Depth-Time Conversion
 - DT Extend
 - DataClean
 - Interpretation
 - Rock Physics
 - Statistic
 - Extraction
 - Data Set
 - GeoMechanical

AC Borehole

Input and Output | Parameter

Input

声波 伽马（必须剔除异常值） 井径

Select Well...

QC	ll Na	P_AC	Version	GR	Version	CAL	Version
17	lo...	P_AC	1	GR_final	1	CAL	1
18	lo...	P_AC	1	GR_final	1	CAL	1
19	lo...	P_AC	1	GR_final	1	CAL	1
20	lo...	P_AC	1	GR_final	1	CAL	1
21	lo...	P_AC	1	GR_final	1	CAL	1
22	lo...	P_AC	1	GR_final	1	CAL	1
23	lo...	P_AC	1	GR_final	1	CAL	1
24	lo...	P_AC	1	GR_final	1	CAL	1
25	lo...	P_AC	1	GR_final	1	CAL	1
26	he...	P_AC	1	GR_final	1	CAL	1
27	he...	P_AC	1	GR_final	1	CAL	1
28	he...	P_AC	1	GR_final	1	CAL	1
29	he...	P_AC	1	GR_final	1	CAL	1
30	he...	P_AC	1	GR_final	1	CAL	1
31	Q...	P_AC	1	GR_final	1	CAL	1

Select All | Select Reversed | Select Invalid | Well Name Filter |

Vertical Range

Extraction Mode | All |

声波时差井径校正原理：根据GR计算出地层的泥质含量，即砂、泥岩在地层中的百分比；然后结合参数页面中填写的砂、泥岩声波时差，根据体积模型计算出声波时差，用以校正扩径段的声波测井曲线。

AC Borehole

Input and Output | Parameter

Set Parameter

Tsh	300	泥岩声波	(us/m)	Tma	220	砂岩声波	(us/m)
Bits	10	钻头尺寸	(in)	Space	0.5	校正界限	(in)
C	2.0	经验系数					

泥岩及砂岩的声波时差：可以先采用默认值进行试验，如果不合适，后续可以根据需要动态调整。增大这两项的参数值，扩径段的校正结果会相应增大，减小这两个参数值校正结果会相应减小。

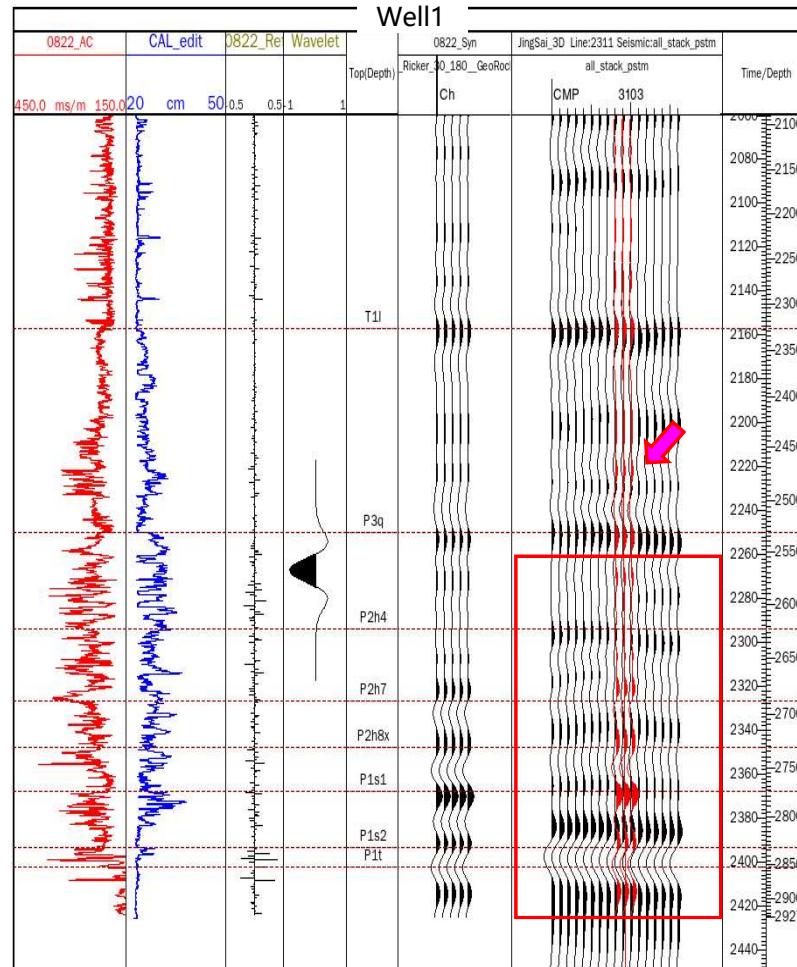
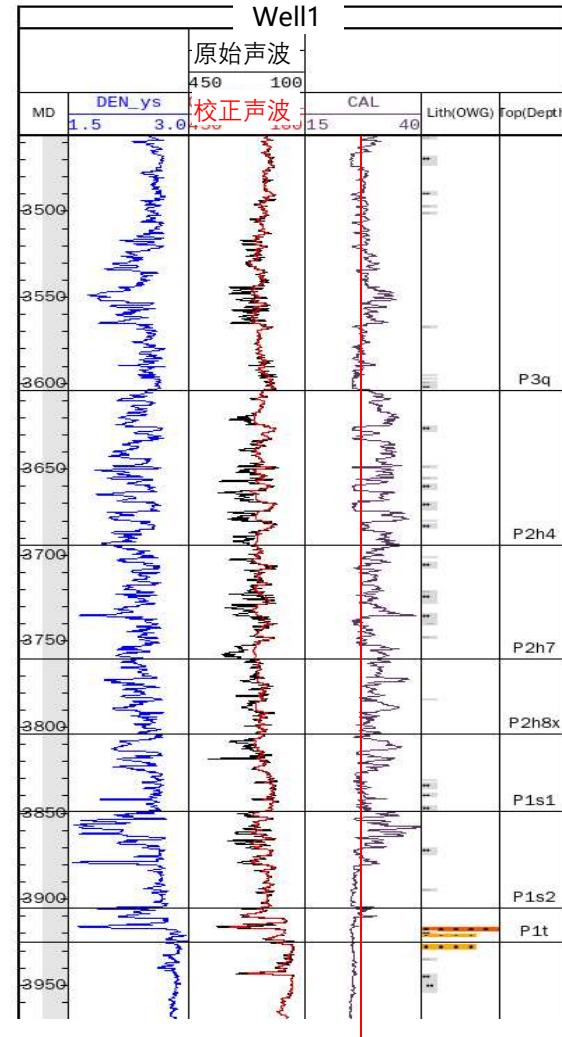
钻头尺寸：由井径曲线读取，钻头尺寸变化后，须进行分段校正；

校正界限：井径曲线值大于钻头尺寸+校正界限时，对曲线进行校正；

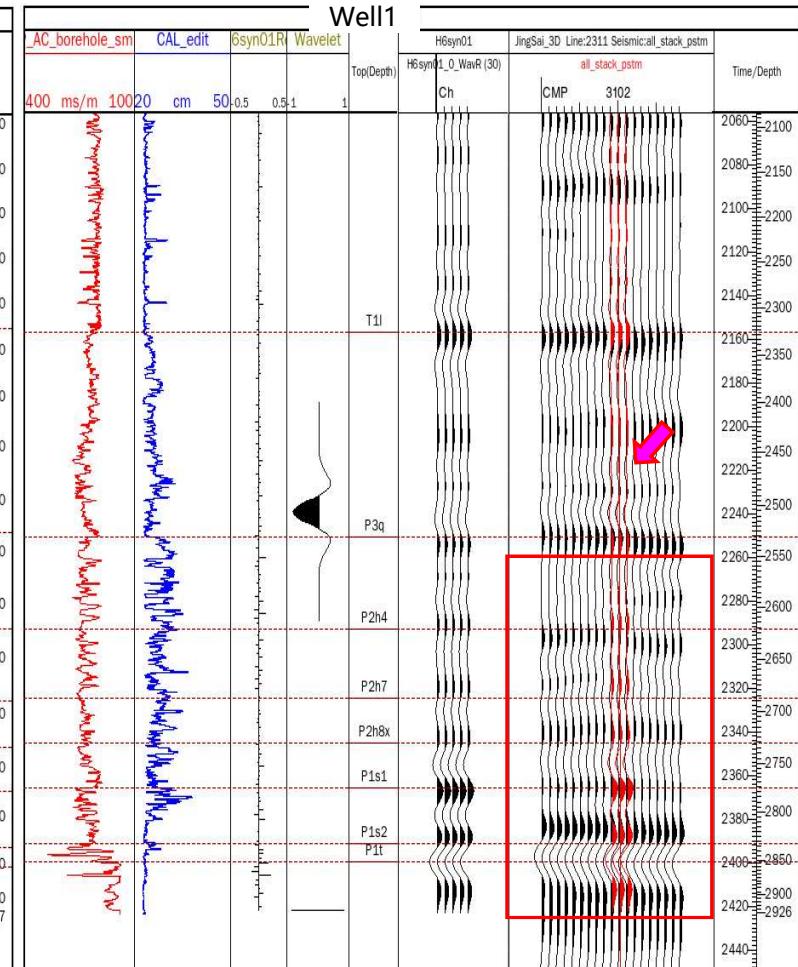
C为经验系数：以上第三系为界，老地层为2，新地层为3.7。



三、井曲线校正



声波曲线校正前的合成记录



声波曲线校正后的合成记录



三、井曲线校正

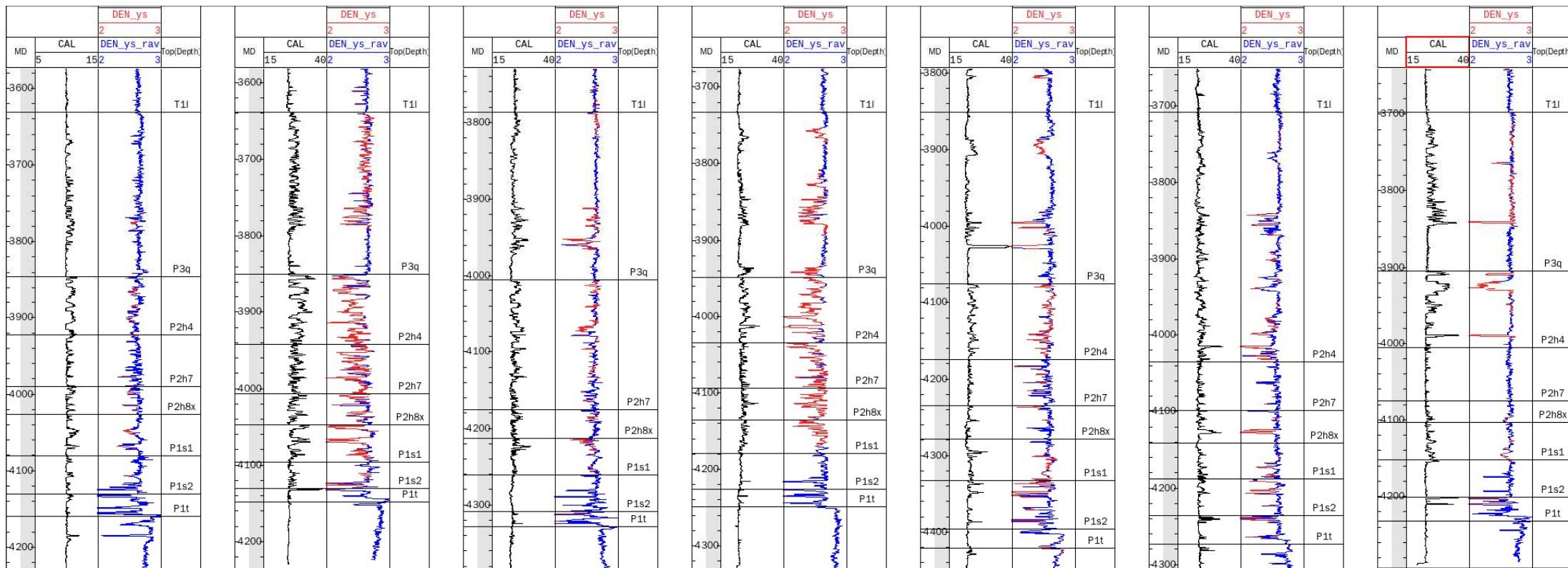
2、AI方法（适用于所有岩性）



自适应扩径检测

原始密度曲线

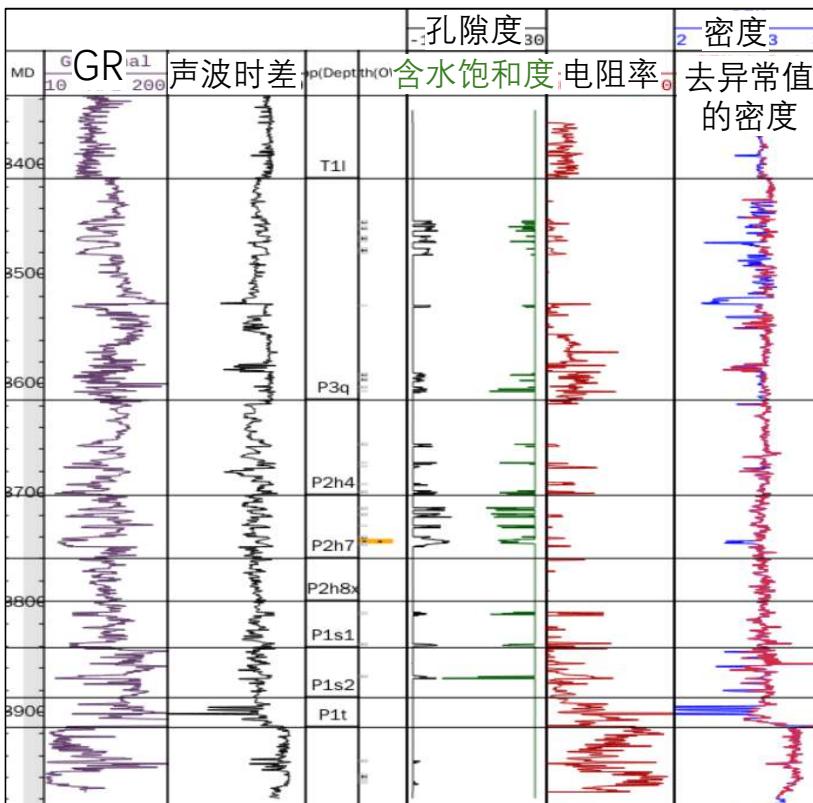
扩径段删除后



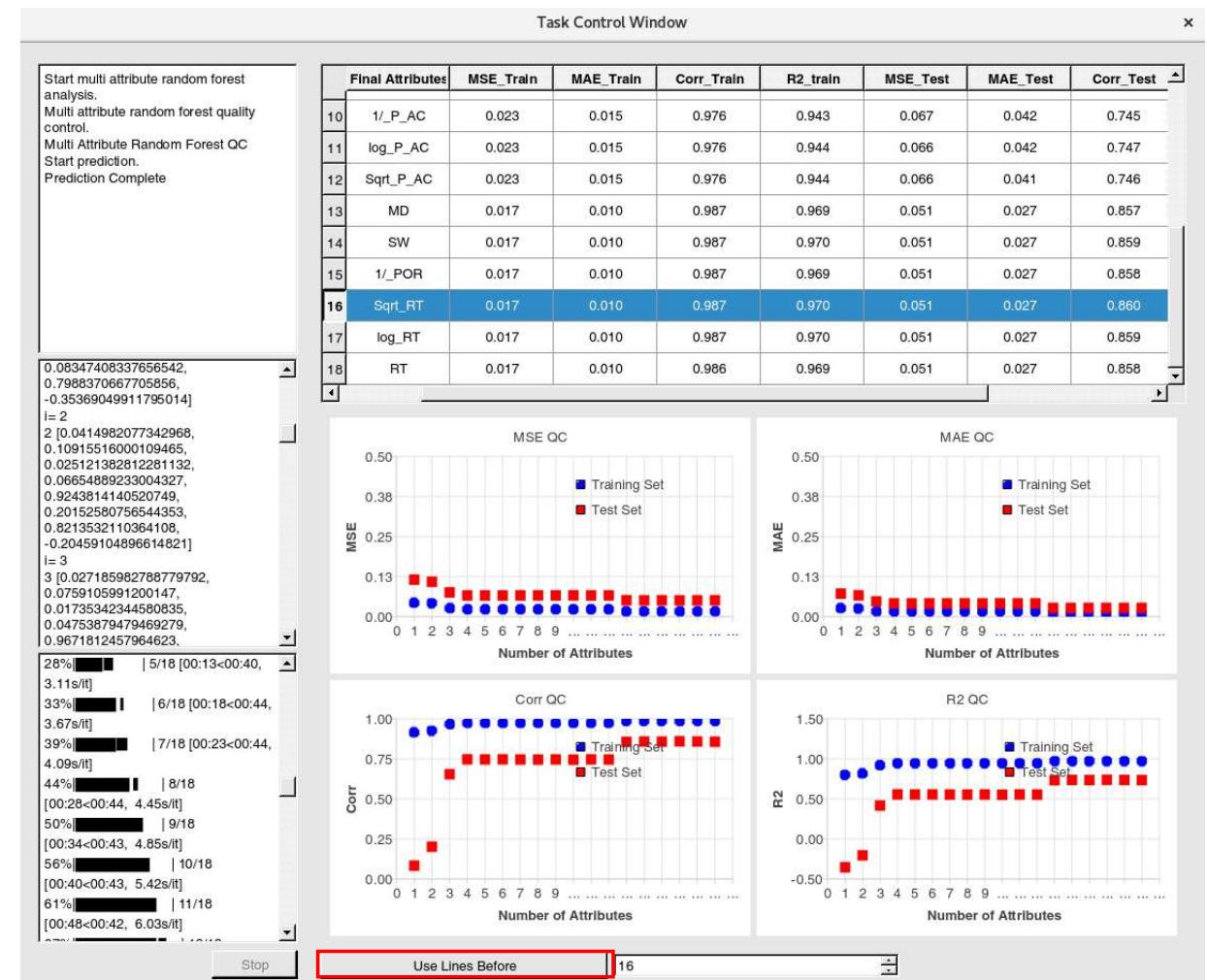


三、井曲线校正

筛选质量比较高的其他测井曲线，以去除异常值后的待校正曲线为标签，进行深度学习，根据AI建立的待校正曲线与其他高质量测井曲线之间的关系，补充待校正曲线在扩径井段的曲线值。



以密度曲线校正为例，可以选取GR、孔隙度、声波时差、电阻率、含水饱和度等曲线进行AI学习。





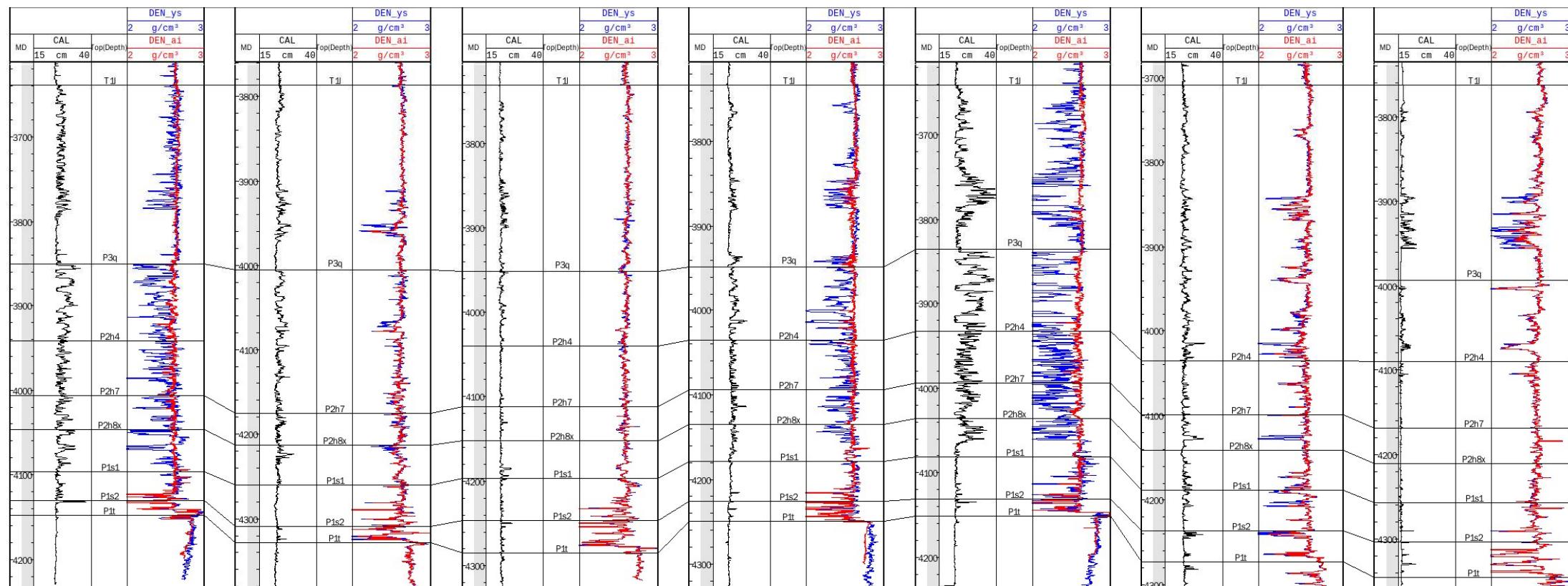
三、井曲线校正

2、AI方法（适用于所有岩性）

智能曲线填充

原始密度曲线

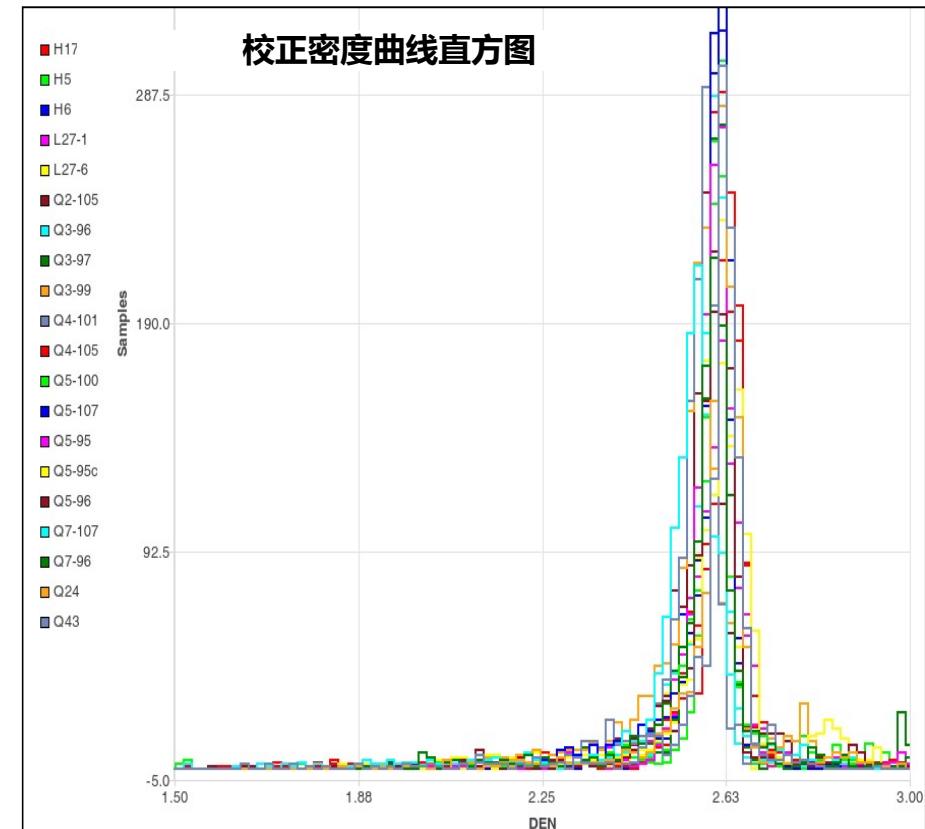
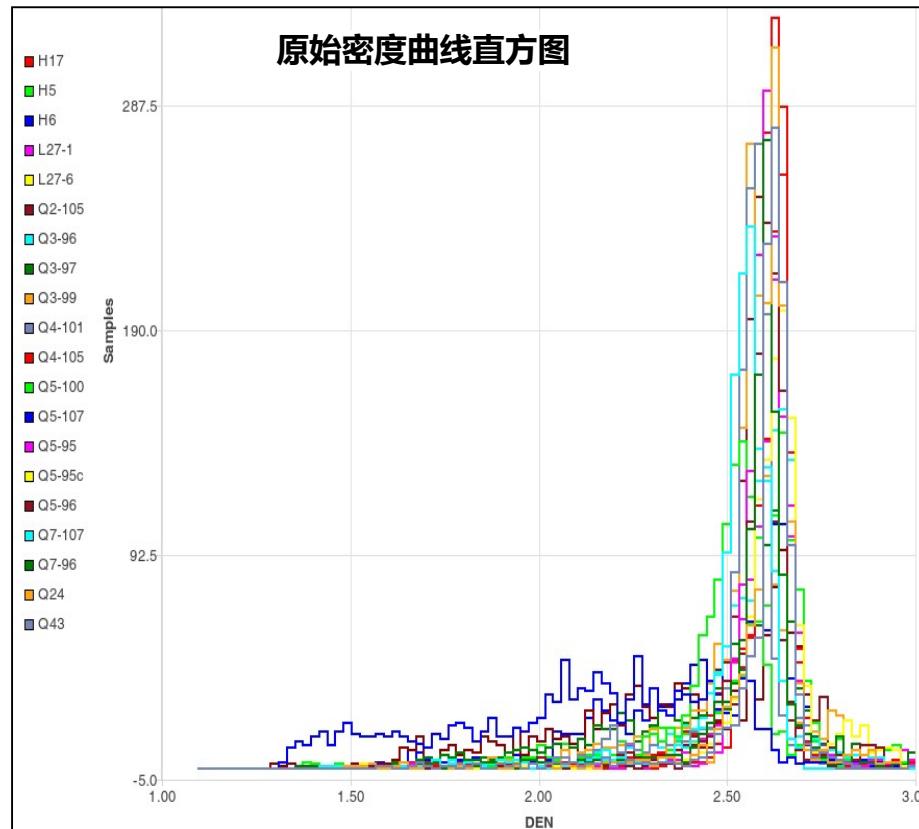
智能井径校正后





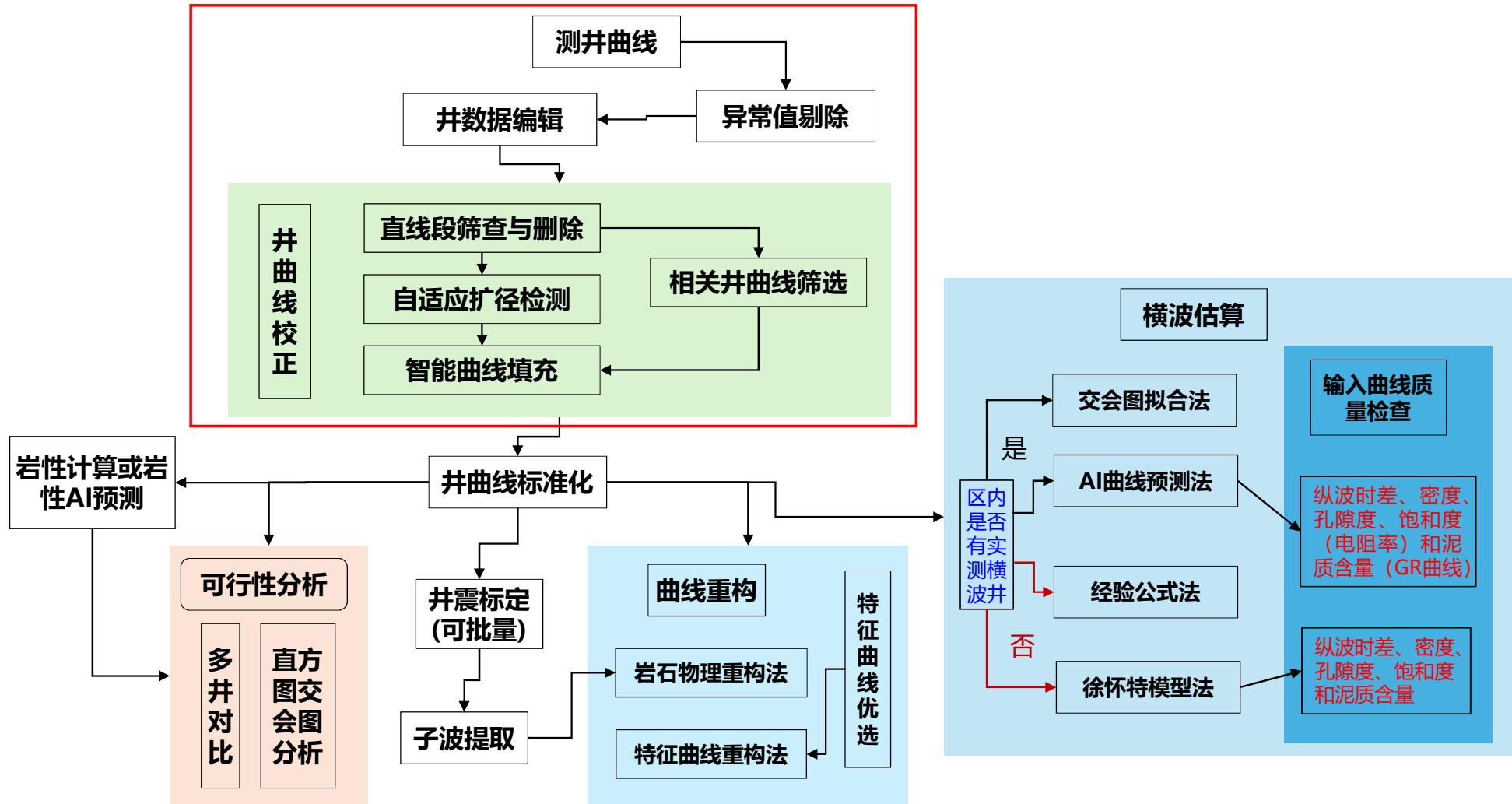
三、井曲线校正

2、AI方法（适用于所有岩性）





测井数据预处理——推荐流程图





感谢大家对GeoEast软件的信任和支持！

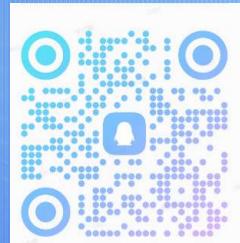
更多详情请关注



GeoEast微信公众号



解释技术支持QQ1群



解释技术支持QQ2群



Bilibili视频教程

2026

技术支持热线电话： 18233420979

服务邮箱： geoeast@cnpc.com.cn

问题管理系统： <https://wt.gs.com.cn>

QQ交流群： 196011710、 340847471

官网网址： <http://www.gs.com.cn>

销售热线： 0312-3736073