Analisis Lithologi Reservoir Menggunakan Vp/Vs Hasil Inversi Secara Terpisah (*Independent* Inversion) Gelombang PP dan PS

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Dosen Pembimbing
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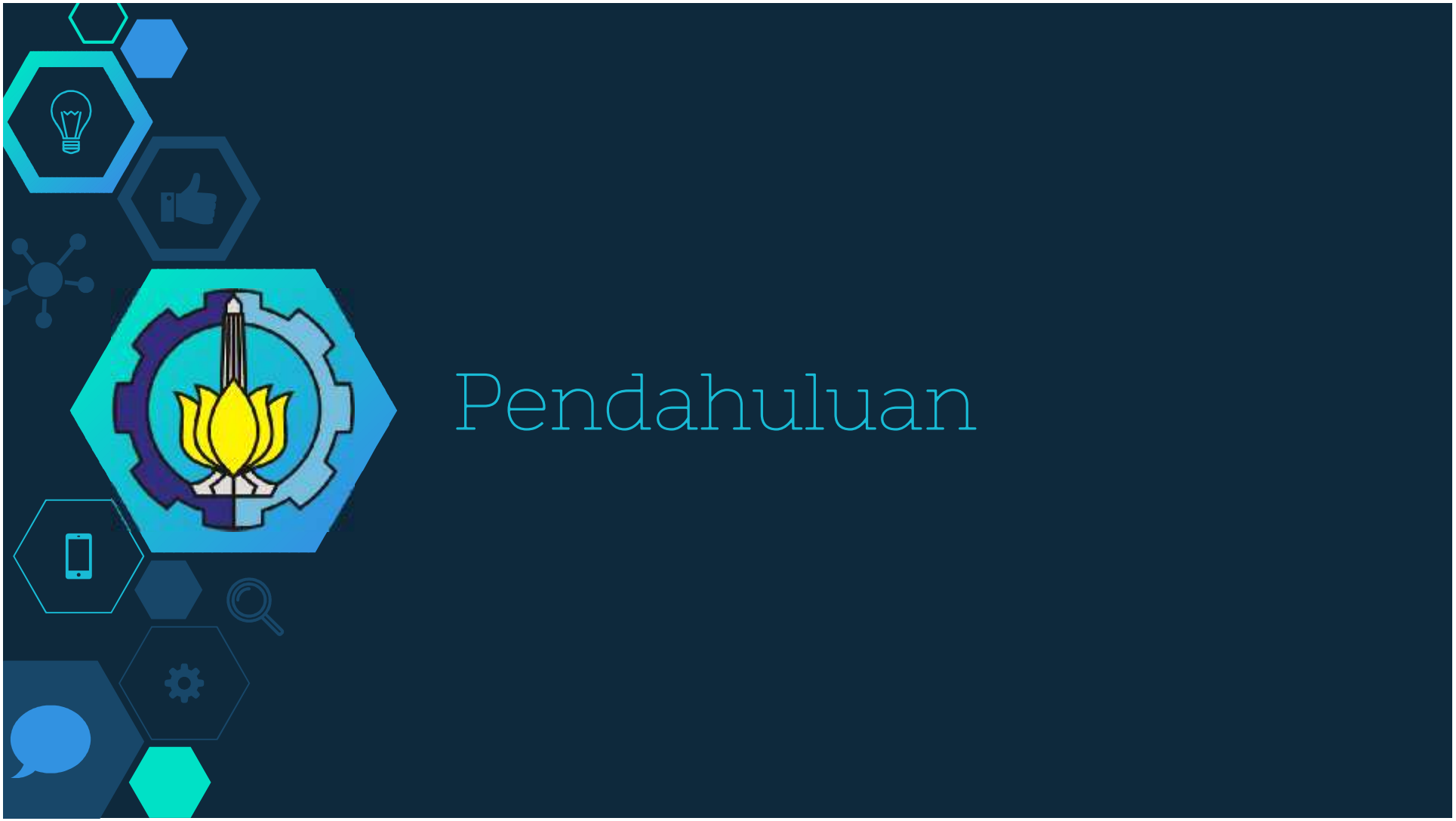
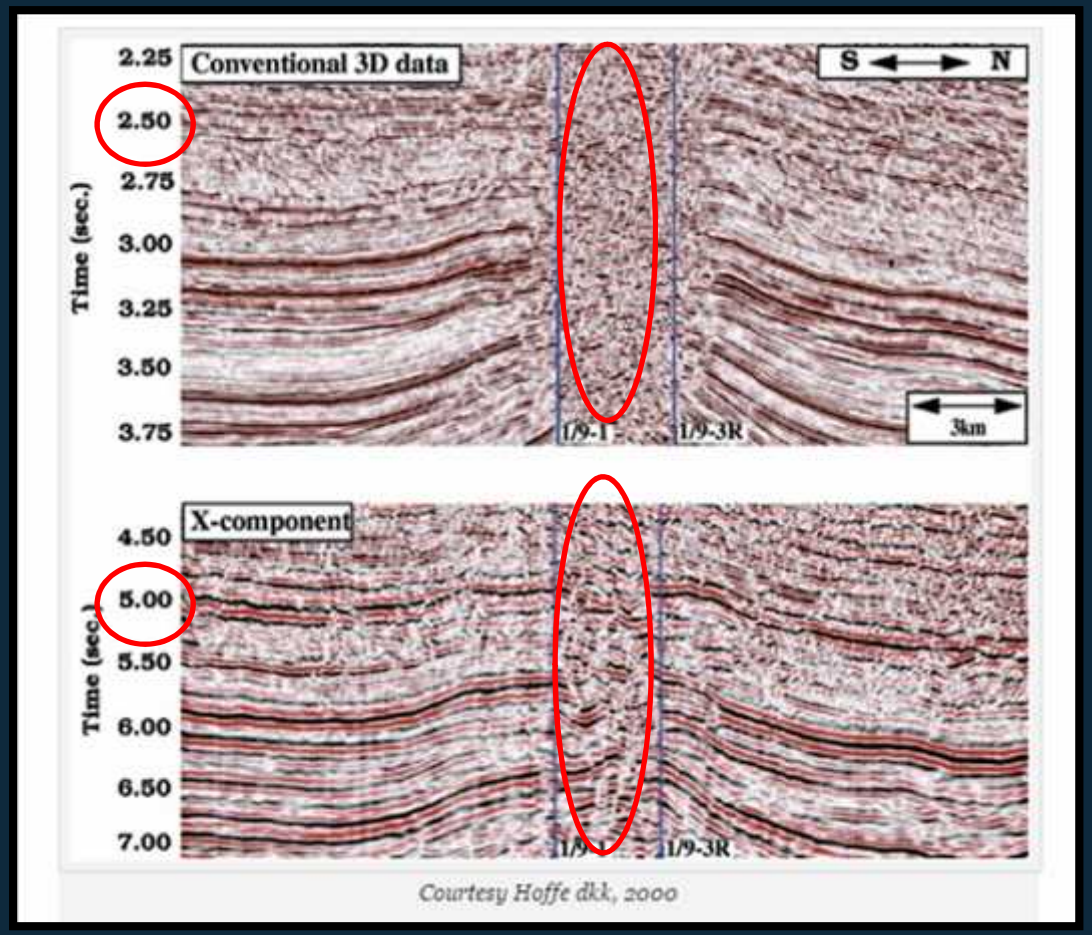
Firman Syaifuddin, S. Si, MT.


Pendahuluan

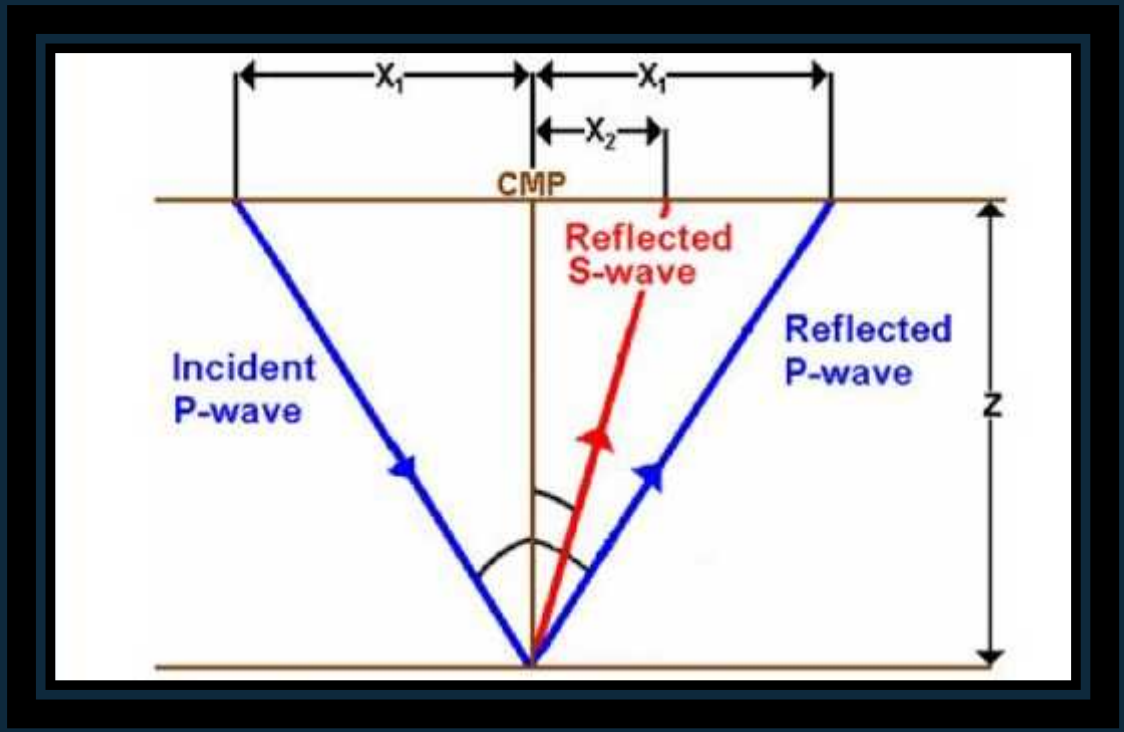
Analisis lithologi umumnya menggunakan inversi seismik gelombang P

Kondisi bawah permukaan kompleks (geologi kompleks) -> interpretasi kurang baik

Menggunakan gelombang P dan S -> mendapatkan interpretasi yang baik



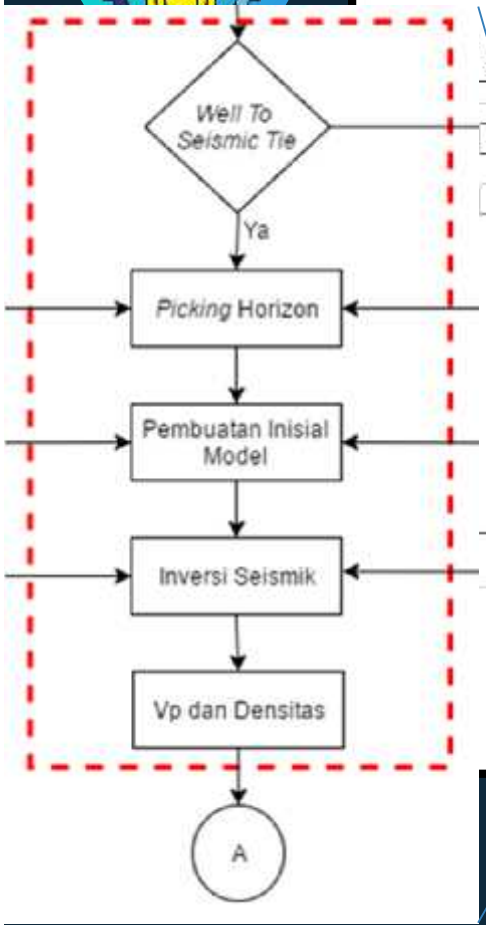
Courtesy Hoffe dkk, 2000

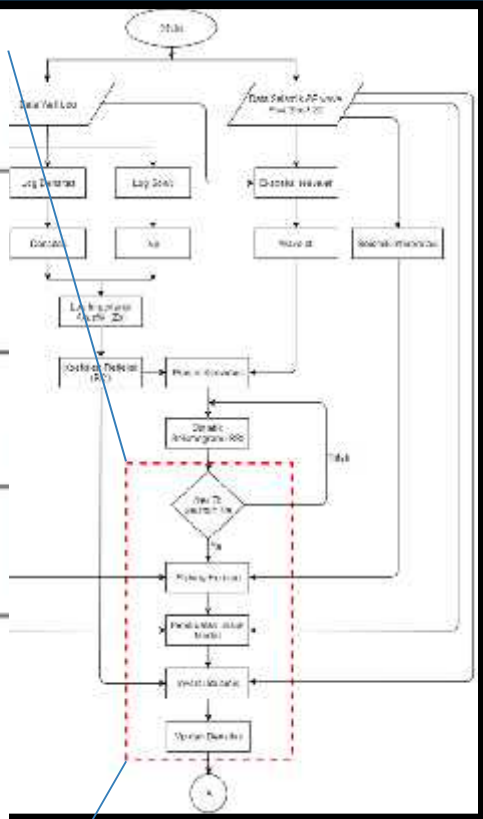

X1
X1
X2
CMP
Reflected
S-wave
Incident
P-wave
Reflected
P-wave
Z

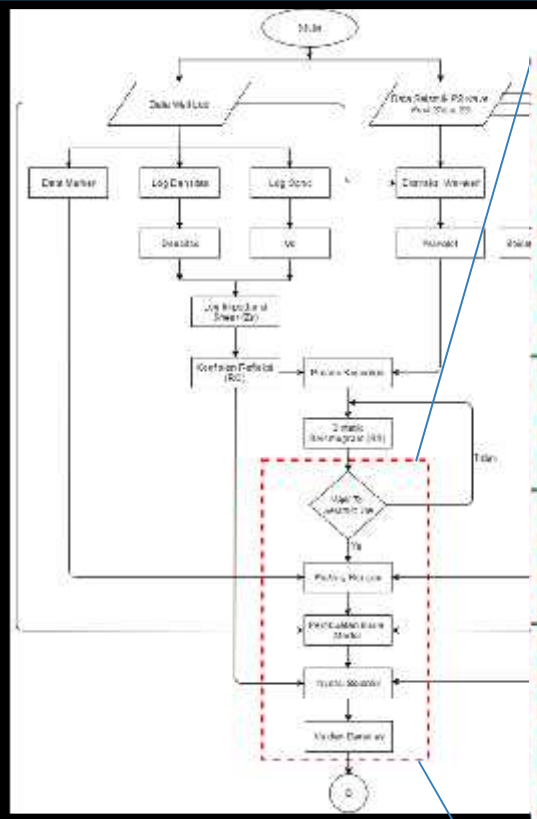

Metodologi

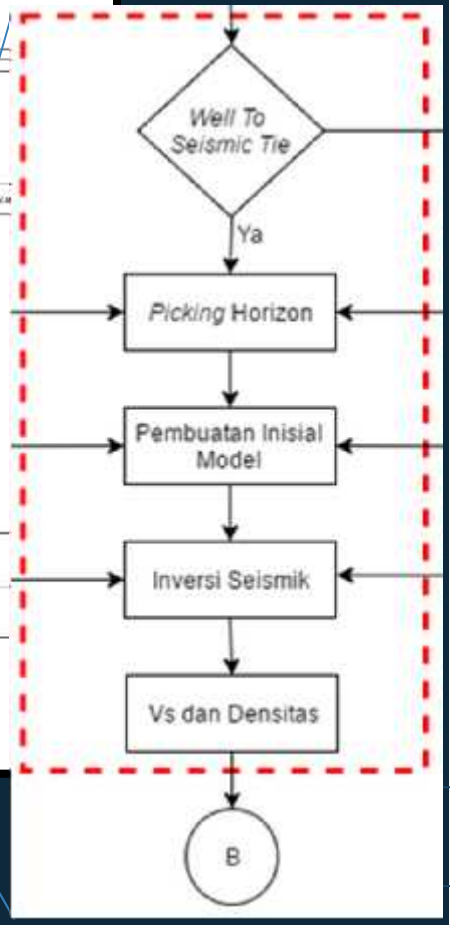
PP

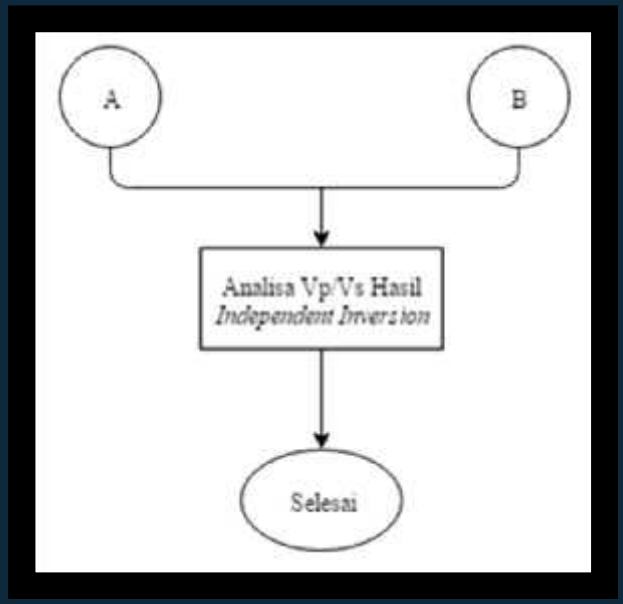
PS


Well To Seismic Tie
Ya
Picking Horizon
Pembuatan Inisial Model
Inversi Seismik
Vp dan Densitas
A



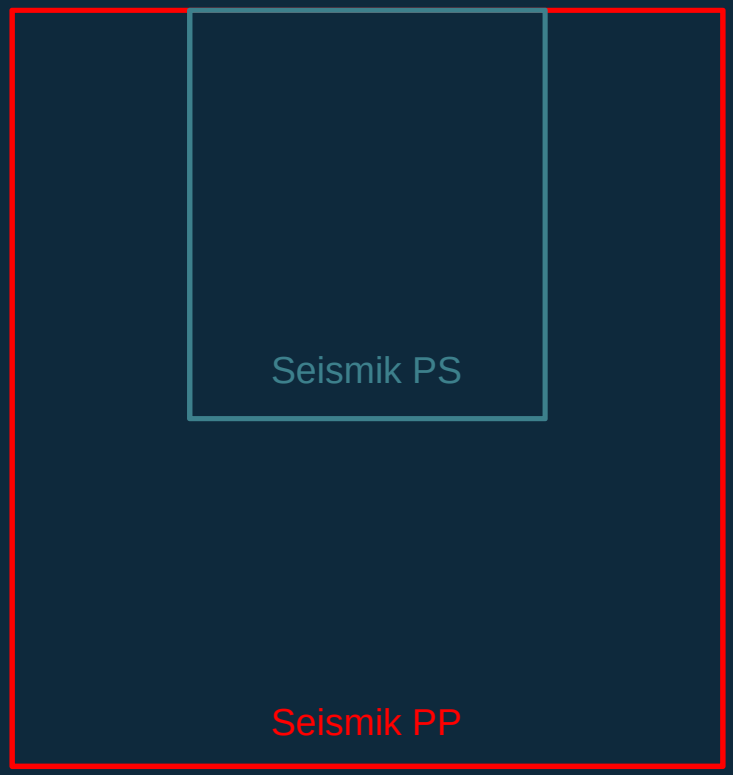



Well To Seismic Tie
Ya
Picking Horizon
Pembuatan Inisial Model
Inversi Seismik
Vs dan Densitas
B

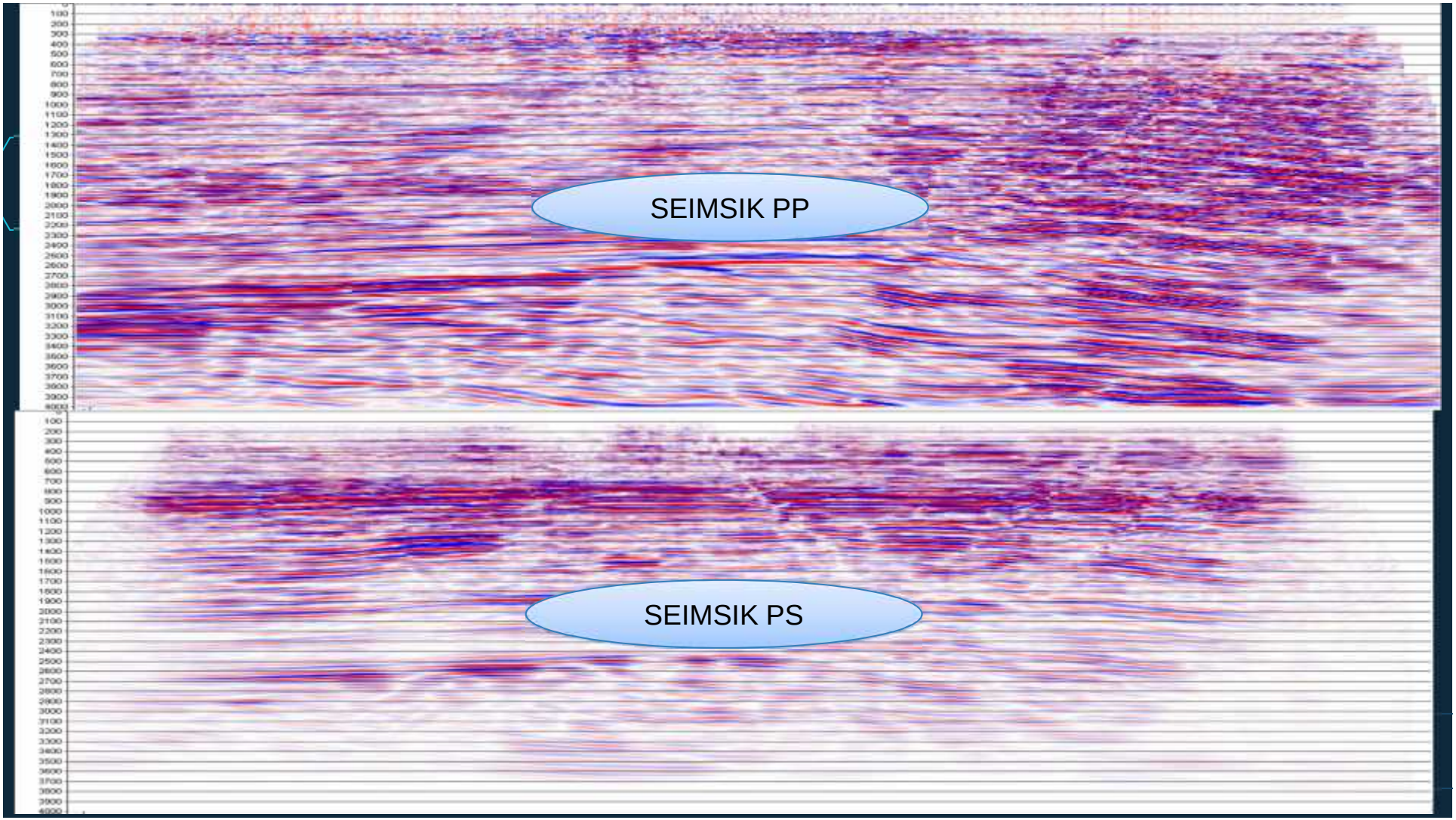

A
B
Analisa Vp/Vs Hasil
Independent Inversion
Selesai

Hasil dan Pembahasan

Conditioning Data Seismik

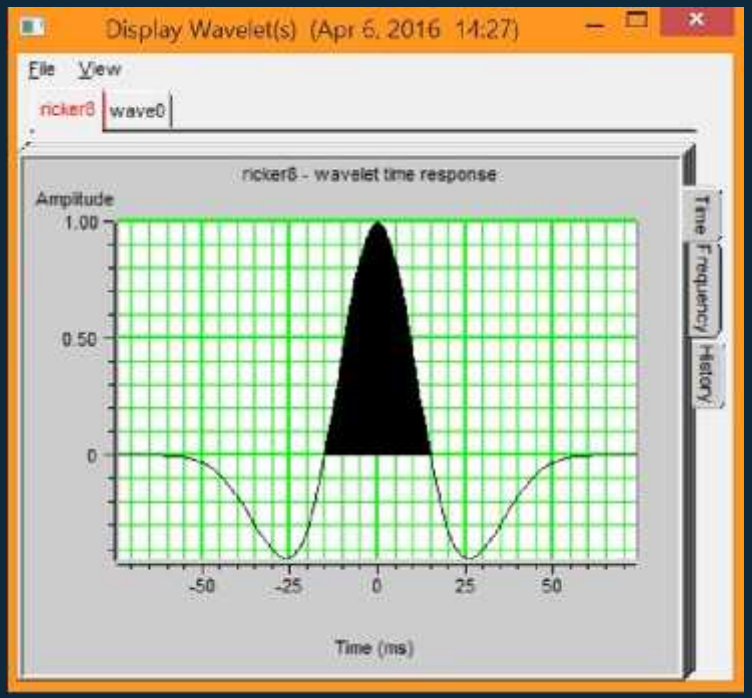


	PP	PS
Trace	930	851
Position x	52938-64550	53425-64050

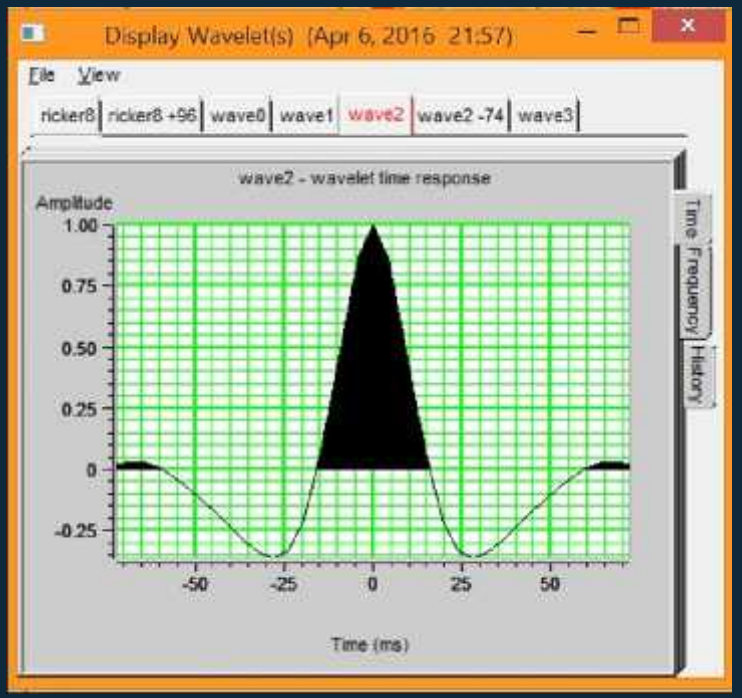

SEIMSIK PP
SEIMSIK PS

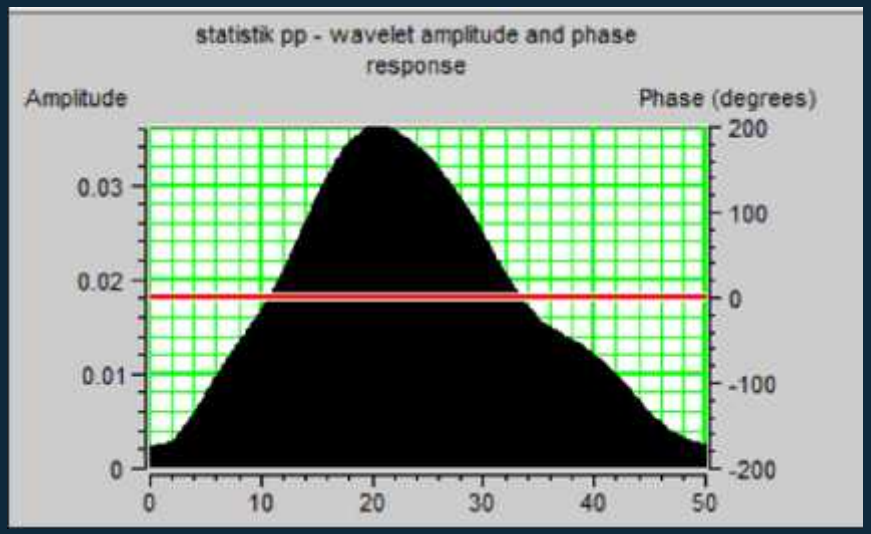
Ekstraksi Wavelet

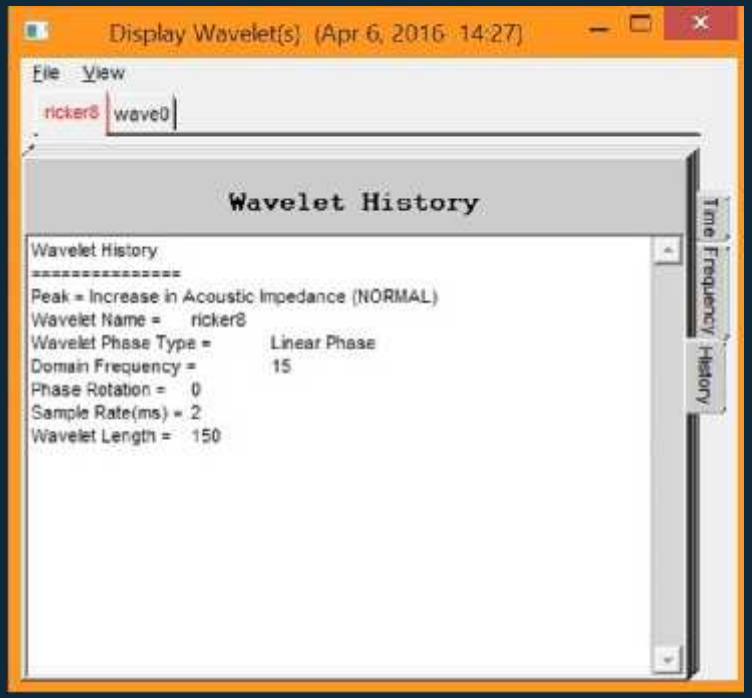
PP

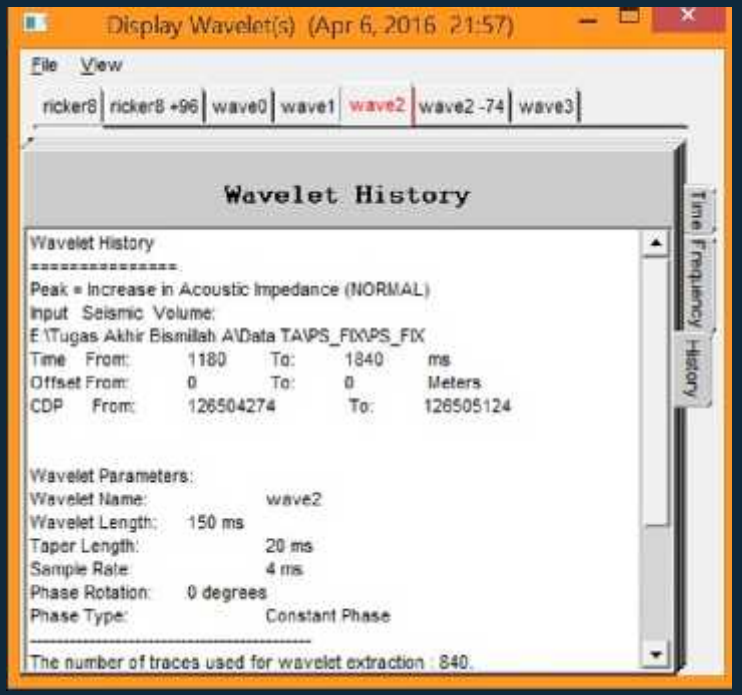


PS

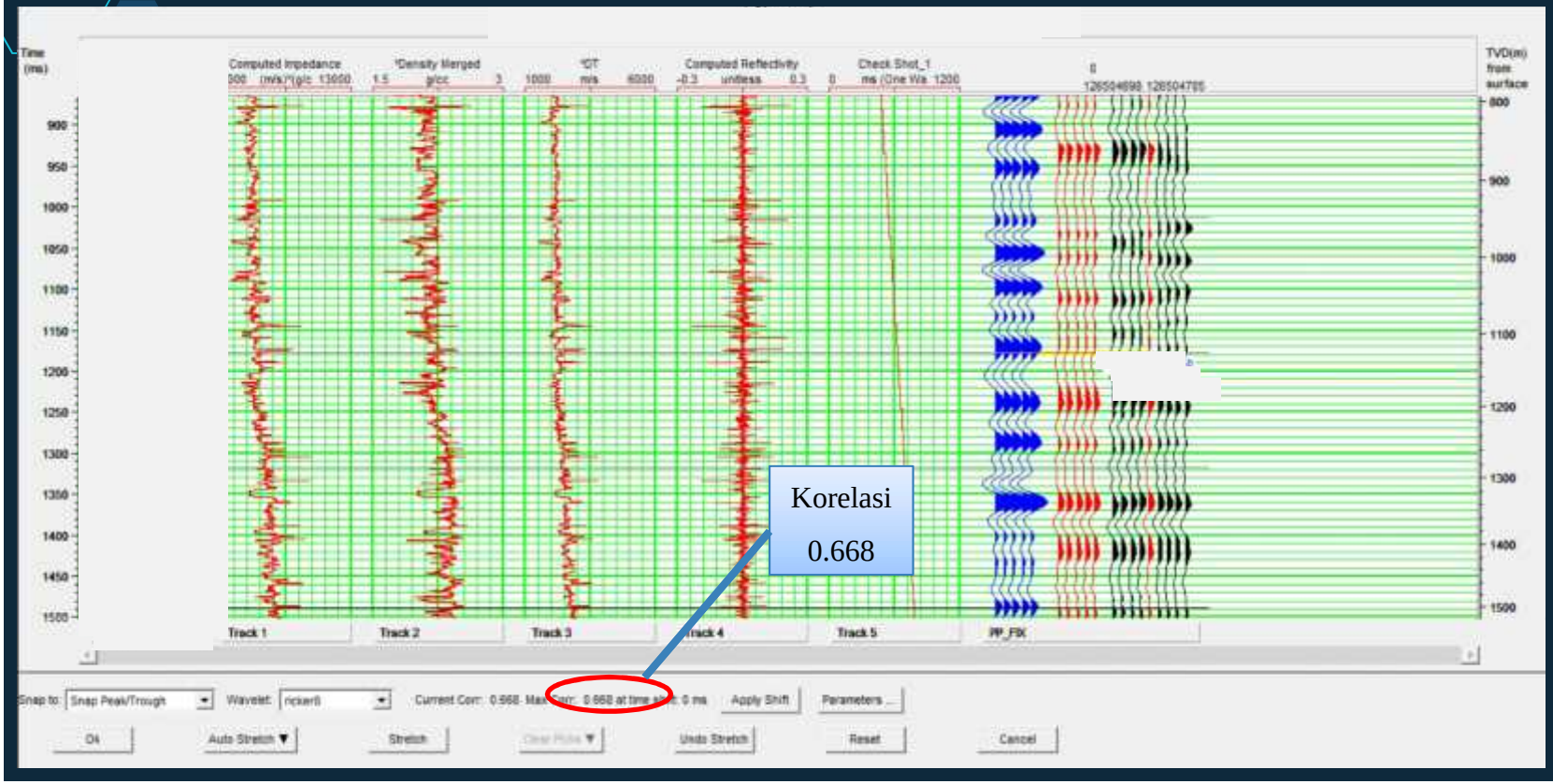



statistik pp - wavelet amplitude and phase response
Amplitude
Phase (degrees)
0.03
0.02
0.01
0
200
100
0
-100
-200
0
10
20
30
40
50


Display Wavelet(s) (Apr 6, 2016 14:27)
File View
ricker8
wave0
Wavelet History
Wavelet History
==========
Peak = Increase in Acoustic Impedance (NORMAL)
Wavelet Name = ricker8
Wavelet Phase Type = Linear Phase
Domain Frequency = 15
Phase Rotation = 0
Sample Rate(ms) = 2
Wavelet Length = 150
Time
Frequency
History

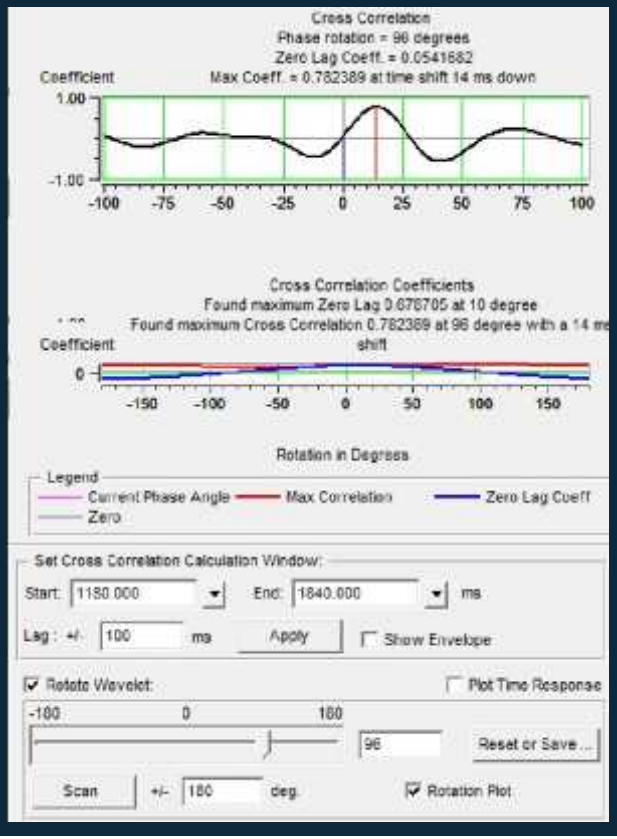

Display Wavelet(s) (Apr 6, 2016 21:57)
File View
ricker8
ricker8 +96
wave0
wave1
wave2
wave2 -74
wave3
Wavelet History
Wavelet History
==========
Peak = Increase in Acoustic Impedance (NORMAL)
Input Seismic Volume:
E:\Tugas Akhir Bismillah A\Data TA\PS_FIX\PS_FIX
Time From: 1180 To: 1840 ms
Offset From: 0 To: 0 Meters
CDP From: 126504274 To: 126505124
Wavelet Parameters:
Wavelet Name: wave2
Wavelet Length: 150 ms
Taper Length: 20 ms
Sample Rate: 4 ms
Phase Rotation: 0 degrees
Phase Type: Constant Phase
The number of traces used for wavelet extraction : 840.
Time
Frequency
History

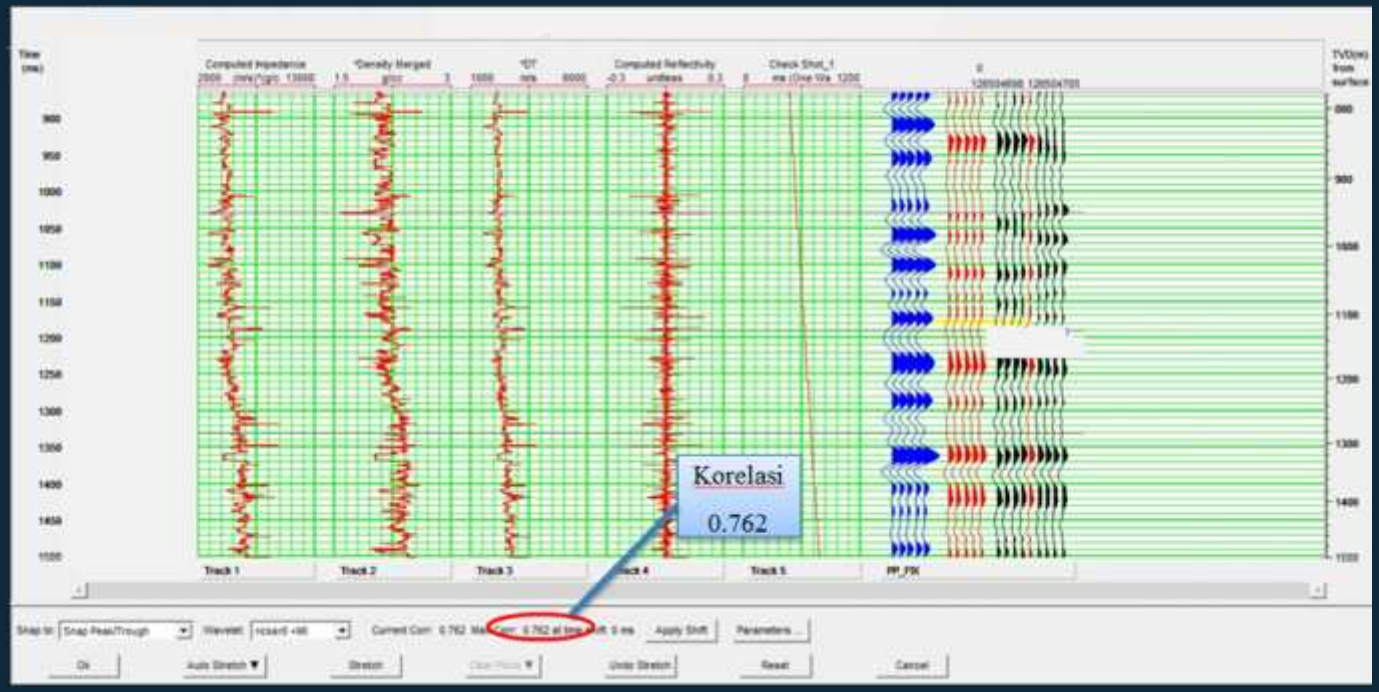
Well to Seismic Tie

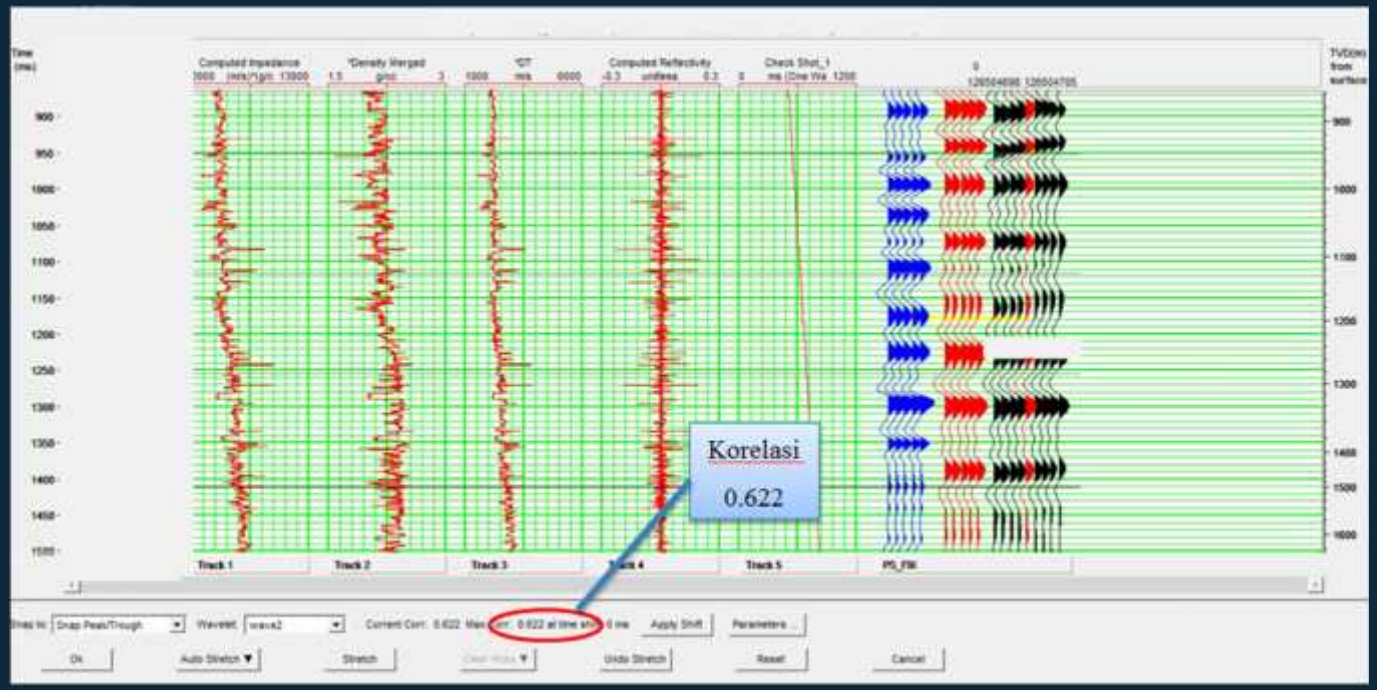


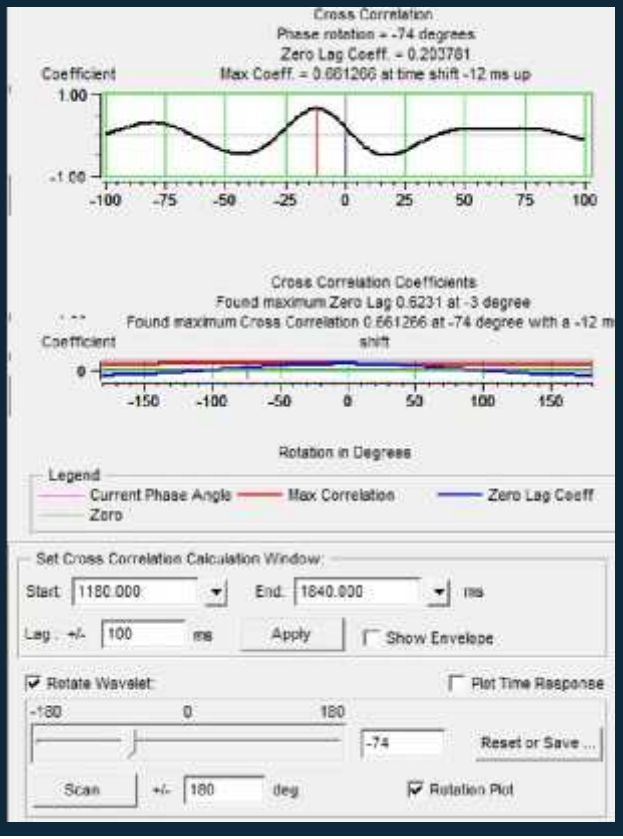
PP

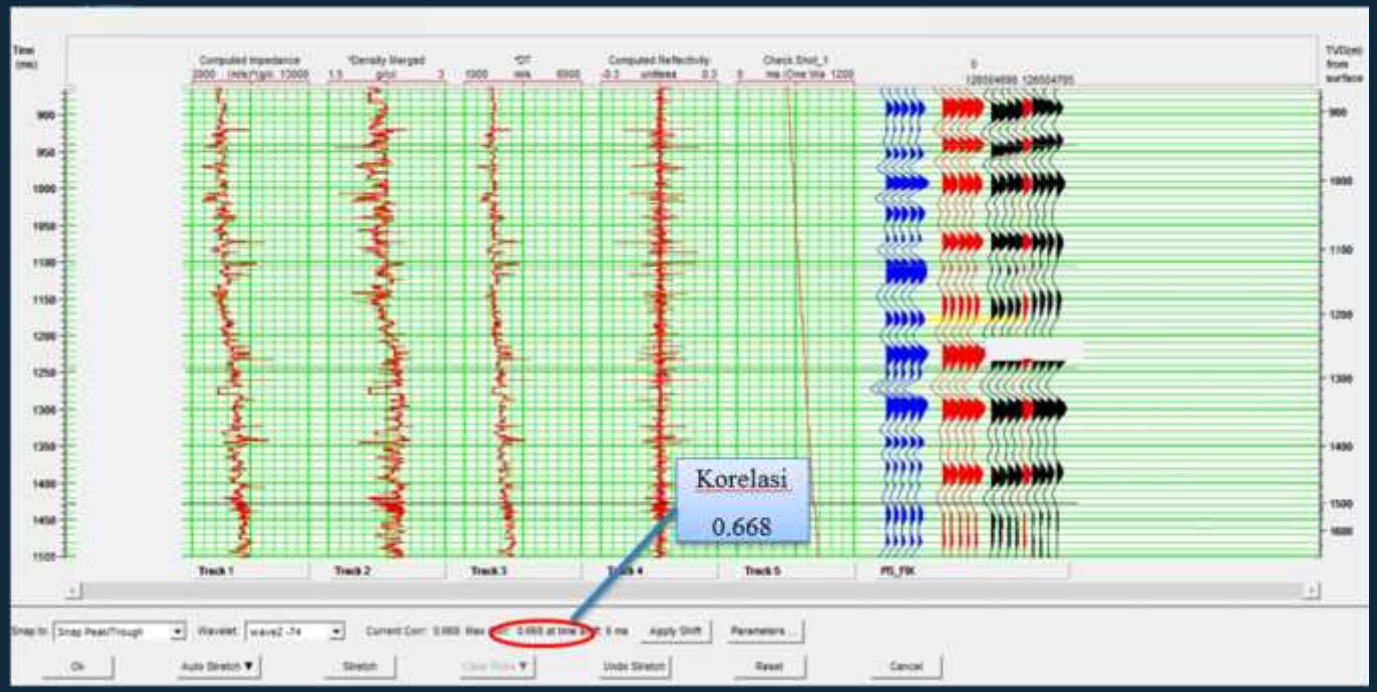
PS


Cross Correlation
Phase rotation = 96 degrees
Zero Lag Coeff. = 0.0541682
Max Coeff. = 0.782389 at time shift 14 ms down
Coefficient
1.00
-1.00
-100 -75 -50 -25 0 25 50 75 100
Cross Correlation Coefficients
Found maximum Zero Lag 0.676705 at 10 degree
Found maximum Cross Correlation 0.782389 at 96 degree with a 14 ms shift
Coefficient
0
-150 -100 -50 0 50 100 150
Rotation in Degrees
Legend
Current Phase Angle
Max Correlation
Zero Lag Coeff
Zero
Set Cross Correlation Calculation Window:
Start: 1180.000
End: 1840.000
ms
Lag : +/- 100 ms
Apply
Show Envelope
Rotate Wavelet:
Plot Time Response
-180 0 180
96
Reset or Save...
Scan
+/- 180 deg.
Rotation Plot


Korelasi
0.762

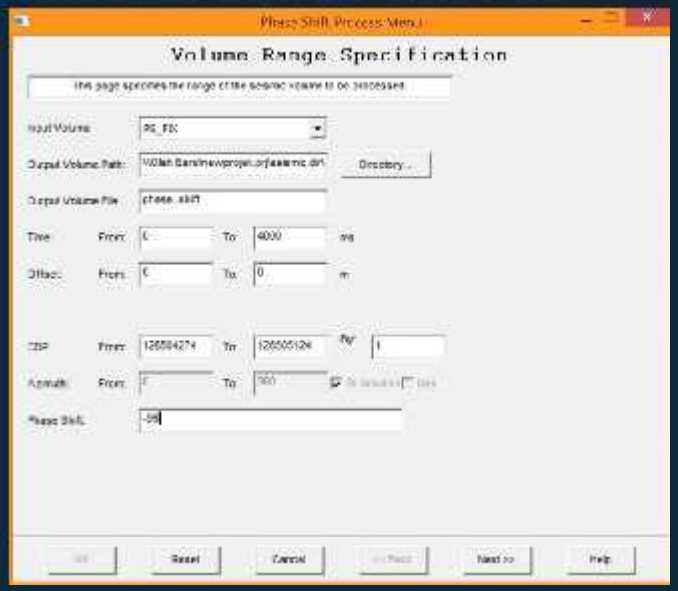

Korelasi
0.622


Cross Correlation
Phase rotation = -74 degrees
Zero Lag Coeff. = 0.203781
Max Coeff. = 0.661266 at time shift -12 ms up
Coefficient
1.00
-1.00
-100 -75 -50 -25 0 25 50 75 100
Cross Correlation Coefficients
Found maximum Zero Lag 0.6231 at -3 degree
Found maximum Cross Correlation 0.661266 at -74 degree with a -12 m
shift
Coefficient
0
-150 -100 -50 0 50 100 150
Rotation in Degrees
Legend
Current Phase Angle
Max Correlation
Zero Lag Coeff
Zero
Set Cross Correlation Calculation Window:
Start 1180.000
End 1840.000
ms
Lag +/- 100
ms
Apply
Show Envelope
Rotate Wavelet:
Plot Time Response
-180 0 180
-74
Reset or Save ...
Scan
+/- 180
deg
Rotation Plot

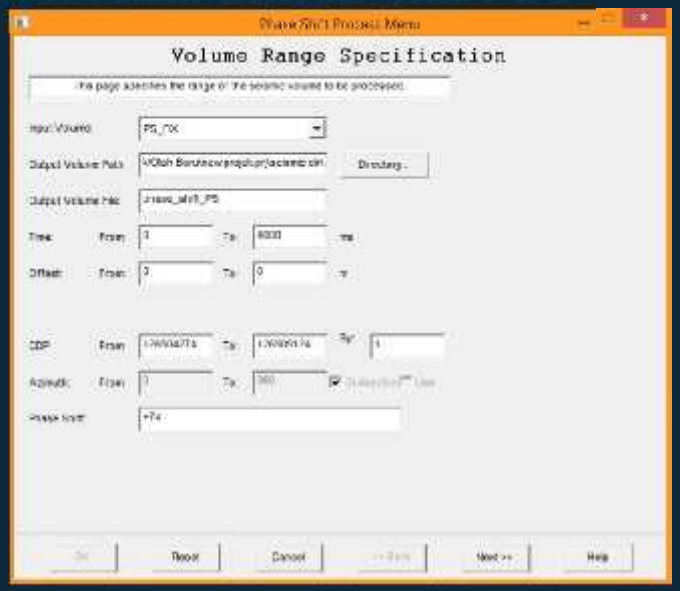

Korelasi
0.668

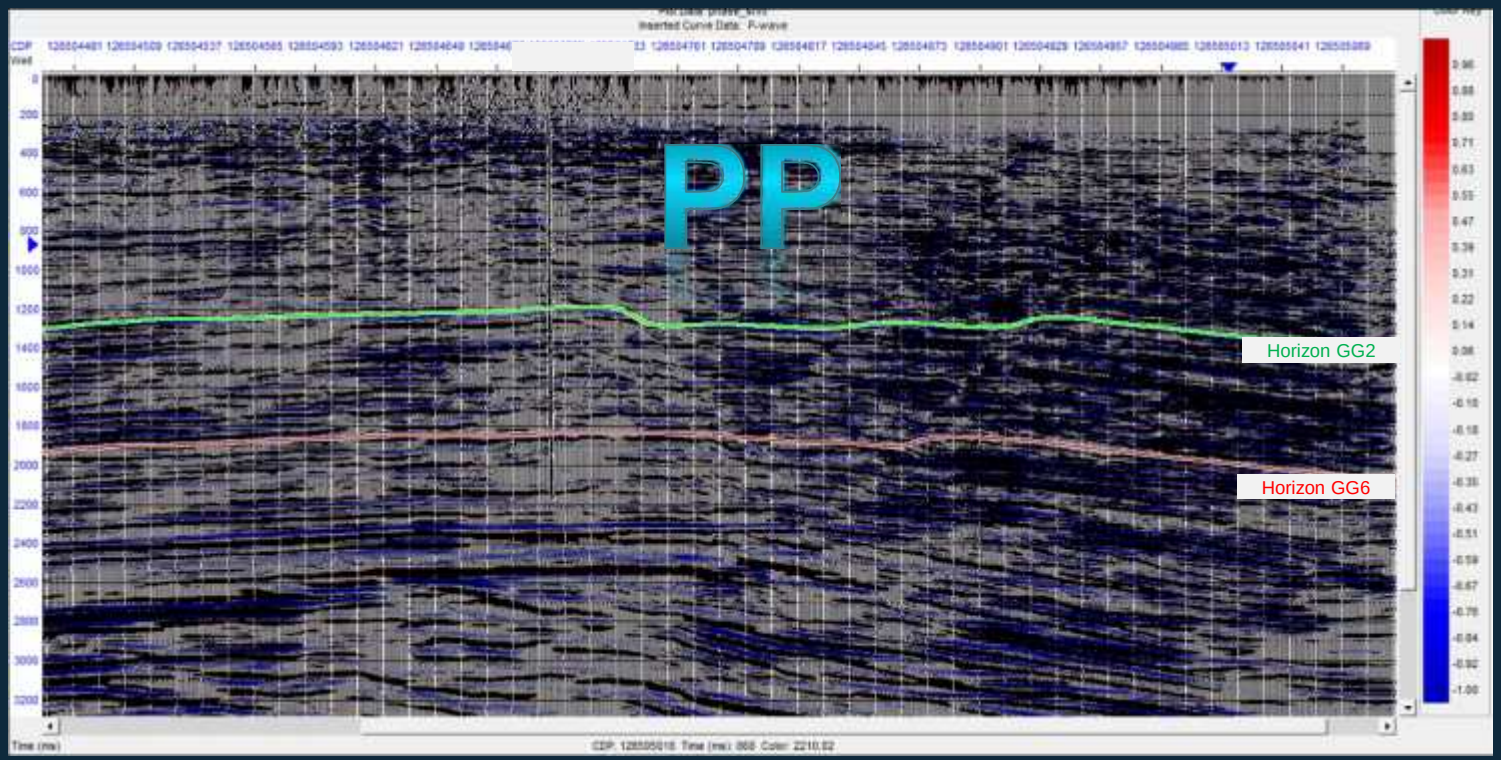
Picking Horizon

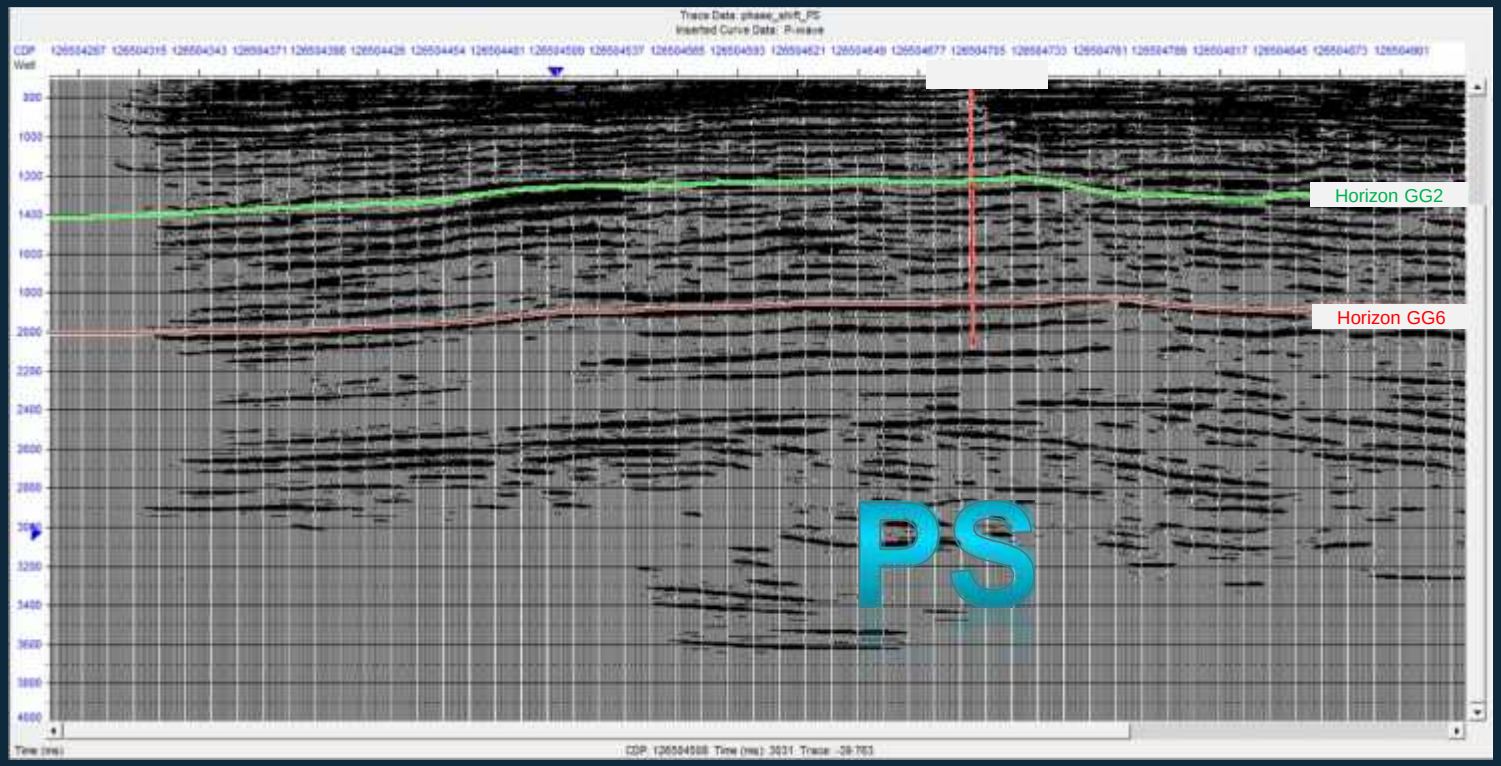
SEISMIK PHASE SHIFT PP



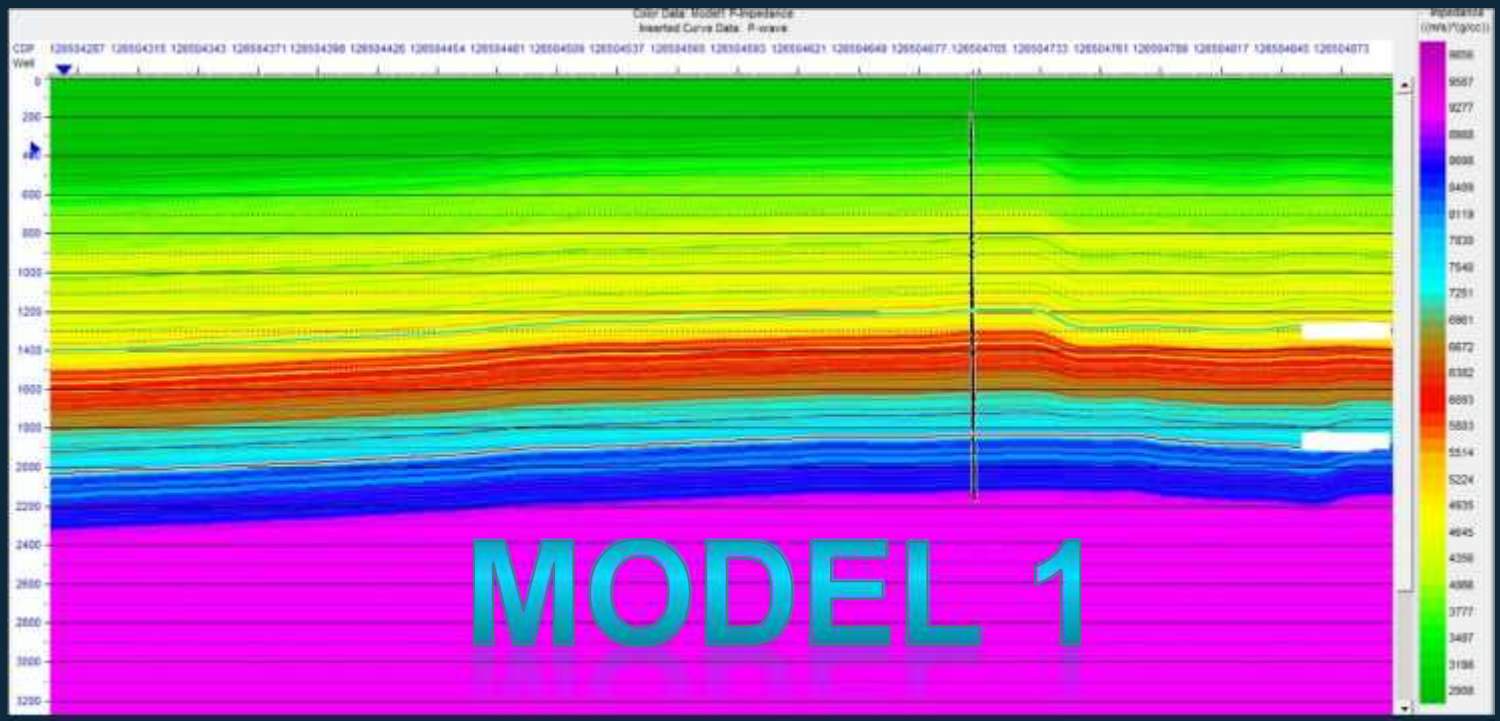
SEISMIK PHASE SHIFT PS

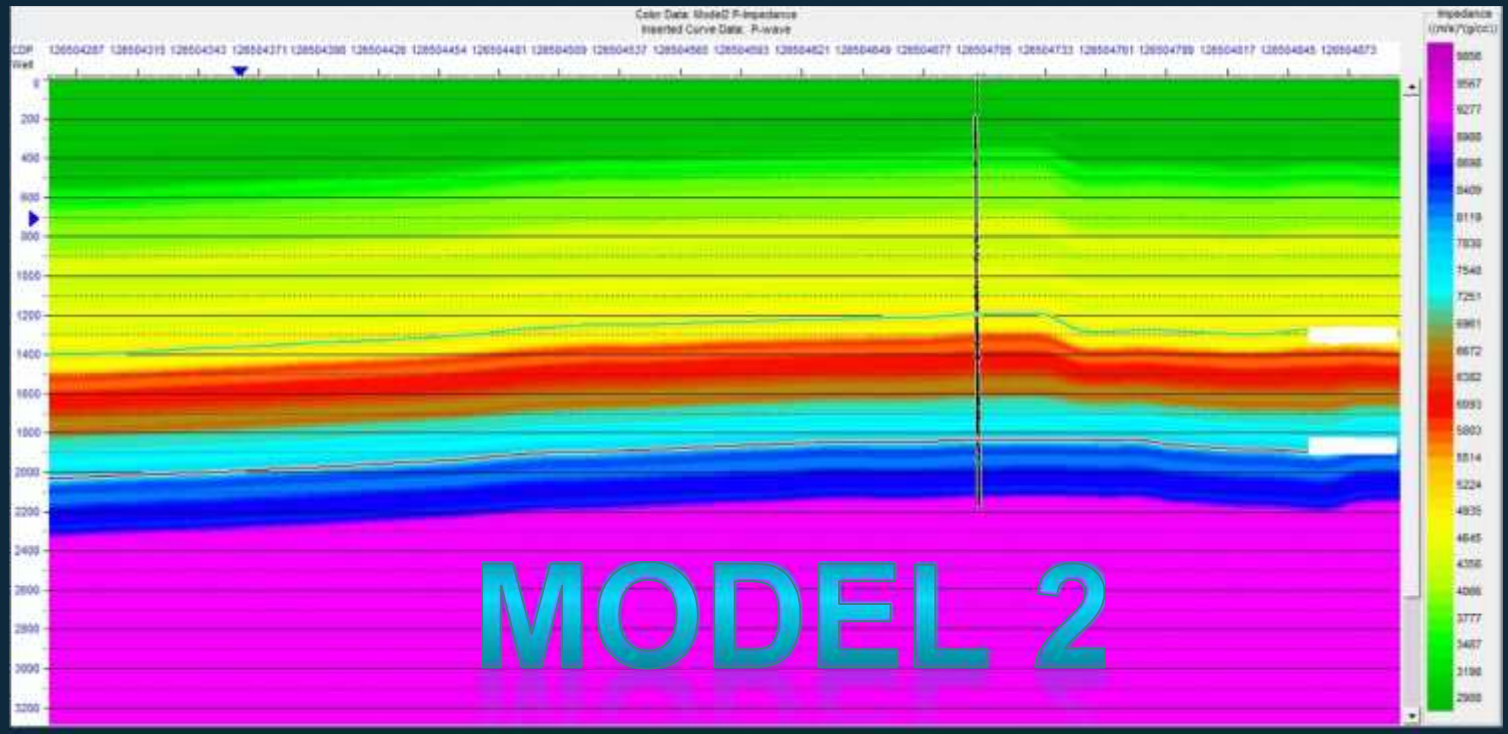


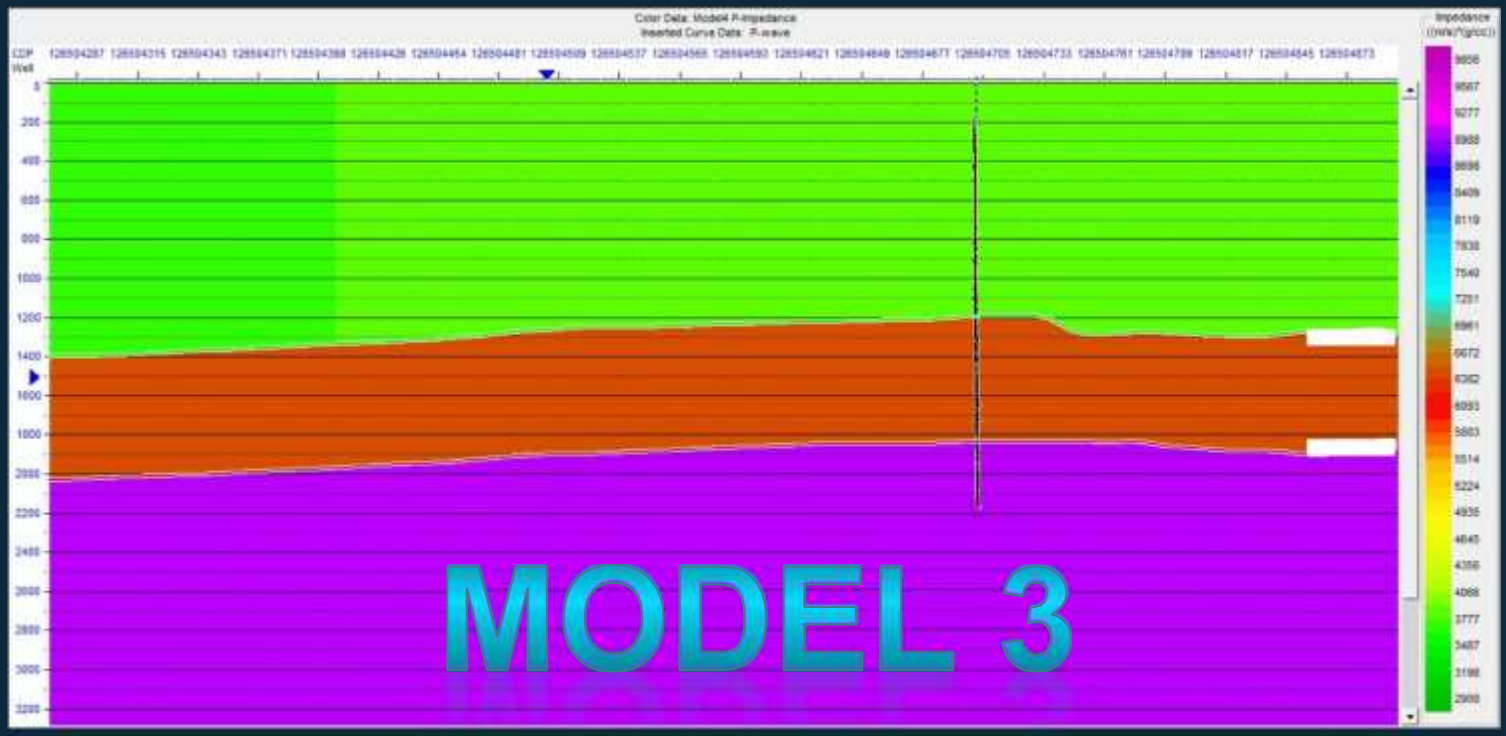

PP
Horizon GG2
Horizon GG6

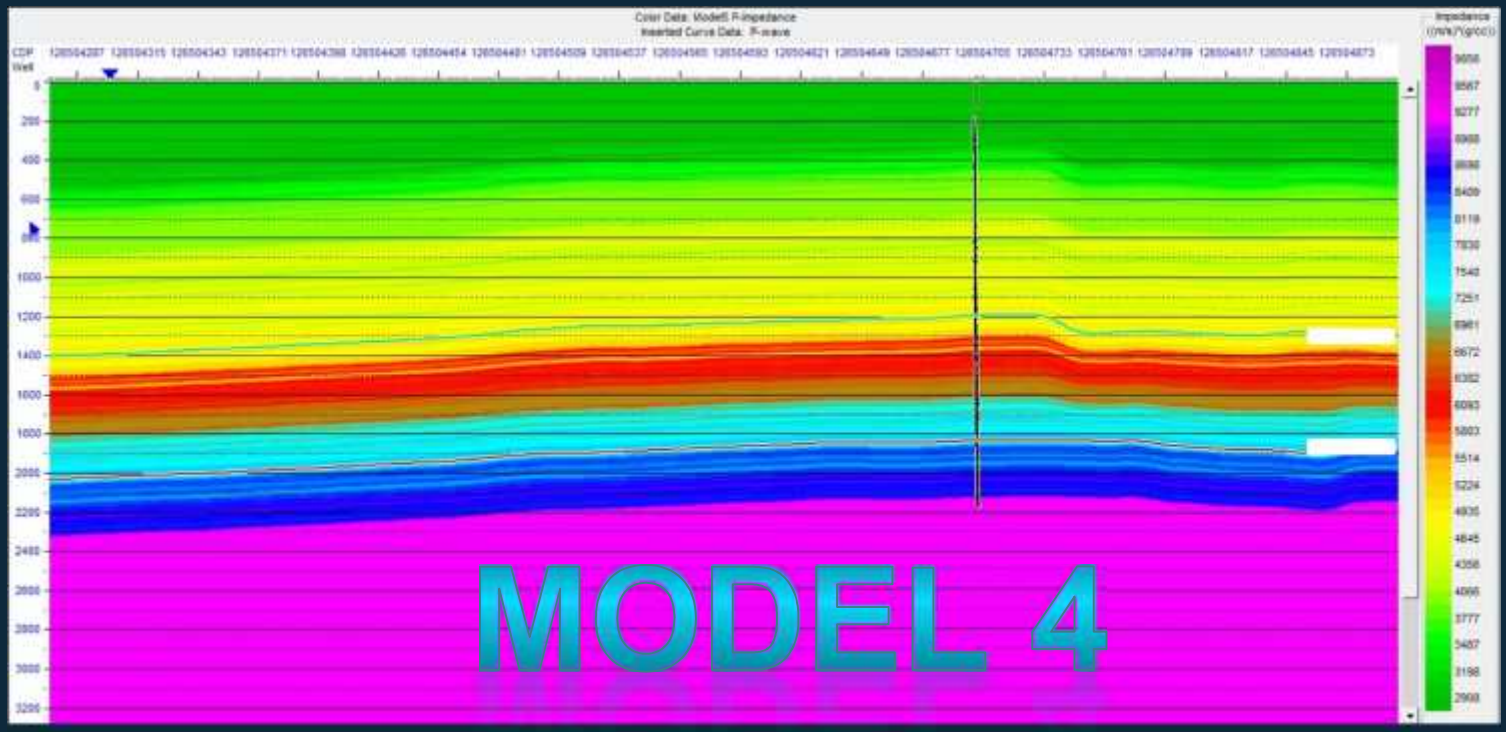

Horizon GG2
Horizon GG6
PS

Model Inisial PP

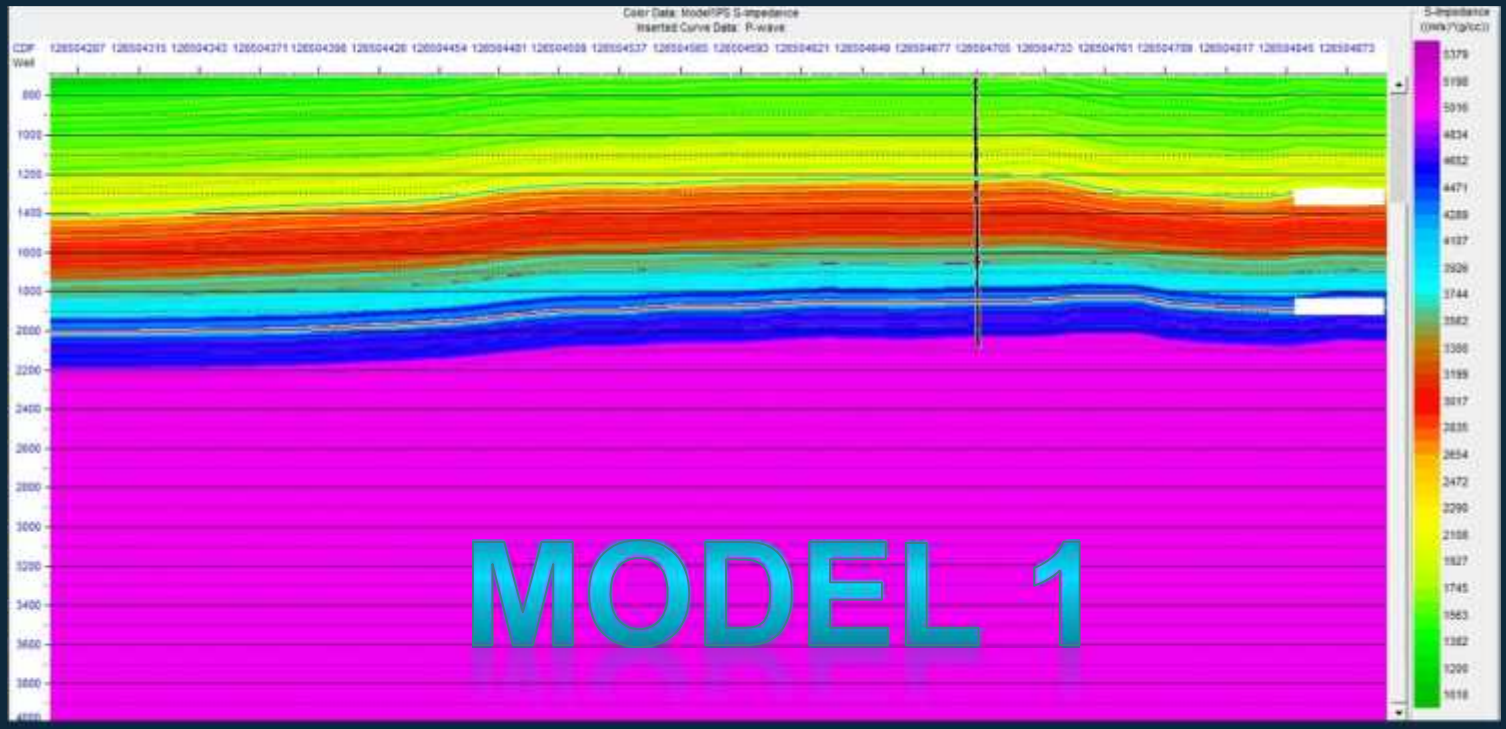


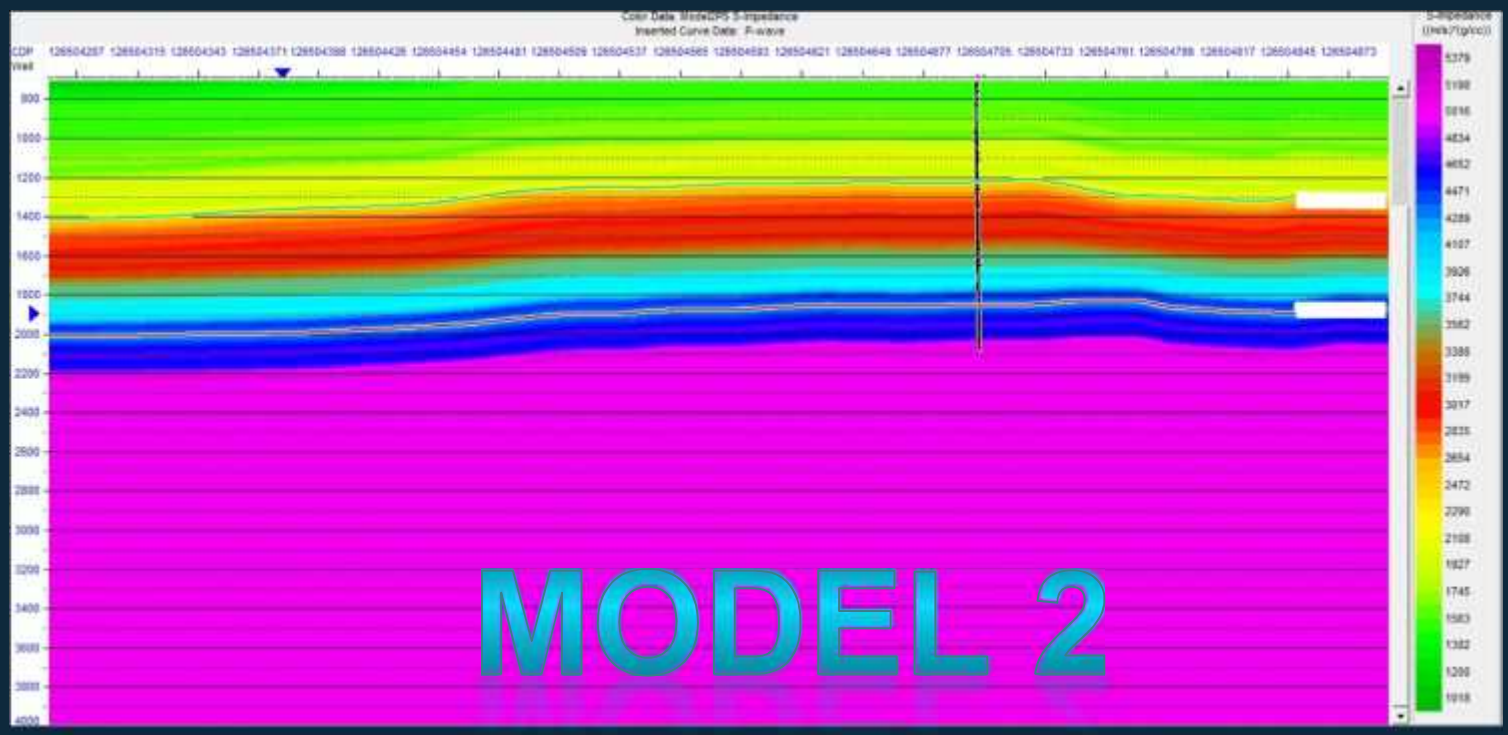

MODEL 2


MODEL 3

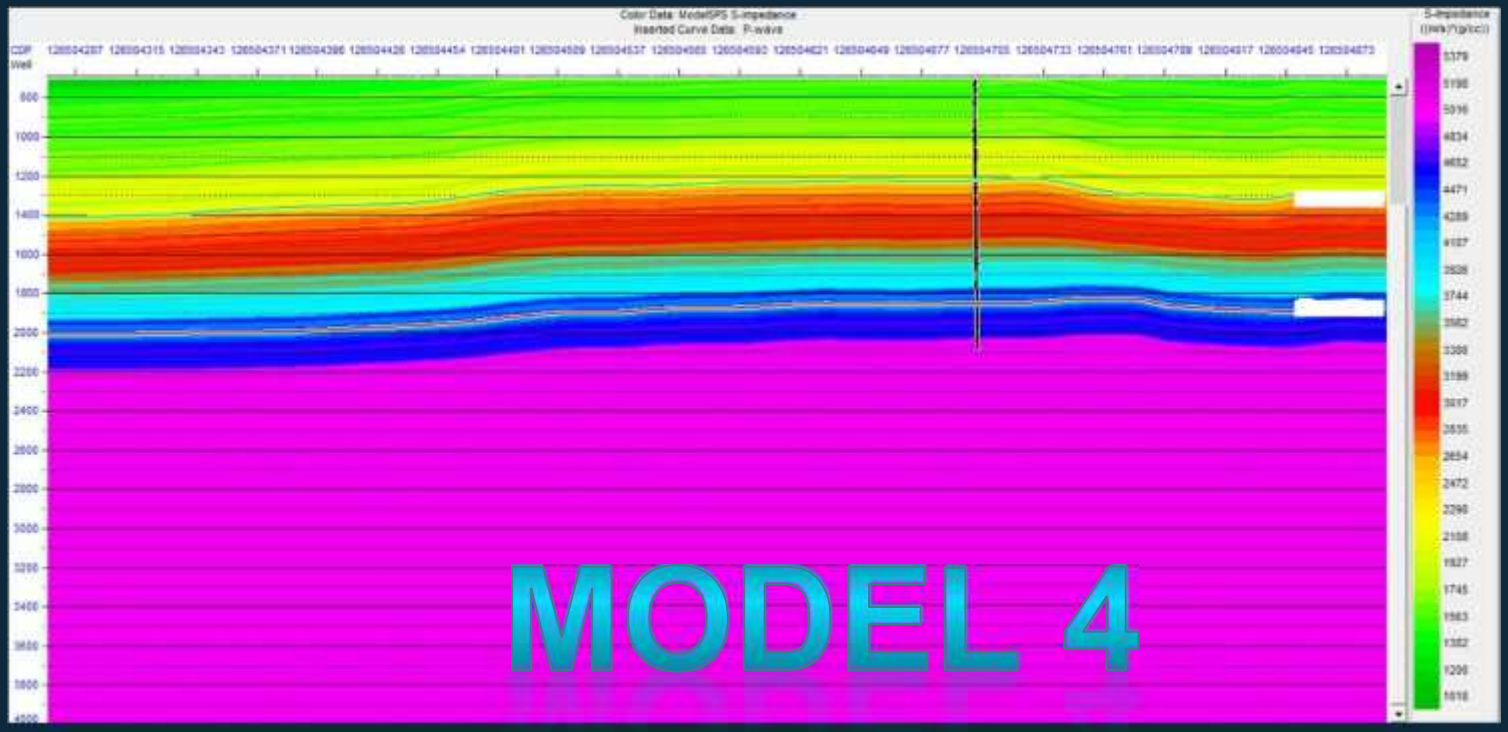

MODEL 4

Model Inisial PS



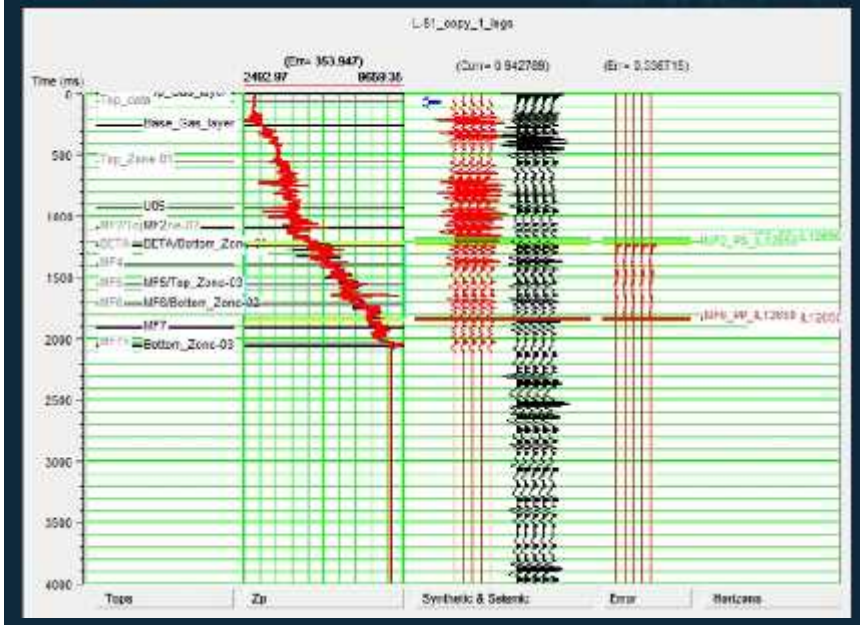

MODEL 2


MODEL 3

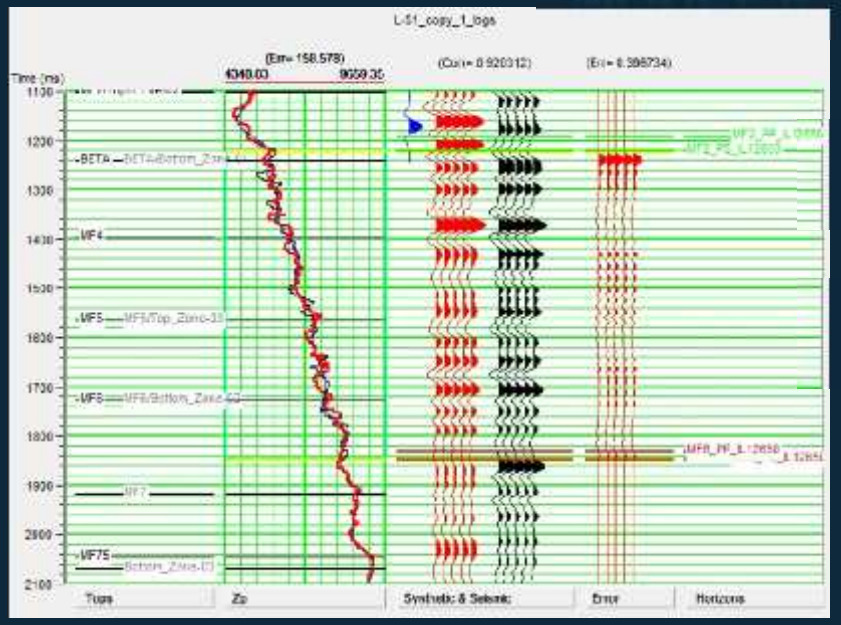

MODEL 4

Quality Control Inisial Model

MODEL 1

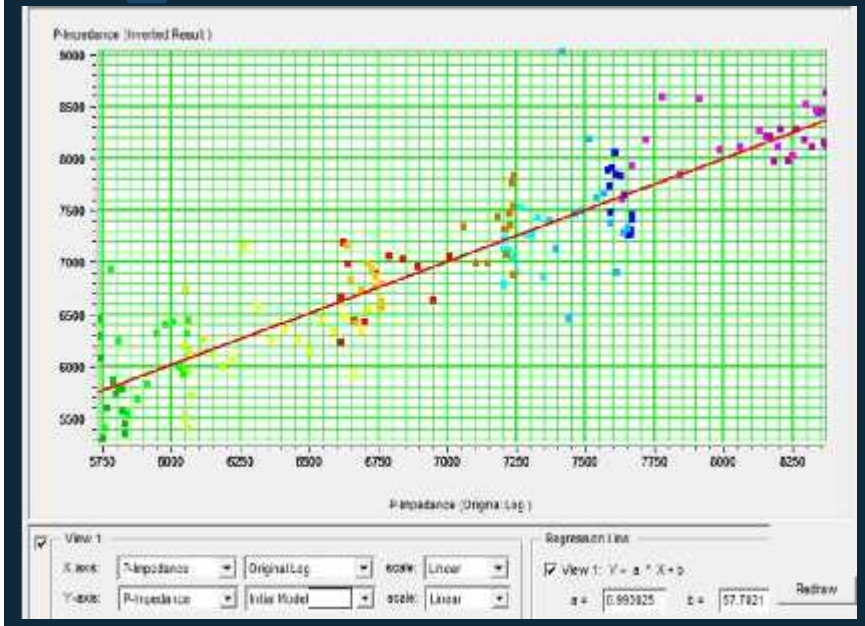


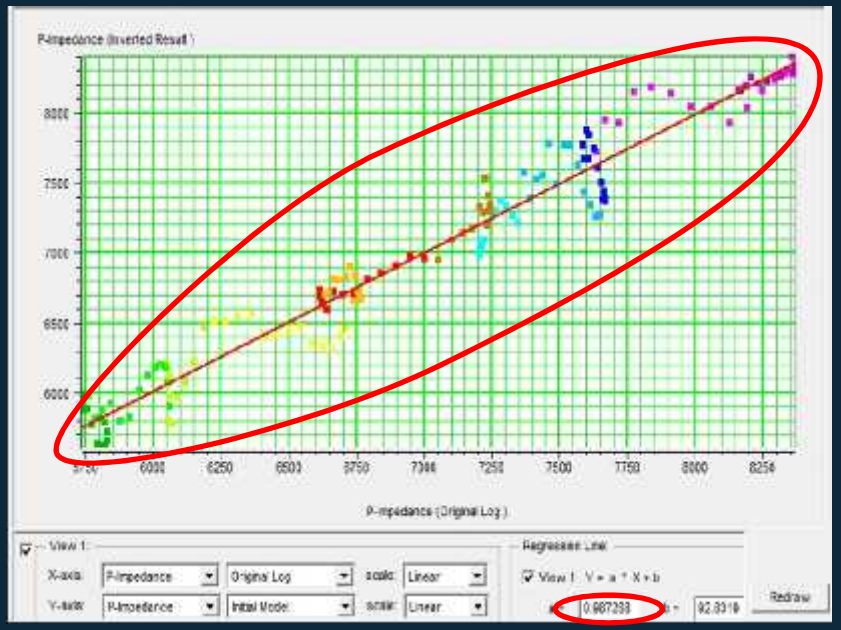
MODEL 4



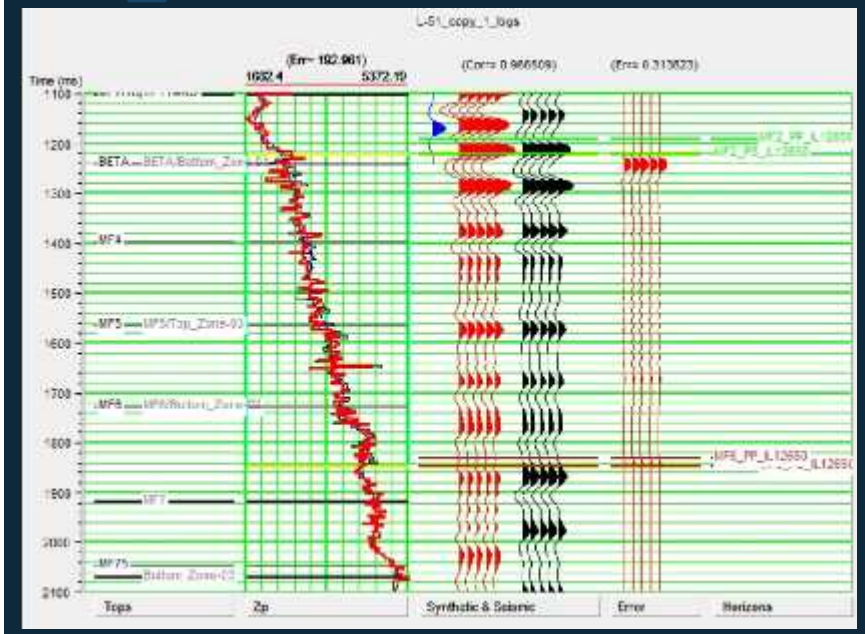
PP

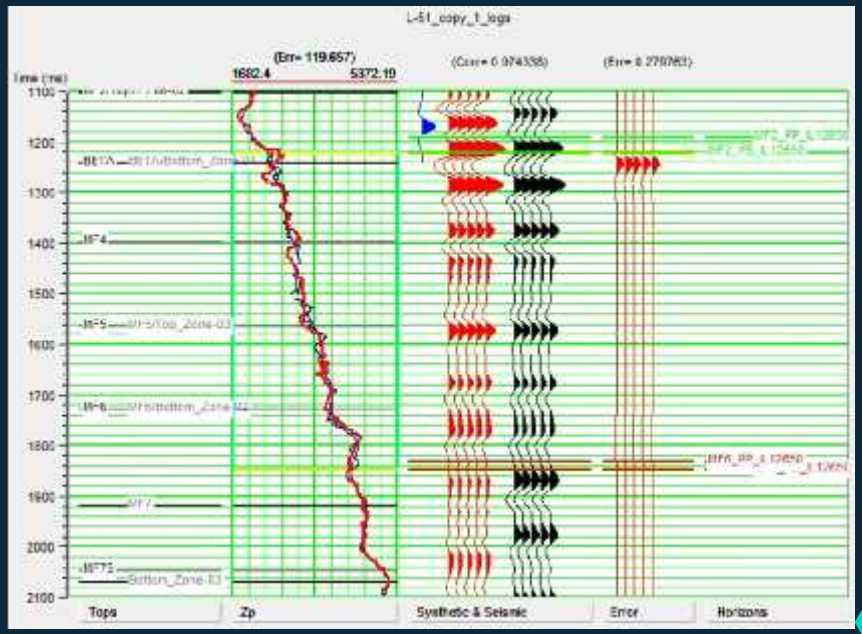
PS

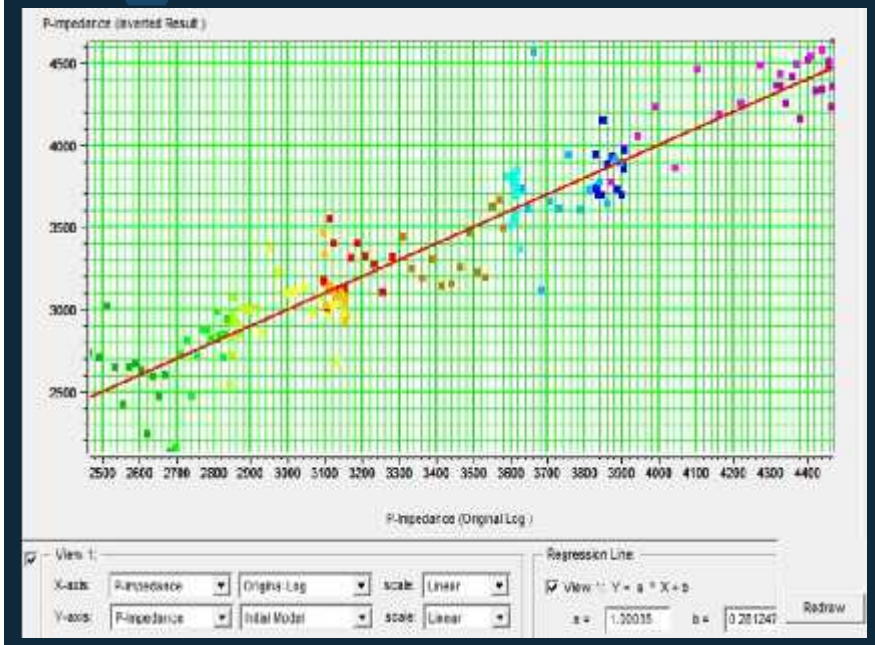


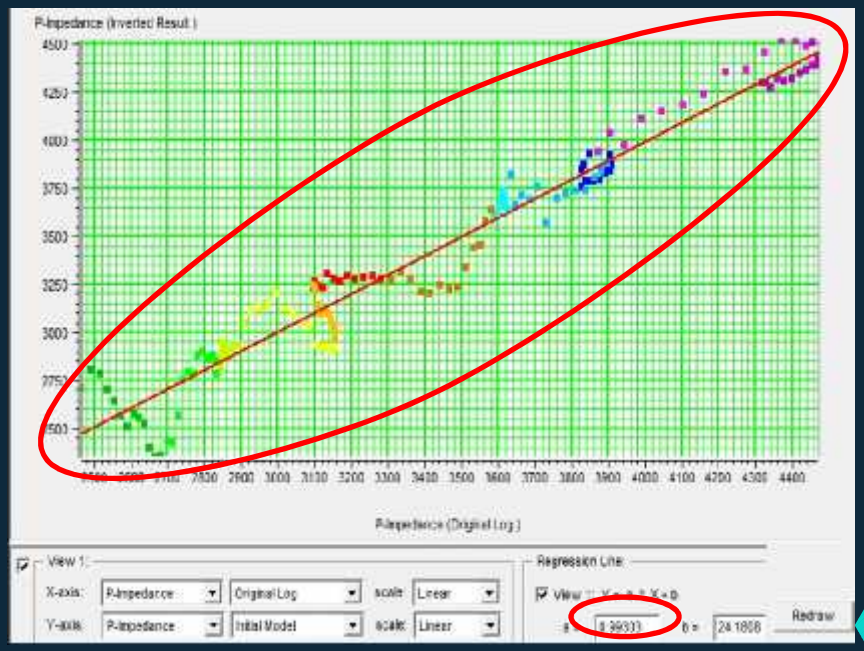


Koefisien Regresi PP = 0.987


L-51_copy_1_logs
(Err= 192.961)
1682.4
5372.19
Time (ms)
BETA
MF4
MF5
MF6
MF7
MF7S
Tops
Zp
Synthetic & Seismic
Error
Horizons

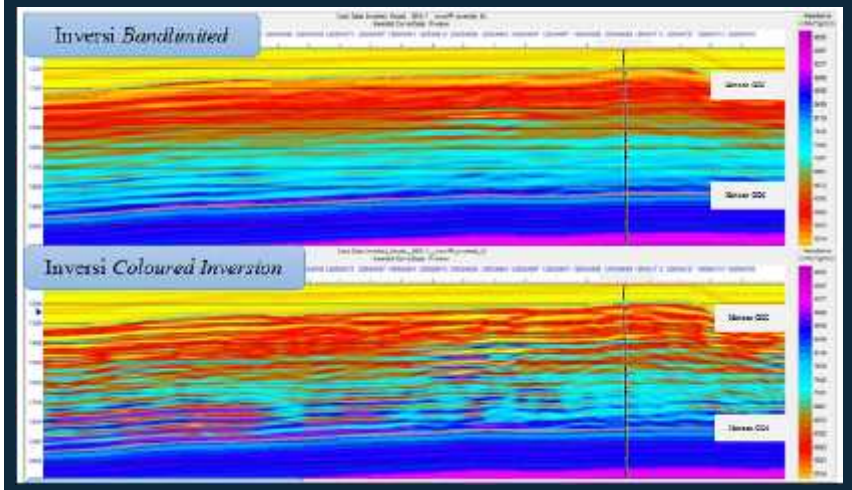

L-51_copy_1_logs
(Err= 119.657)
1682.4
5372.19
Time (ms)
BETA
MF4
MF7
MF7S
Tops
Zp
Synthetic & Seismic
Error
Horizons

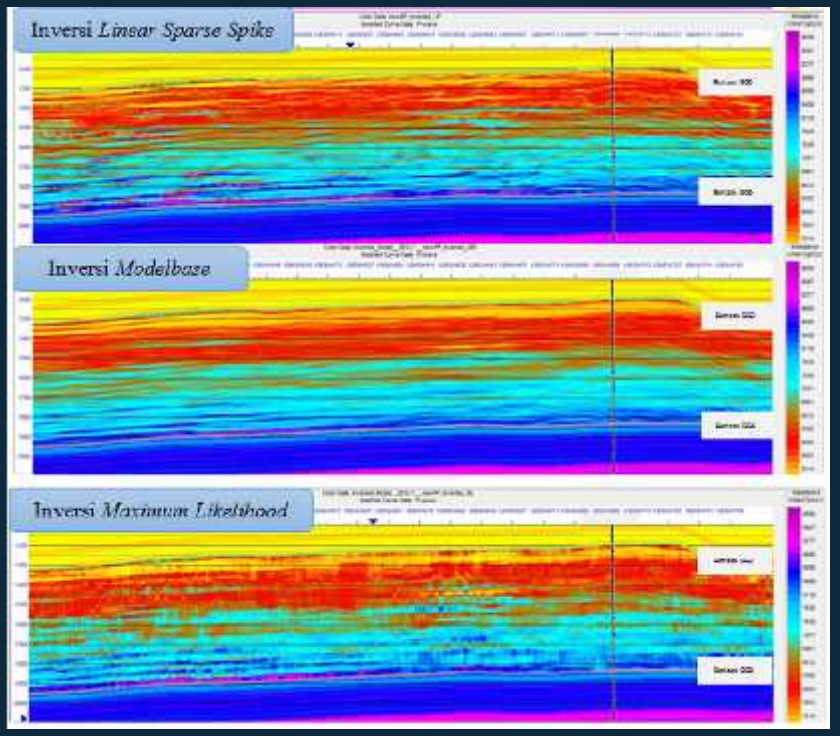


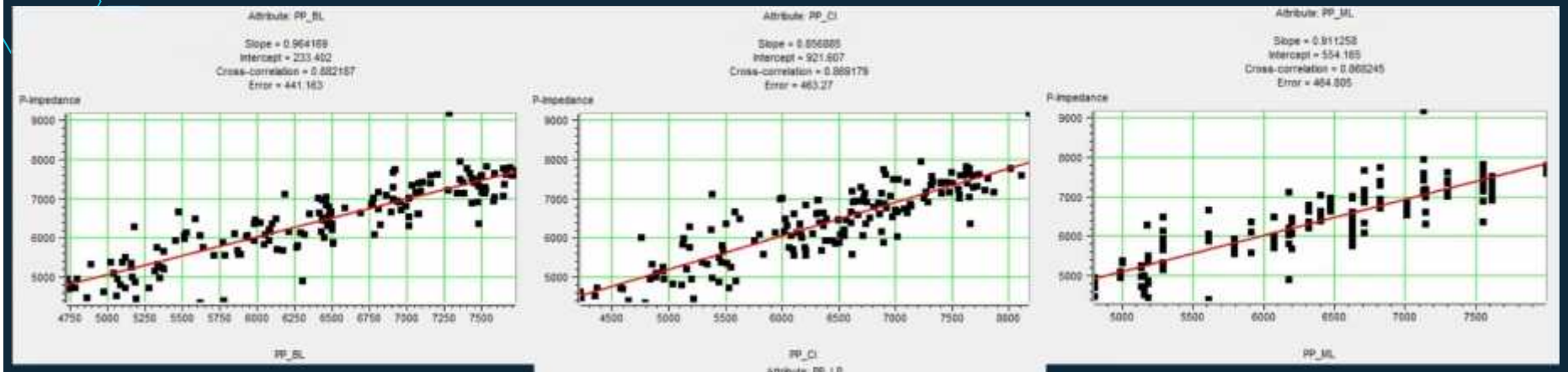


Koefisien Regresi PS = 0.99

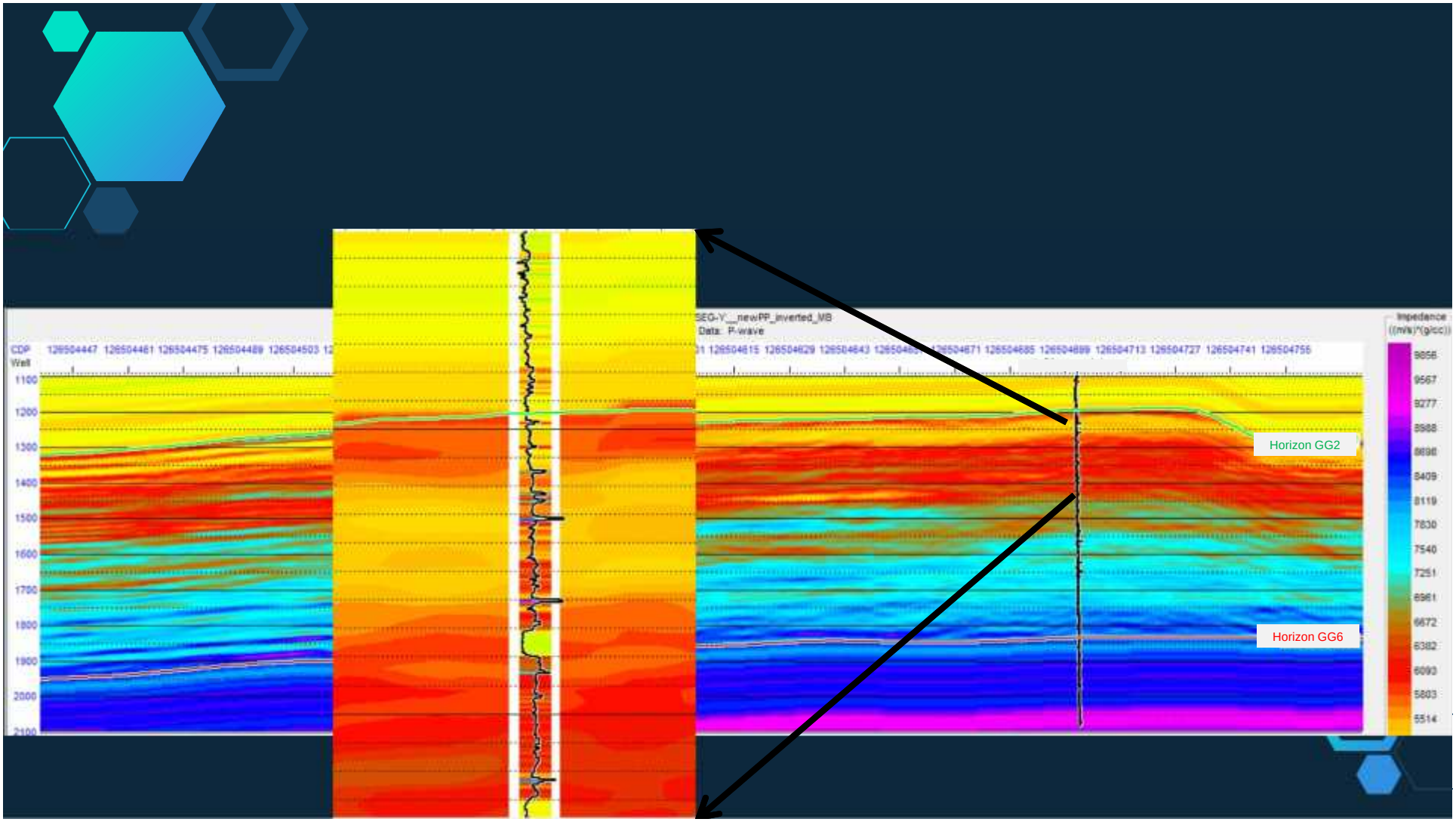
Hasil Inversi Gelombang PP



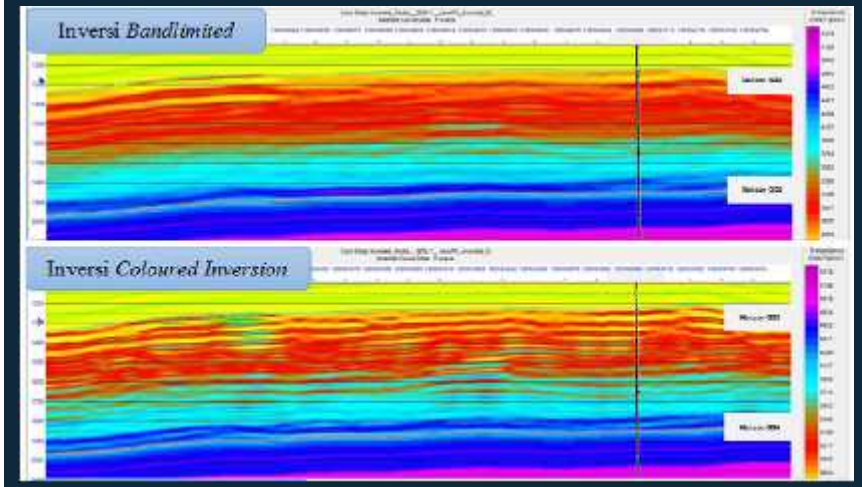


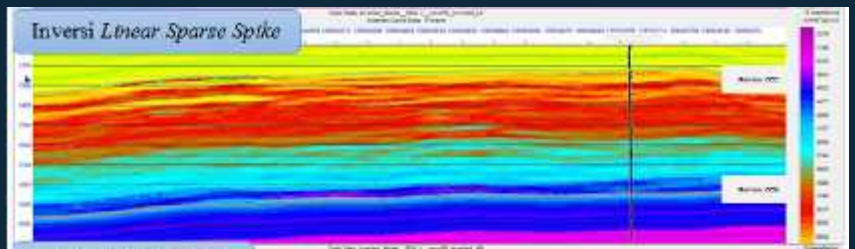

Attribute: PP_BL
Slope = 0.964169
Intercept = 233.402
Cross-correlation = 0.882187
Error = 441.163
P-impedance
PP_BL
Attribute: PP_CI
Slope = 0.856885
Intercept = 921.607
Cross-correlation = 0.869179
Error = 463.27
P-impedance
PP_CI
Attribute: PP_ML
Slope = 0.911258
Intercept = 554.165
Cross-correlation = 0.868245
Error = 464.805
P-impedance
PP_ML
Attribute: PP_LP
Slope = 0.821423
Intercept = 508.019
Cross-correlation = 0.873998
Error = 455.243
P-impedance

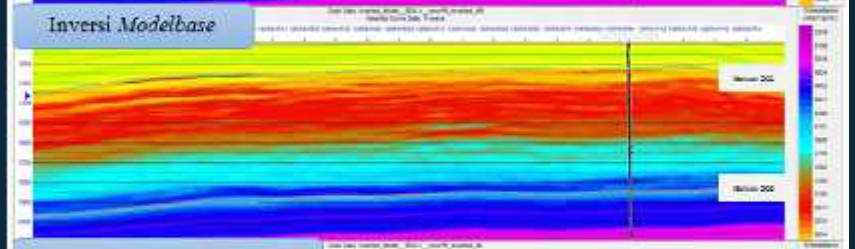

Energize Training Data
Time (ms)
250
500
750
1000
1250
1500
1750
2000
3000
8000
5000
7500
Zp Modelbase
Cross Plot (Apr 28, 2016 22:33)
File Edit View
Attribute: Zp Modelbase
Slope = 0.990242
Intercept = -316.69
Cross-correlation = 0.947058
Error = 424.604
P-Impedance
9000
8000
7000
6000
5000
4000
5000
5500
6000
6500
7000
7500
8000
8500
9000
Zp Modelbase
Legend
Regression Line

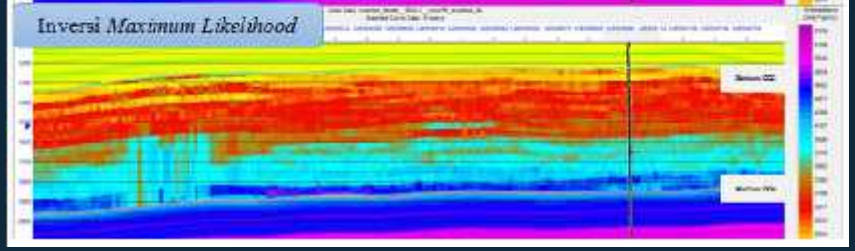

Horizon GG2
Horizon GG6

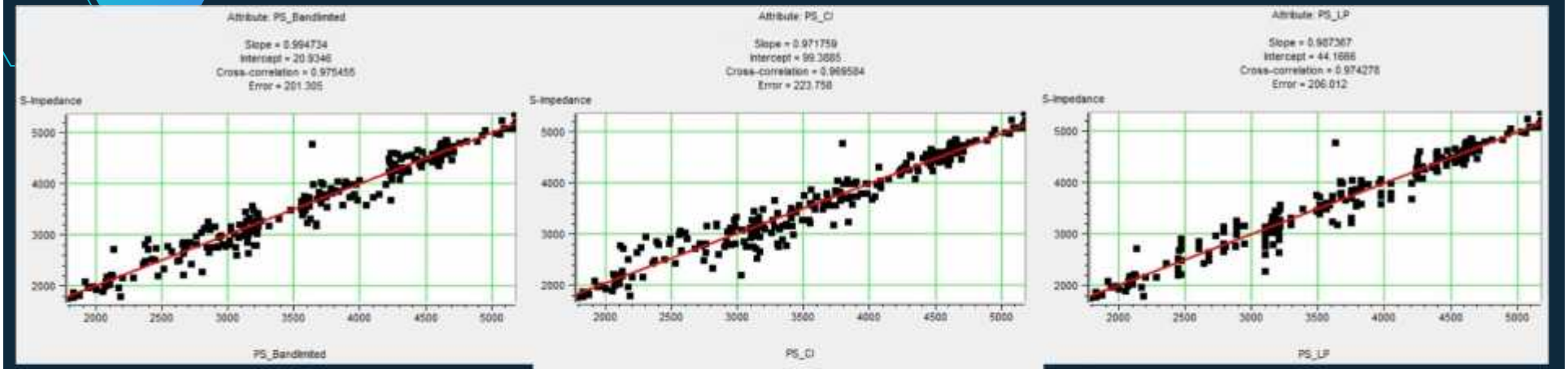
Hasil Inversi Gelombang PS

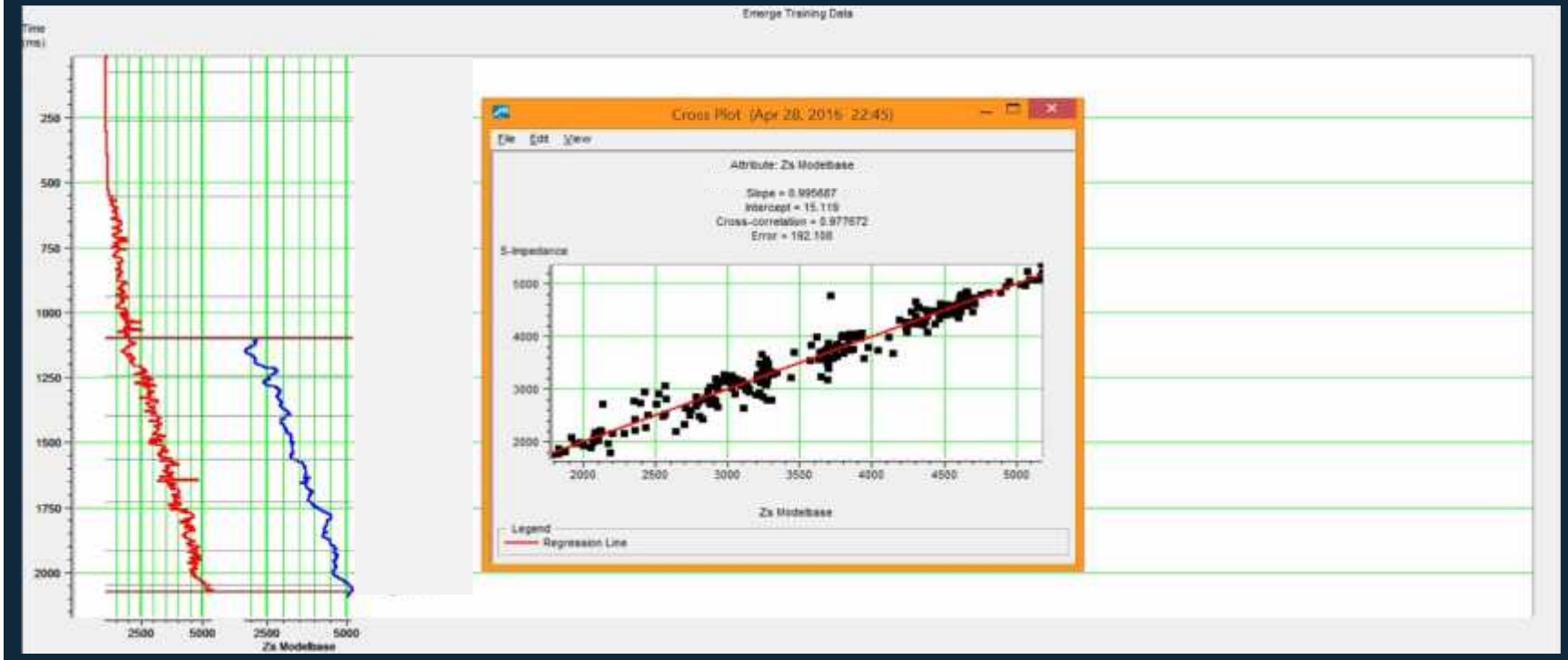


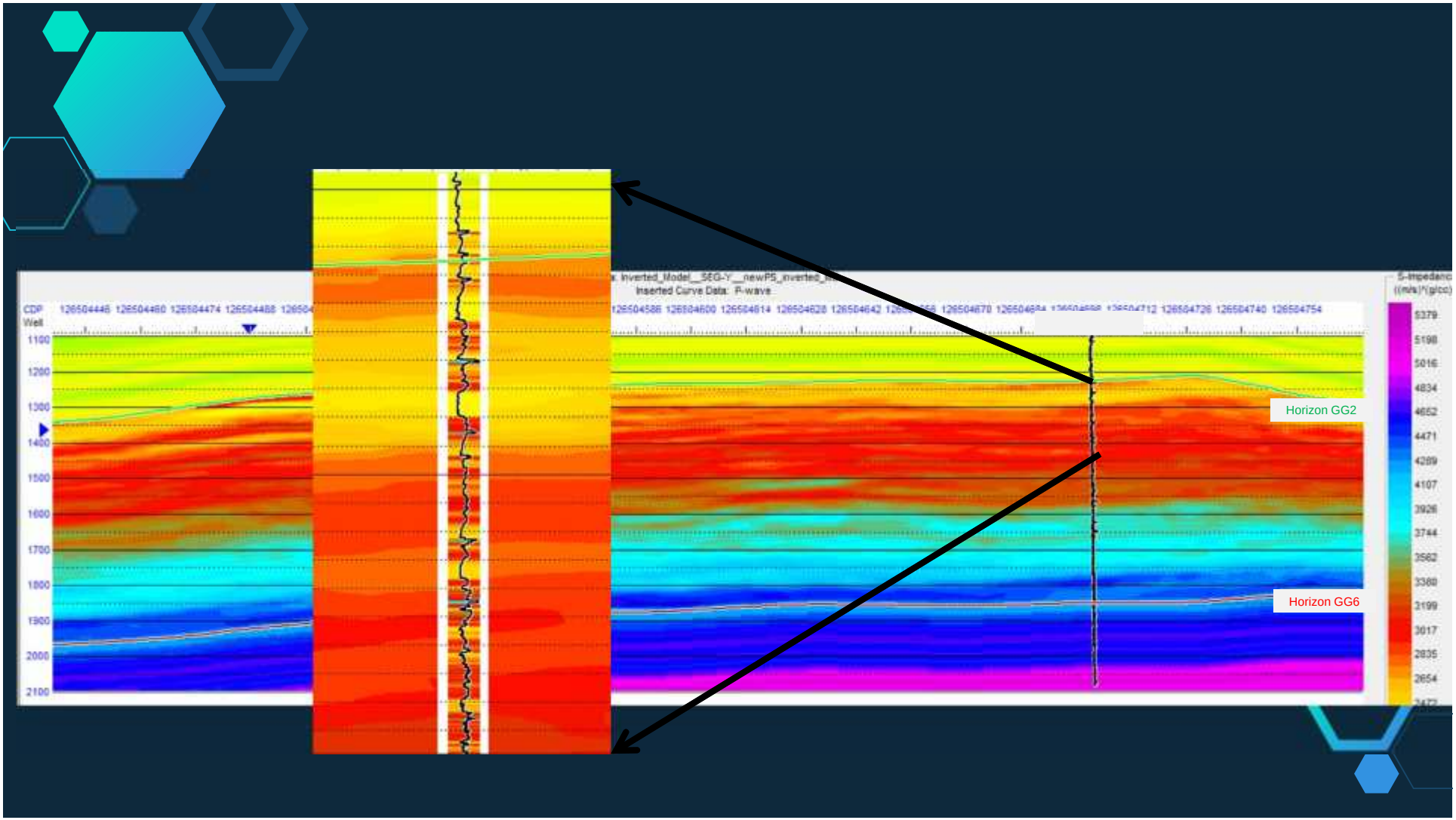




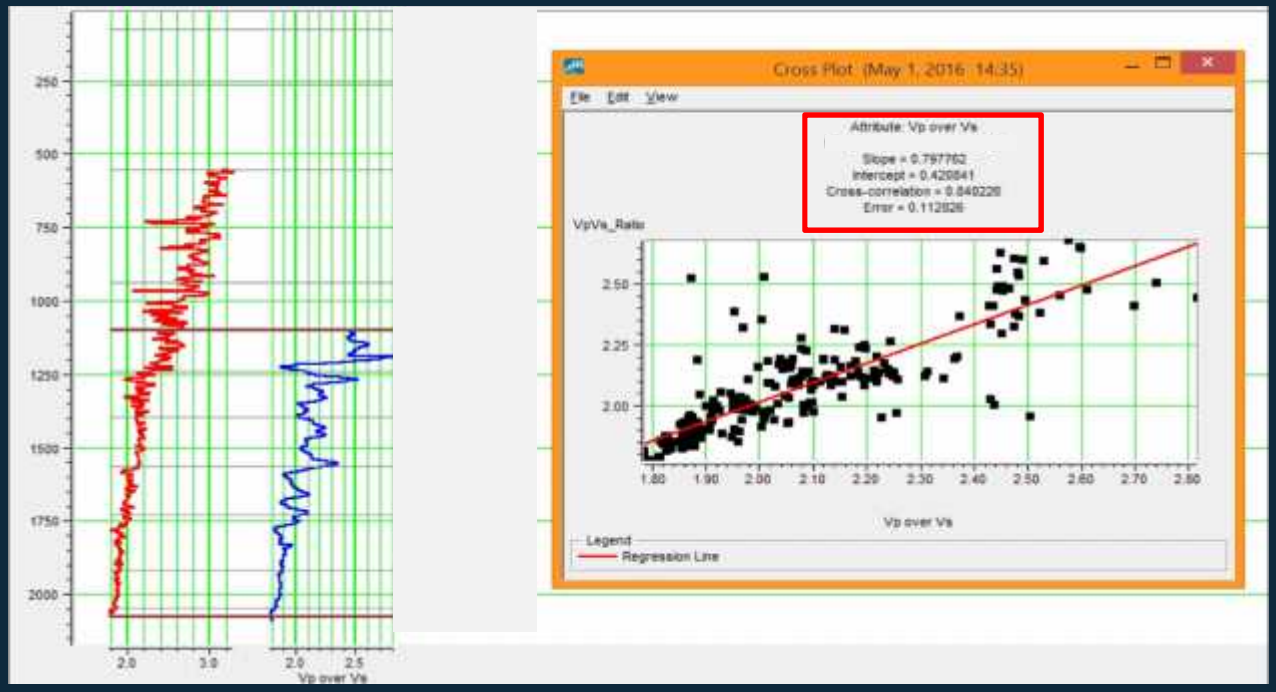


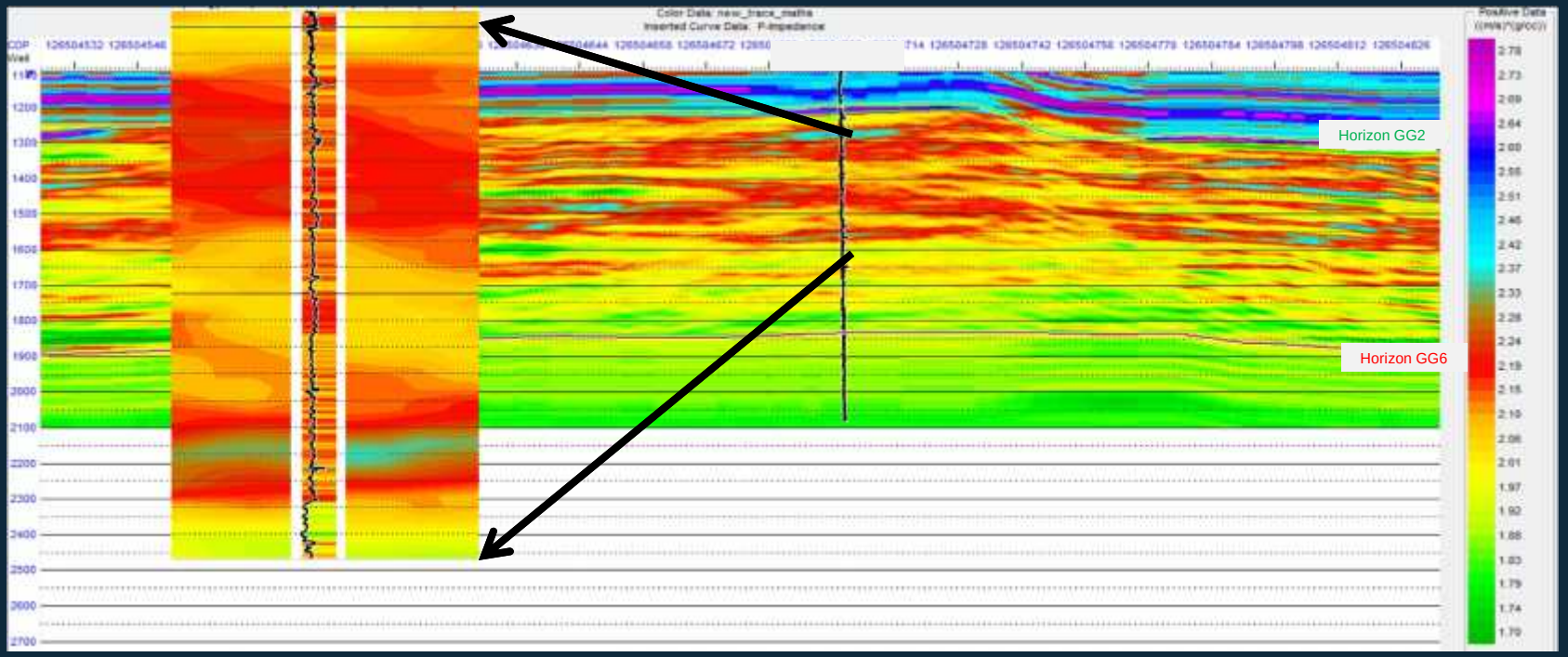

Attribute: PS_Bandlimited
Slope = 0.994734
Intercept = 20.9346
Cross-correlation = 0.975455
Error = 201.305
S-Impedance
PS_Bandlimited
Attribute: PS_CI
Slope = 0.971759
Intercept = 99.3685
Cross-correlation = 0.969584
Error = 223.758
S-Impedance
PS_CI
Attribute: PS_LP
Slope = 0.987367
Intercept = 44.1686
Cross-correlation = 0.974278
Error = 206.012
S-Impedance
PS_LP
Attribute: PS_ML
Slope = 0.983689
Intercept = 13.9072
Cross-correlation = 0.971078
Error = 218.274
S-Impedance


Emerge Training Data
Time (ms)
250
500
750
1000
1250
1500
1750
2000
2500
5000
2500
5000
Zs Modelbase
Cross Plot (Apr 28, 2016 22:45)
File Edit View
Attribute: Zs Modelbase
Slope = 0.995687
Intercept = 15.119
Cross-correlation = 0.977672
Error = 192.108
S-Impedance
5000
4000
3000
2000
2000
2500
3000
3500
4000
4500
5000
Zs Modelbase
Legend
Regression Line


Horizon GG2
Horizon GG6

Penampang Vp/Vs

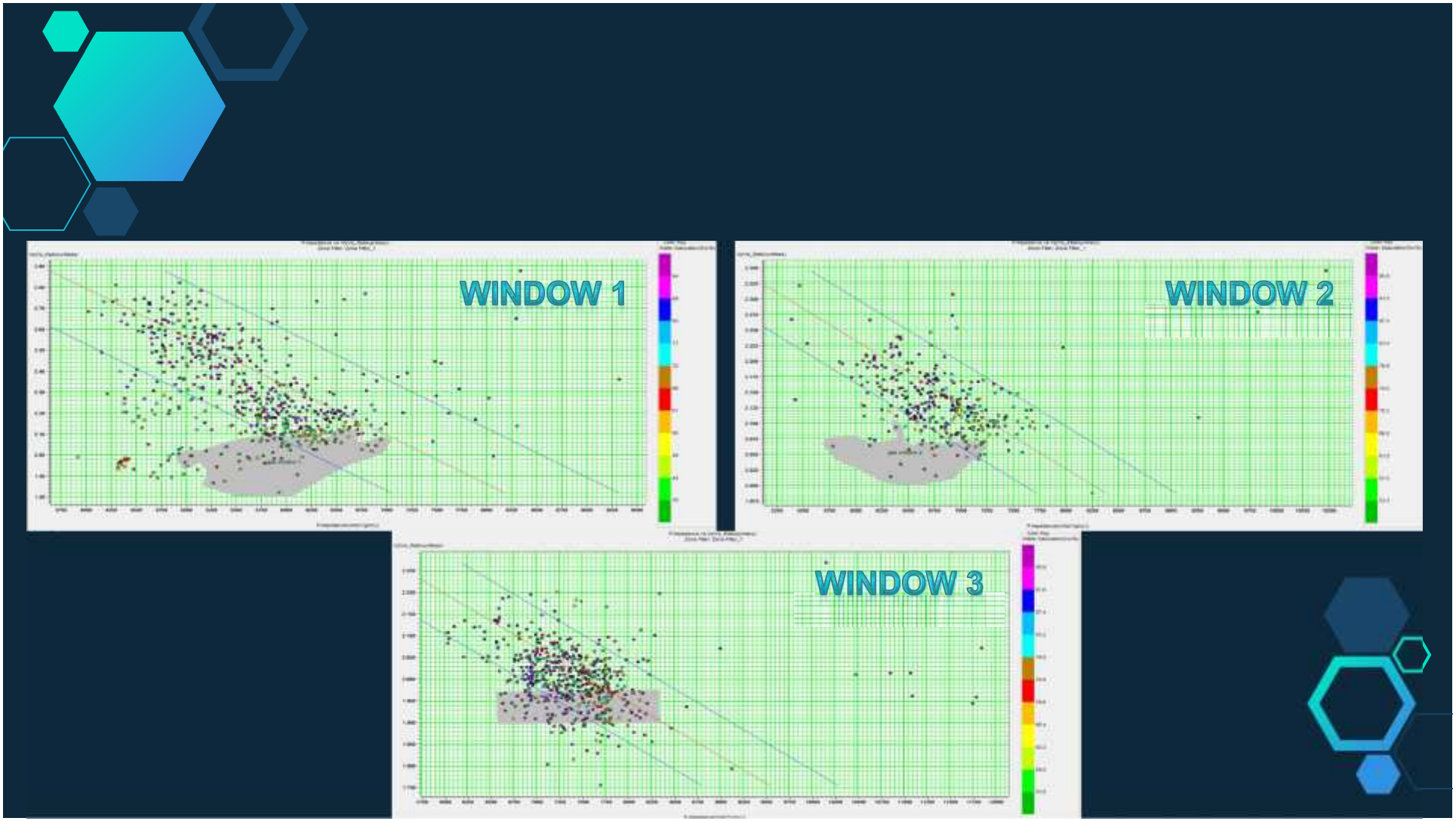



Horizon GG2
Horizon GG6

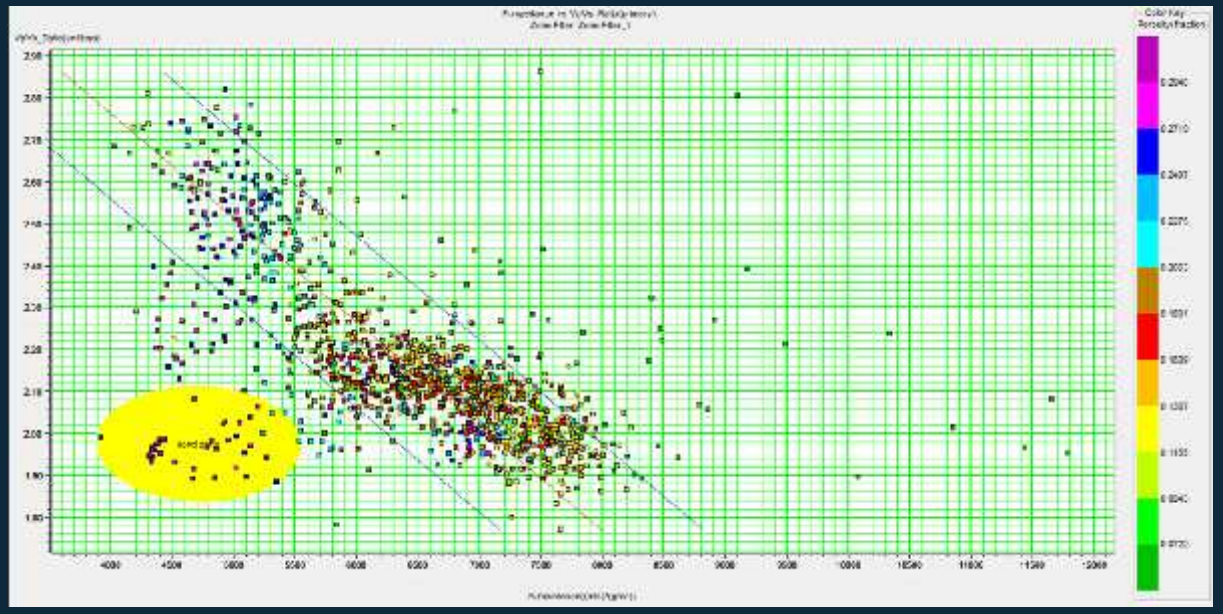
Analisis Reservoir

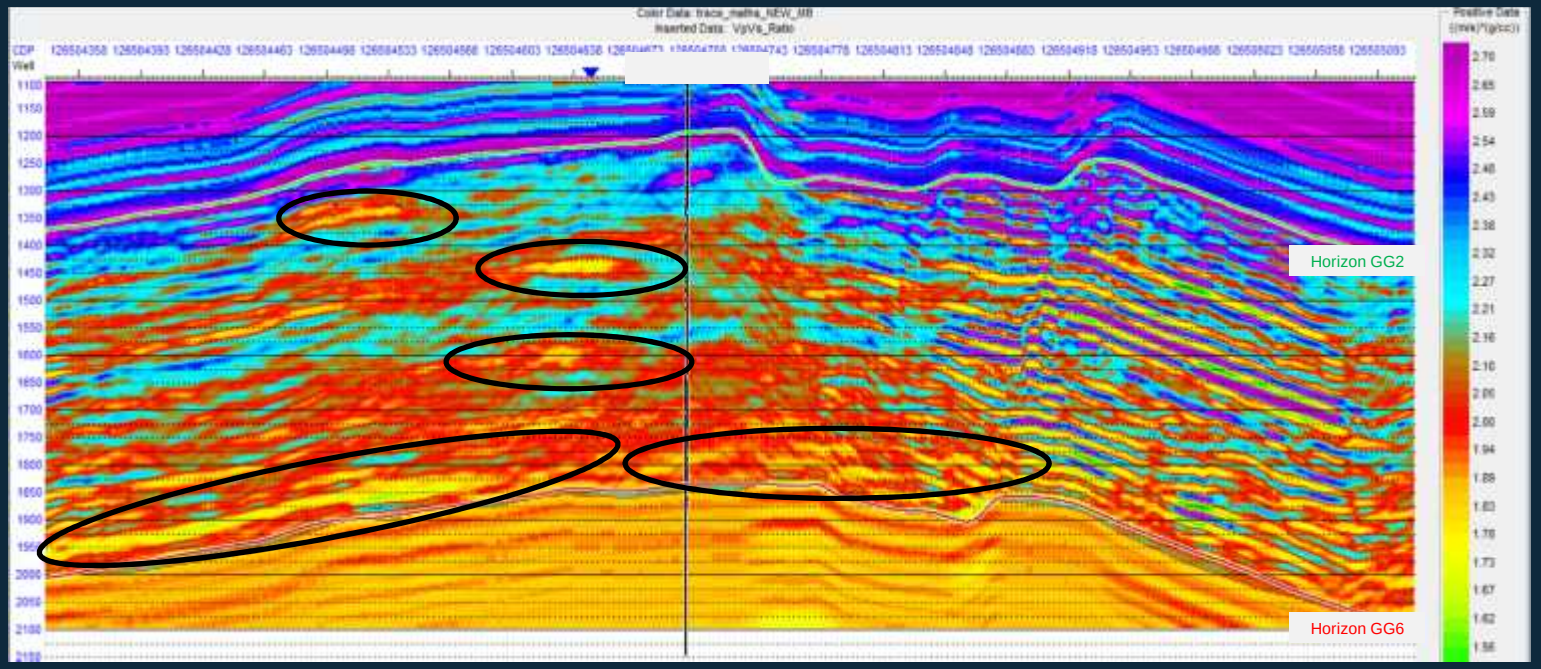
PEMBAGIAN WINDOW UNTUK INTERPRETASI

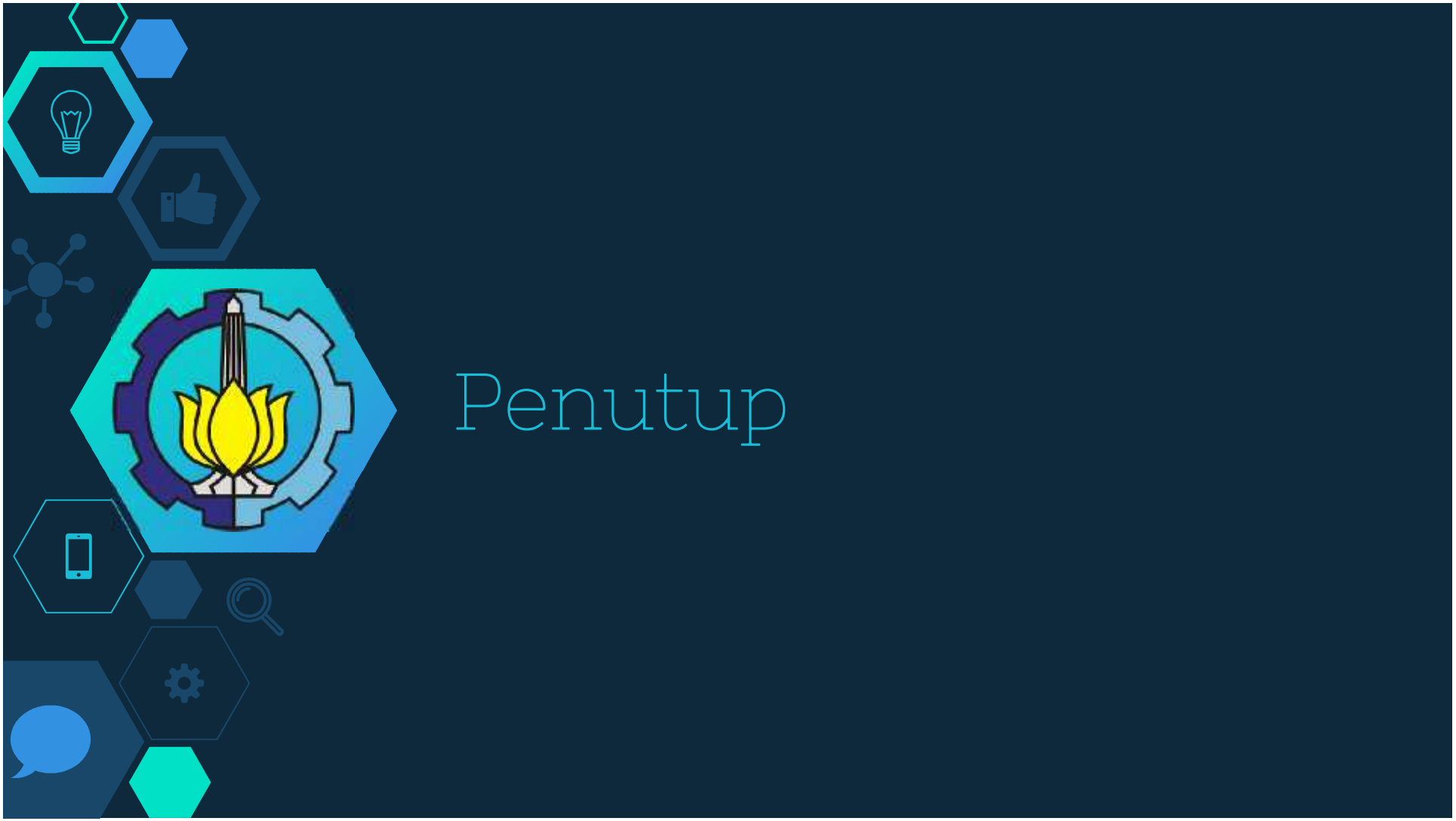
	Data Marker			
Domain	**GG2**	**GG4**	**GG5**	**GG6**
Time (ms)	1104.71	1401.06	1566.95	2100
Depth (m)	1127.6901	1504.17	1711.61	1991.23


WINDOW 1
WINDOW 2
WINDOW 3

Analisis Lithologi Reservoir




Horizon GG2
Horizon GG6


Penutup

Kesimpulan

1. *Hasil inversi secara terpisah dengan menggunakan asumsi bahwa gelombang PS adalah SS dapat diestimasi dengan menggunakan kontras impedansi S (Zs).*
2. *Lithologi reservoir yang didapatkan dari penampang Vp/Vs dengan nilai < 2.1 adalah sand dengan didukung Zp sebesar < 5000 m/s*g/cc dan porositas dengan nilai 27-29% dari data sumur.*
3. *Zona gas dapat ditentukan dengan nilai Vp/Vs sekitar < 1.8 dan didukung oleh data sumur dengan Zp < 7000 m/s*g/cc dan saturasi air dengan nilai 38-44%.*
4. *Didapatkan zona gas terbesar pada window 3 (GG5-GG6) dengan lokasi CDP 126504358-126504708 dengan kedalaman dalam domain waktu 1850-1950 ms disebelah Barat sumur, dan pada CDP 126504708-126504813 dengan kedalaman dalam domain waktu 1700-1800 ms di sebelah Timur sumur.*

Saran

1. *Perlu adanya perbandingan nilai Vp/Vs antara Independent Inversion dengan Joint Inversion untuk menghasilkan interpretasi yang lebih baik lagi.*
2. *Perlu adanya penambahan informasi lithologi dengan melakukan proses fluid probability untuk memprediksi properti dari lithologi yang ada.*

Terimakasih!

Pertanyaan?

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