A Prototype Application for Machine Learning-Based Anomaly Detection in Well Log Data

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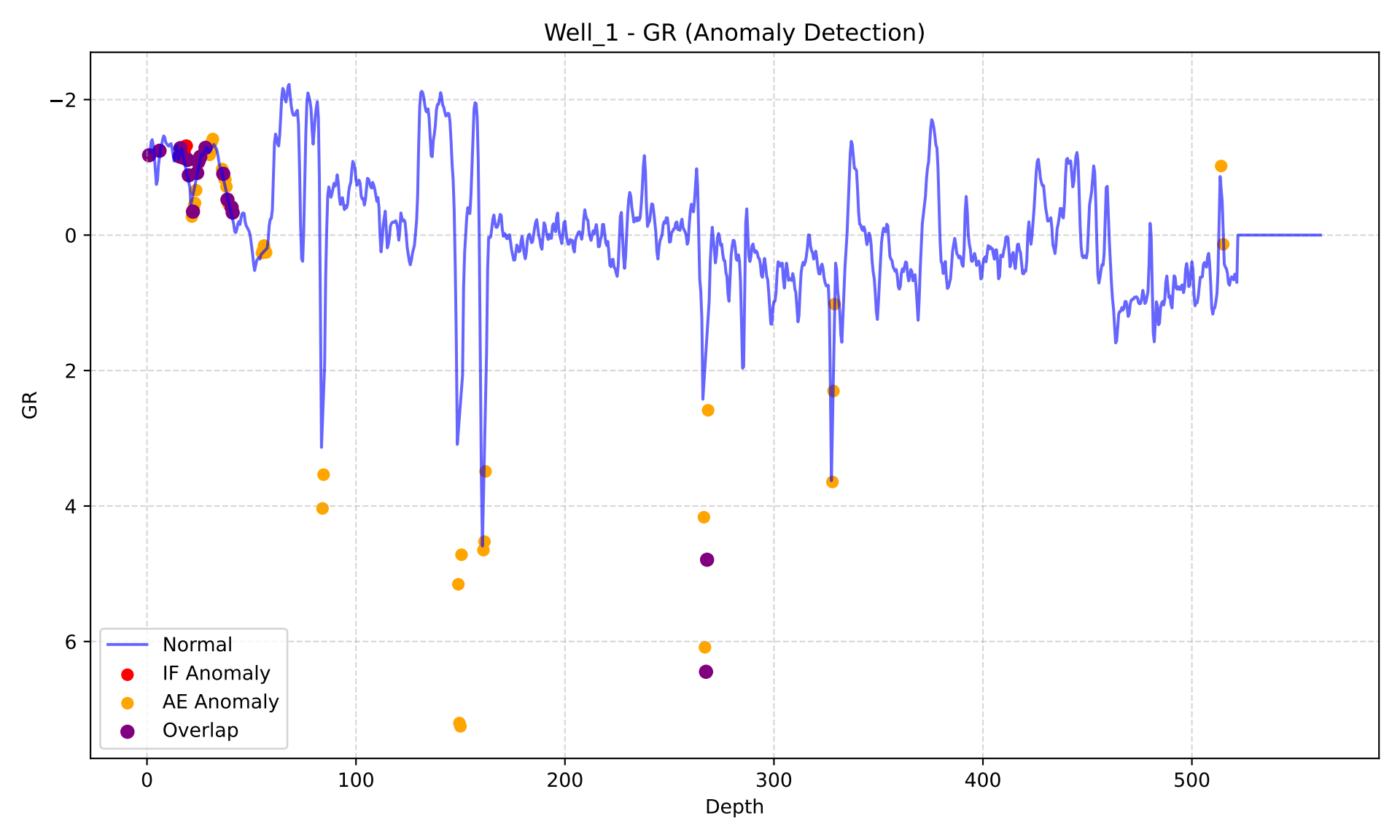
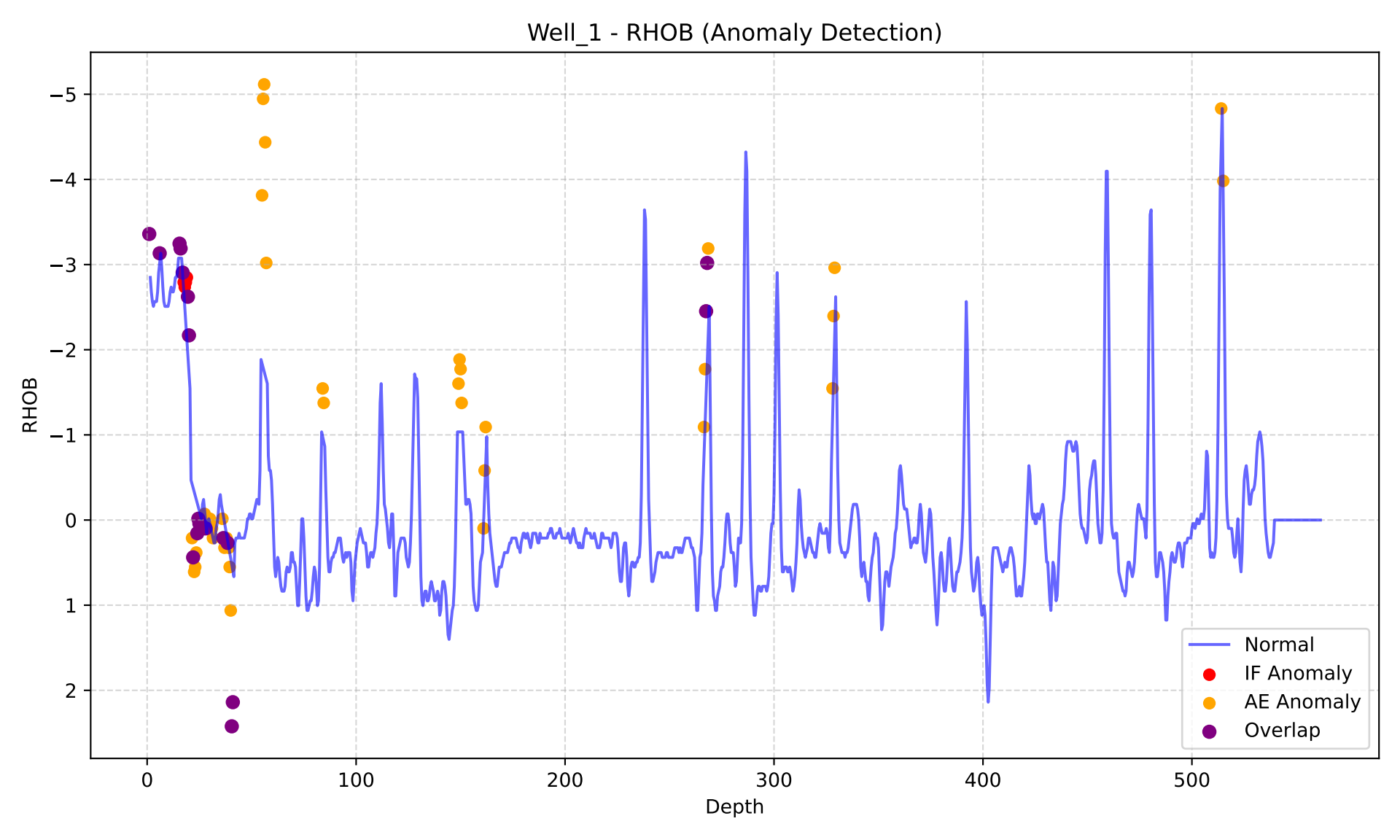
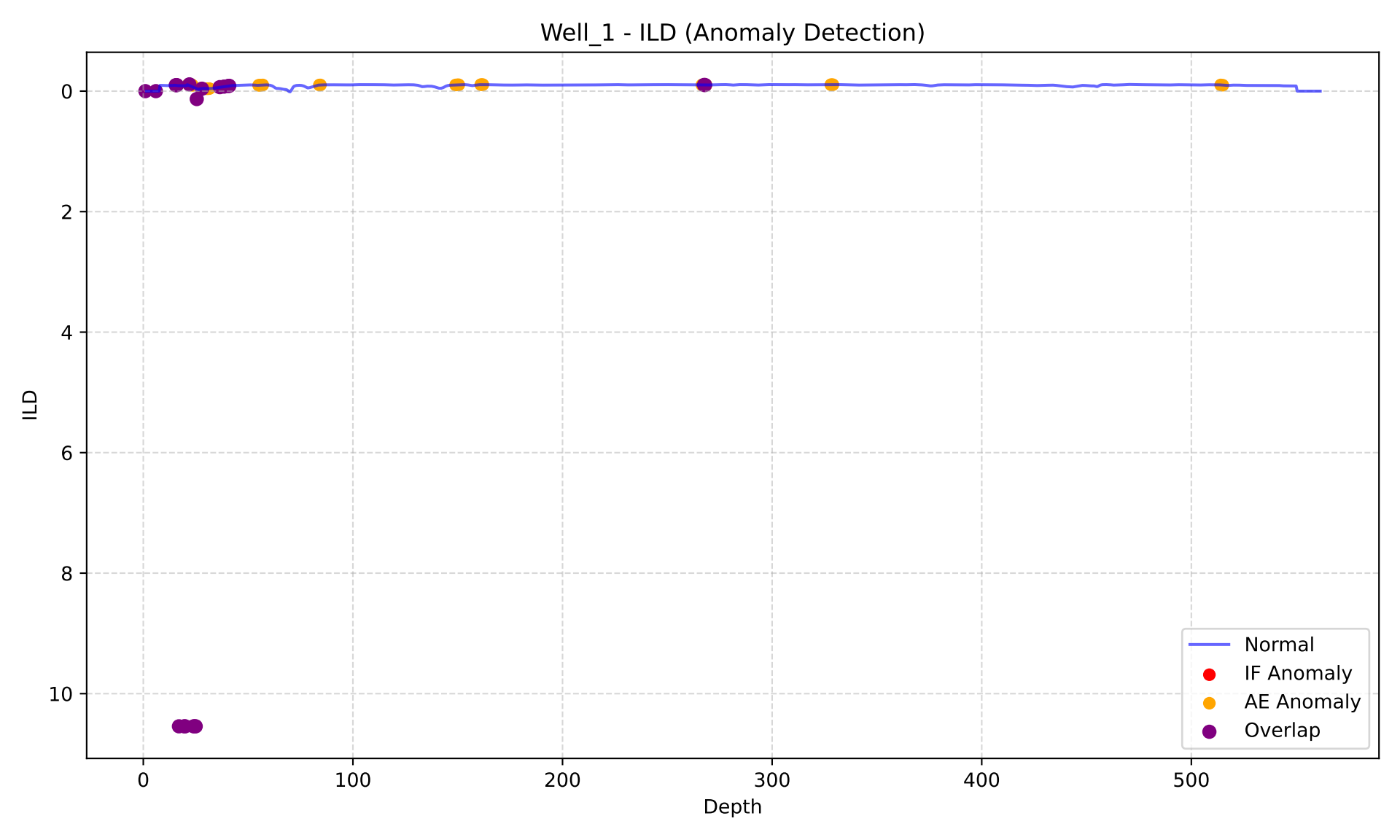
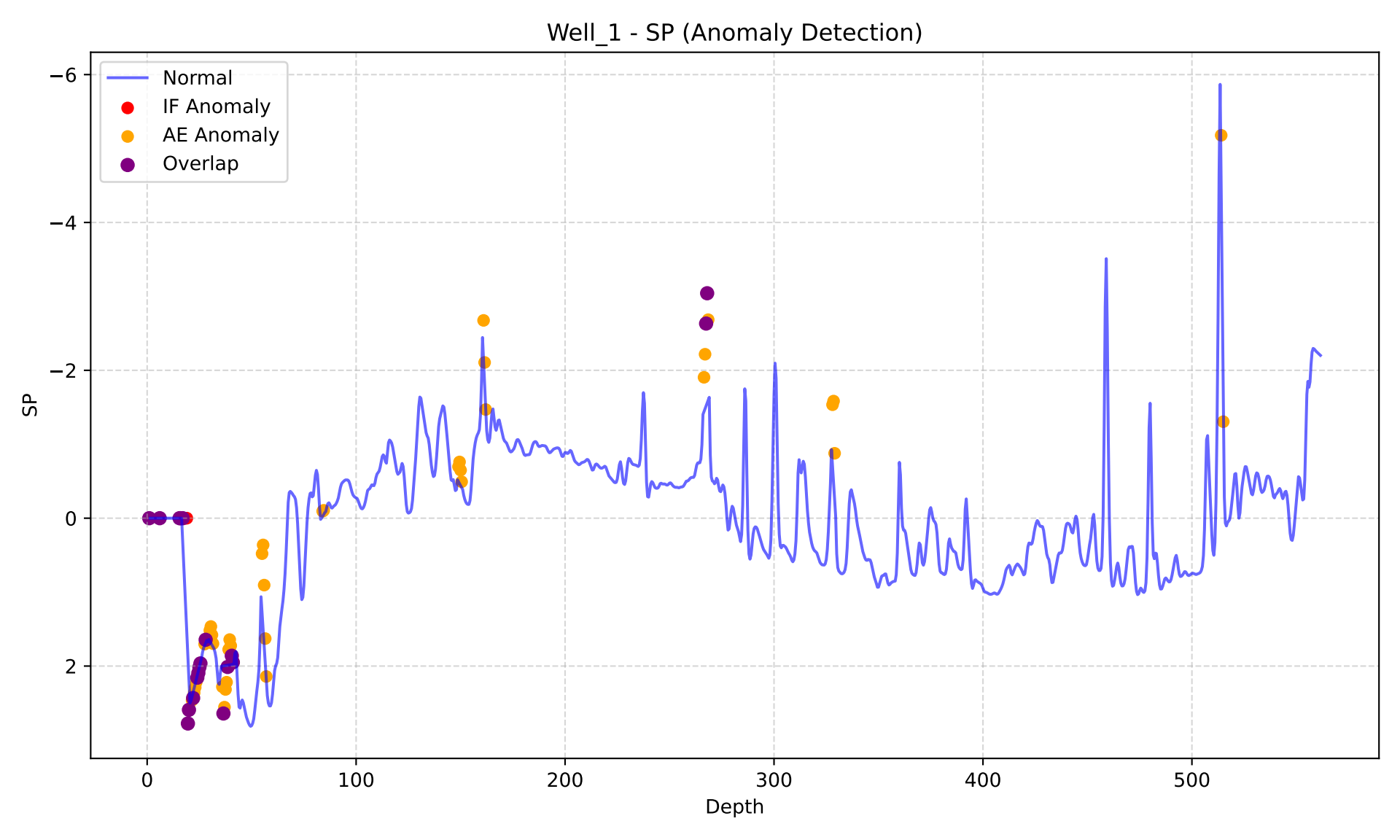
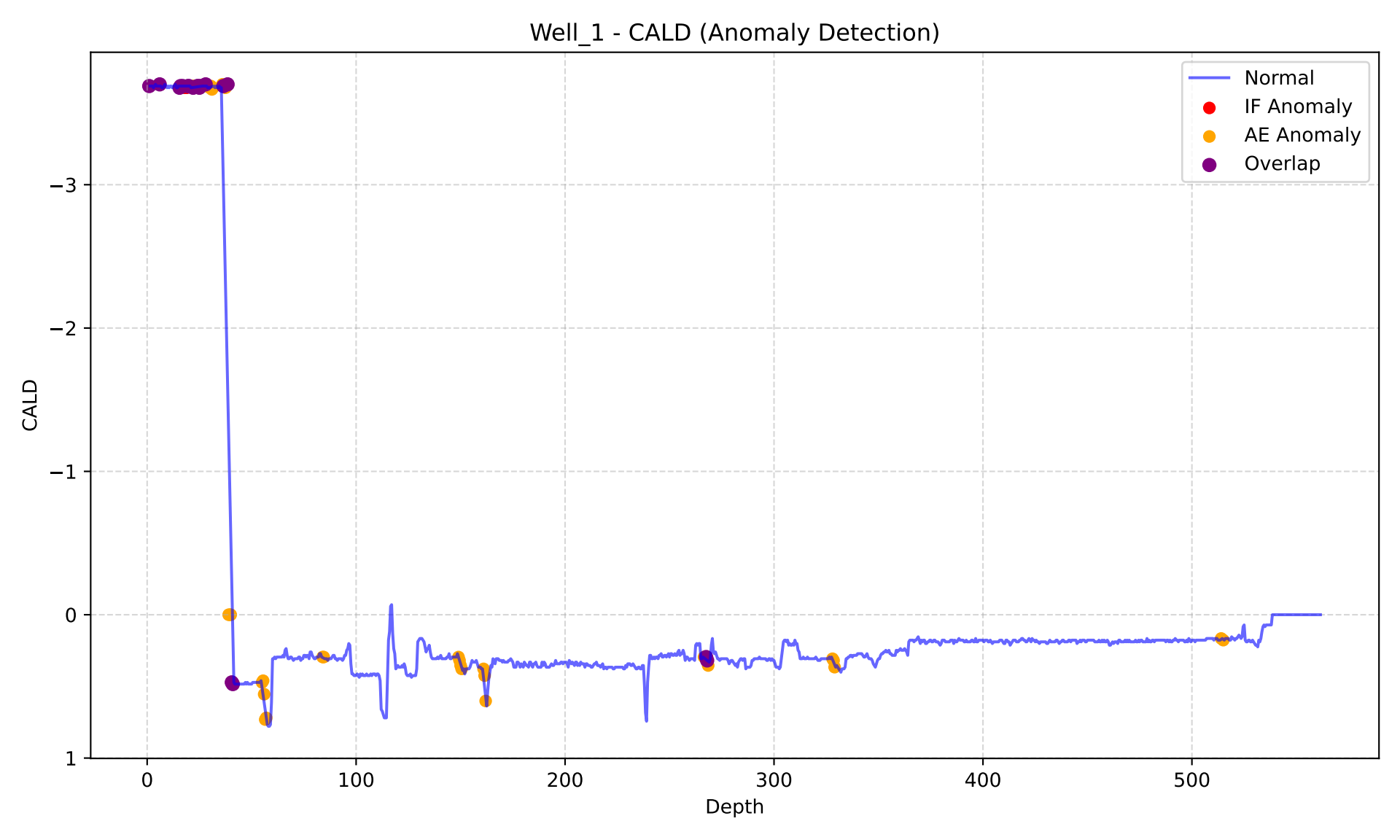
Well	Total Points	IF_Anomalies	IF_%	AE_Anomalies	AE_%	Overlap	Overlap_%	AE_Recon_Mean	AE_Recon_Std
Well_1	1122	23	2.05	57	5.08	19	1.69	0.004736	0.008891
Well_2	1081	22	2.04	54	5.0	14	1.3	0.000953	0.001326
Well_3	998	20	2.0	50	5.01	12	1.2	0.001678	0.003948
Well_4	1196	24	2.01	60	5.02	18	1.51	0.001054	0.003074

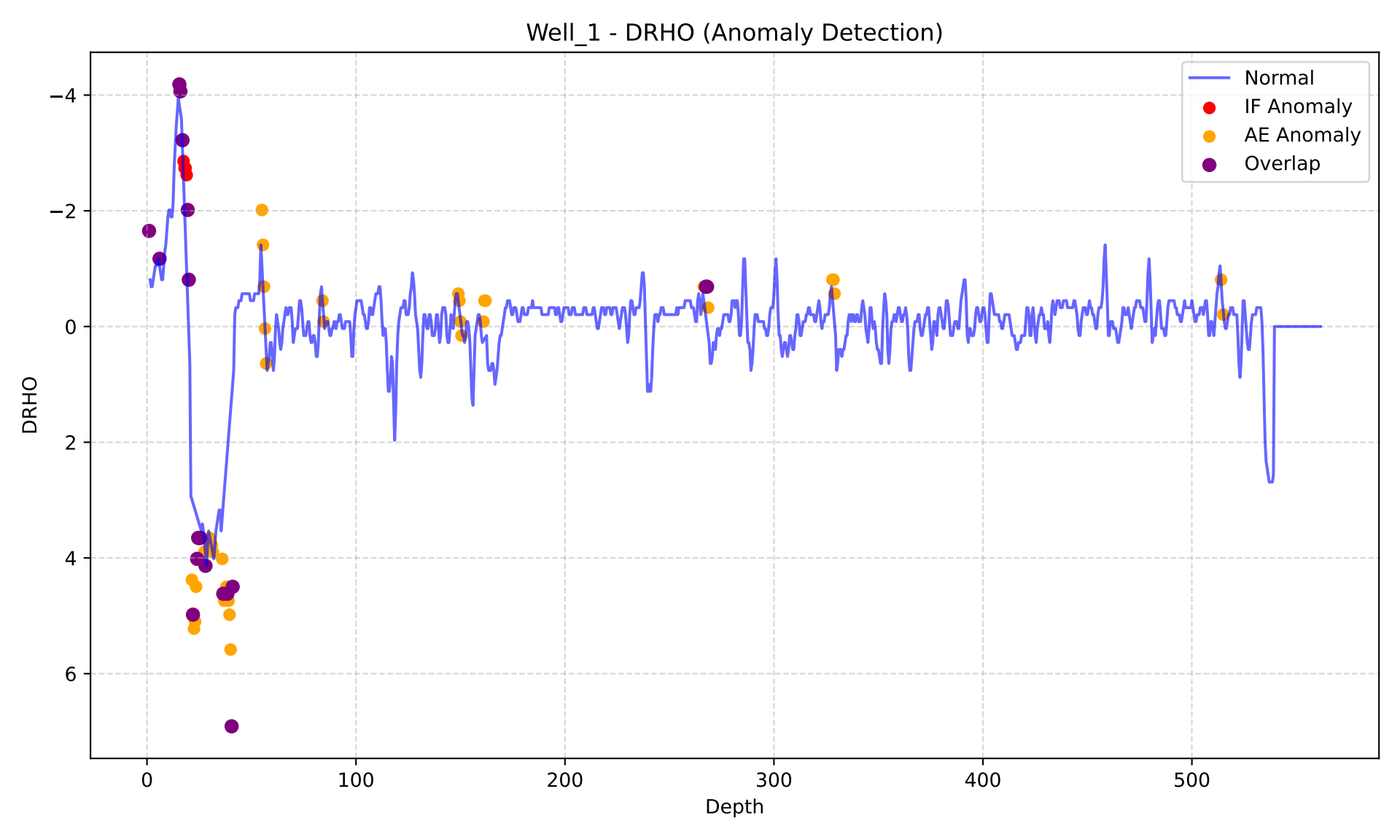

Well_1 - GR (Anomaly Detection)
GR
Depth
−2
0
2
4
6
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

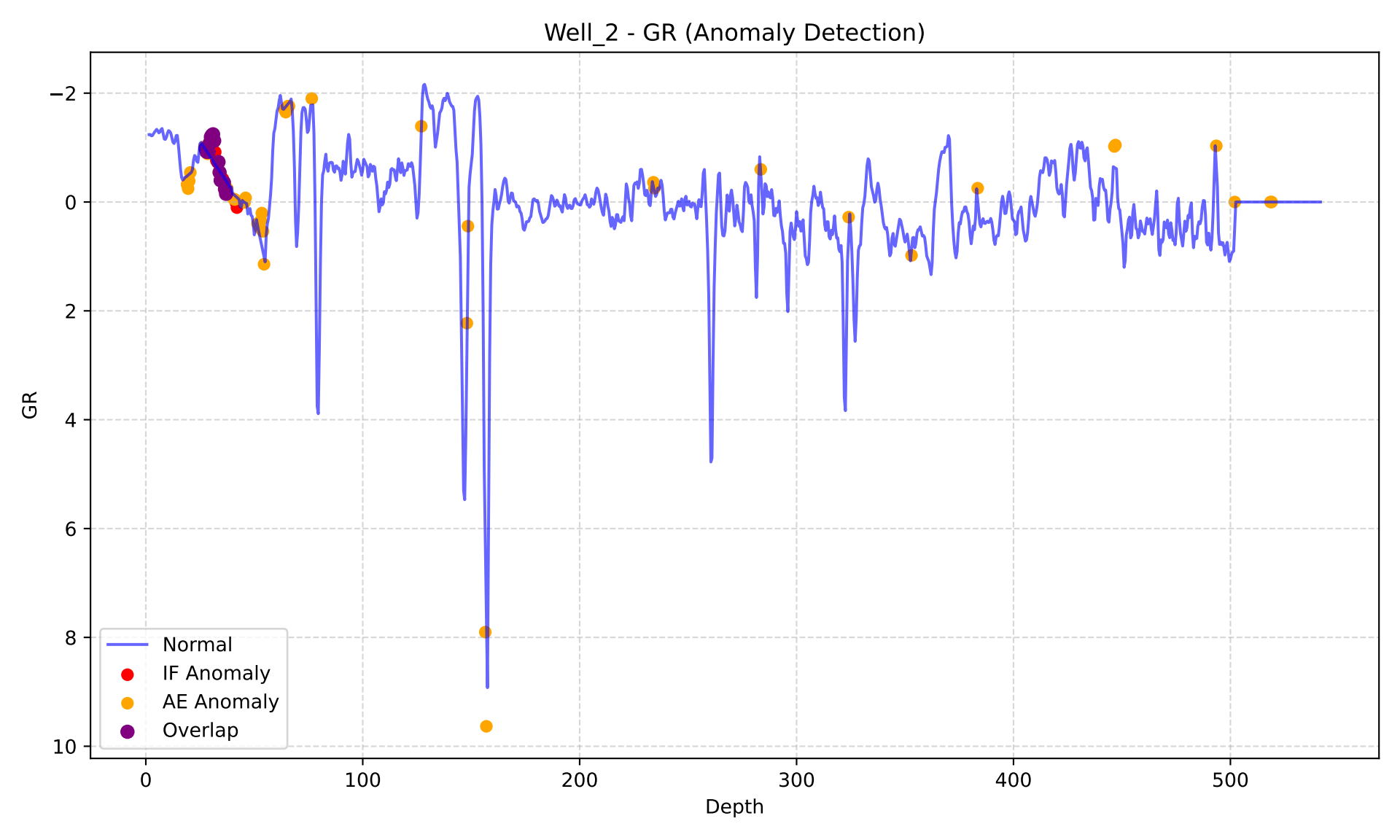

Well_1 - RHOB (Anomaly Detection)
RHOB
Depth
−5
−4
−3
−2
−1
0
1
2
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

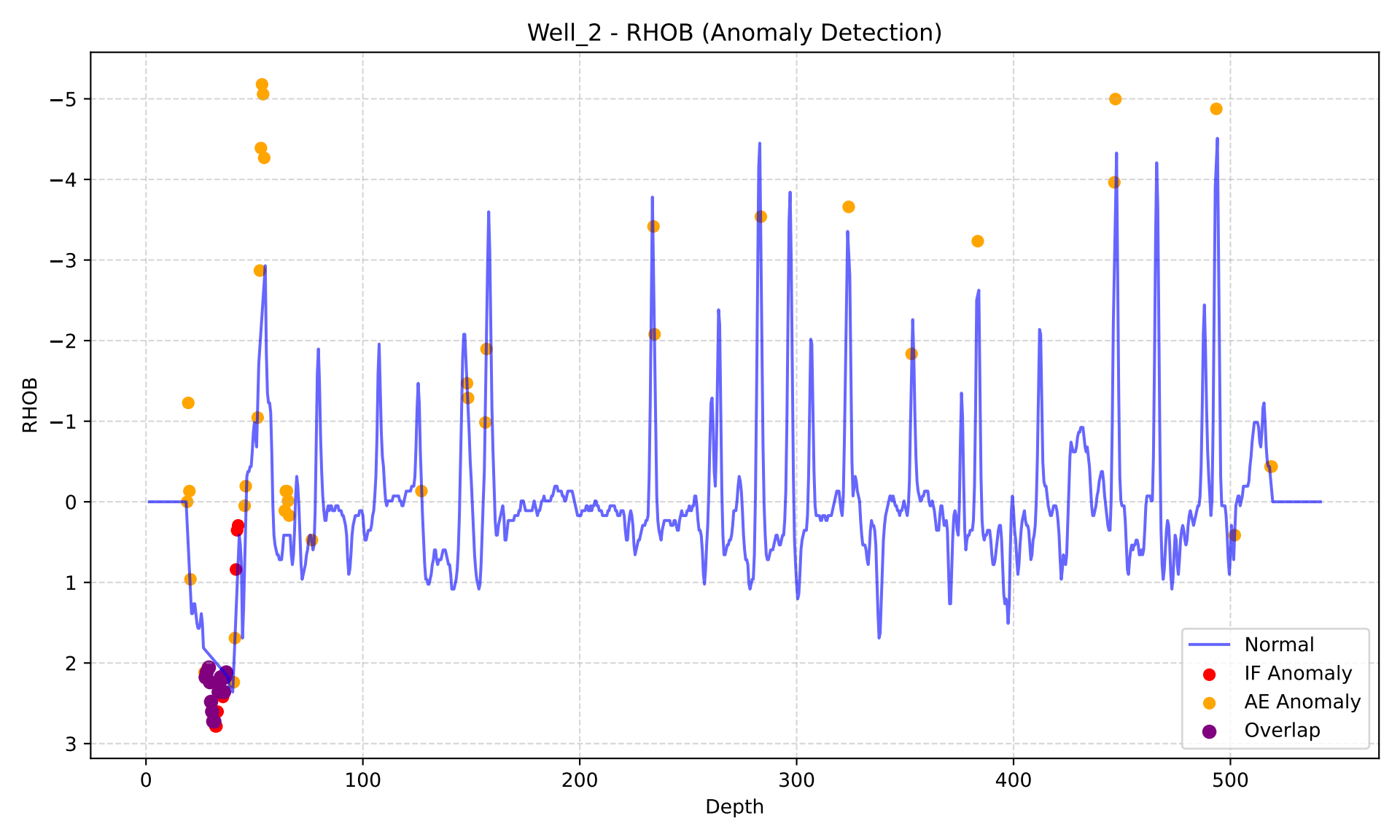

Well_1 - ILD (Anomaly Detection)
ILD
Depth
0
2
4
6
8
10
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

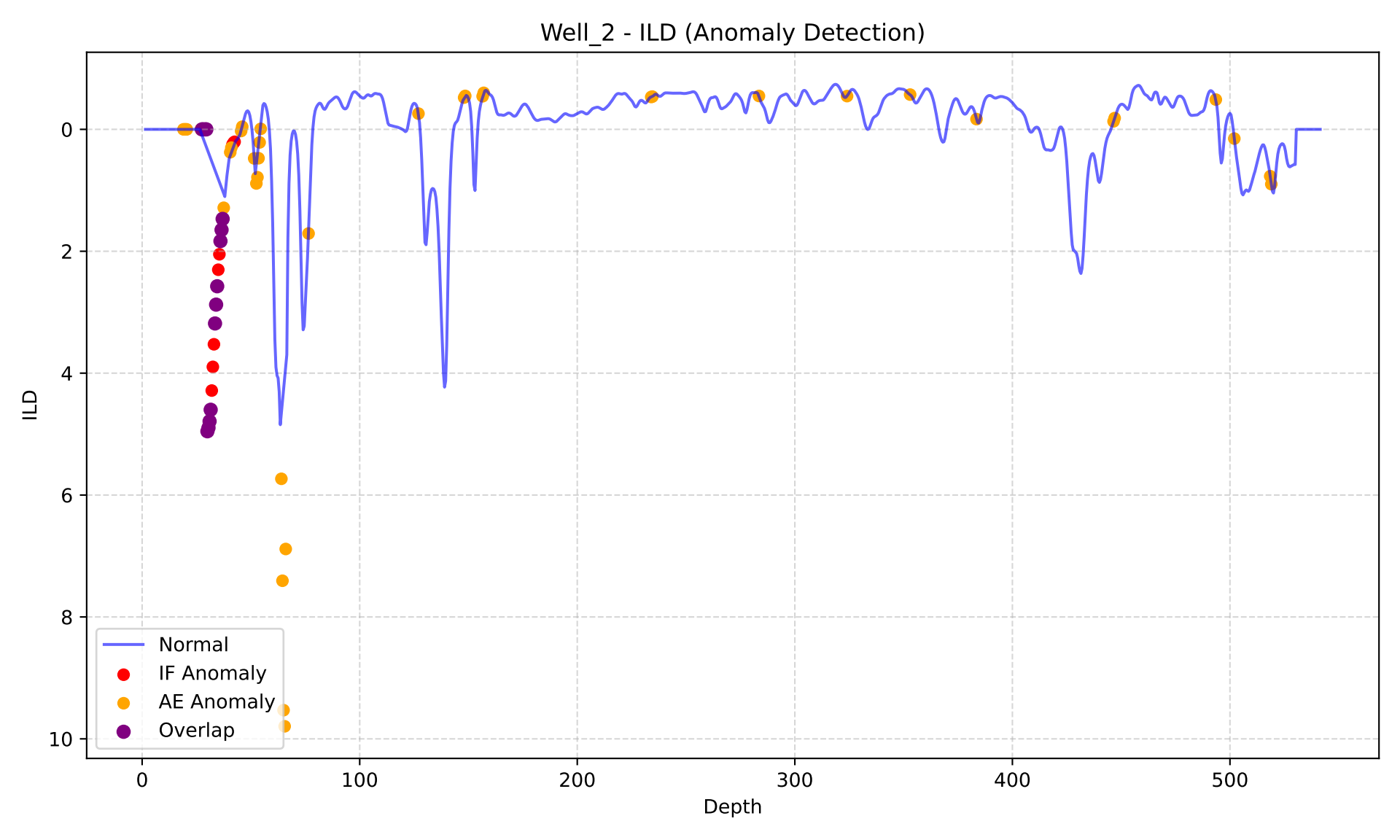

Well_1 - SP (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
SP
Depth
−6
−4
−2
0
2
0
100
200
300
400
500

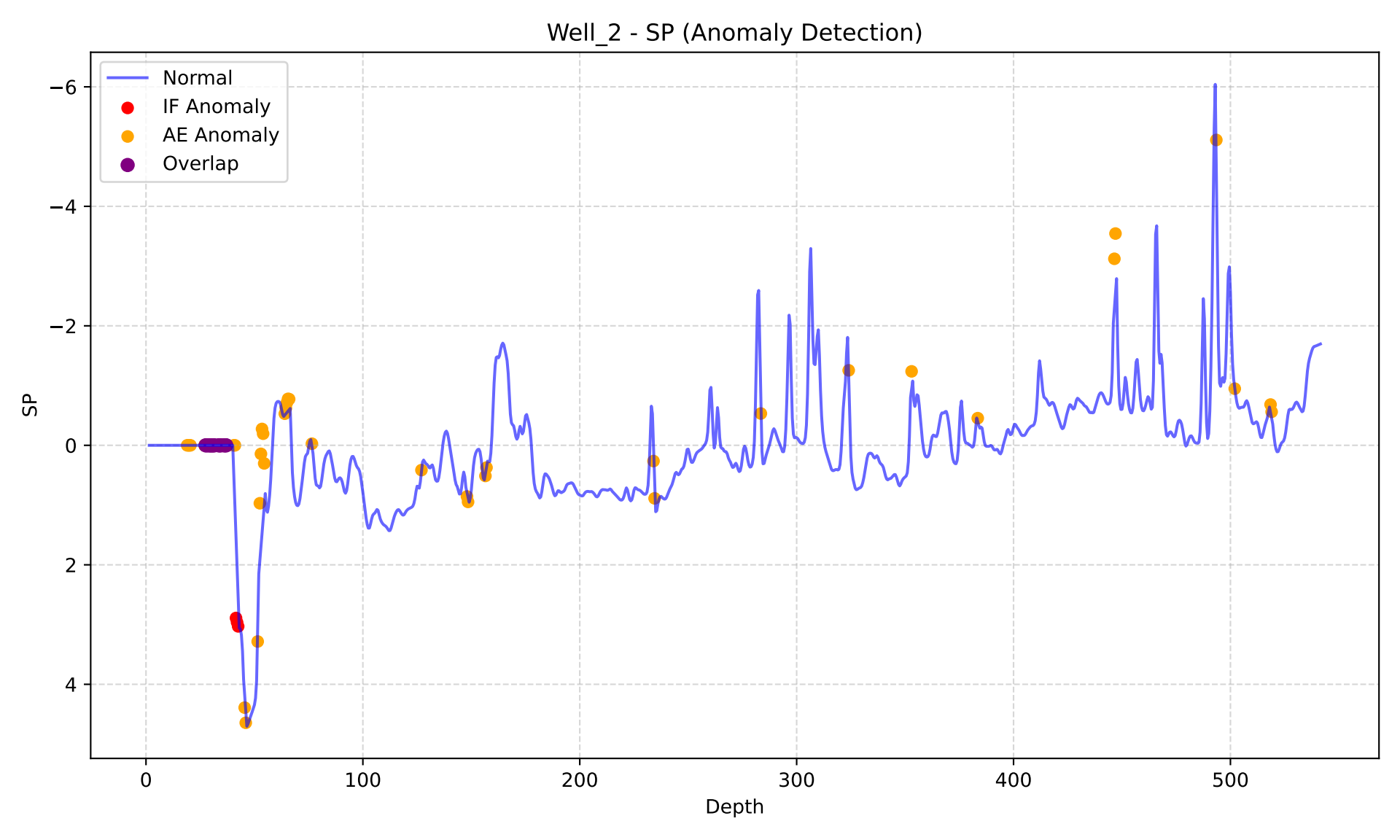

Well_1 - CALD (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
CALD
−3
−2
−1
0
1
0
100
200
300
400
500
Depth

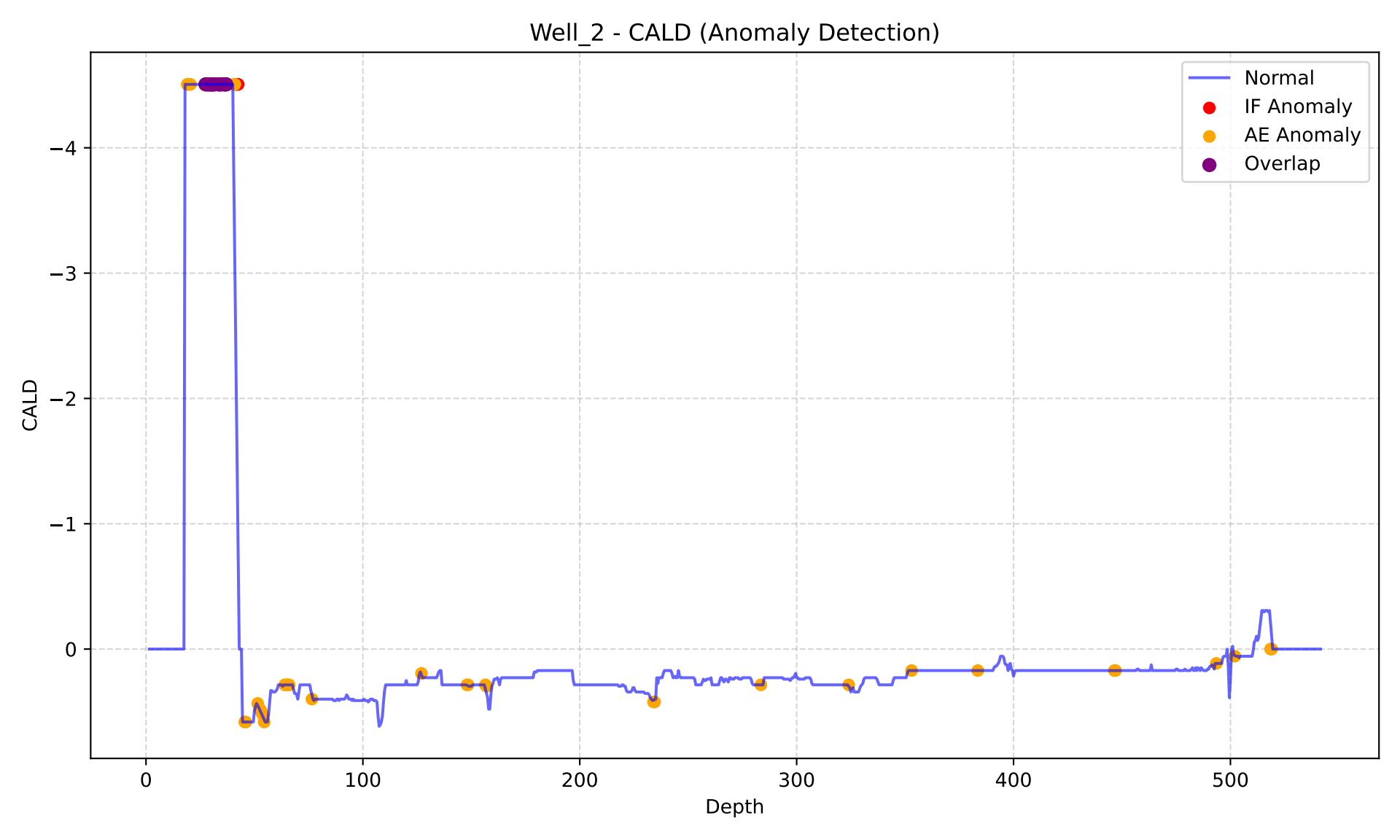

Well_1 - DRHO (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
DRHO
Depth
−4
−2
0
2
4
6
0
100
200
300
400
500

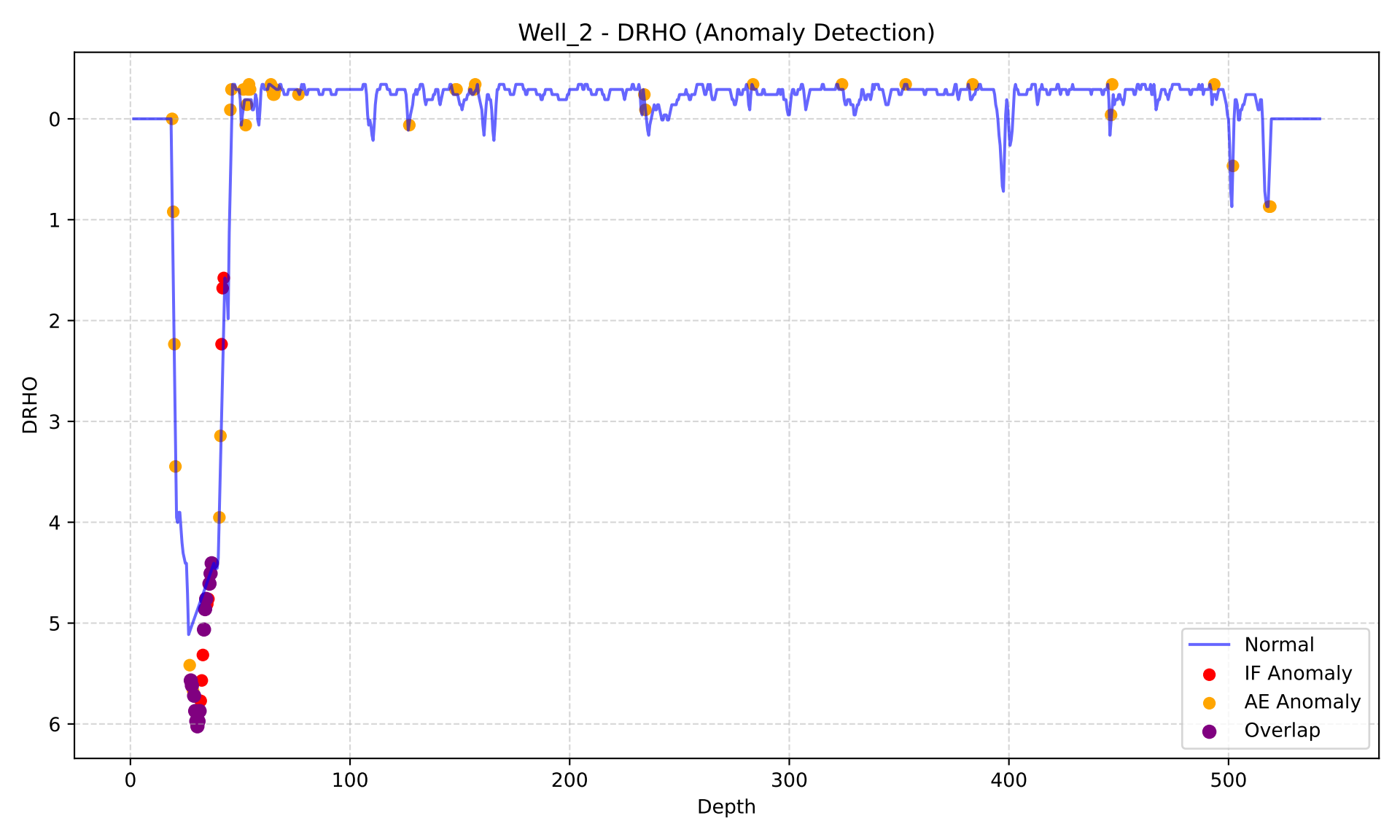

Well_2 - GR (Anomaly Detection)
GR
Depth
−2
0
2
4
6
8
10
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

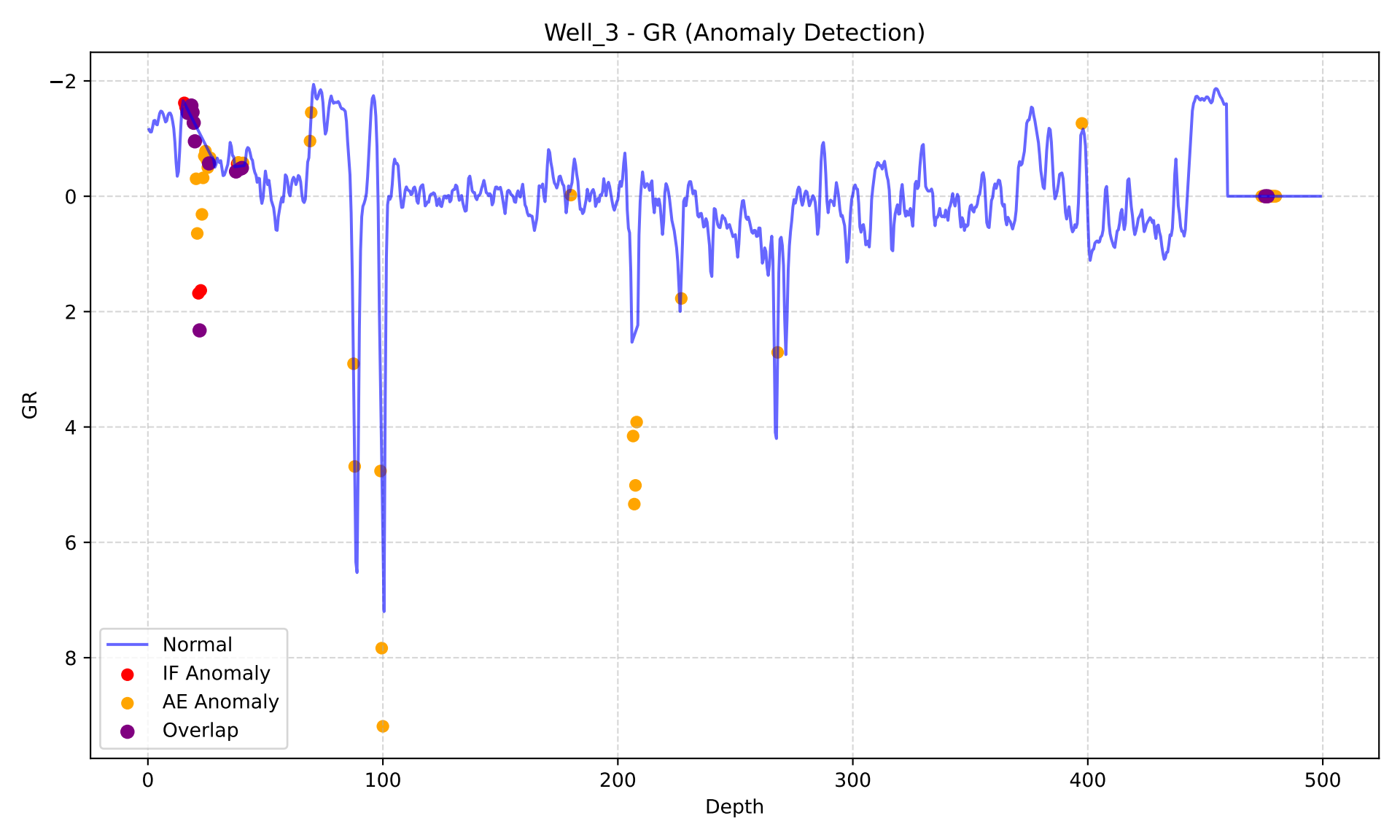

Well_2 - RHOB (Anomaly Detection)
RHOB
Depth
−5
−4
−3
−2
−1
0
1
2
3
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

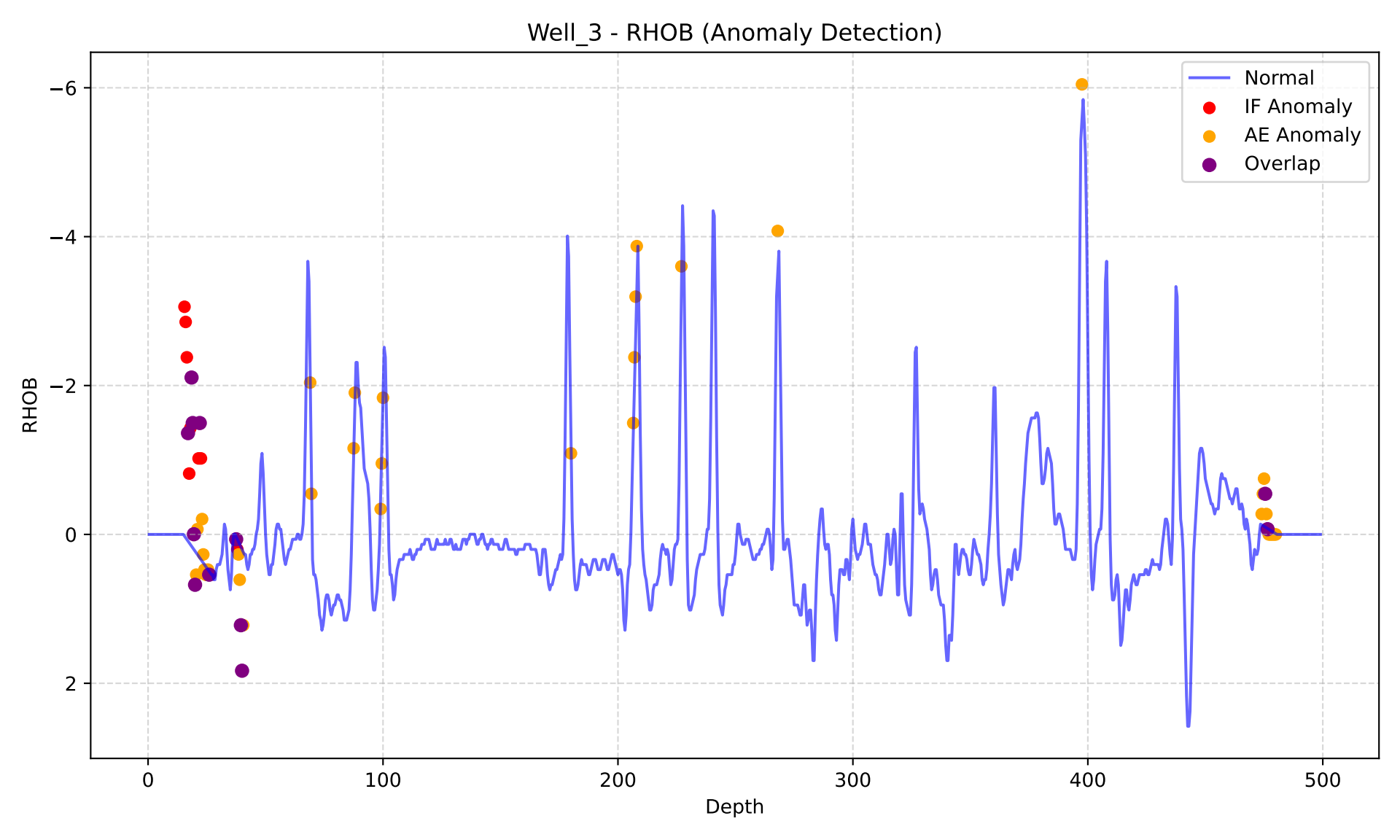

Well_2 - ILD (Anomaly Detection)
ILD
Depth
0
2
4
6
8
10
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

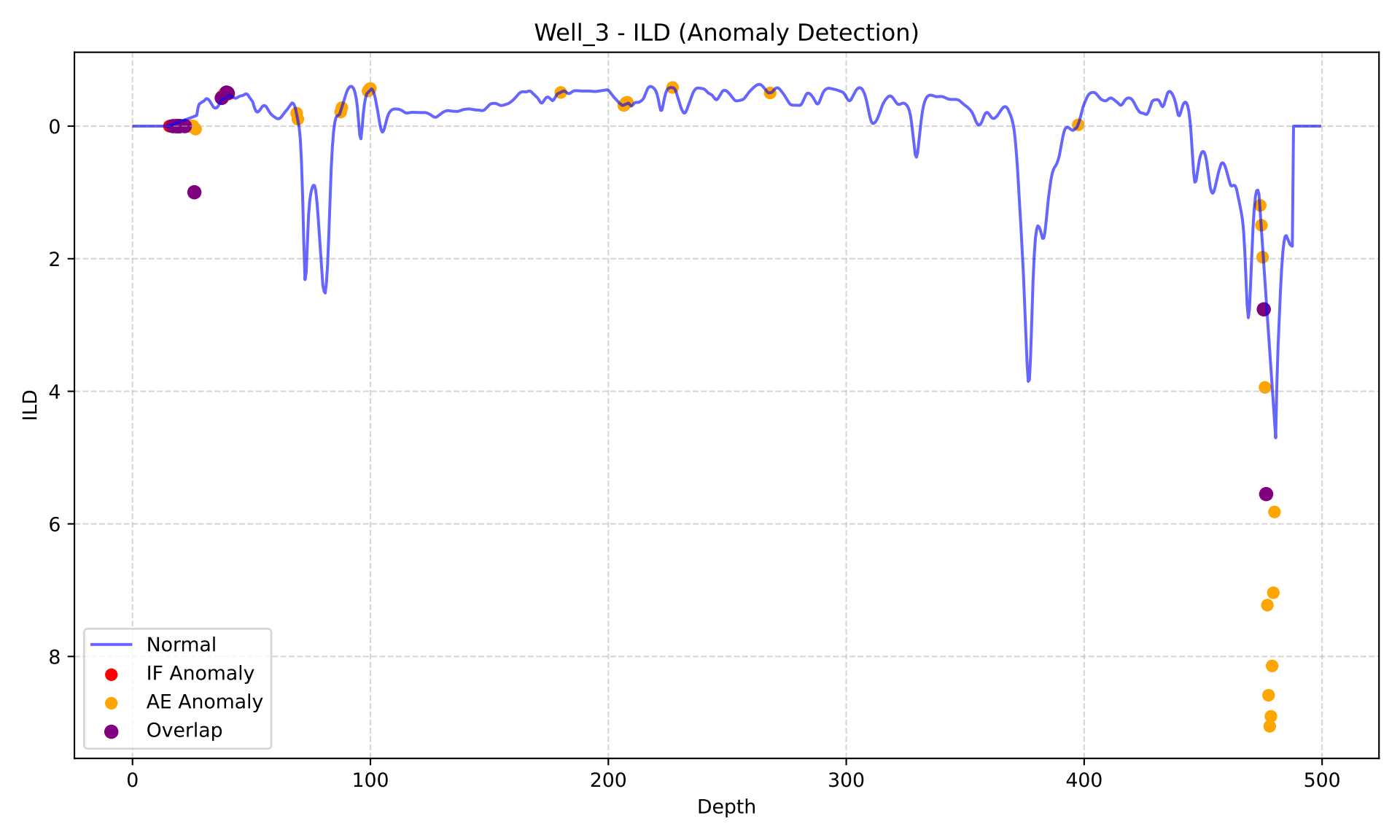

Well_2 - SP (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
SP
Depth
−6
−4
−2
0
2
4
0
100
200
300
400
500

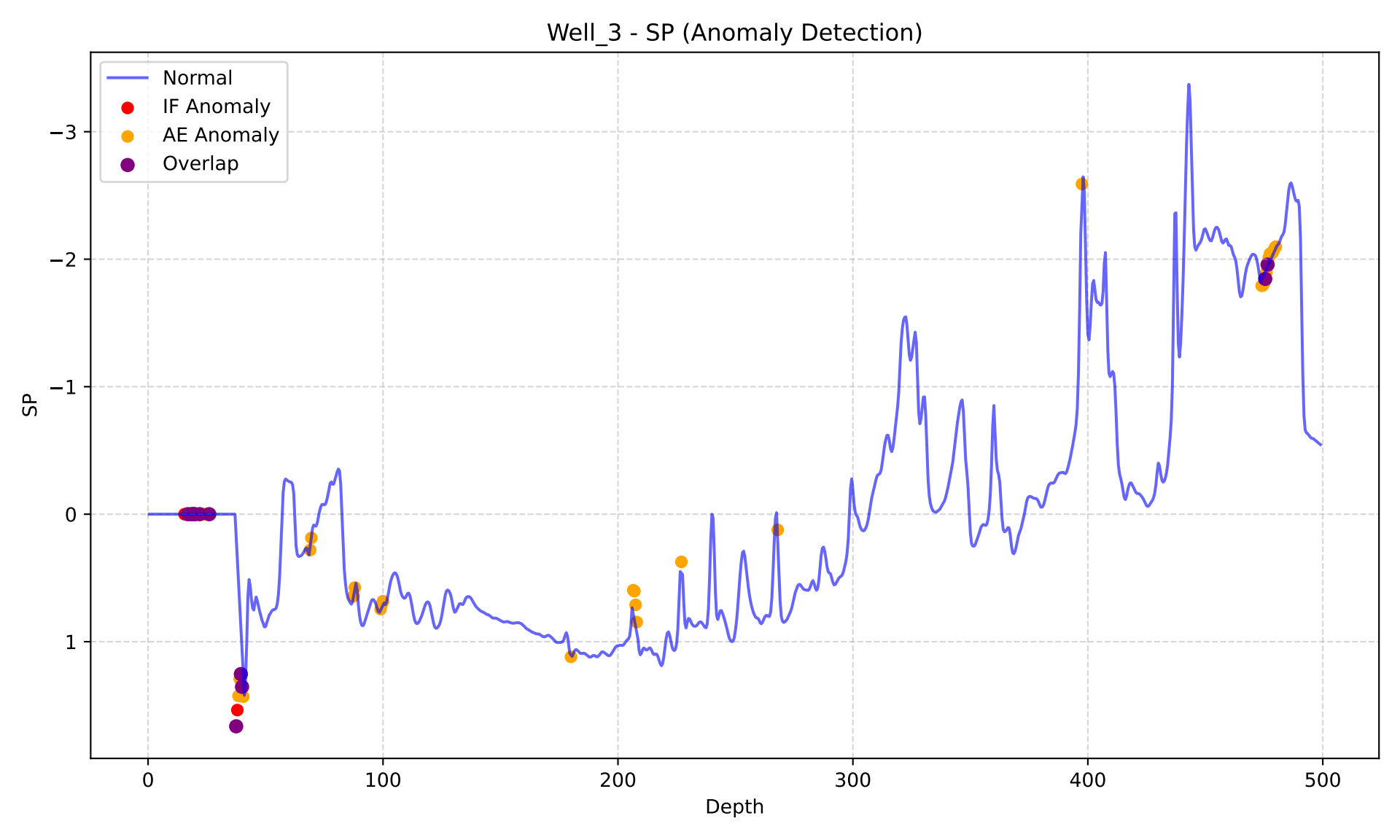

Well_2 - CALD (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
CALD
−4
−3
−2
−1
0
Depth
0
100
200
300
400
500

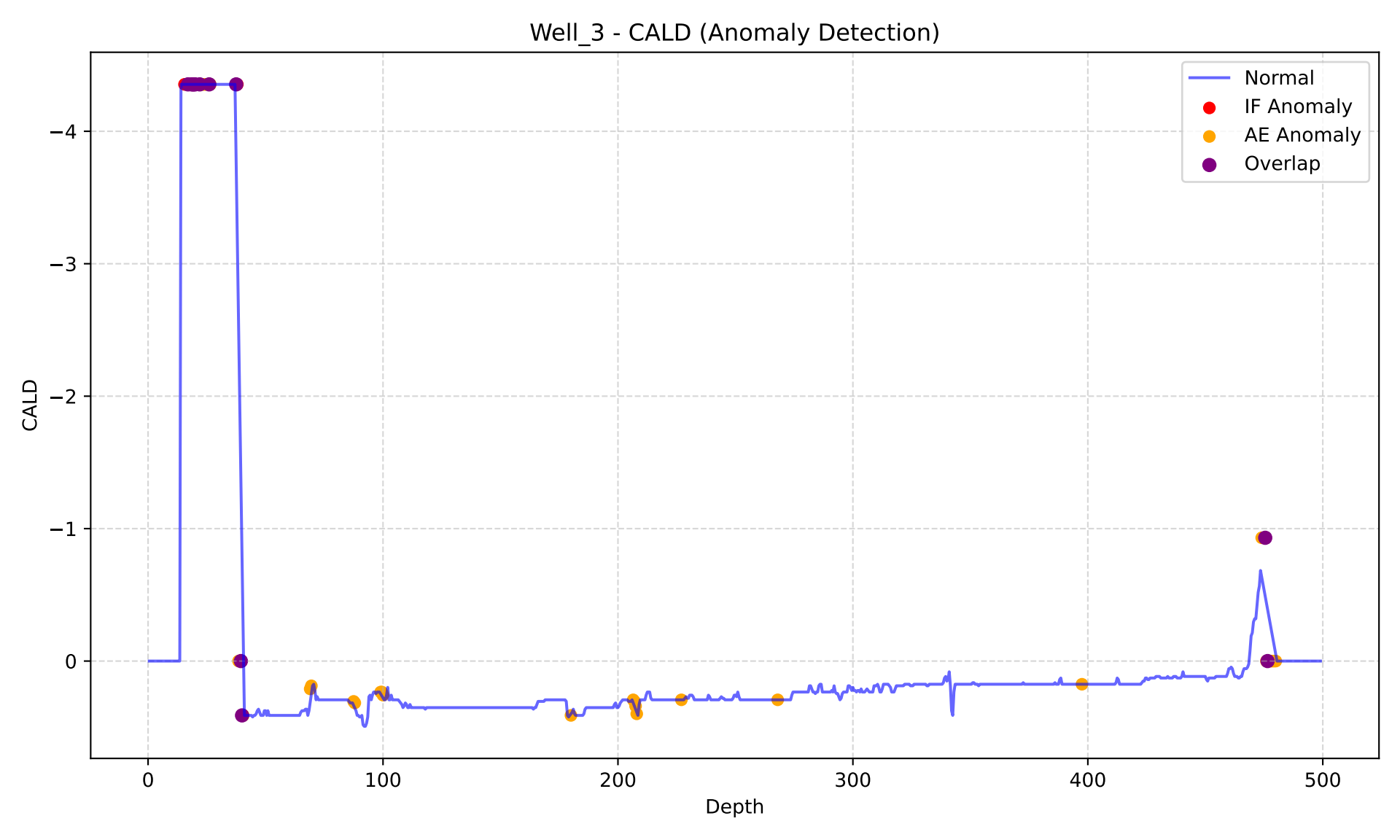

Well_2 - DRHO (Anomaly Detection)
DRHO
Depth
0
1
2
3
4
5
6
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

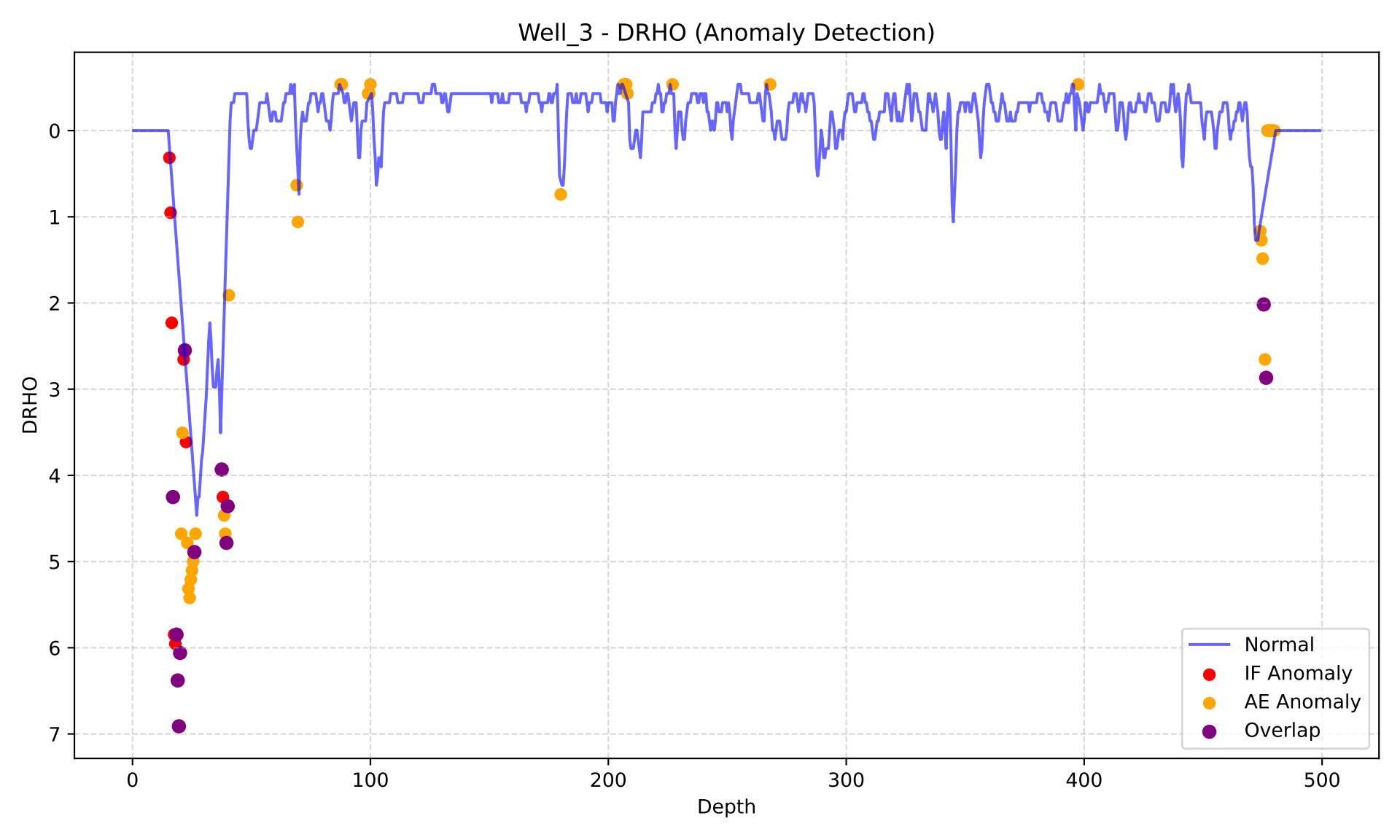

Well_3 - GR (Anomaly Detection)
GR
Depth
−2
0
2
4
6
8
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

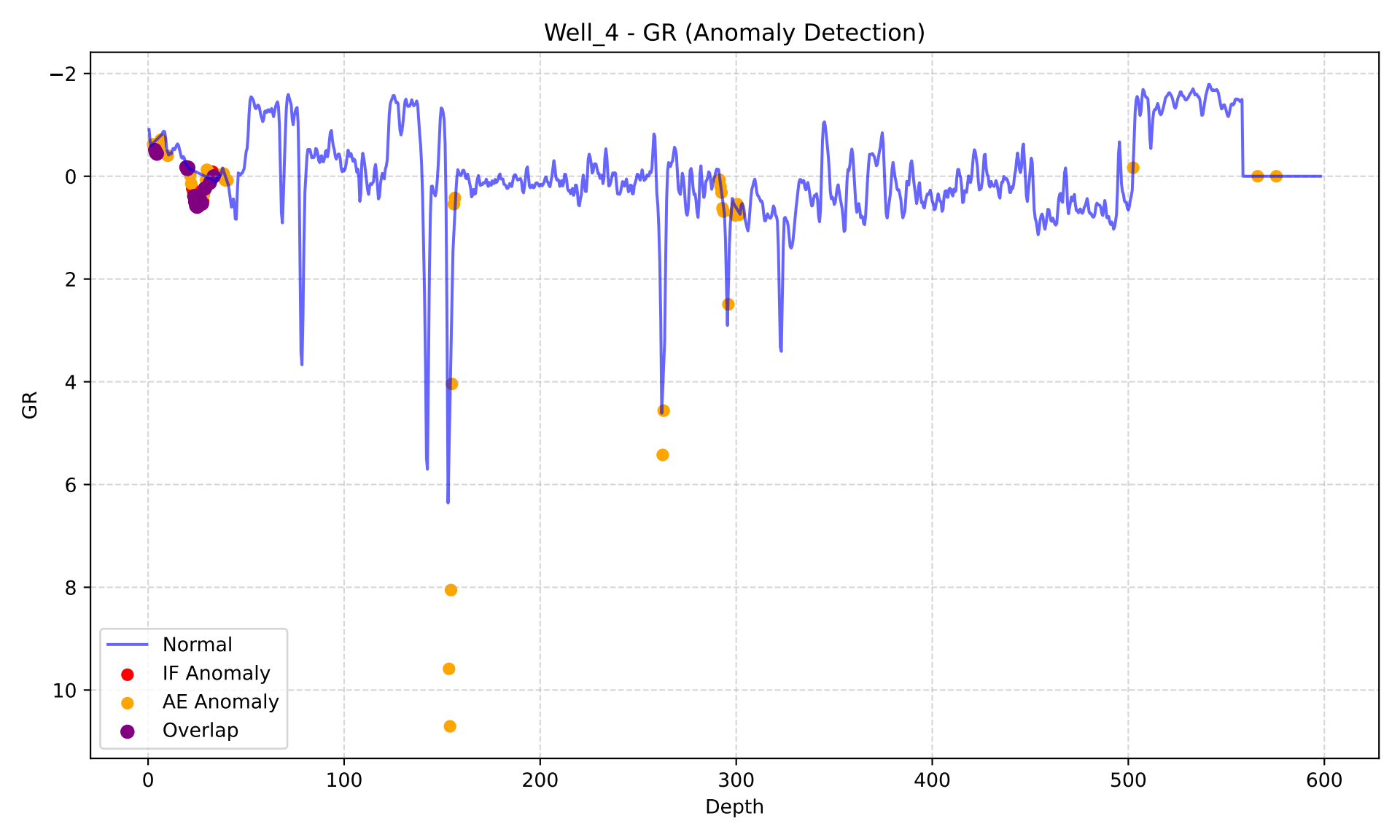

Well_3 - RHOB (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
RHOB
Depth
−6
−4
−2
0
2
0
100
200
300
400
500

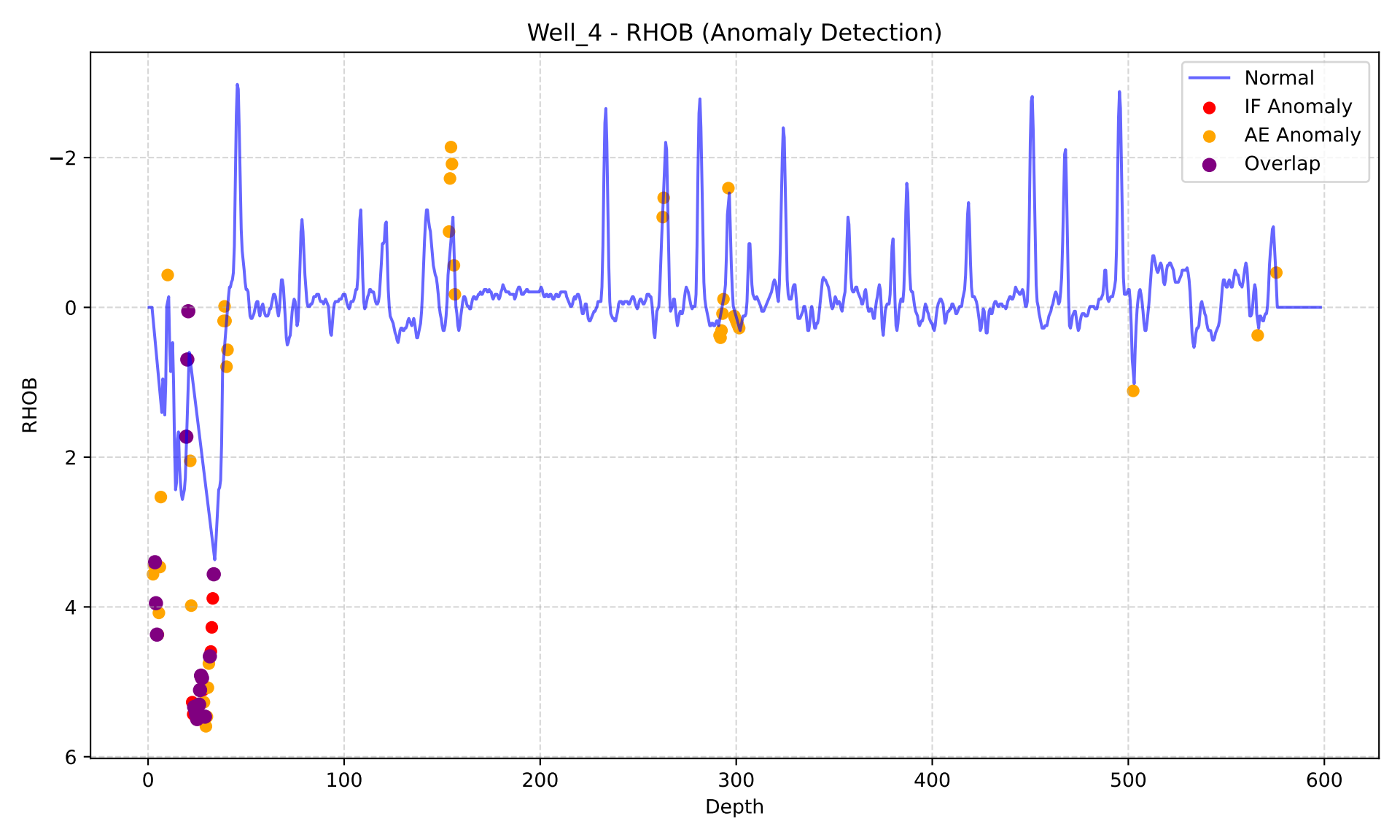

Well_3 - ILD (Anomaly Detection)
ILD
Depth
0
2
4
6
8
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

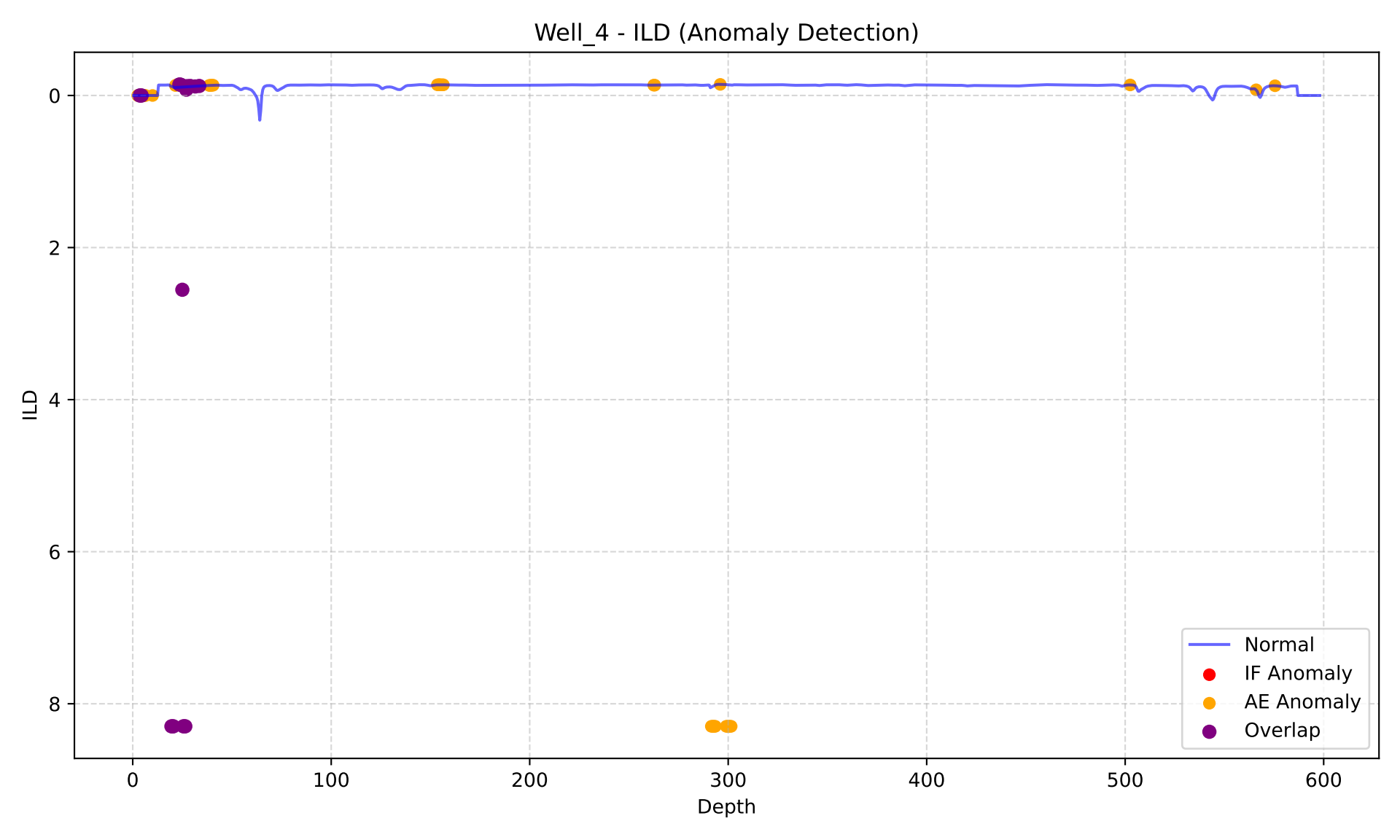

Well_3 - SP (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
SP
−3
−2
−1
0
1
Depth
0
100
200
300
400
500

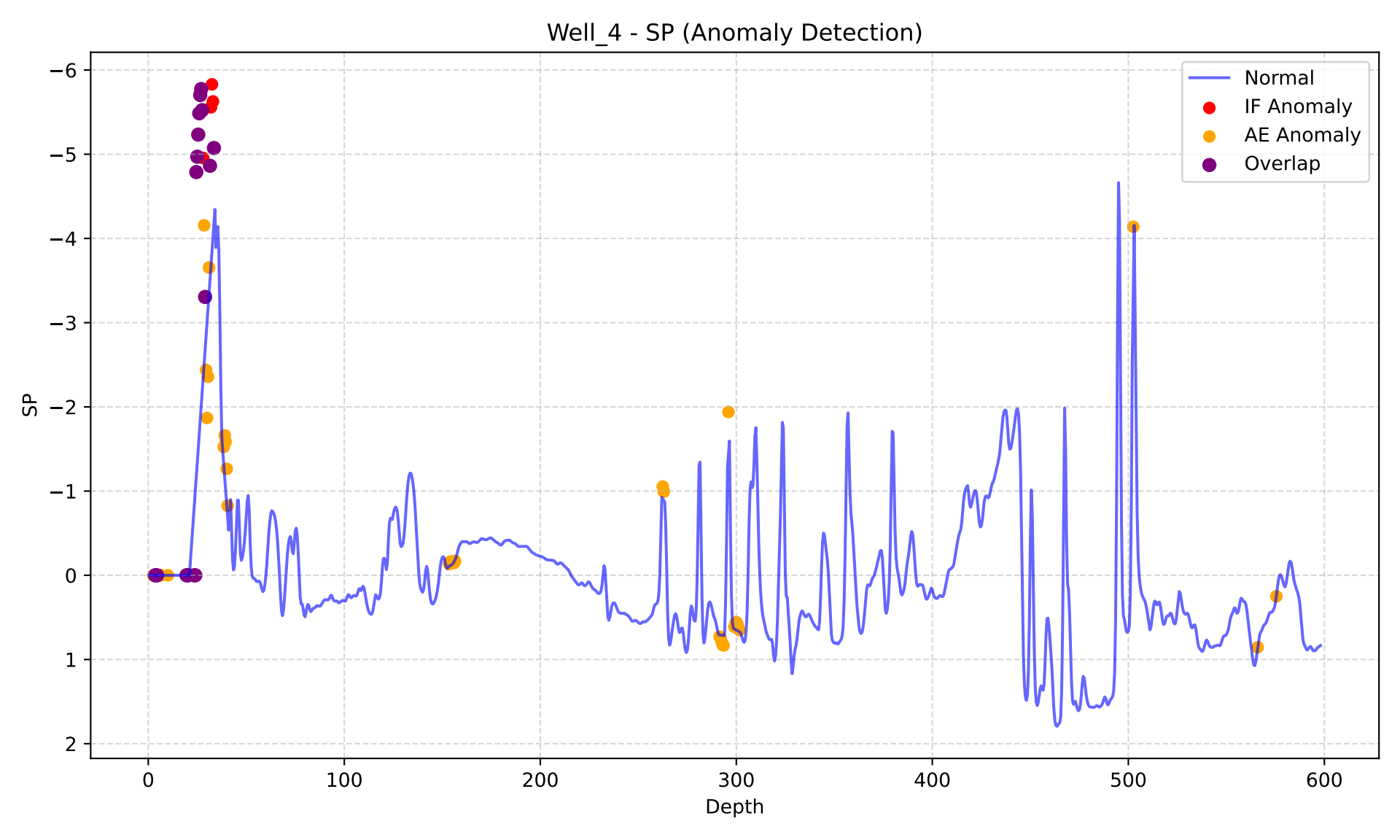

Well_3 - CALD (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
CALD
Depth
−4
−3
−2
−1
0
0
100
200
300
400
500

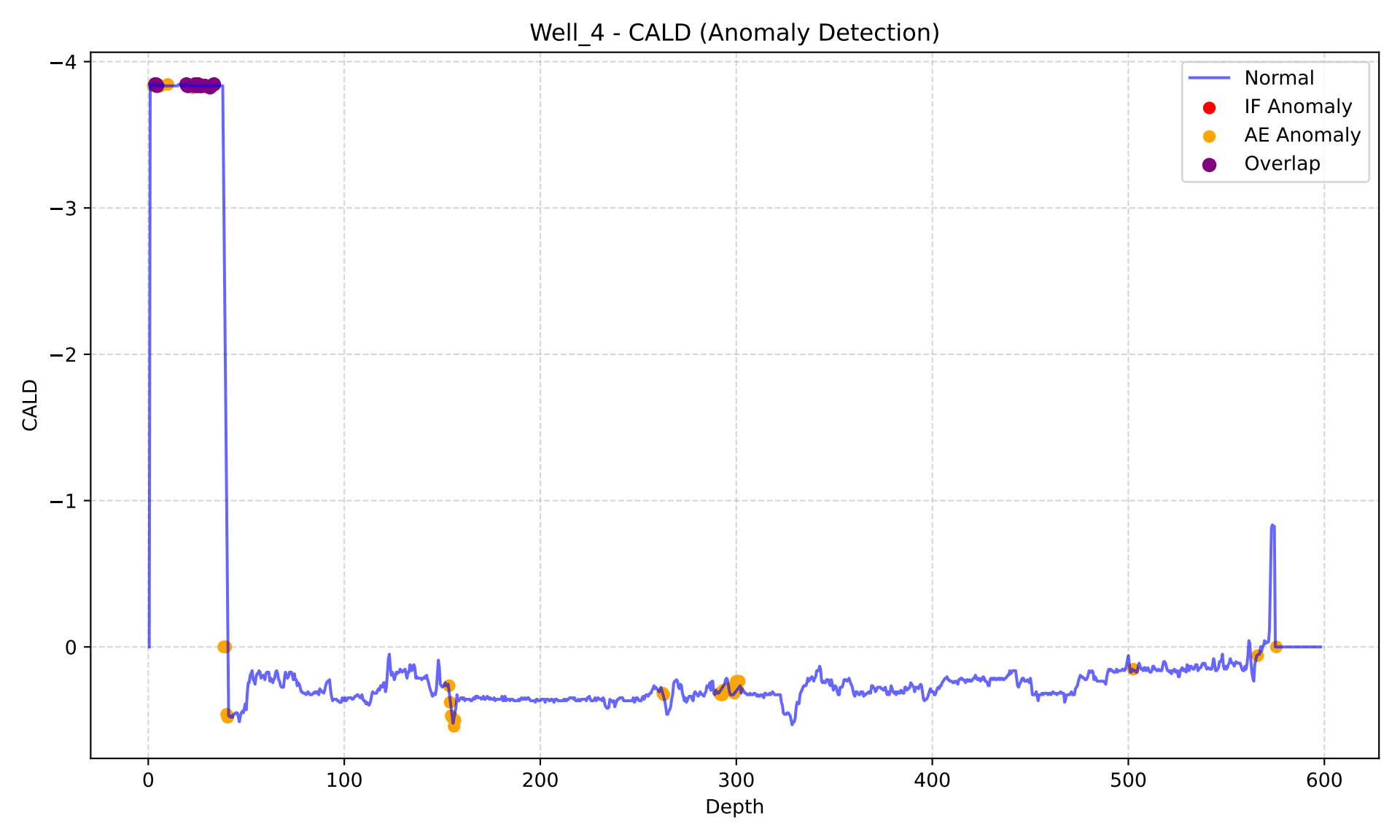

Well_3 - DRHO (Anomaly Detection)
DRHO
Depth
0
1
2
3
4
5
6
7
0
100
200
300
400
500
Normal
IF Anomaly
AE Anomaly
Overlap

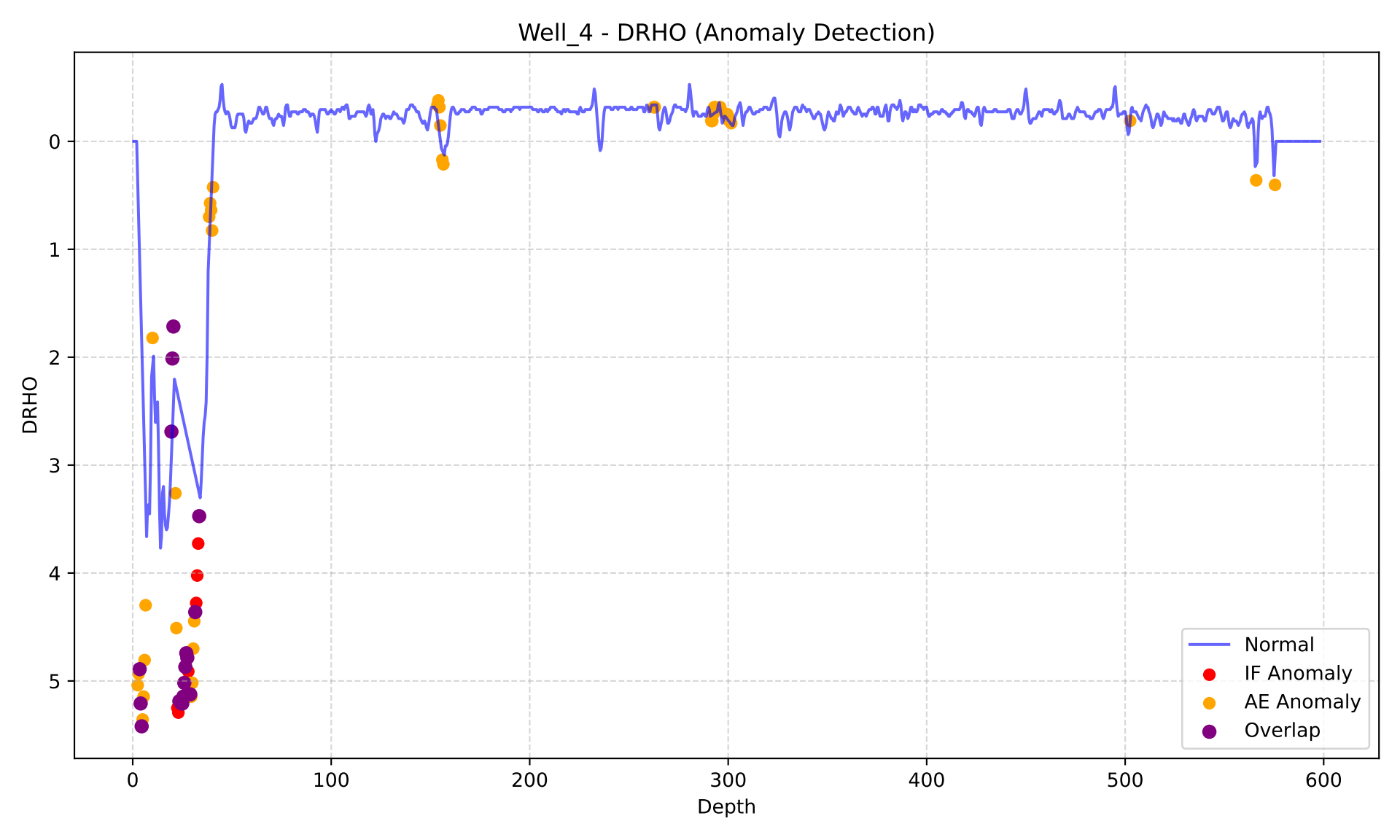

Well_4 - GR (Anomaly Detection)
GR
Depth
−2
0
2
4
6
8
10
0
100
200
300
400
500
600
Normal
IF Anomaly
AE Anomaly
Overlap


Well_4 - RHOB (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
RHOB
Depth
−2
0
2
4
6
0
100
200
300
400
500
600


Well_4 - ILD (Anomaly Detection)
ILD
Depth
0
2
4
6
8
0
100
200
300
400
500
600
Normal
IF Anomaly
AE Anomaly
Overlap


Well_4 - SP (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
SP
Depth
−6
−5
−4
−3
−2
−1
0
1
2
0
100
200
300
400
500
600


Well_4 - CALD (Anomaly Detection)
Normal
IF Anomaly
AE Anomaly
Overlap
CALD
Depth
−4
−3
−2
−1
0
0
100
200
300
400
500
600


Well_4 - DRHO (Anomaly Detection)
DRHO
Depth
0
1
2
3
4
5
0
100
200
300
400
500
600
Normal
IF Anomaly
AE Anomaly
Overlap