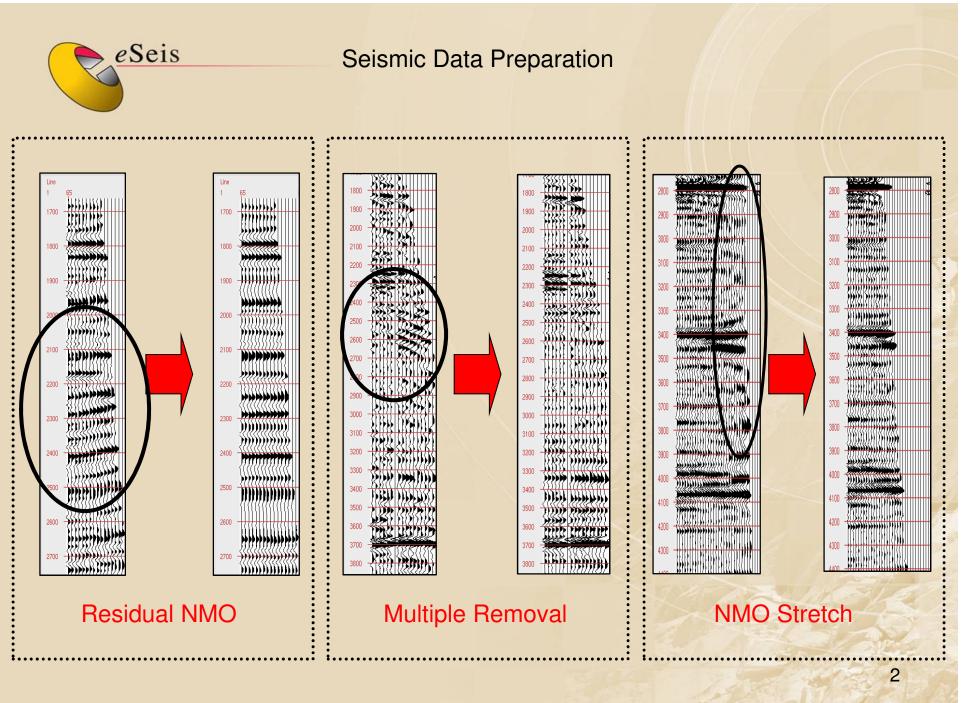
# DHI Consortium Processing Impact on AVO Products



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## Before Scaling

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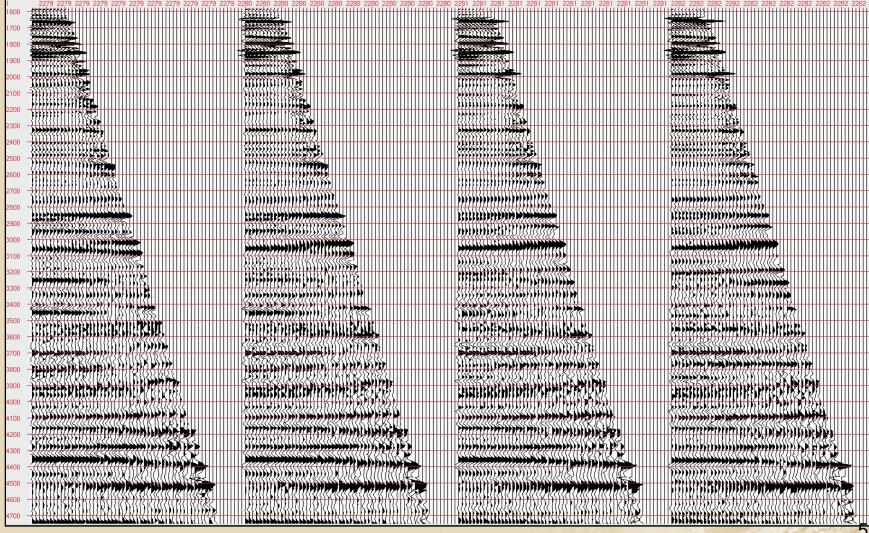
3



# After Scaling

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#### 2000 ms AGC



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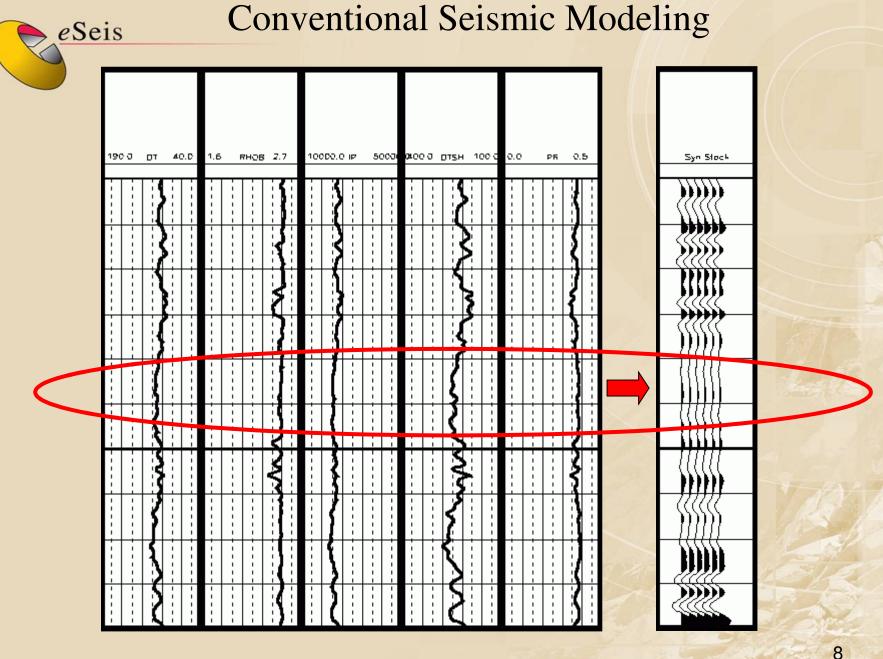
### 2000 ms TVS

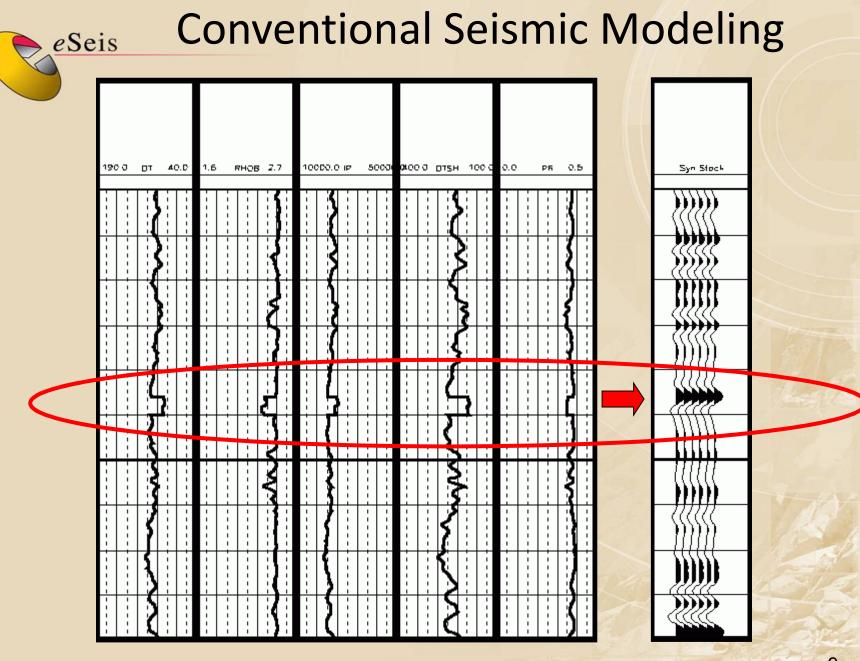
1 1600	2279 2279 2279 2279 2279 2279 2279 2279	79 2280 2280 2280 2280 2280 2280 2280 228	2280 2281 2281 2281 2281 2281 2281 2281	2281 2282 2282 2282 2282 2282 2282 2282
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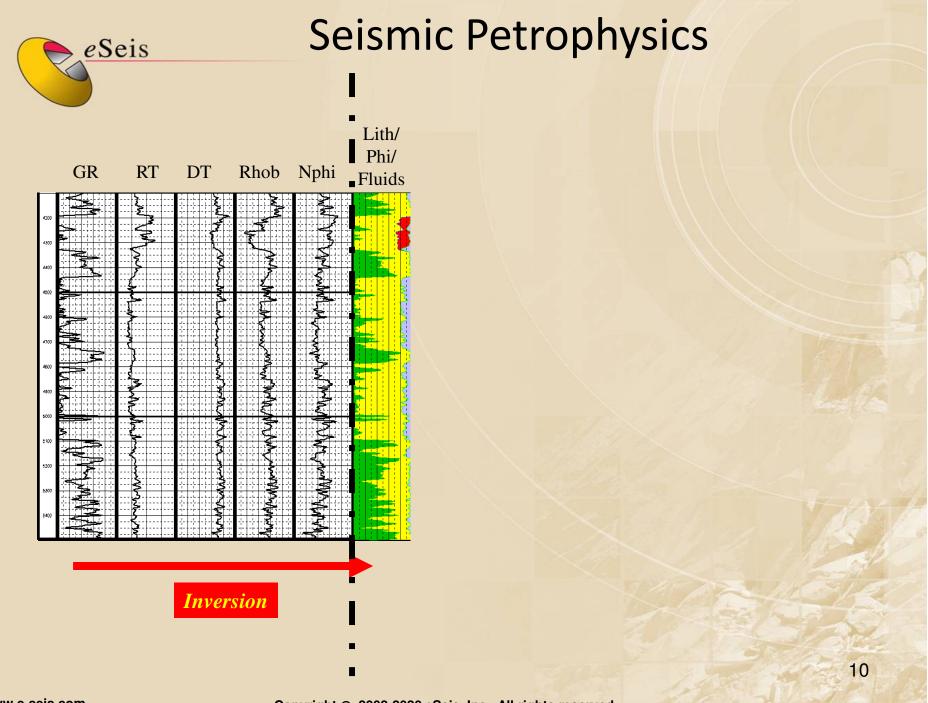
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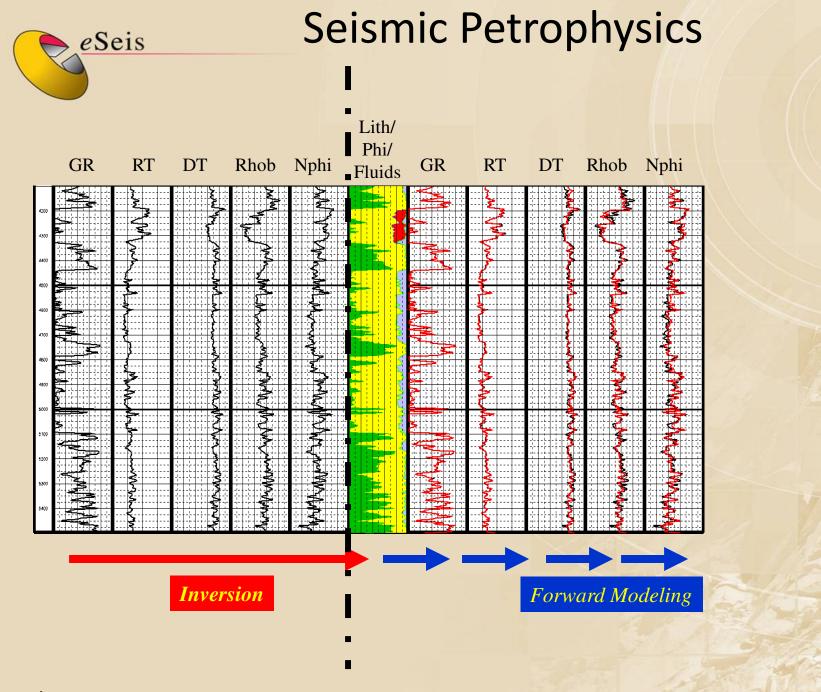


# Modeling Methodology



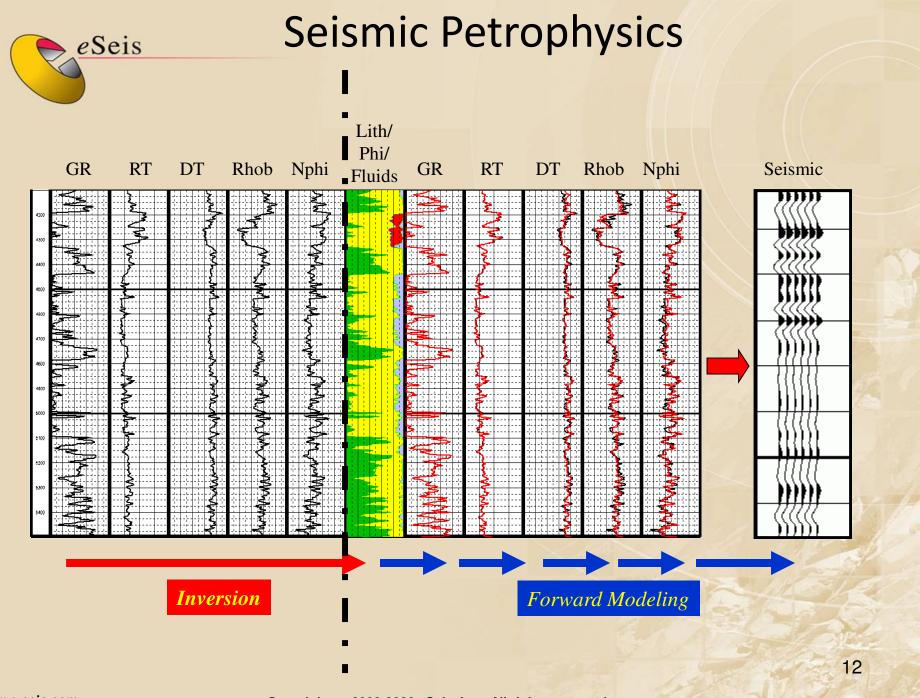


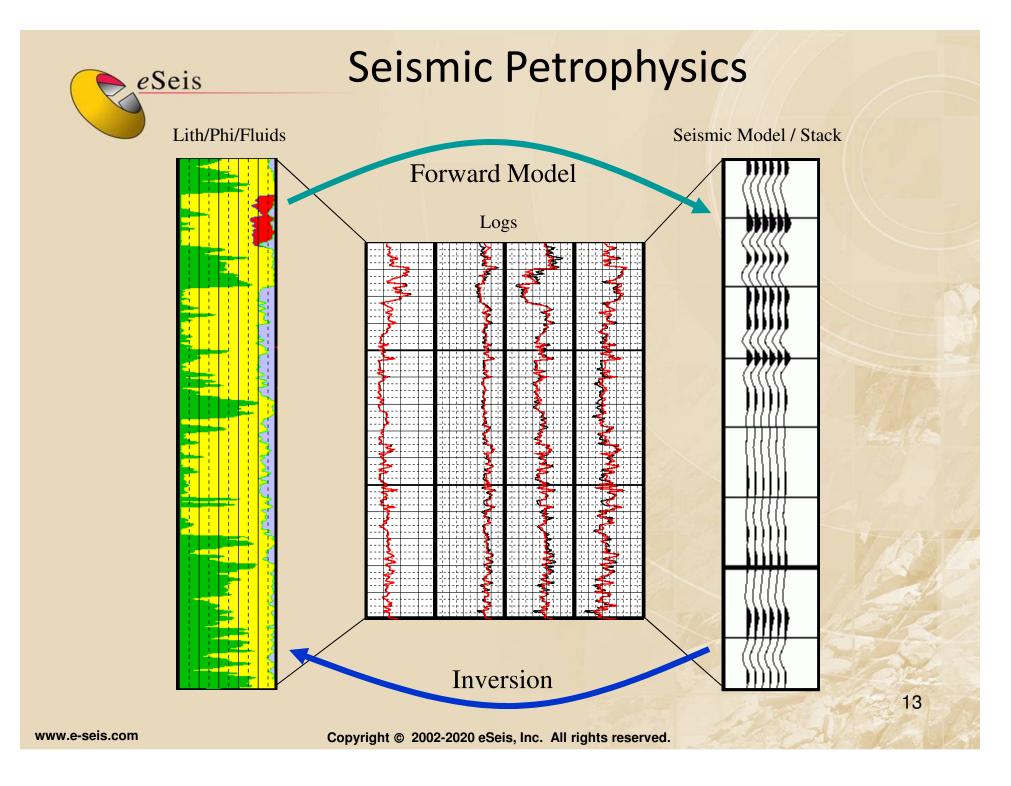


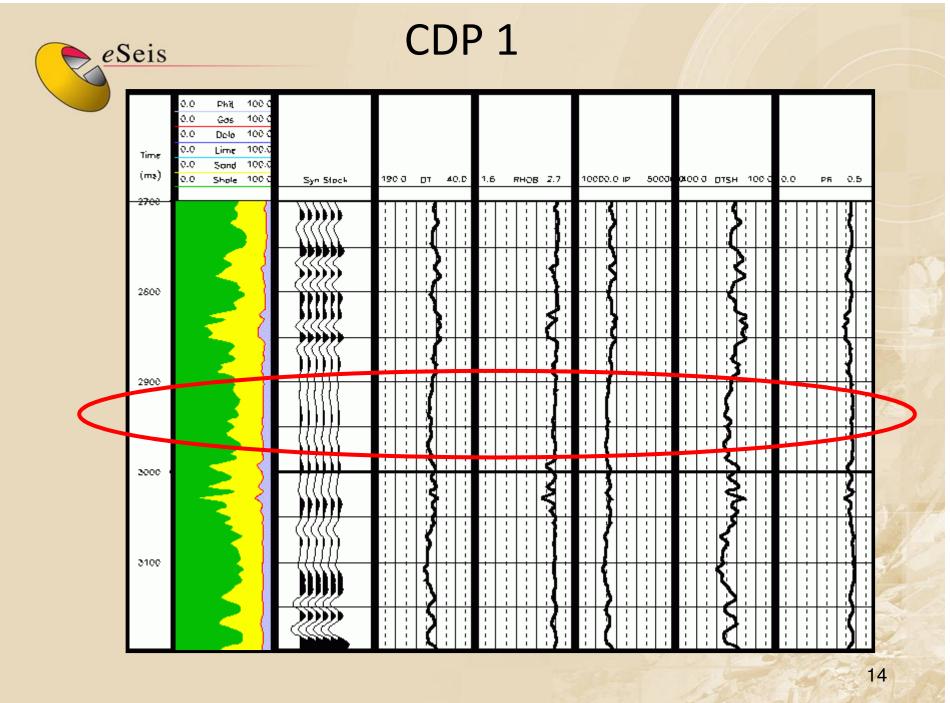


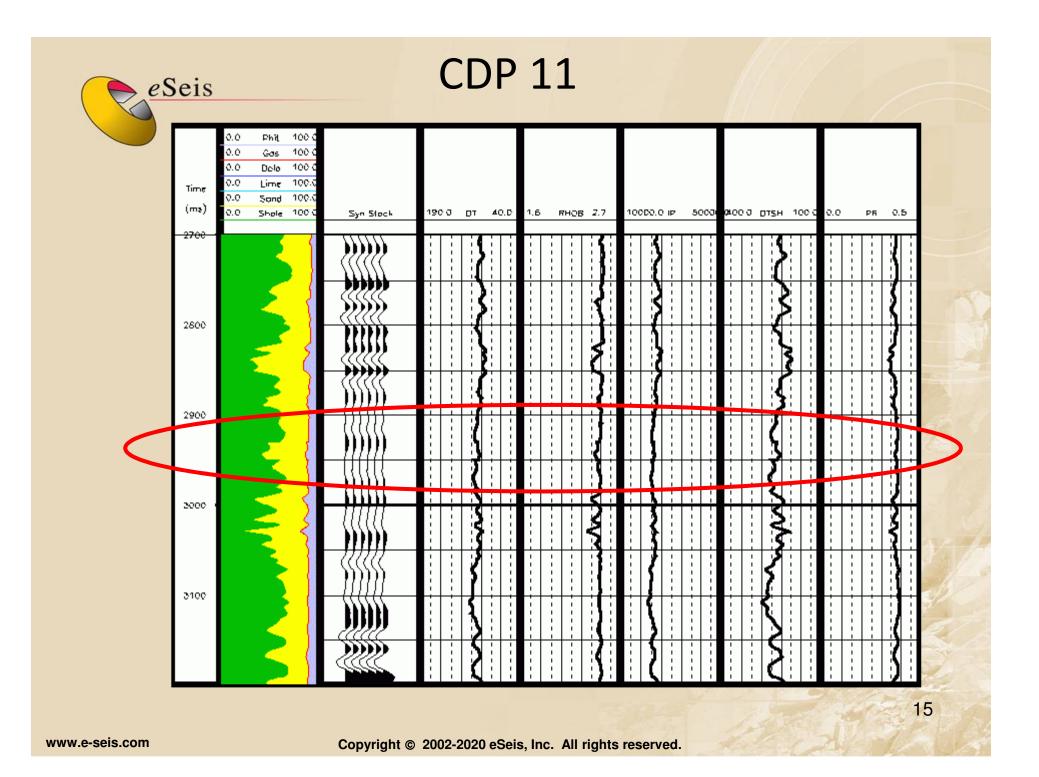
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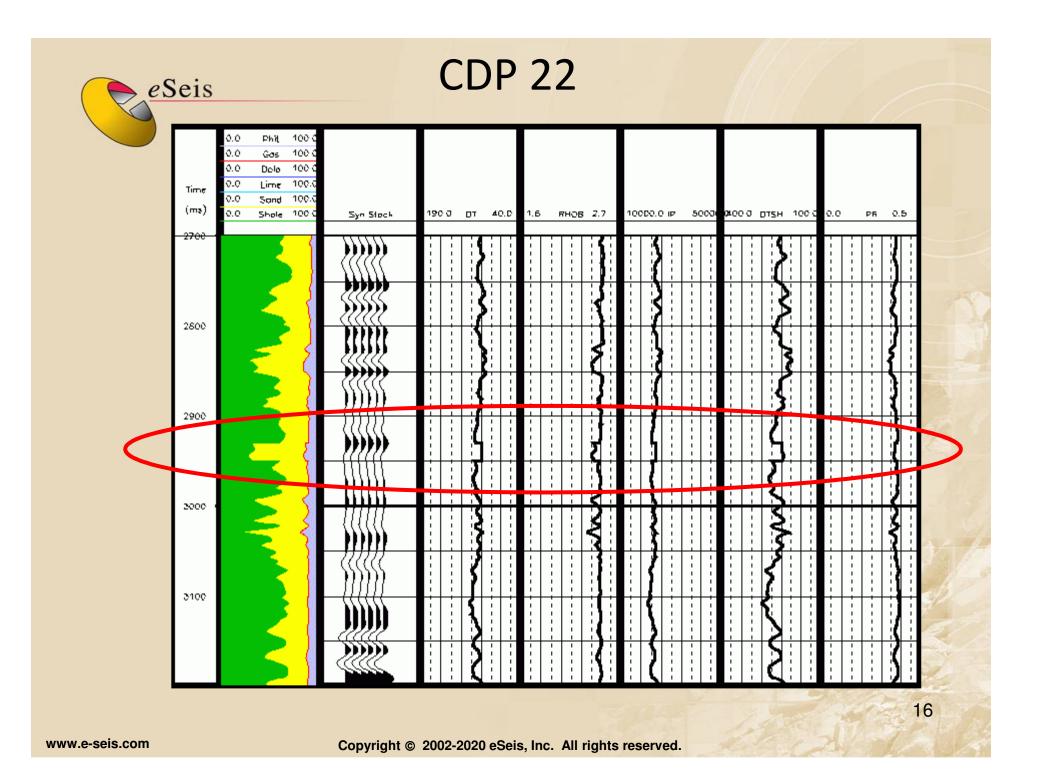
11

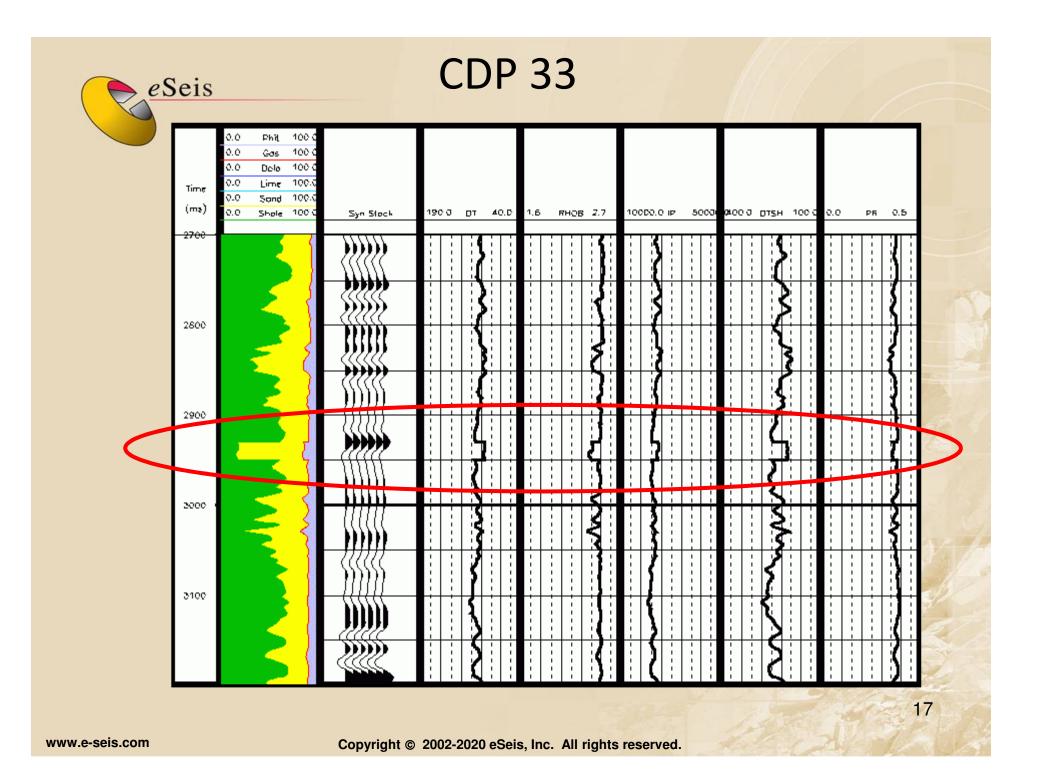


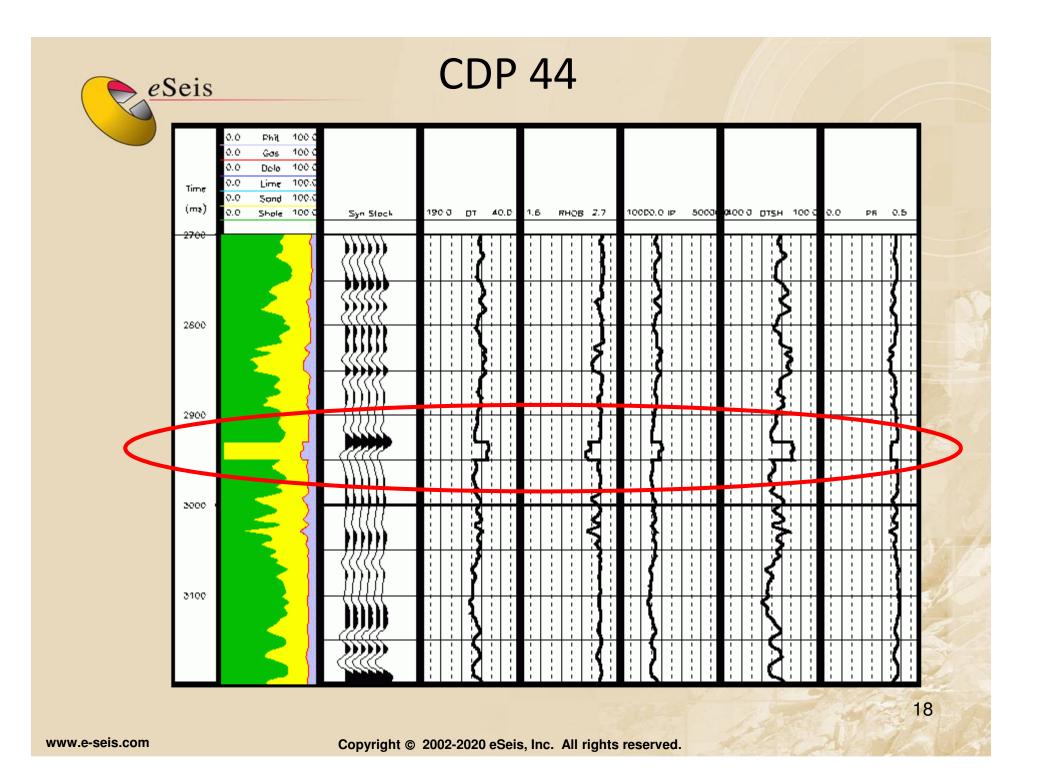


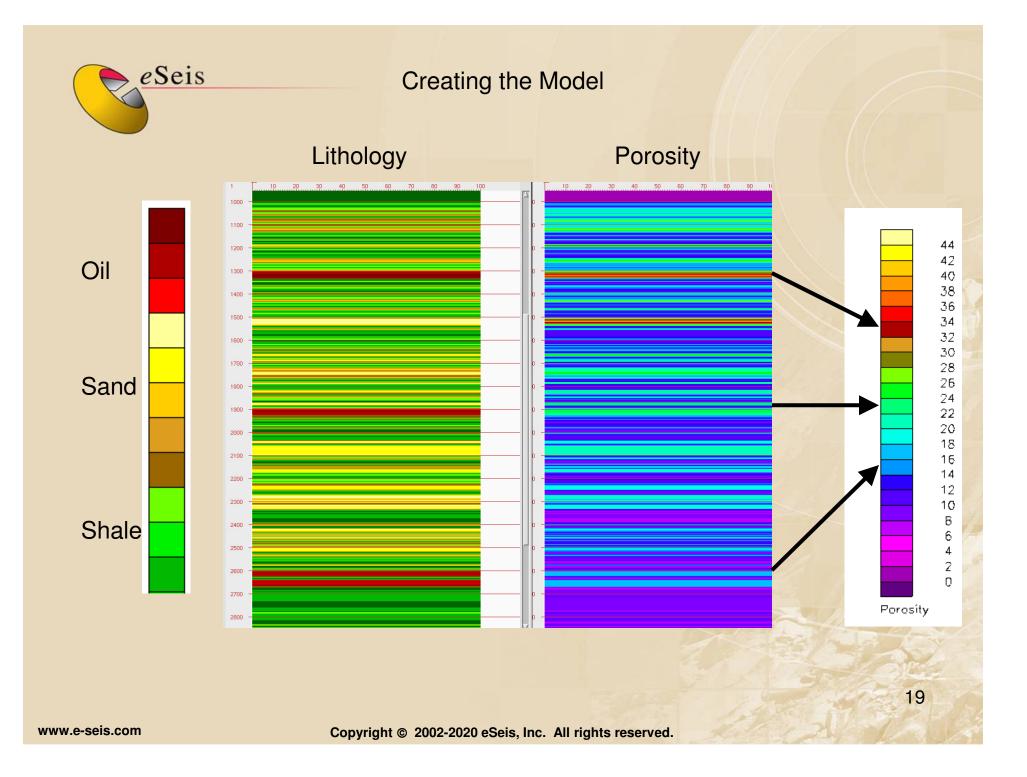


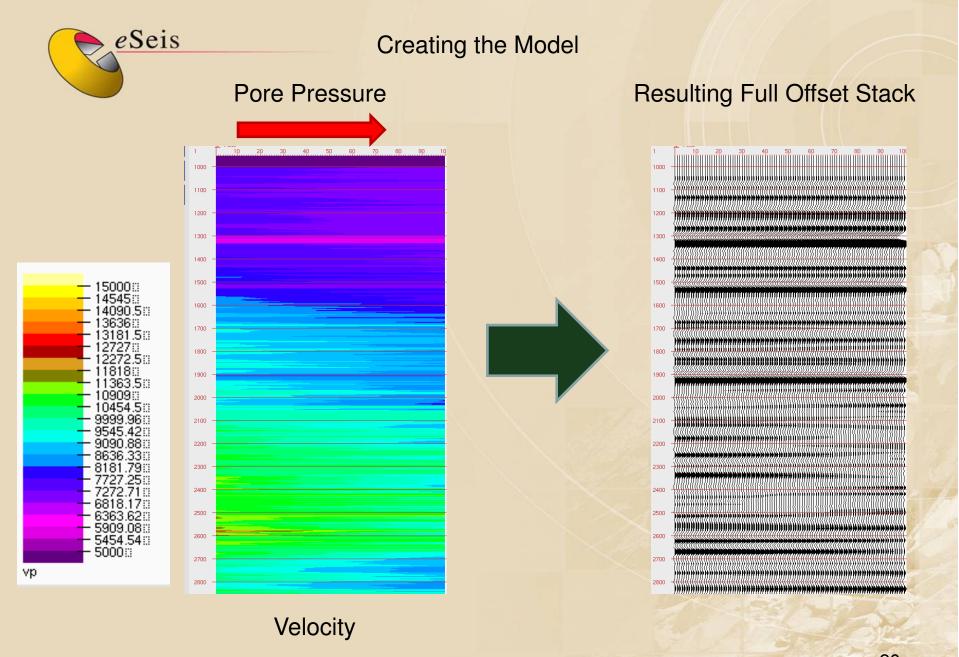












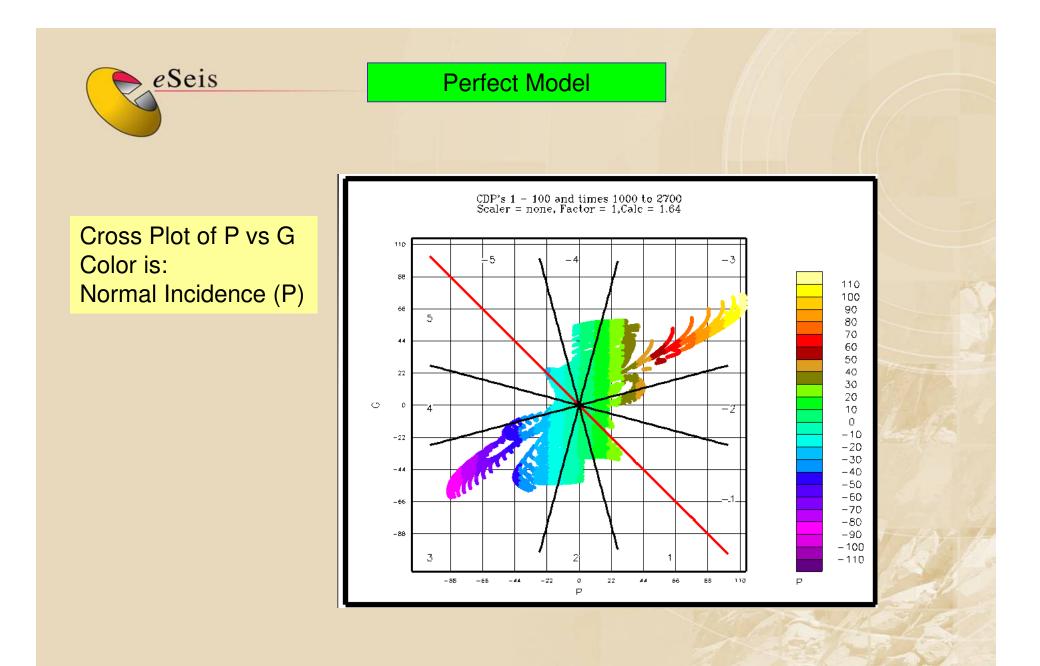


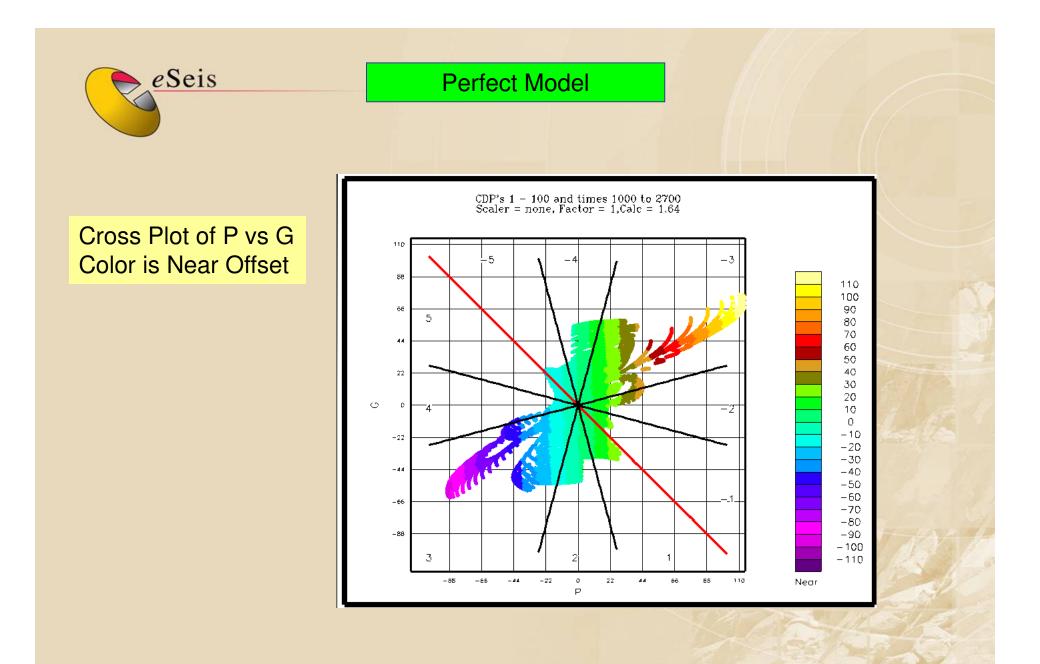
Gathers Near and Far Stacks Intercept (P) Gradient (G) P vs G cross plots AVO Types Lithology Inversion Velocity Inversion Density Inversion

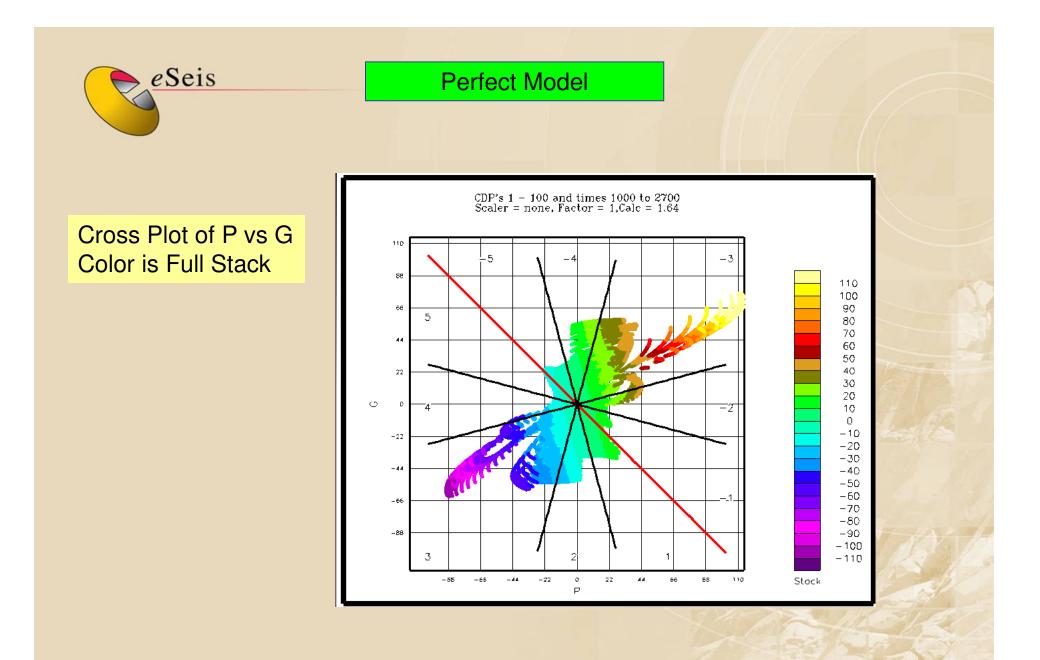
eSeis

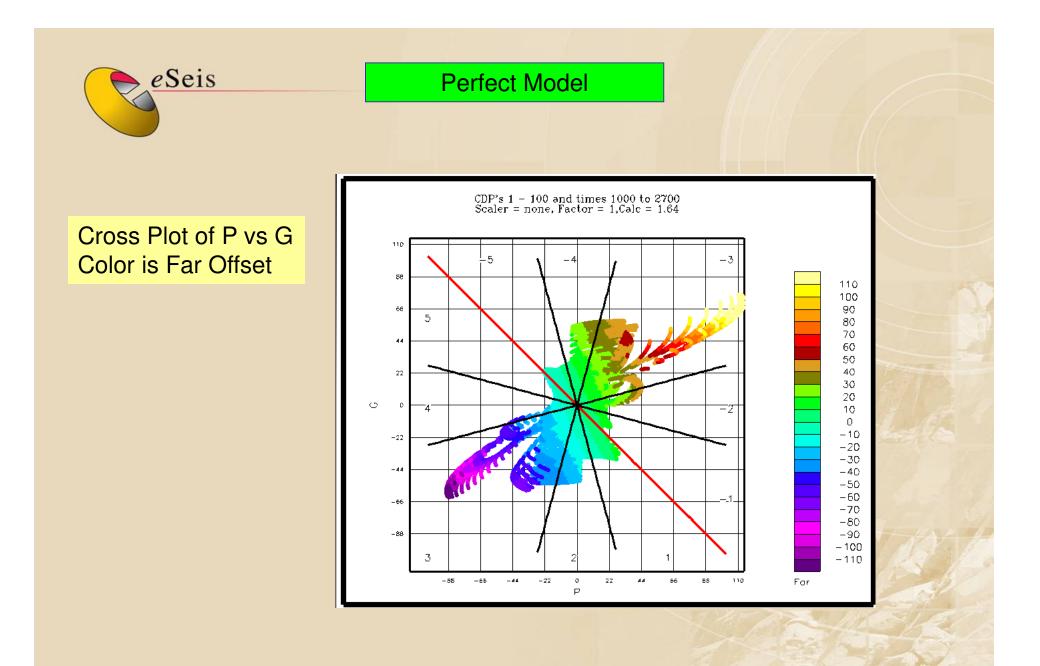
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
ne 2dmodel-dec.sgy 20 40 40 4050 6050 6050 8000 8000	Line 2dmodel-near.sgy 1 10 20 30 40 50 60 70 80 90 100	2dmodel-far.sgy 10 20 30 40 50 60 70 80 90 10
<ul> <li></li></ul>		
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	2700	200
<sup>8</sup> <del>3979977777 9797777777 9979777777 9799777777</del>		

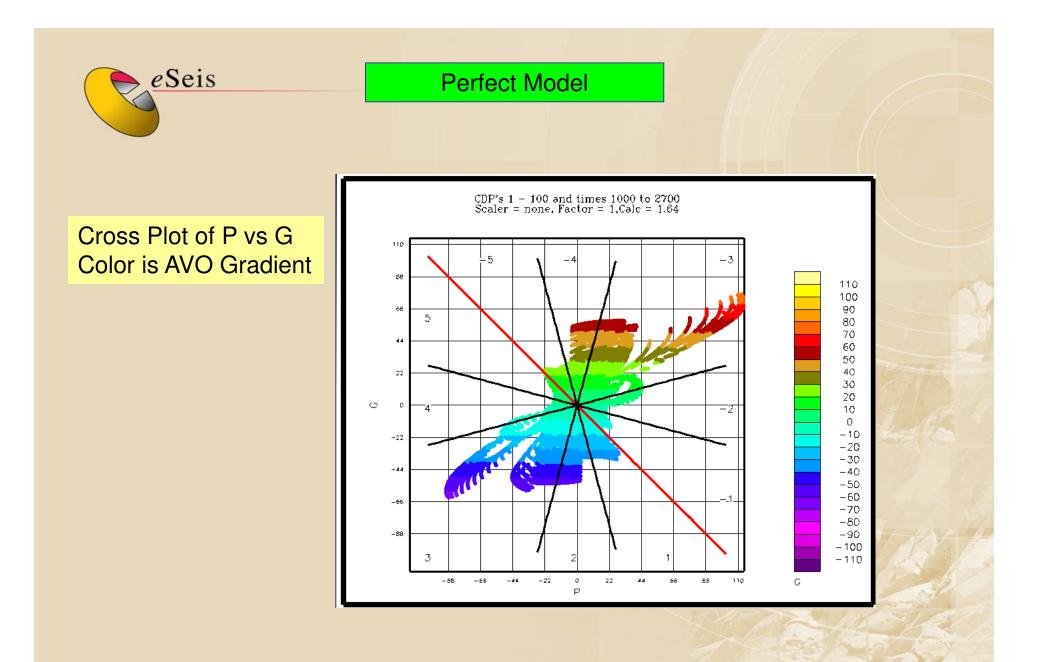
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ne 2000 40 40 400 400 600 600 600 600 600 60	Line         2dmodel-pl.soy           1         10         20         30         40         50         90         70         80         100           10         20         30         40         50         90         70         80         100           10         20         30         40         50         90         70         80         100           10         100	2dmodel-gl sgy         30         40         50         60         70         80         90         10           I000
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	2200	2200
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	2400	2400
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700		2700

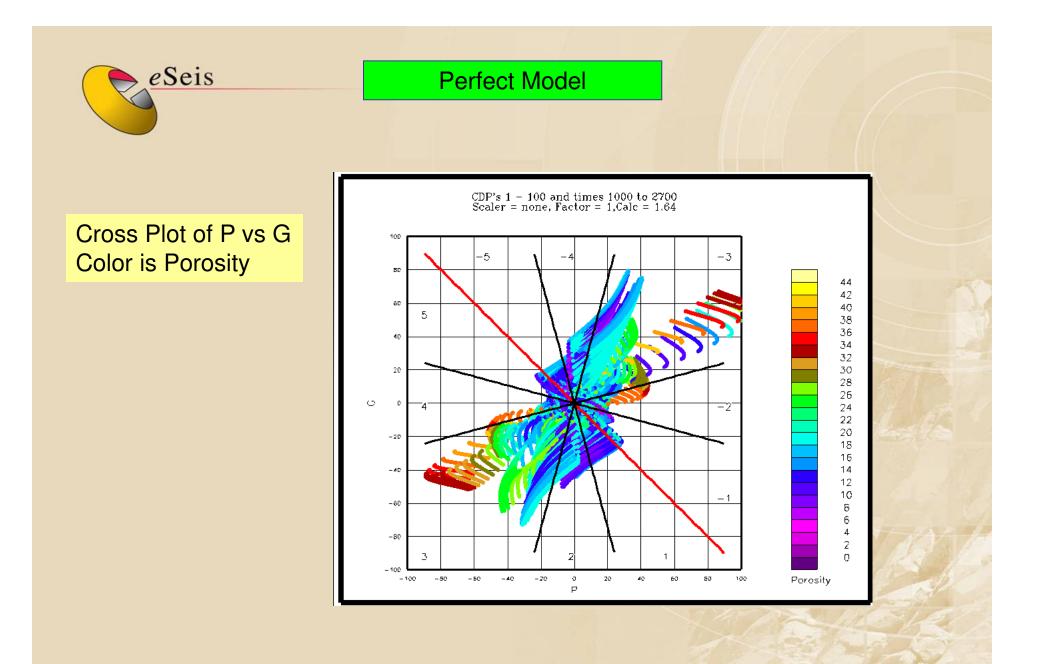


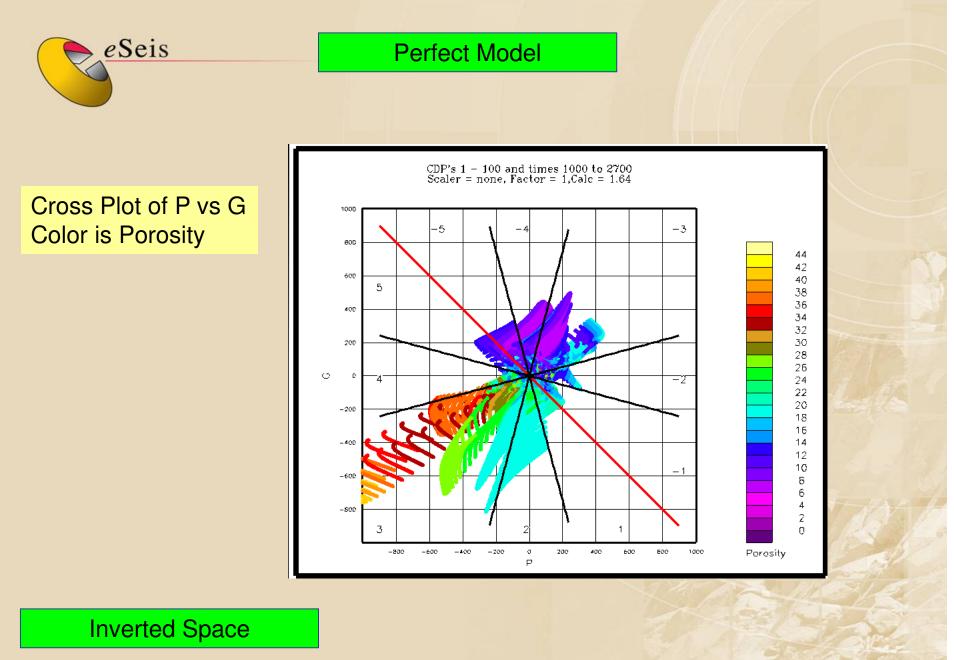


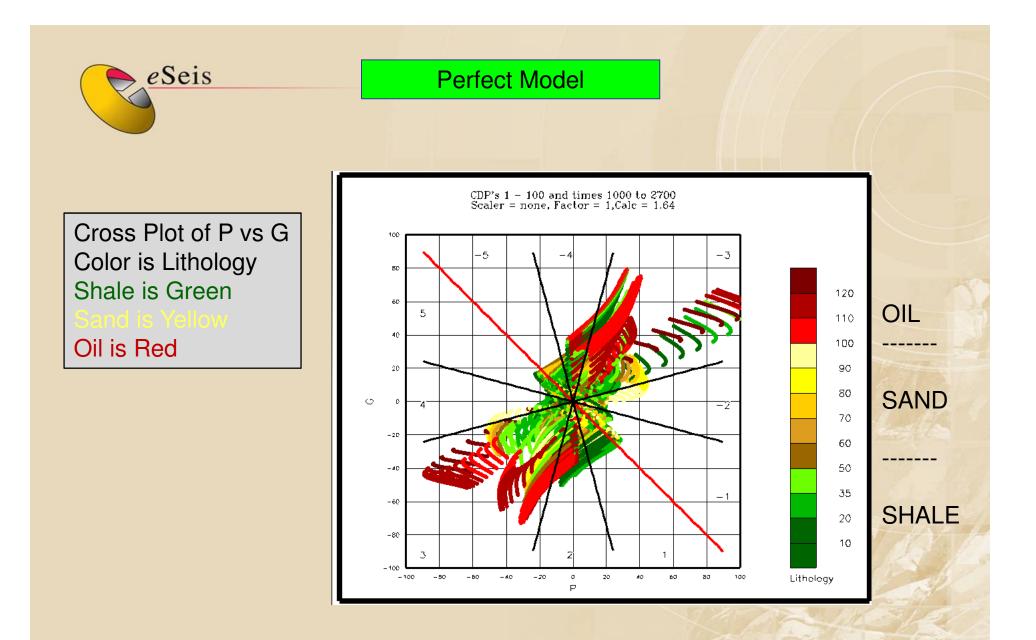


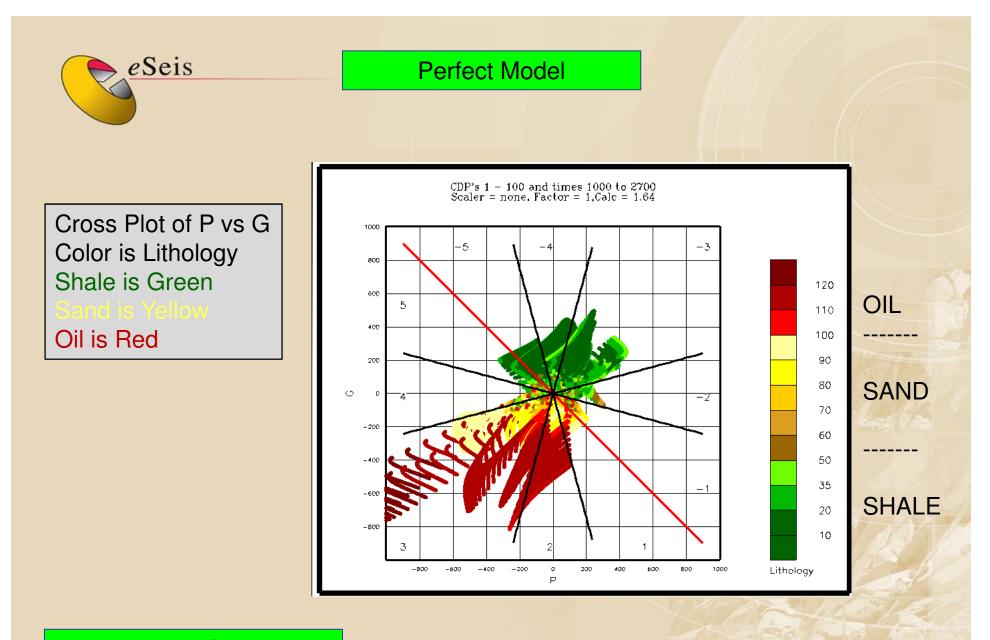




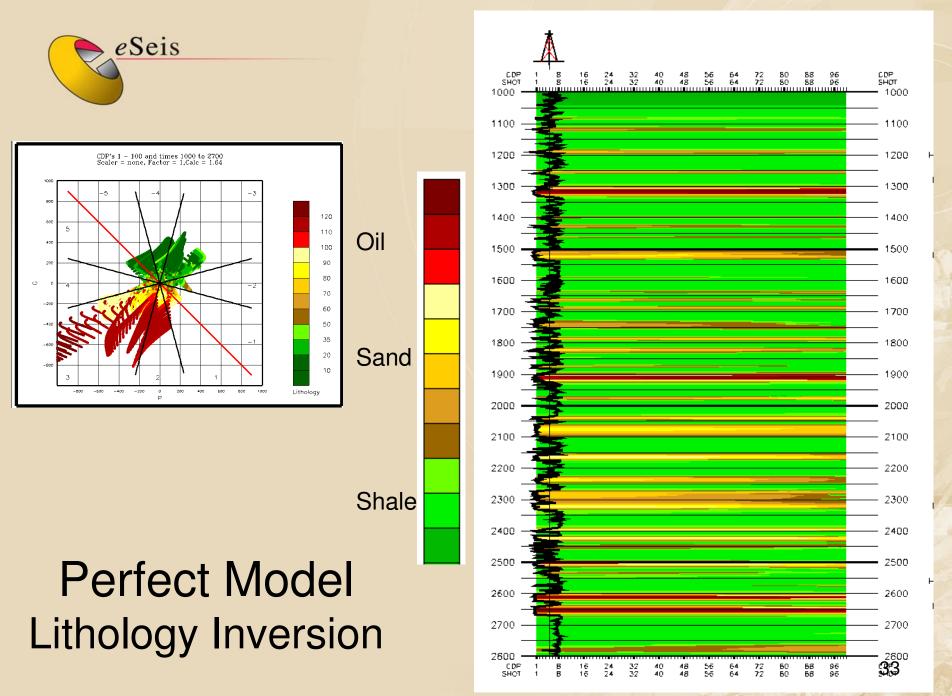


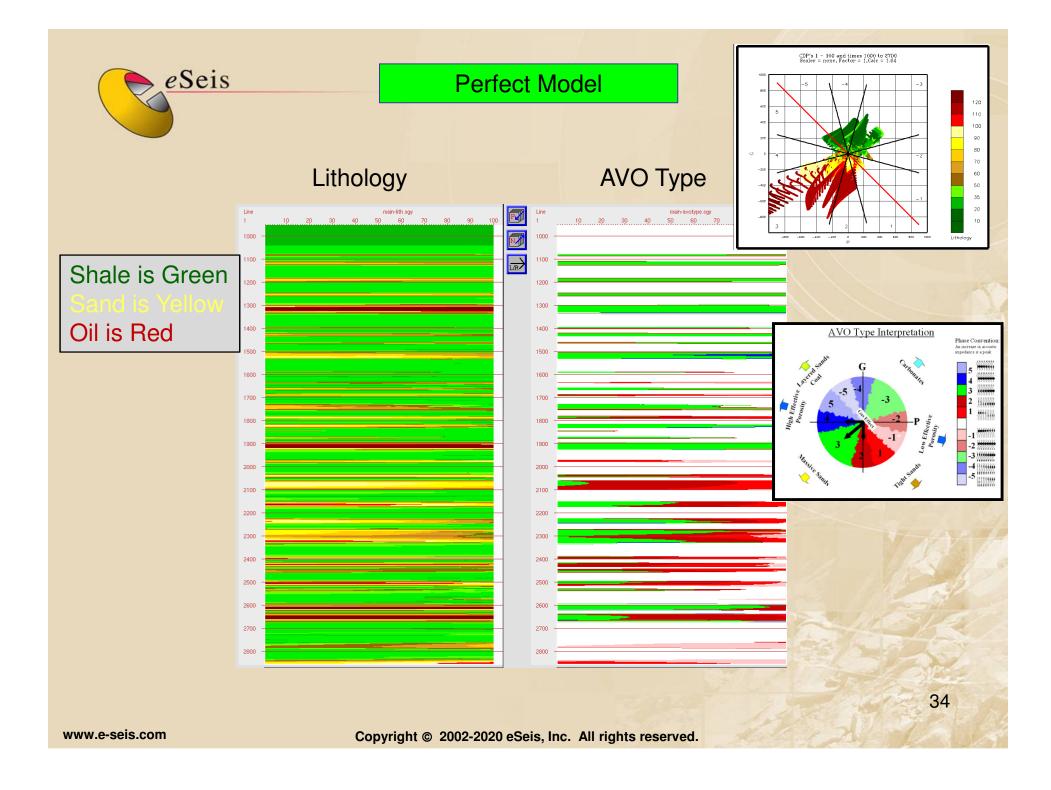


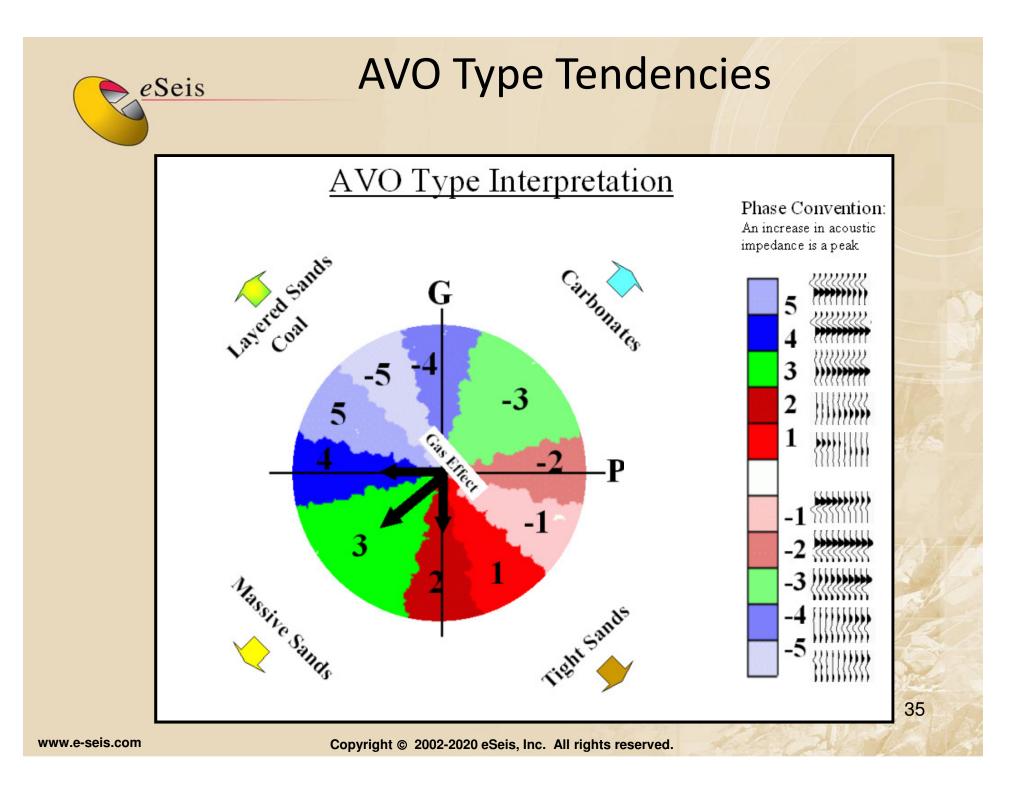


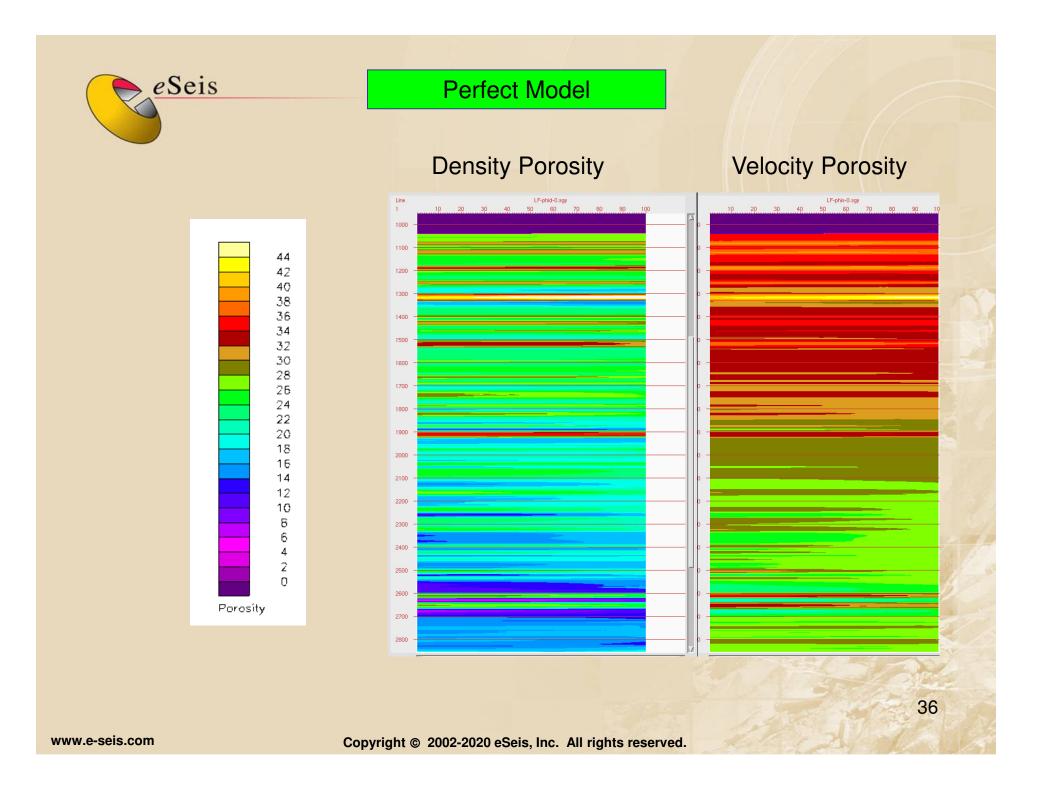


#### **Inverted Space**





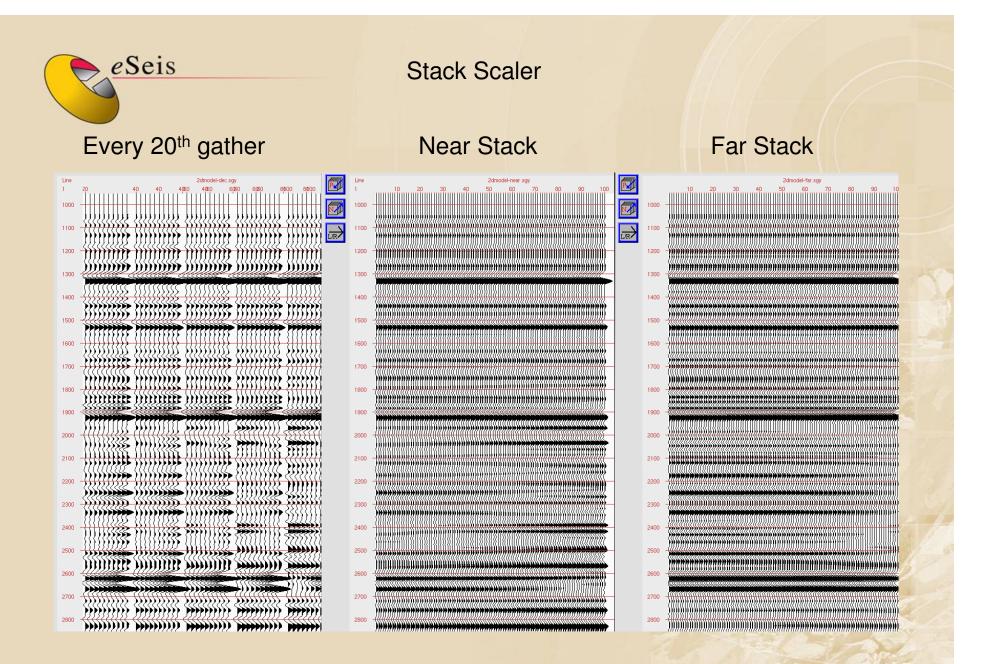




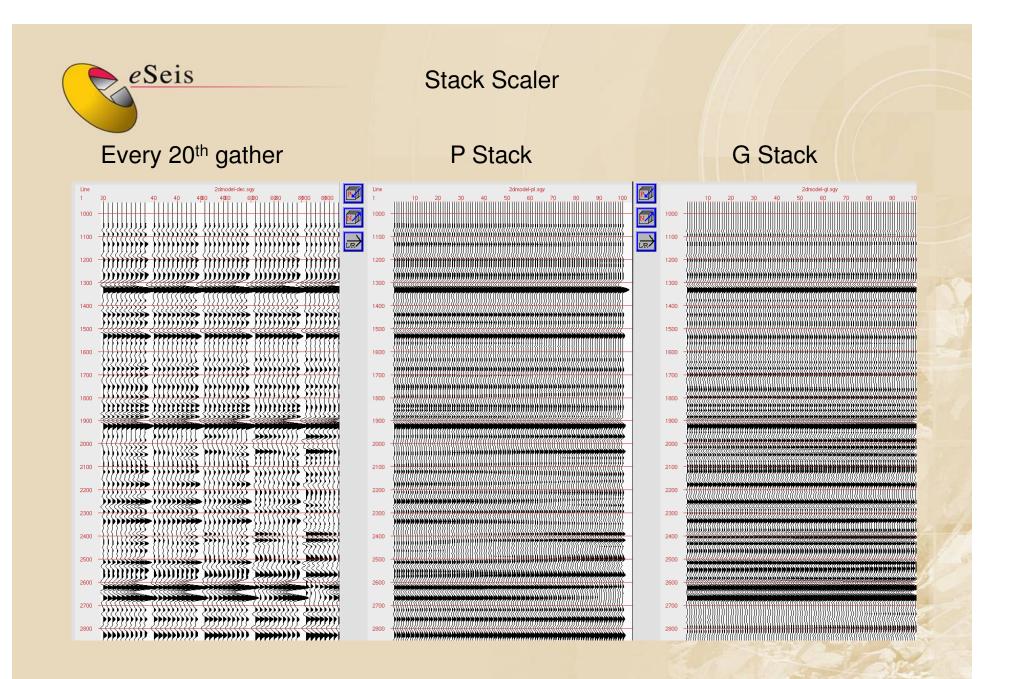


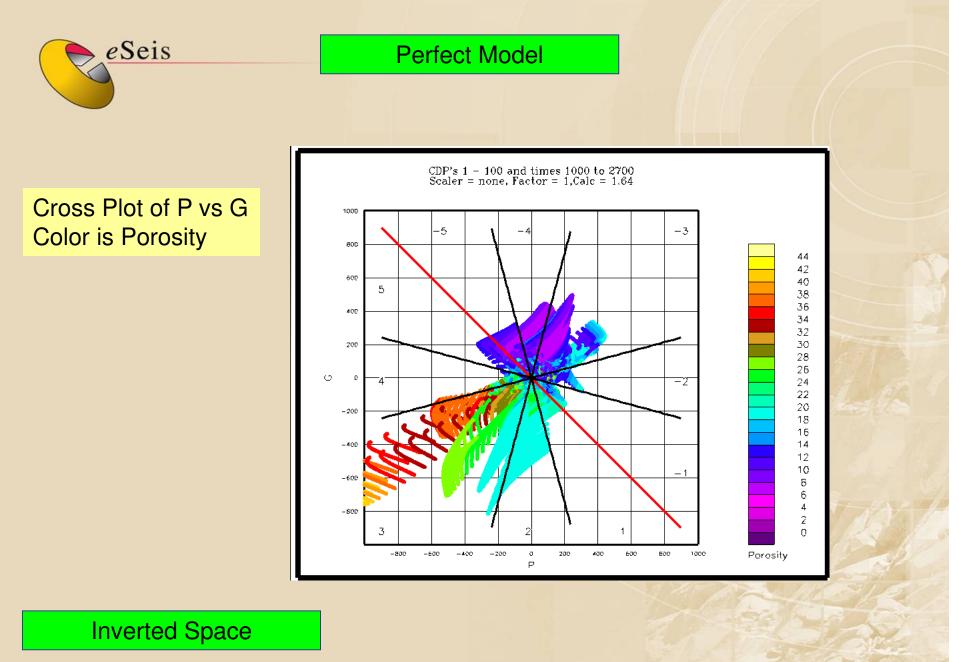
## Stack Scaler

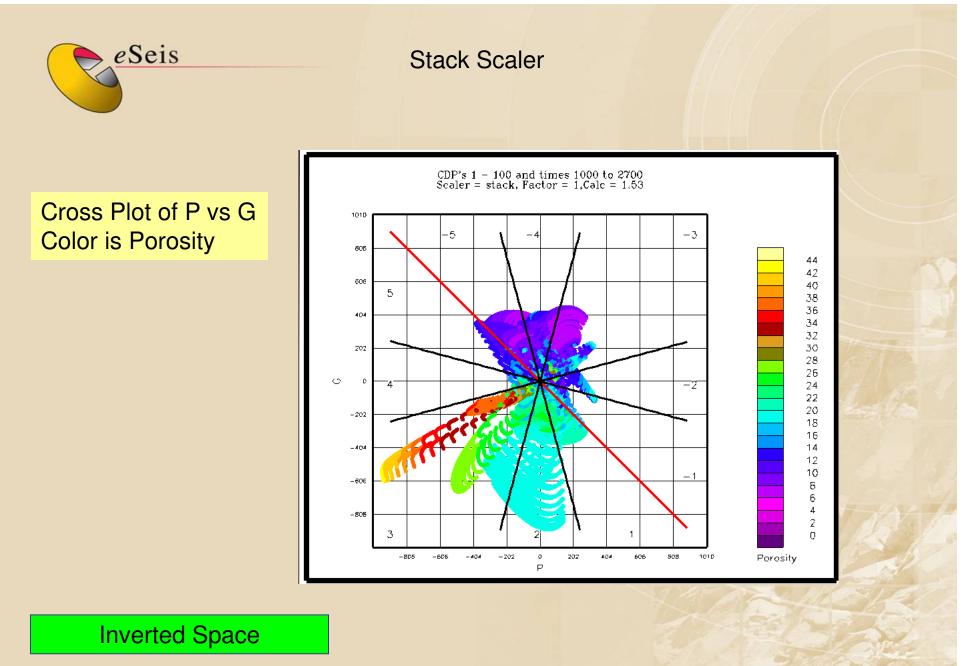
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
ne 2dmodel-dec.say 20 40 40 4050 6050 6050 8050 8000 8000	Line 2dmodel-near.sgy 1 10 20 30 40 50 60 70 80 90 100	2dmodel-far.sgv 10 20 30 40 50 60 70 80 90 10
<ul> <li></li></ul>		
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	1500	
······································	2000	200
		2100
		2400
		2500
		200 -
<sup>8</sup> <del>3979977777 9797777777 9999777777 9799777777</del>	2700	200

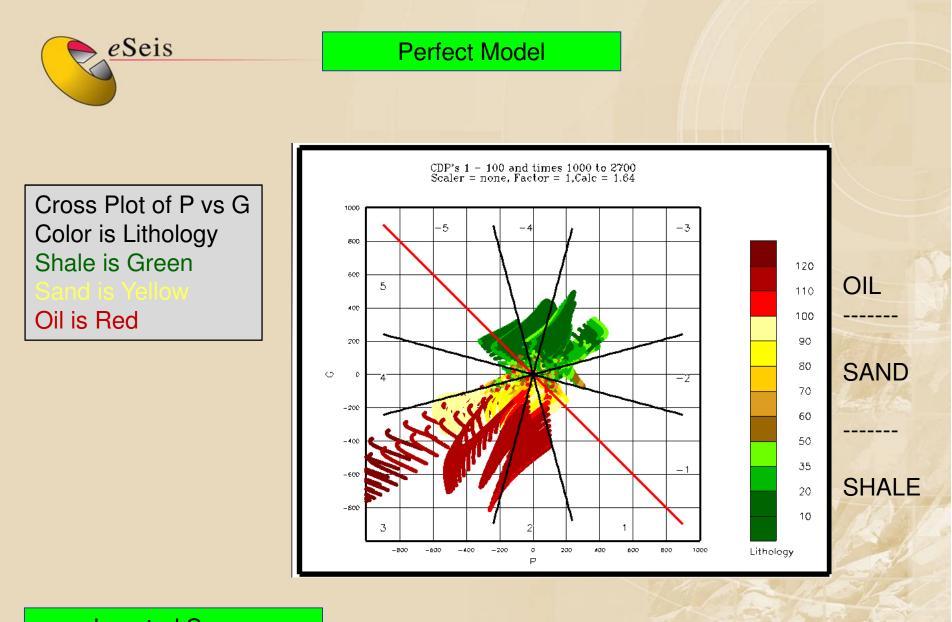


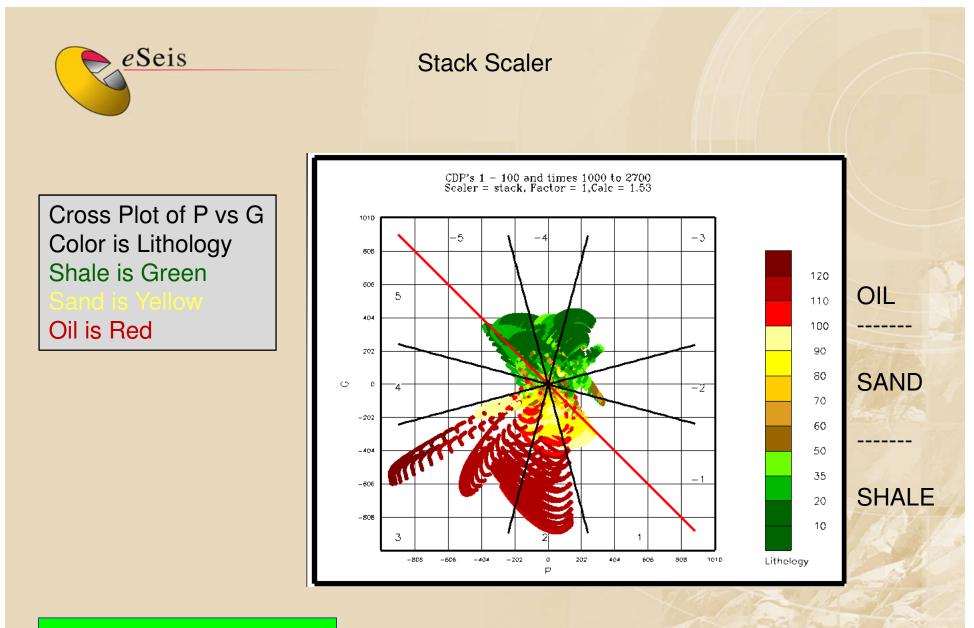
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ne 2000del-dec.sgy 200404040506580698069808900 000	Line 2dmodel-pl.sgy 1 10 20 30 40 50 60 70 80 90 100 1000	2dmodel-gl say         90         10         20         30         40         50         80         70         80         90         10           IOOO
	1200 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	1100
	1700	
	2000	
	200	2200
	2400	2300
	2500	2500 2500 2500 2500 2500 2500 2500 2500
	2700	2700

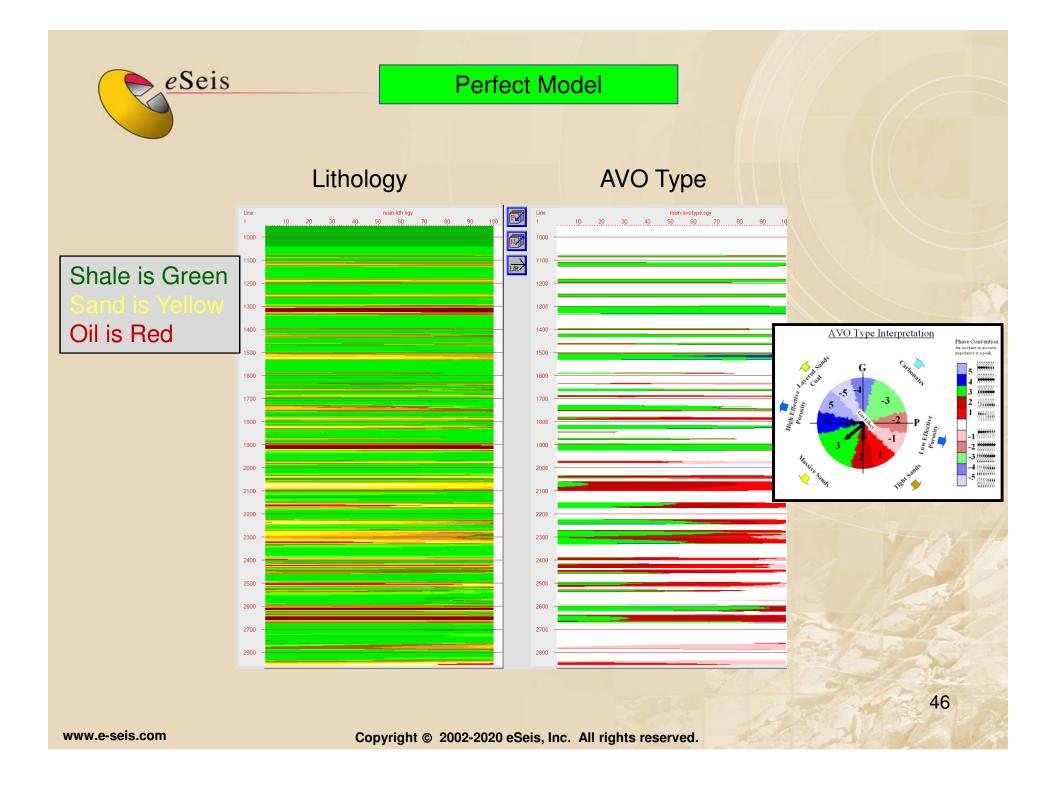


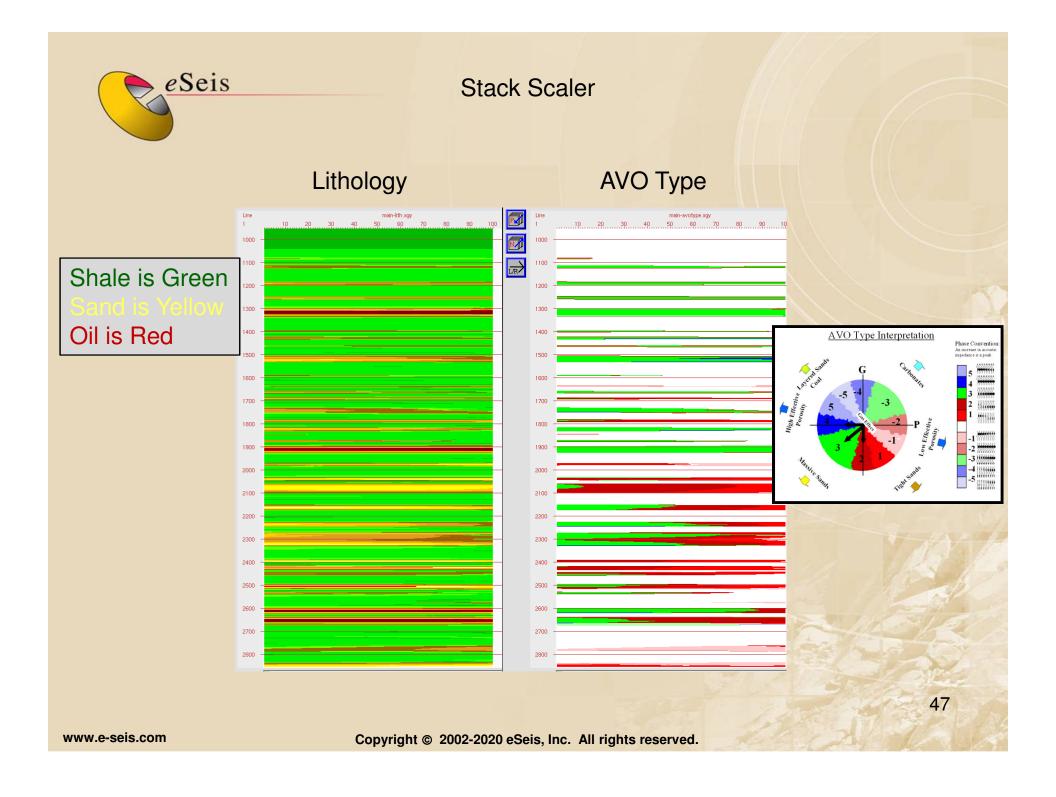


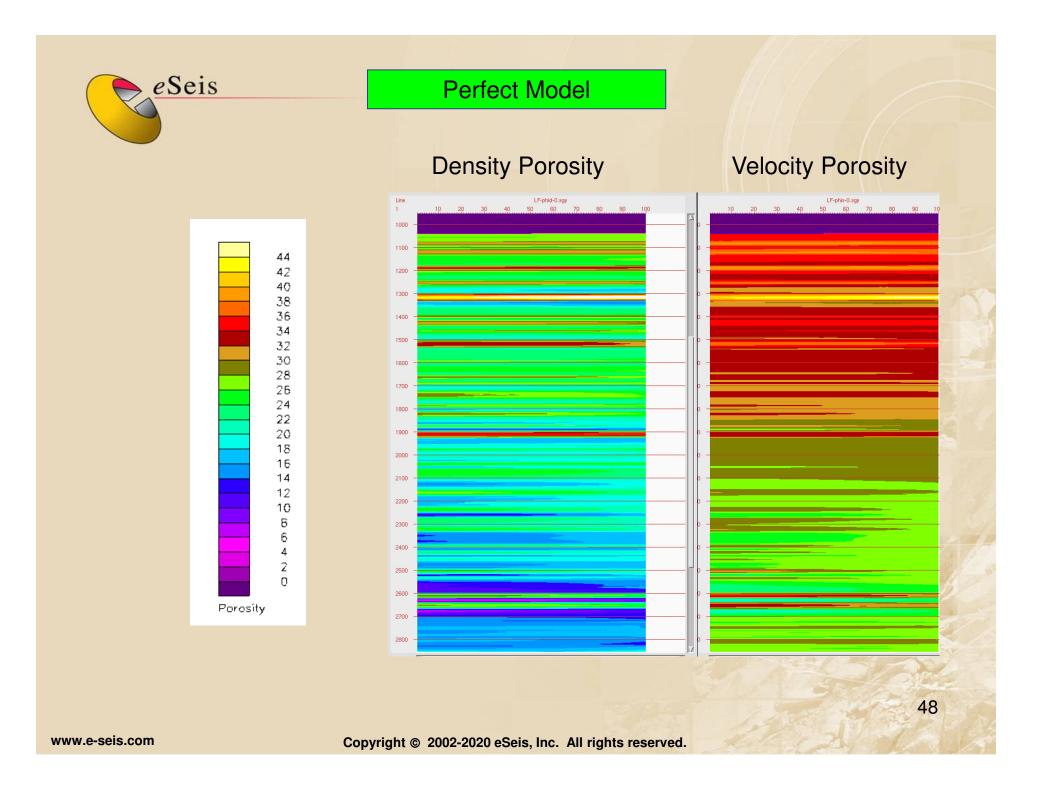


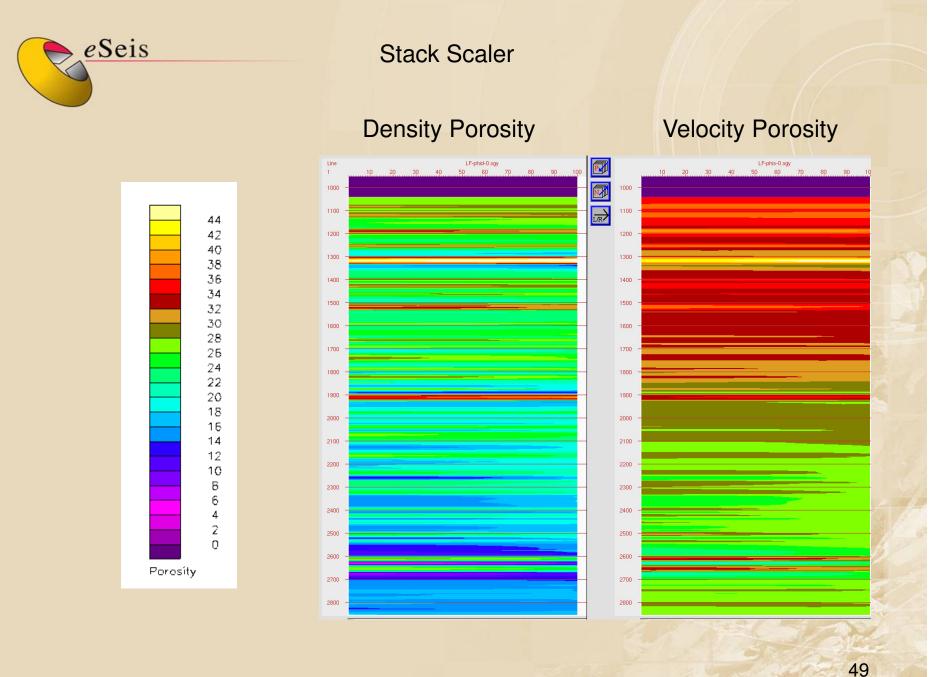








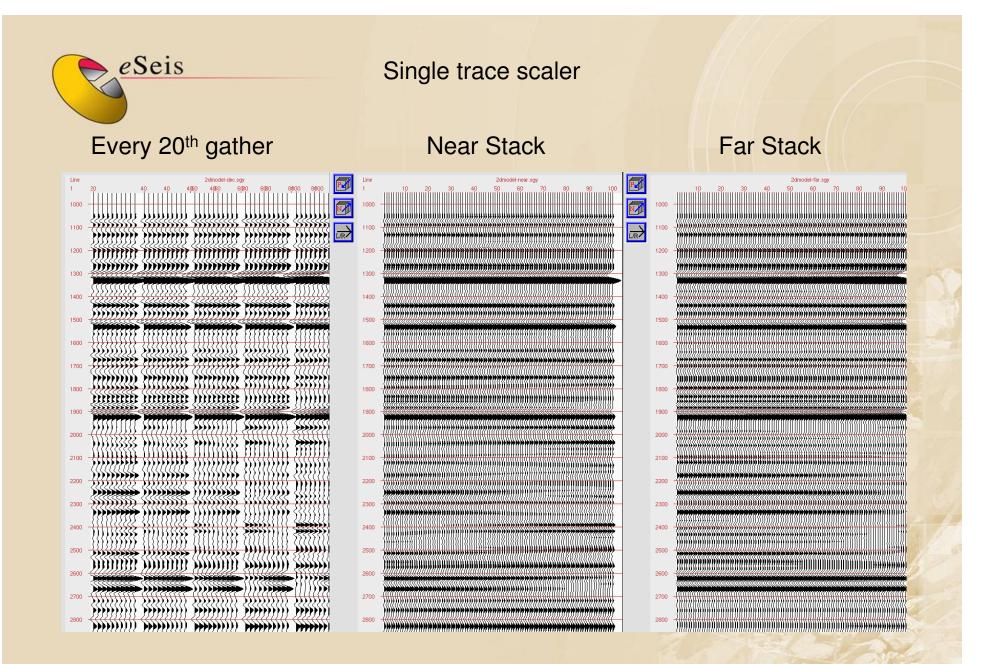




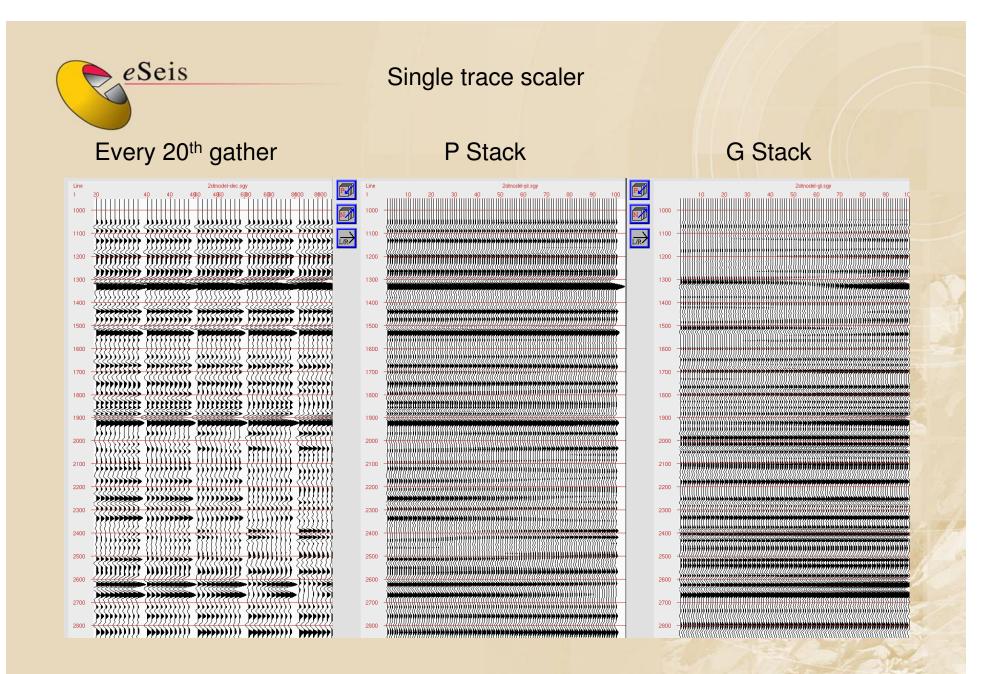


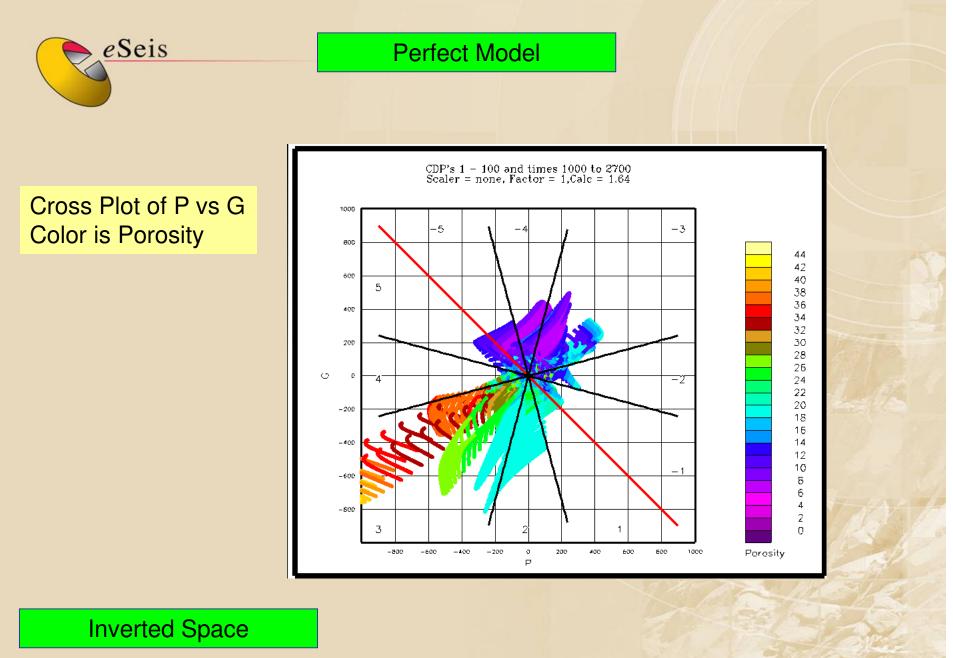
# Single Trace Scaler

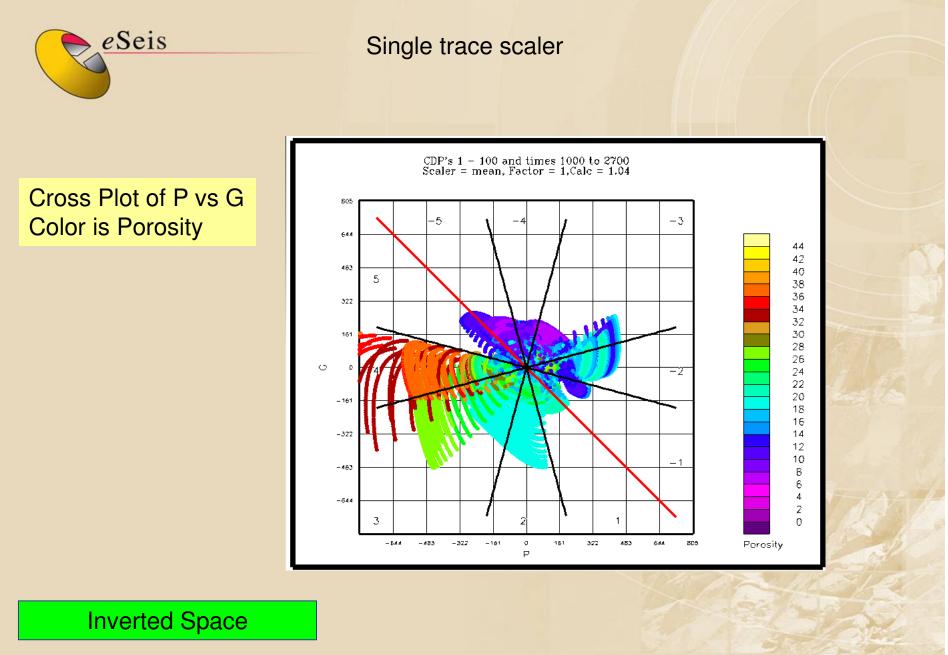
Every 20 <sup>th</sup> gather		
	Near Stack	Far Stack
2dmodel-dec.sgy 20 40 40 40 40 60 60 60 60 60 60 60 60 60 60 60 60 60	Line 2dmodel-near.sgy 1 10 20 30 40 50 60 70 80 90 100	2dmodel-far.sgy 10 20 30 40 50 60 70 60 90 10 1000
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		100 <b>///////////////////////////////////</b>
	1300	1300
	1400	1400
		1500
		2000
		210
	200	2200
		2300
	2400	2400
	2500	2500
	200	
	2700	2000

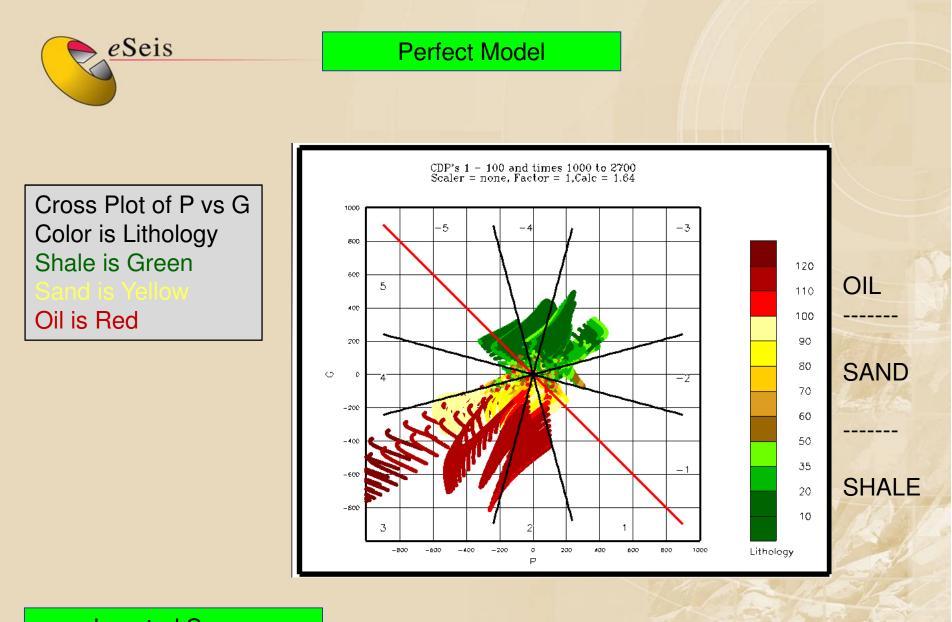


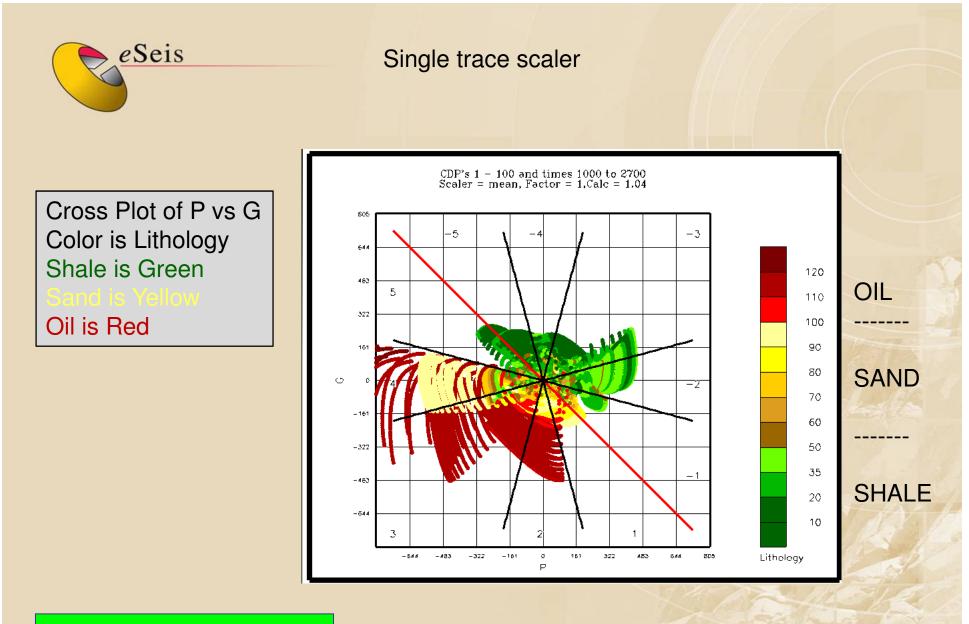
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ine 20model-dec.sgy 20 40 40 4050 6050 6050 8000 6000 	Line 24model-pl say 1 10 20 30 40 50 80 70 80 90 100 1000	2dmodel-gl.sgy         0
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	1400	
	1500	
		1600
	1700	
	1900	
	2000	
· · · · · · · · · · · · · · · · · · ·	2100	
	2200	2200
	2300	
*** ***********************************	2400	2400
	2500	
		2000
700	2700	2700
•••• <u>}}}},;;;;; }};;;; }};;;; }},;;; }</u>	2800	

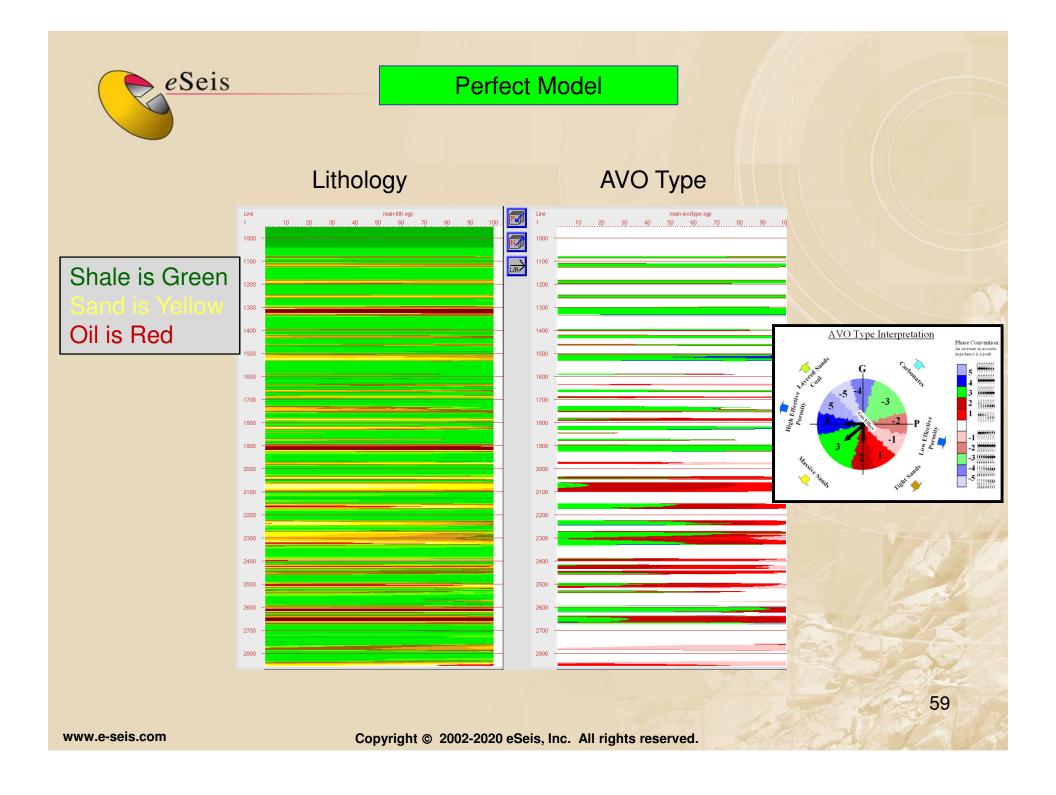


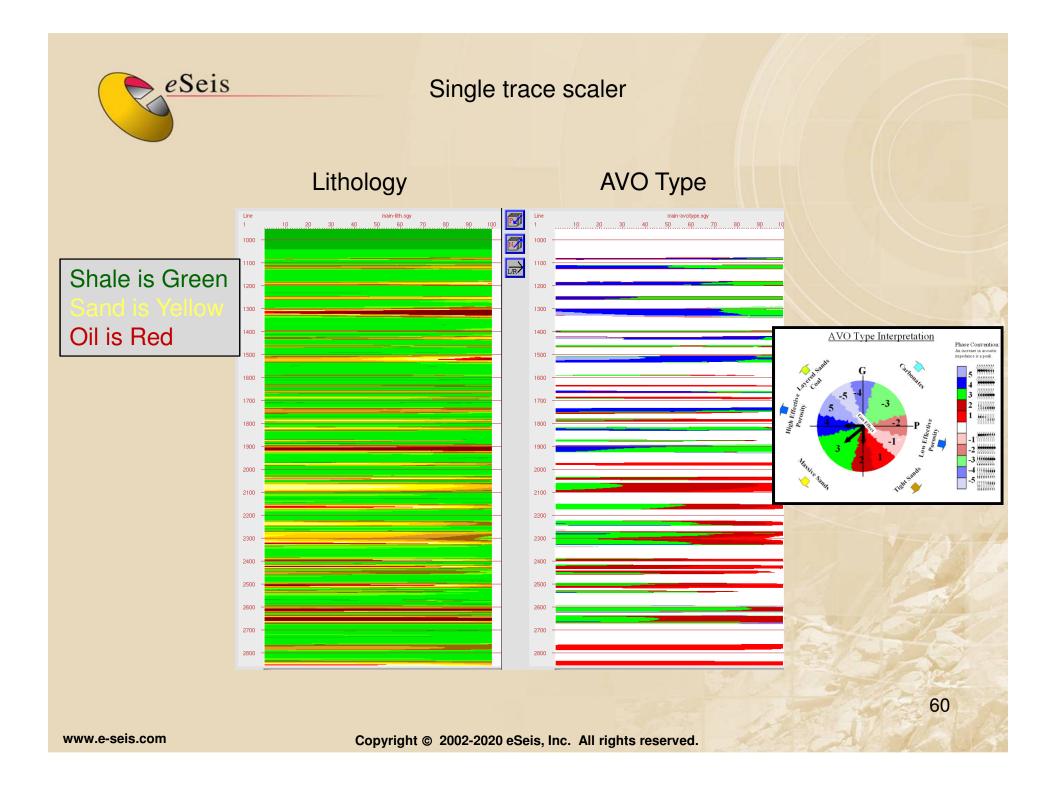


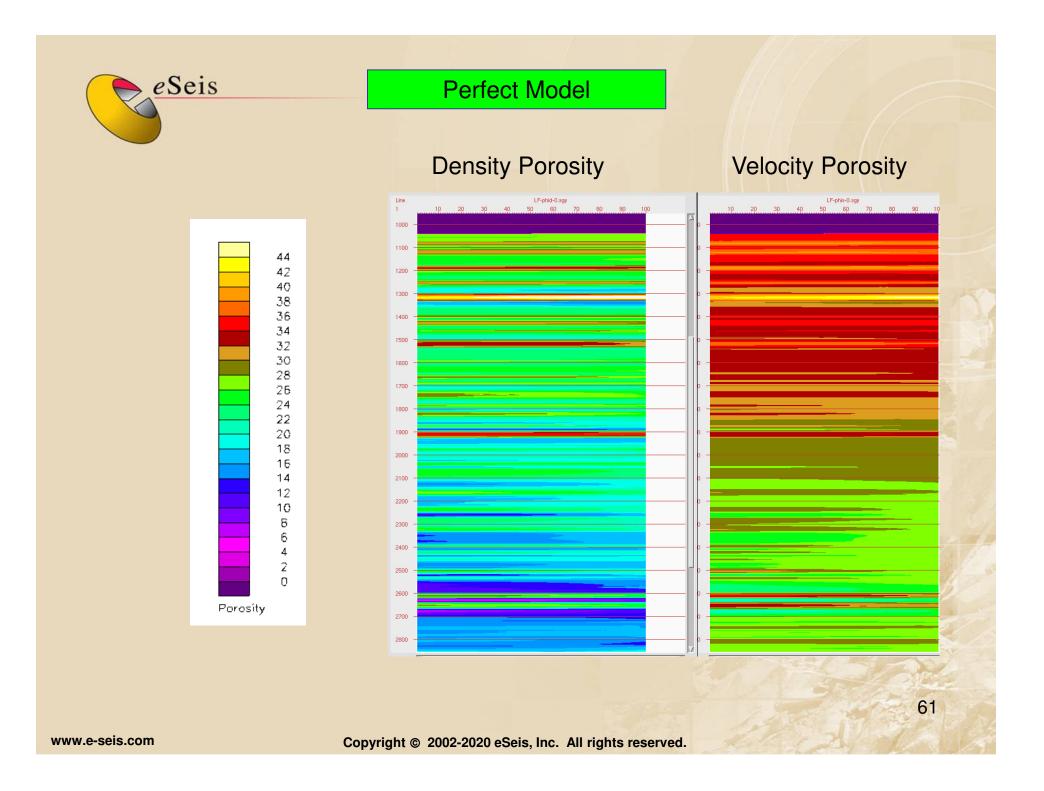












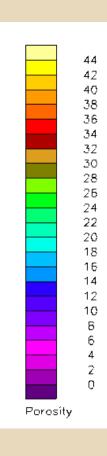


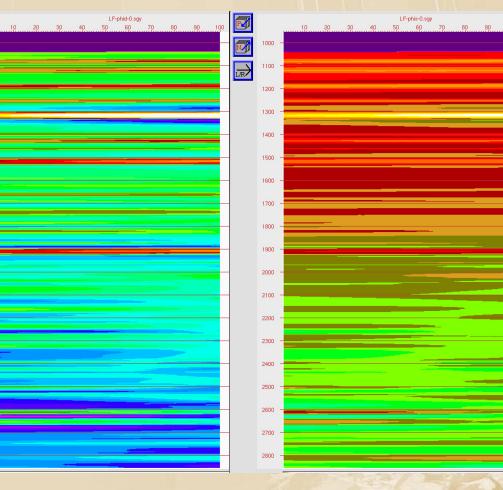
### Single trace scaler

### **Density Porosity**

Line 

### Velocity Porosity







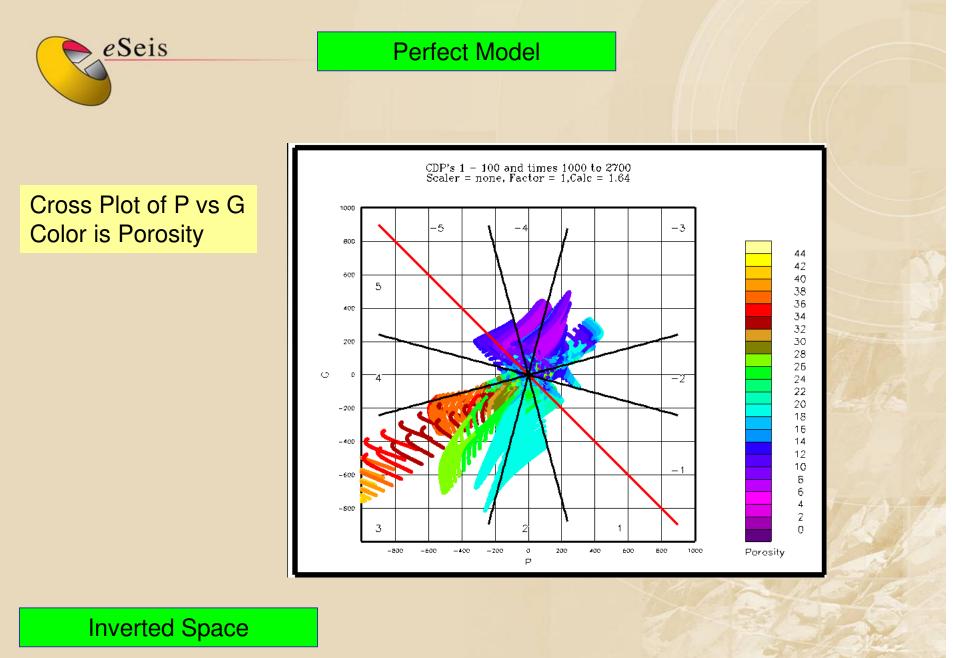
## 1000ms AGC Scaler

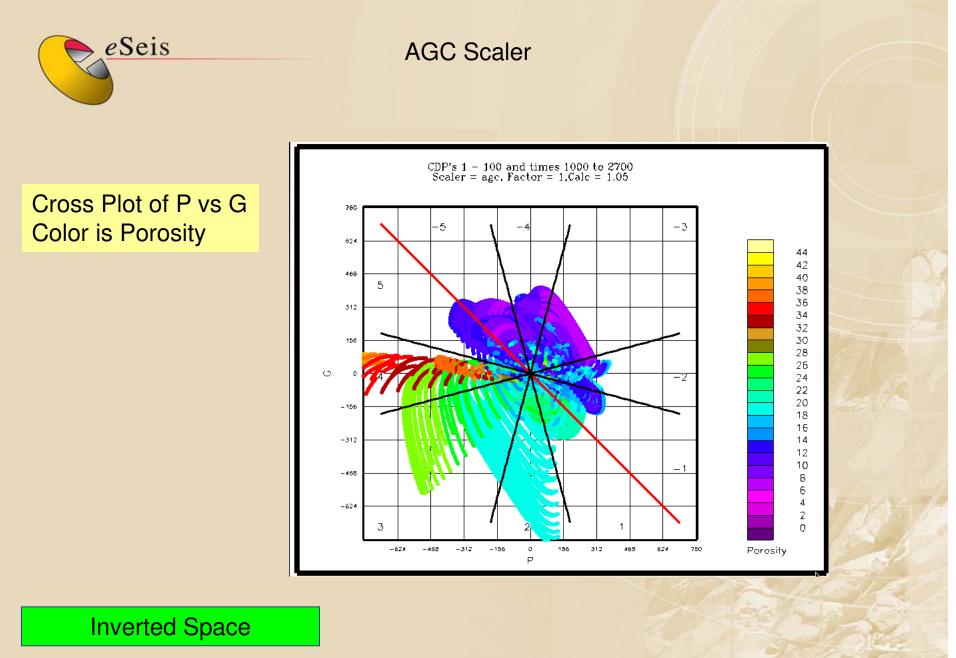
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
ne 24model-dec.sgy 20 40 40 4050 5050 5050 5050 5000 5000	Line 2dmodel-near-agy 1 10 20 30 40 50 60 70 80 90 100 1000	20trodel-for sgy 10 20 30 40 50 60 70 80 90 10 1000
		1200 <b>Пополнования в составляется в с</b>
	1300	
		1400
······································	1600	1600
	2000	200
	200	
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		2200
	2400	240
□□	2500	250
		2000
**************************************	2700	2700

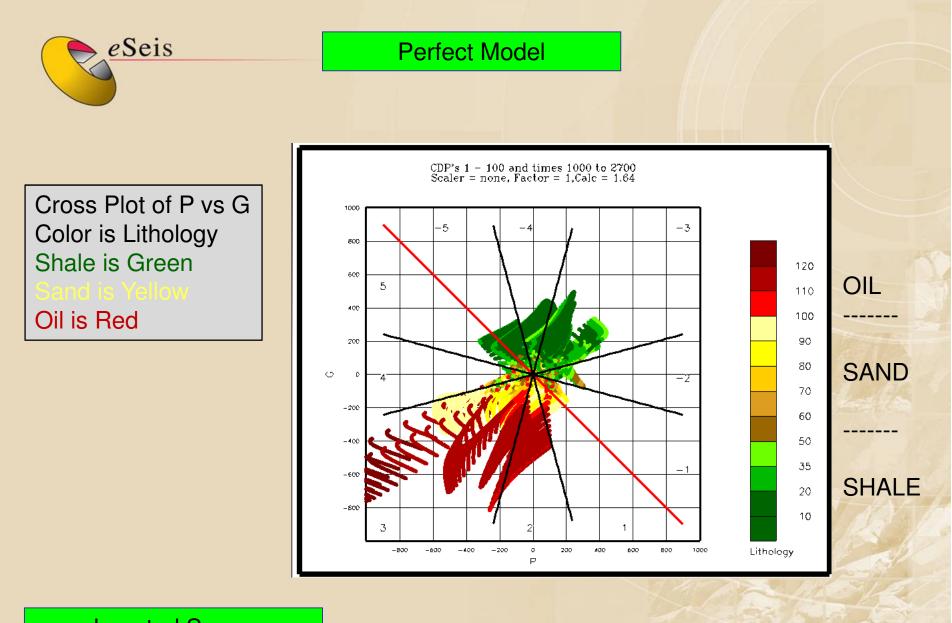
eSeis	AGC Scaler	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
1200	Line       2dmodel-near says         10       10       2000000000000000000000000000000000000	2000000000000000000000000000000000000

eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ne 22model-dec.sgy 20 40 40 4060 6050 6050 6050 6000	Line 20model-pl.sgy 1 19 29 30 49 59 59 79 89 90 100 1000 44444444444444444444444444444	2dmodel-gl.sgy 10 20 30 40 50 60 70 80 90 10 1000
	1100 1100 1100 1000 1000 1000 1000 100	
	<sup>1200</sup> 1000000000000000000000000000000000	1200
	1300	1300
	1400	1400
	1500	
	1900	1900 -
······································	2000	2000
	2100	2100 - <b>199200200000000000000000000000000000000</b>
		2200 -
	2300	2300
	2400	2400
500	2500	
		2700 -
······································	200	200

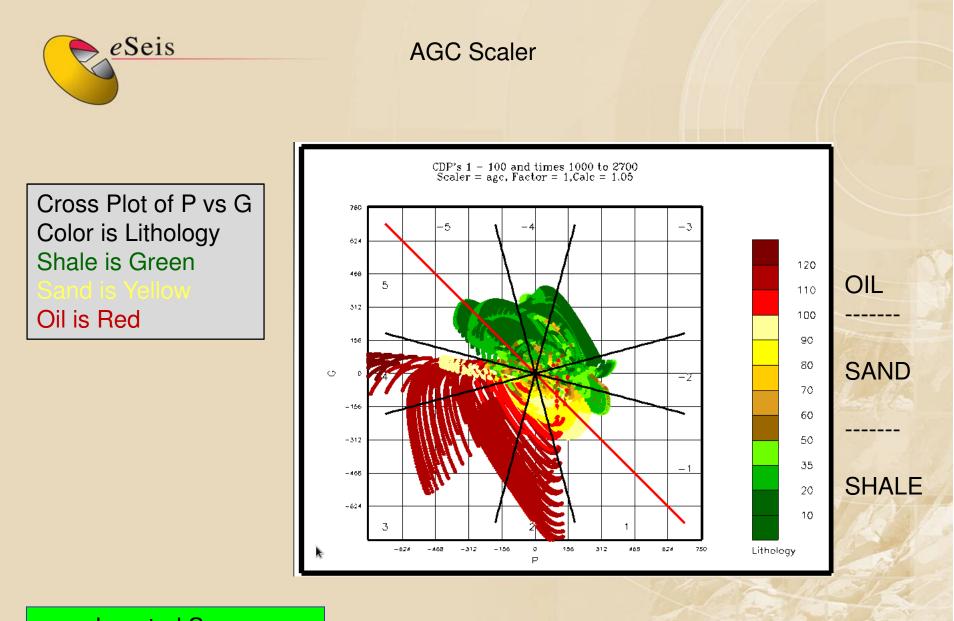
eSeis	AGC Scaler	
Every 20 <sup>th</sup> gather	P Stack	G Stack
	Line 24model-plagy 100 100	



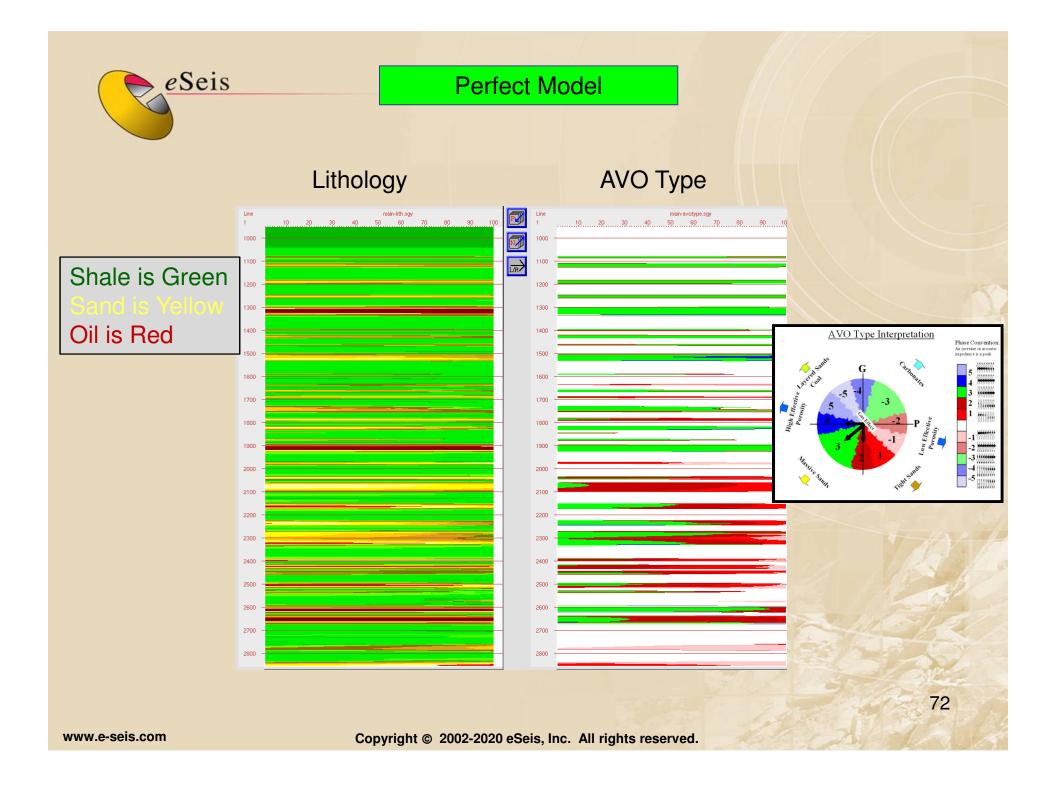


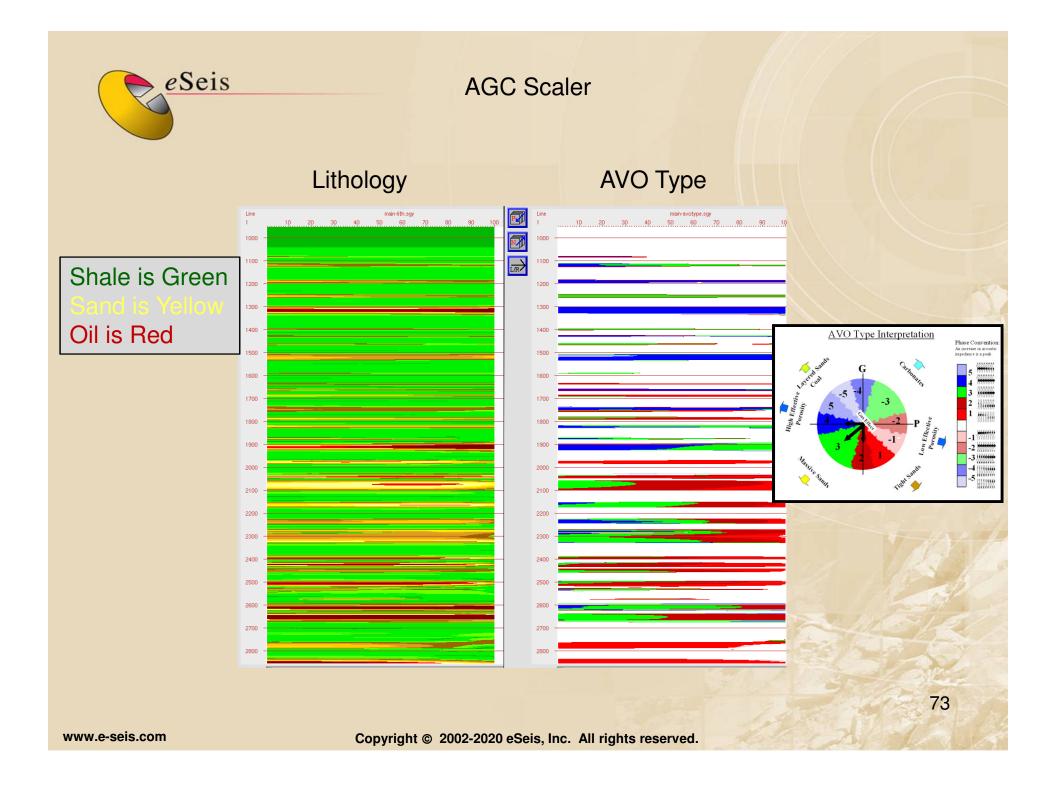


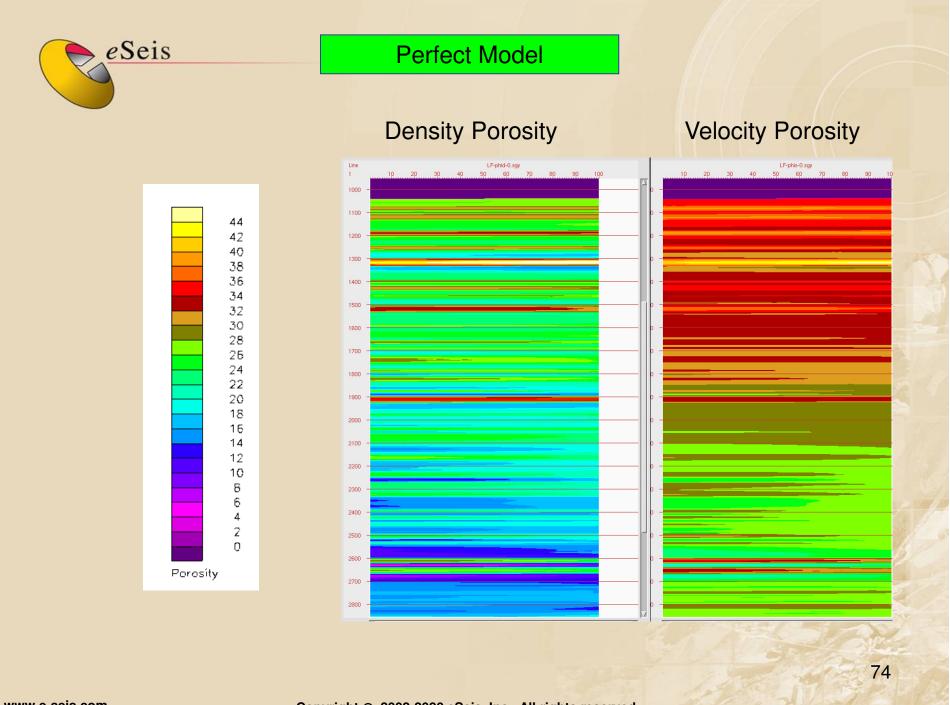
70

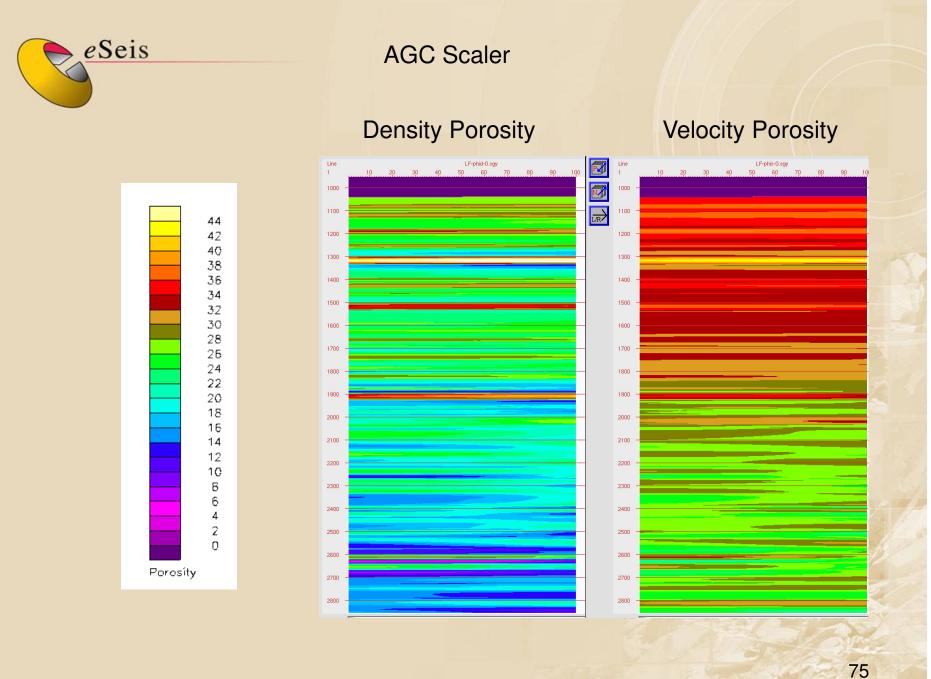


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## NMO Stretch

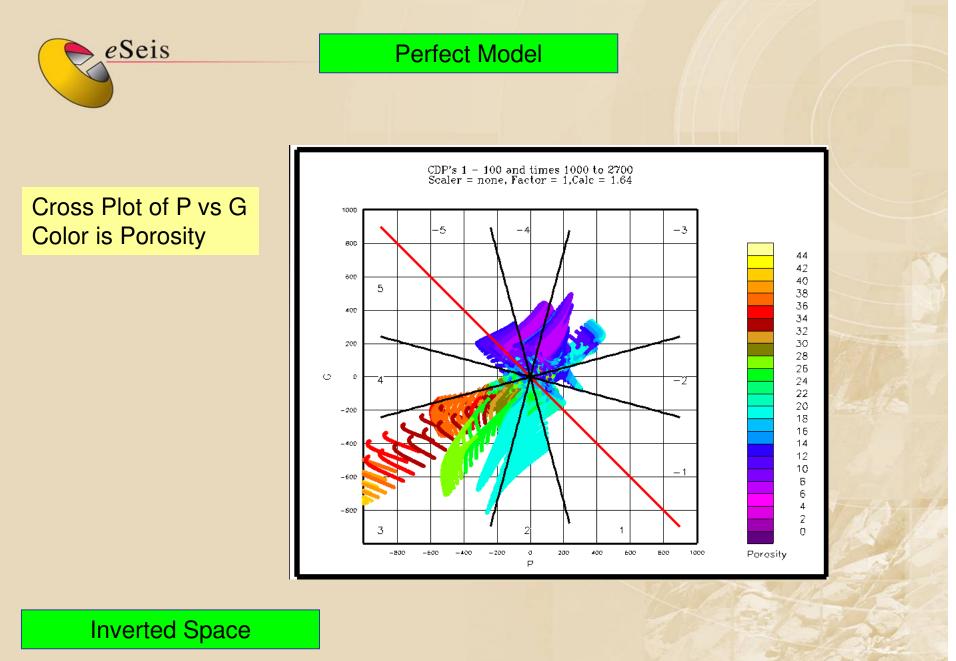
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
ne 24model-dec.sgy 20 40 40 4050 6050 6050 8000 8000	Line 2dmodel-near-agy 1 10 20 30 40 50 60 70 80 90 100 1000	20trodel-for sgy 10 20 30 40 50 60 70 80 90 10 1000
		1200 <b>Пополнования в составляется с с</b>
	1300	
		1400
······································	1600	1600
	2000	200
	200	
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		2200
	2400	240
□□	2500	250
		2000
**************************************	2700	2700

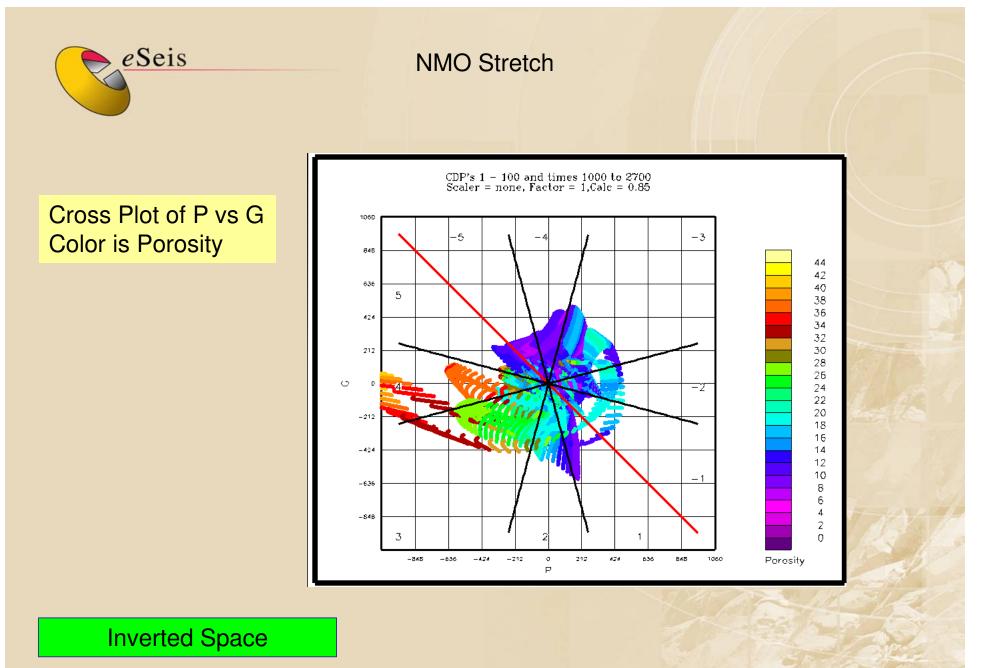
eSeis	NMO Stretch	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
1       20       40       400       400       900 </th <td></td> <td>20 20 10 10 20 30 40 50 90 70 90 90 10</td>		20 20 10 10 20 30 40 50 90 70 90 90 10

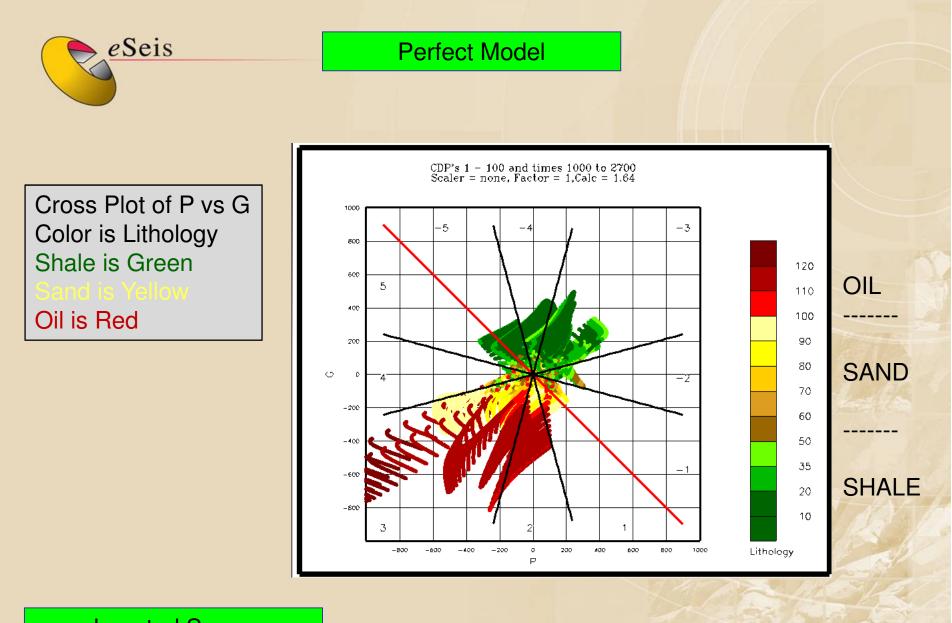
## www.e-seis.com

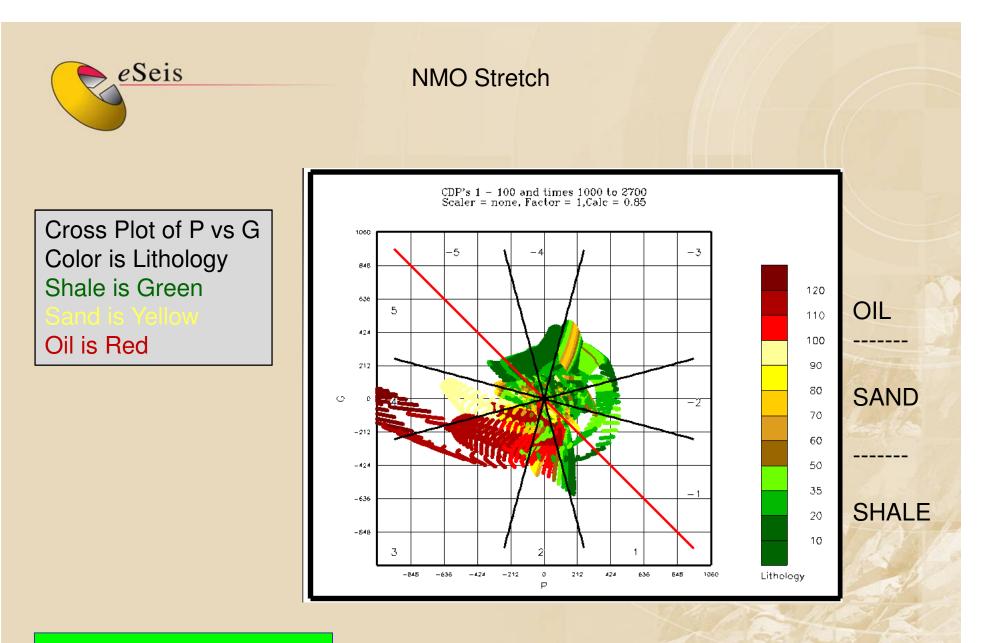
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ne 22model-dec.sgy 20 40 40 4060 6050 6050 6050 6000	Line 20model-pl.sgy 1 19 29 30 49 59 59 79 89 90 100 1000 44444444444444444444444444444	2dmodel-gl.sgy 10 20 30 40 50 60 70 80 90 10 1000
	1100 1100 1100 1000 1000 1000 1000 100	
	<sup>1200</sup> 1000000000000000000000000000000000	1200
	1300	1300
	1400	1400
	1500	
	1900	1900 -
······································	2000	2000
	2100	2100 - <b>1992/00/00/00/00/00/00/00/00/00/00/00/00/00</b>
		2200 -
	2300	2300
	2400	2400
500	2500	
		2000
		2700 -
······································	200	200

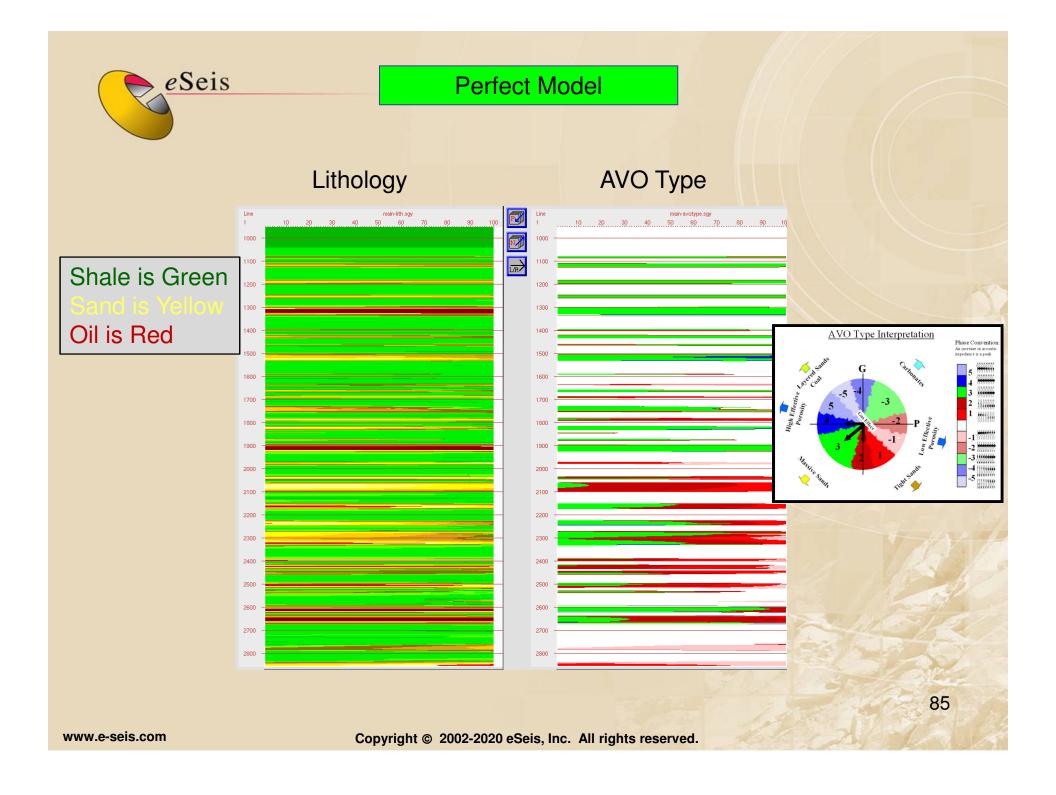
eSeis	NMO Stretch	
Every 20 <sup>th</sup> gather	P Stack	G Stack
Line 22tmodel-dec.agy 1 20 40 40 4(E0 4(E) 6(E) 6(E) 6(E) 8(E) 8(E) 8(E) (E) (E) (E) (E) (E) (E) (E) (E) (E)	Line 2000004-pl.sgy 1 10 20 30 40 50 60 70 80 90 100 1000 + ++++++++++++++++++++++++++++++++	2dmodel-gl.sgy 10 20 30 40 50 80 70 80 90 10
100         2000000000000000000000000000000000000	1100         1100         1100         1200           1200         1200         1200         1200           1300         1200         1200         1200	
	1400 1400 1400 1400 1400 1400 1400 1400	
1600	1600	
2100         ************************************	2100         200         200 </td <td></td>	
200	2000	
	2000	

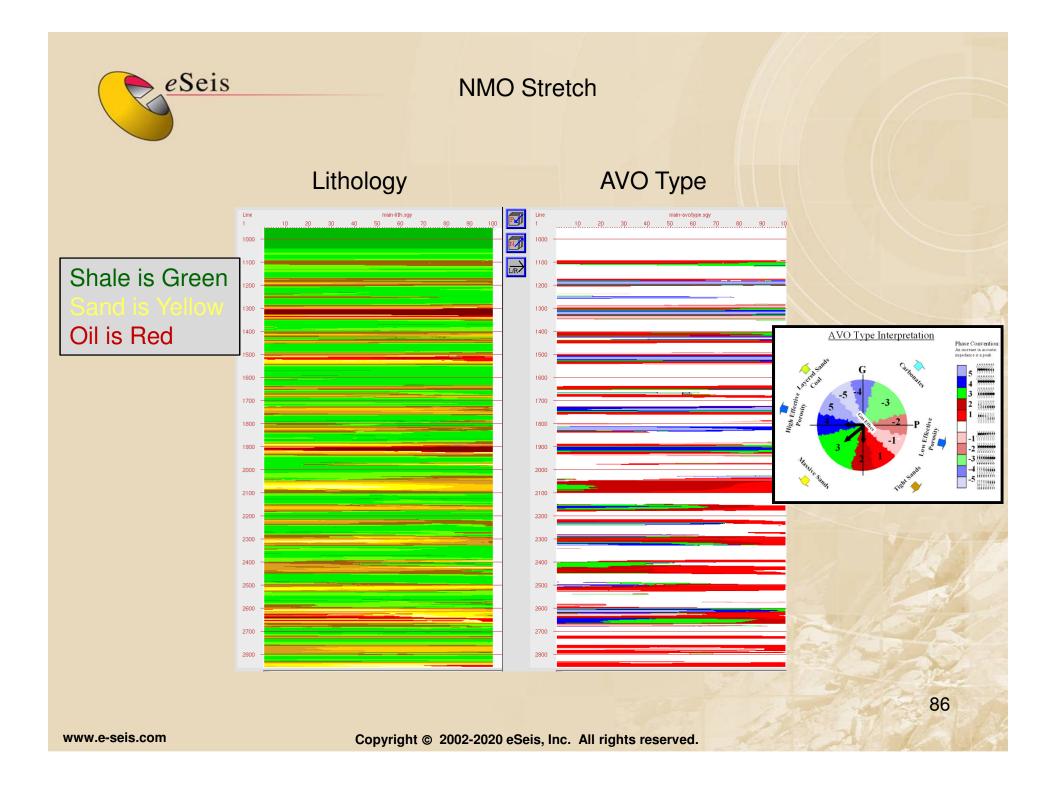


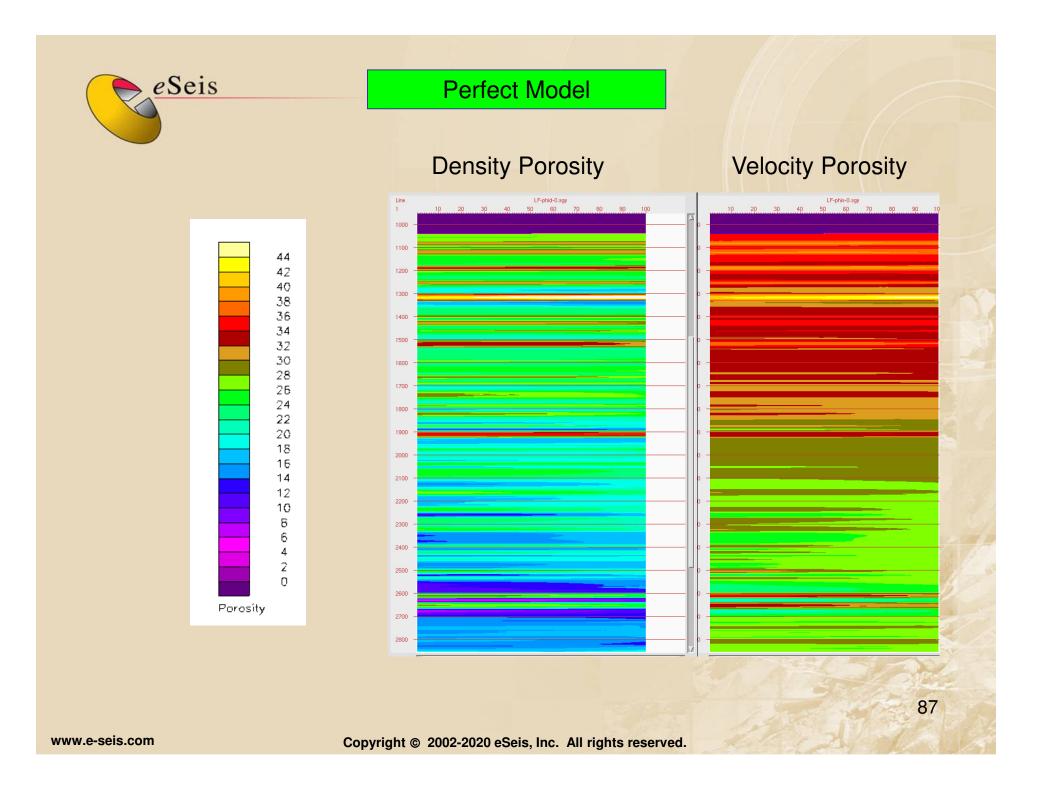


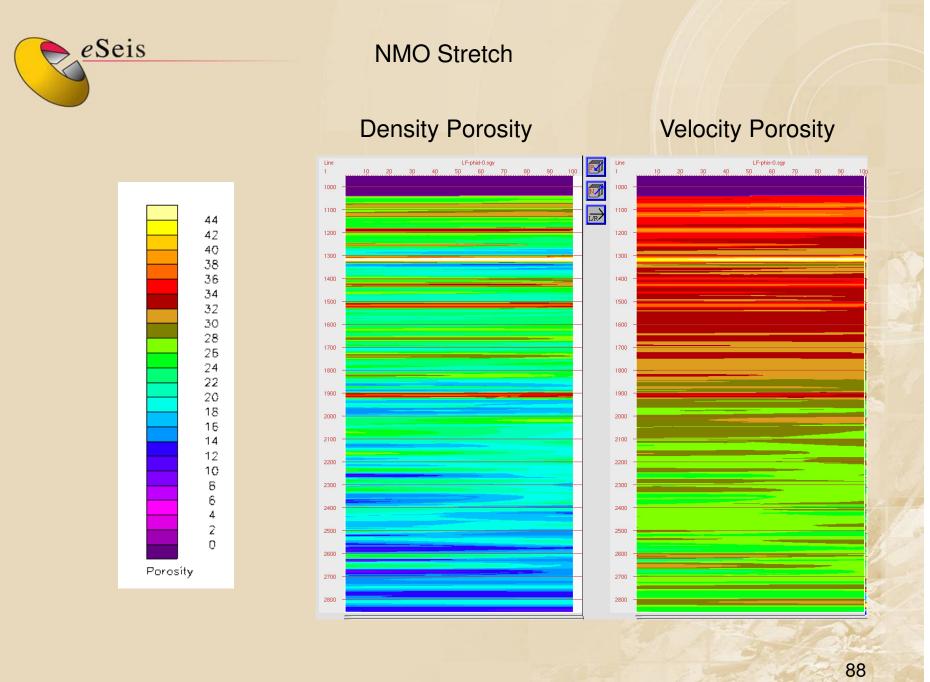








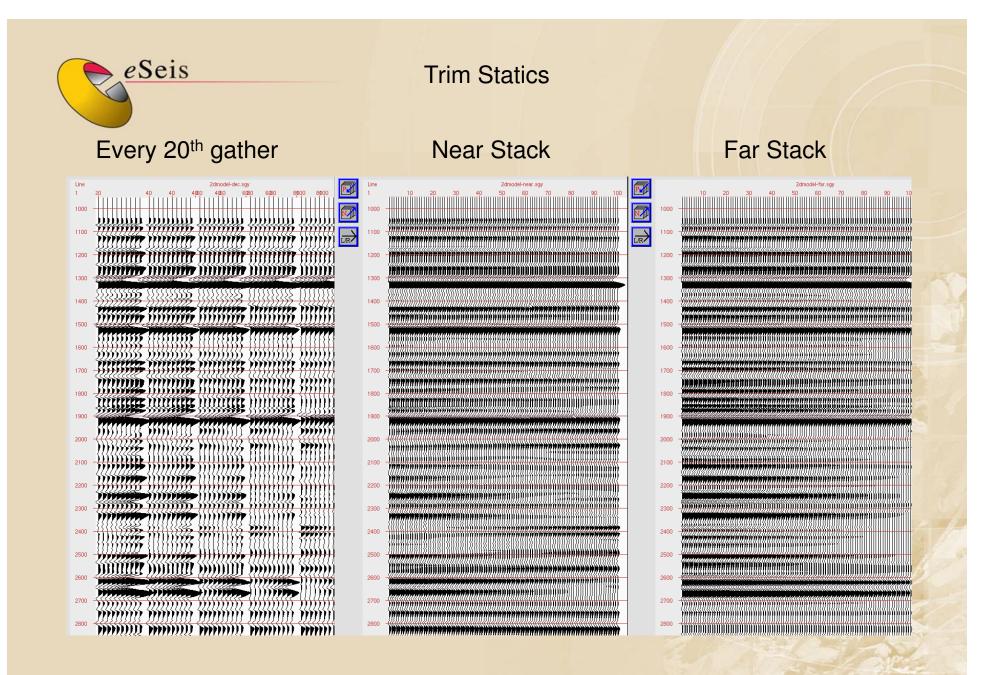






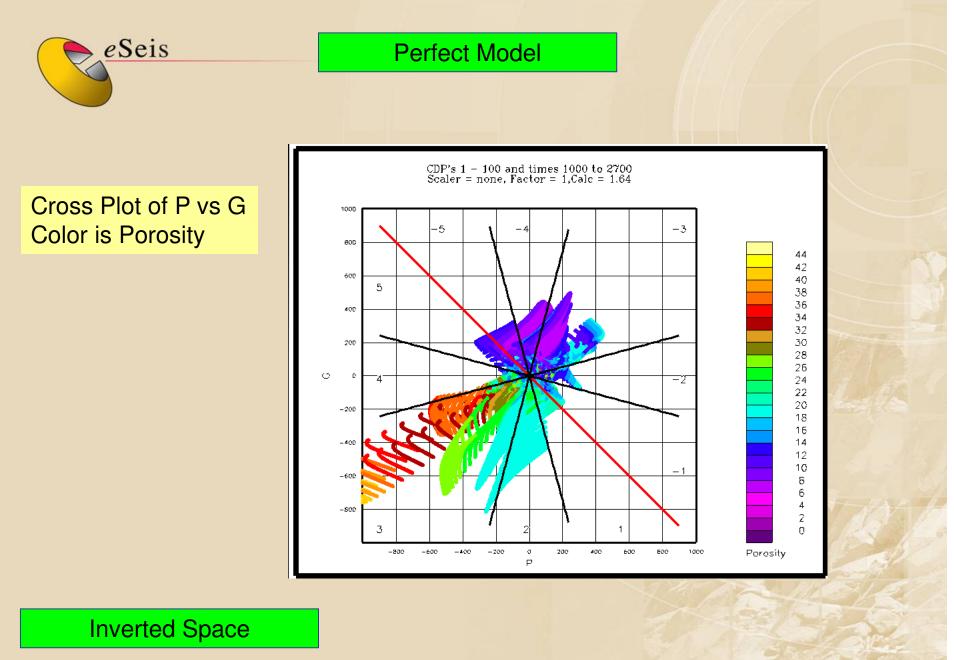
## **Trim Statics**

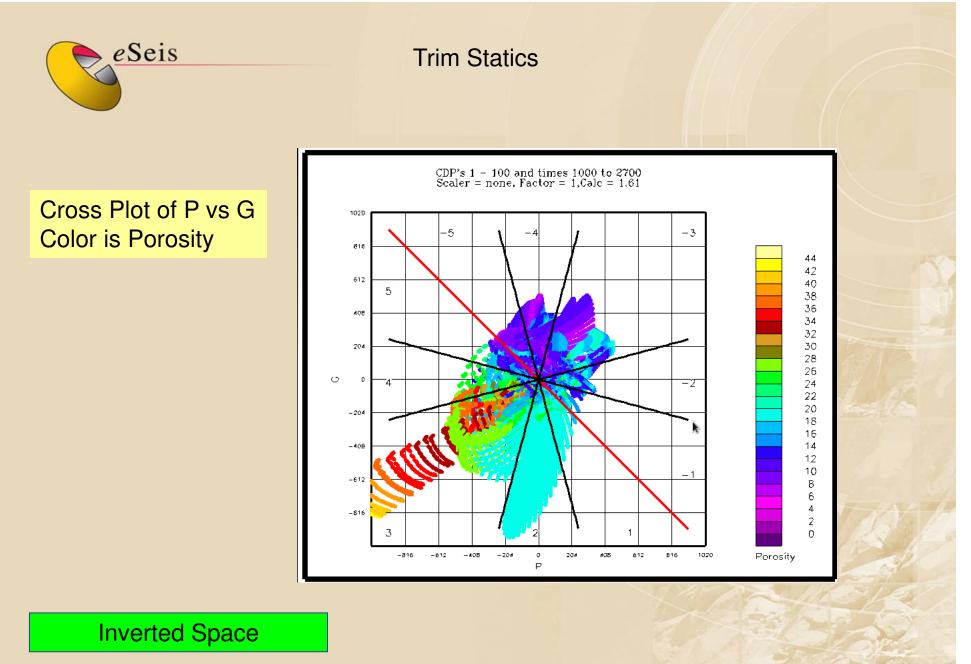
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
ne 24model-dec.sgy 20 40 40 4050 6050 6050 8000 8000	Line 2dmodel-near-agy 1 10 20 30 40 50 60 70 80 90 100 1000	20trodel-for sgy 10 20 30 40 50 60 70 80 90 10 1000
		1200 <b>Пополнования в составляется с с</b>
	1300	
		1400
······································	1600	1600
	2000	200
	200	
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		2200
	2400	240
□□	2500	250
		2000
**************************************	2700	2700

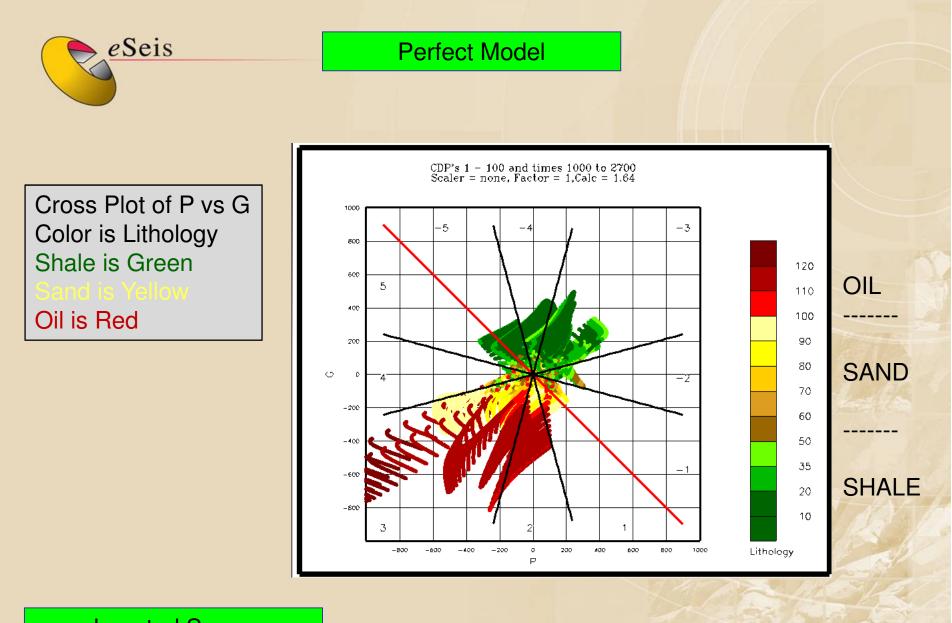


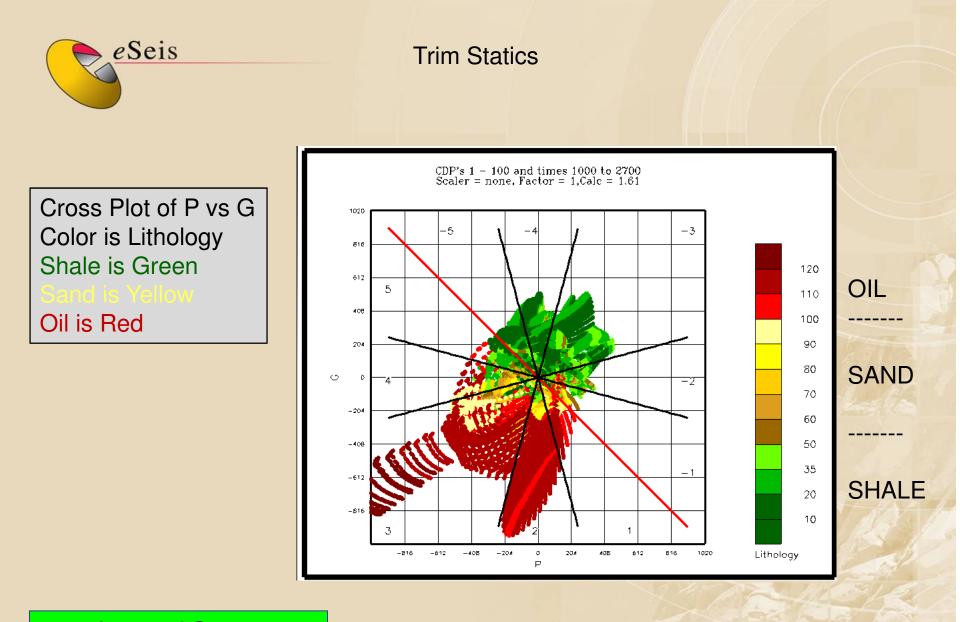
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ine 2chmodel-dec.sgy 20 40 40 4050 6050 6050 8000 6000 	Line 24model-pl.sgy 1 10 20 30 40 50 80 70 80 90 100 1000	2dmodel-gl.sgy         0
□	200	
	1400	
	1500	
		1600
	1700	
	1900	
	2000	
· · · · · · · · · · · · · · · · · · ·	2100	
	2200	2200
	2300	
*** ***********************************	2400	2400
	2500	
		2000
	2700	2700
•••• <u>}}}},;;;;; }};;;; }};;;; }},;;; }</u>	2800	

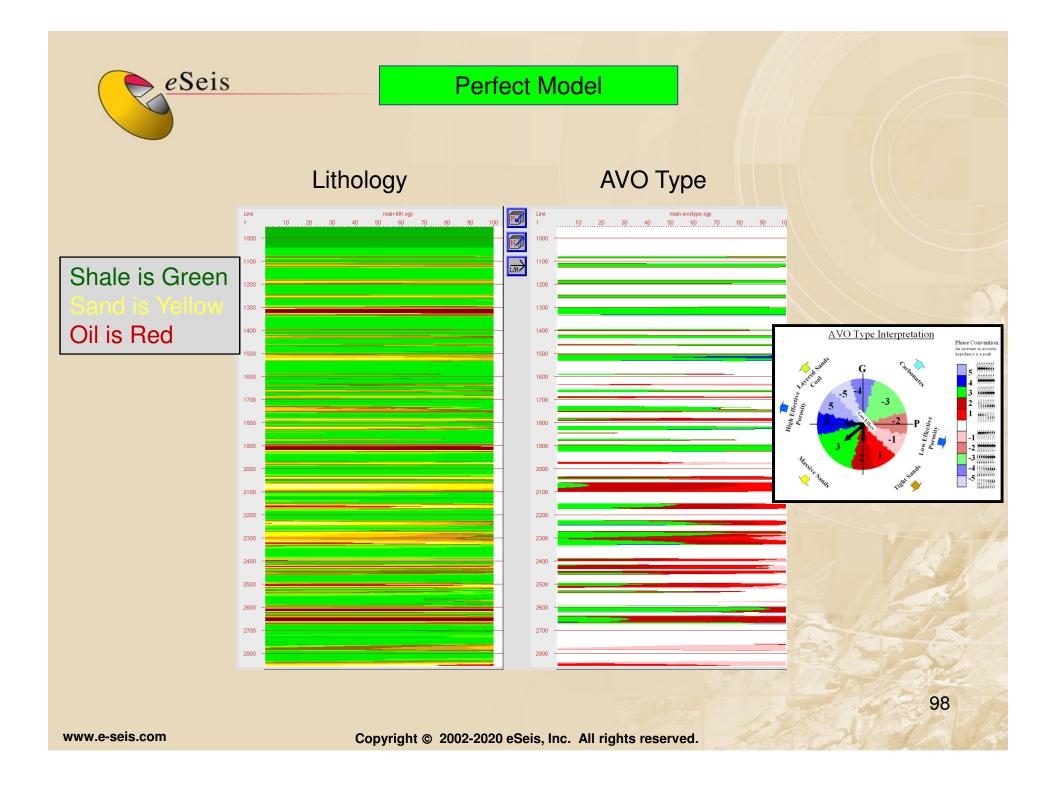
eSeis	Trim Statics	
Every 20 <sup>th</sup> gather	P Stack	G Stack
Line 2dmodel-dec.sgy 1 20 40 40 400 400 600 600 600 600 600 600	Line 2dmodel-pLsgy 1 10 20 30 40 50 60 70 80 90 100 1000	2dmodel-gl.ggy           10         20         30         40         50         60         70         80         90         10           1000
100	1100 <b> </b>	
	1300	
1700		
	2000	2000
	2100	
200	200	200 -
2000		2300
2400	2400	2400 -
2500 111111111 (1111111) (1111111) (1111111) (11111111	2500	
		2800 -
		2700
	2000	

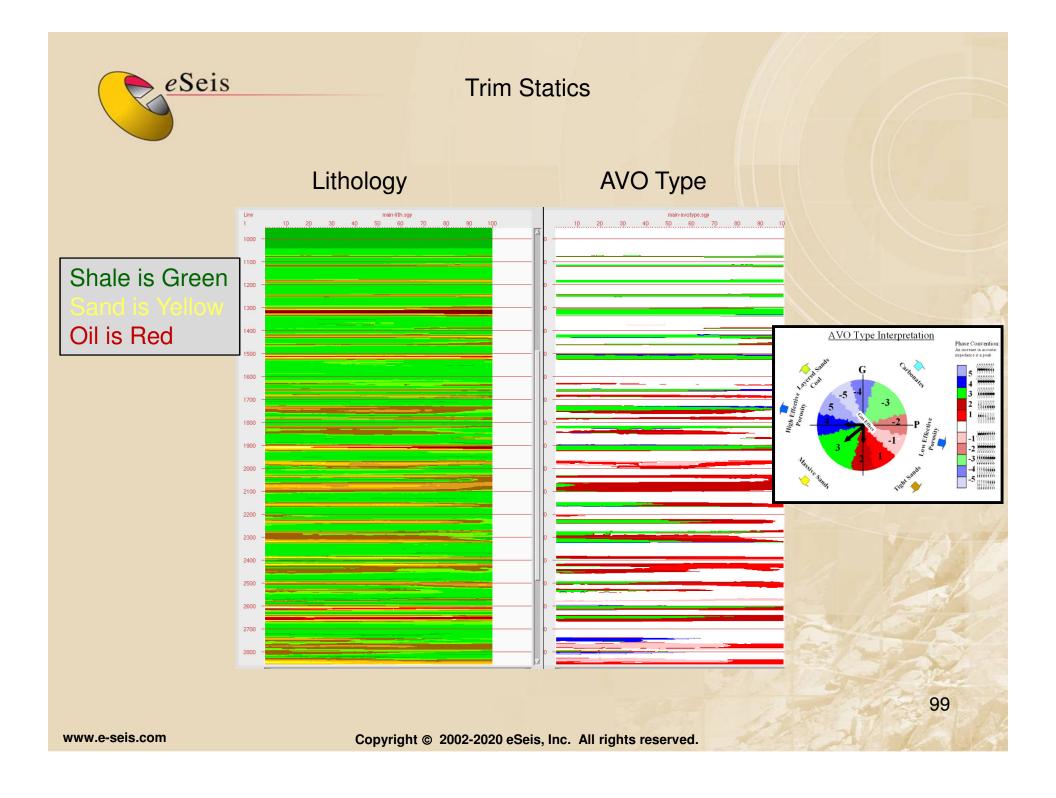


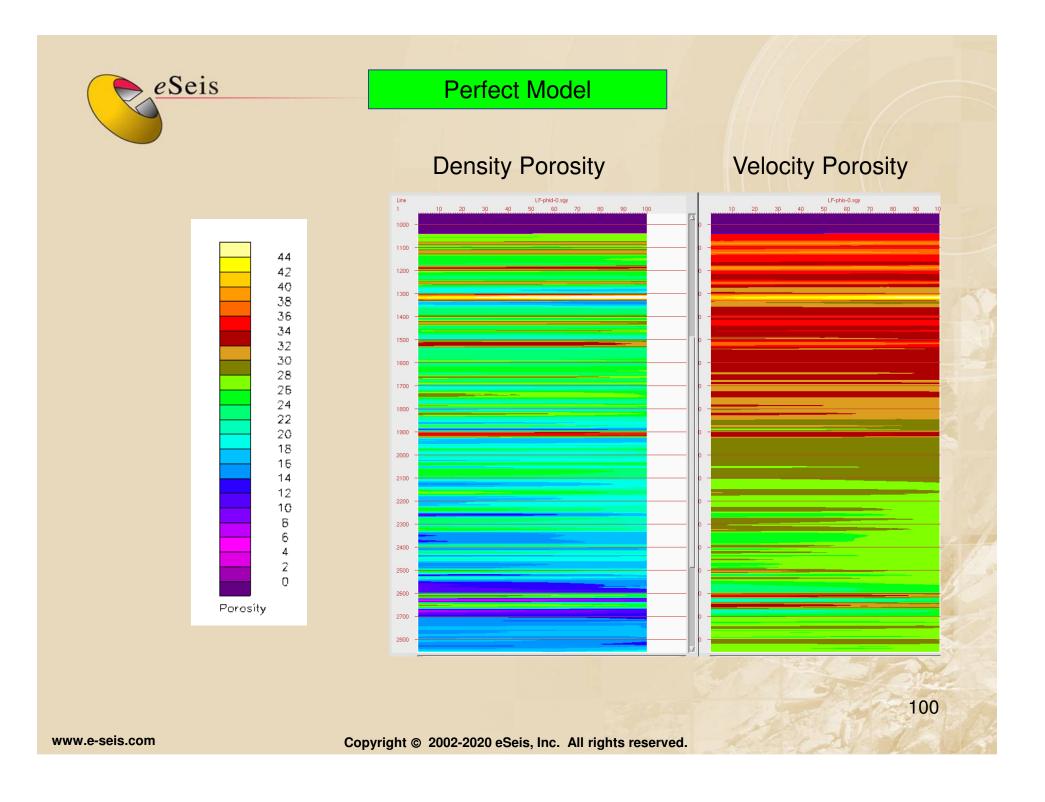


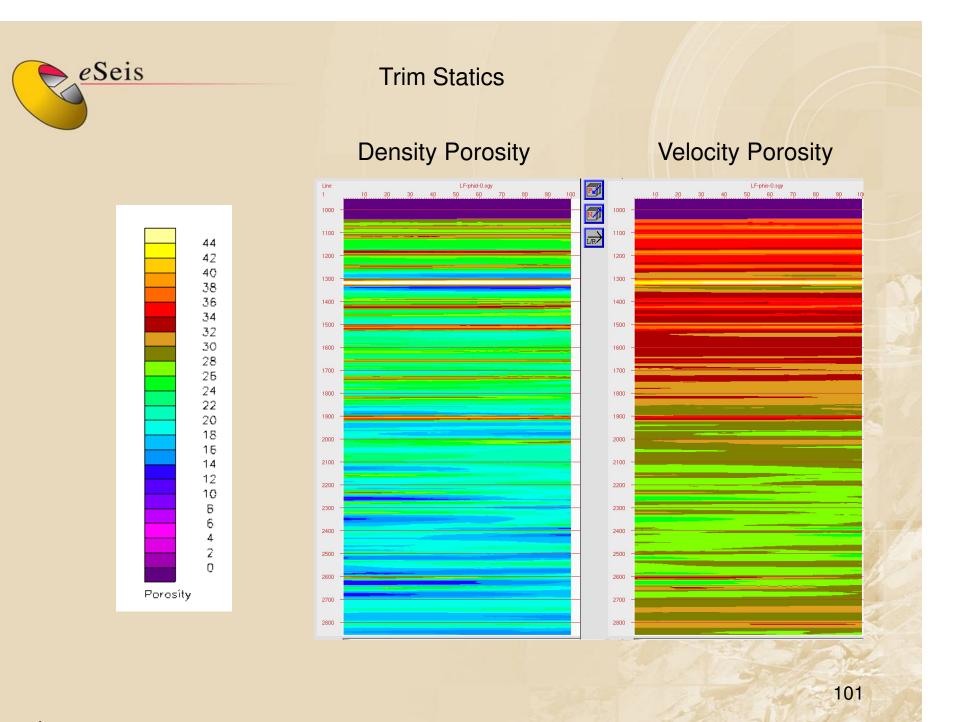










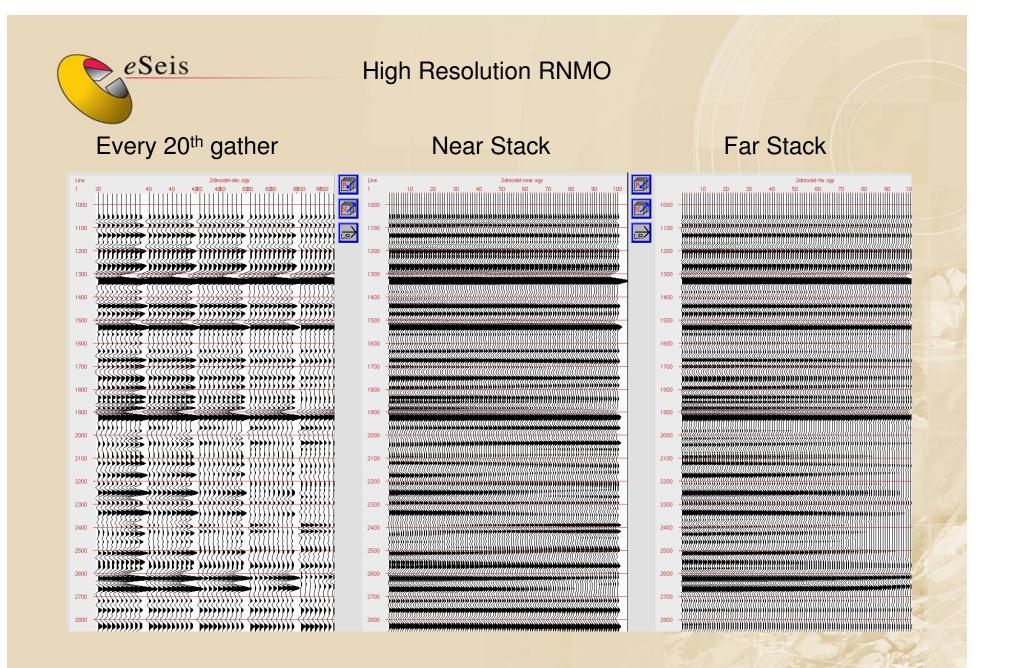




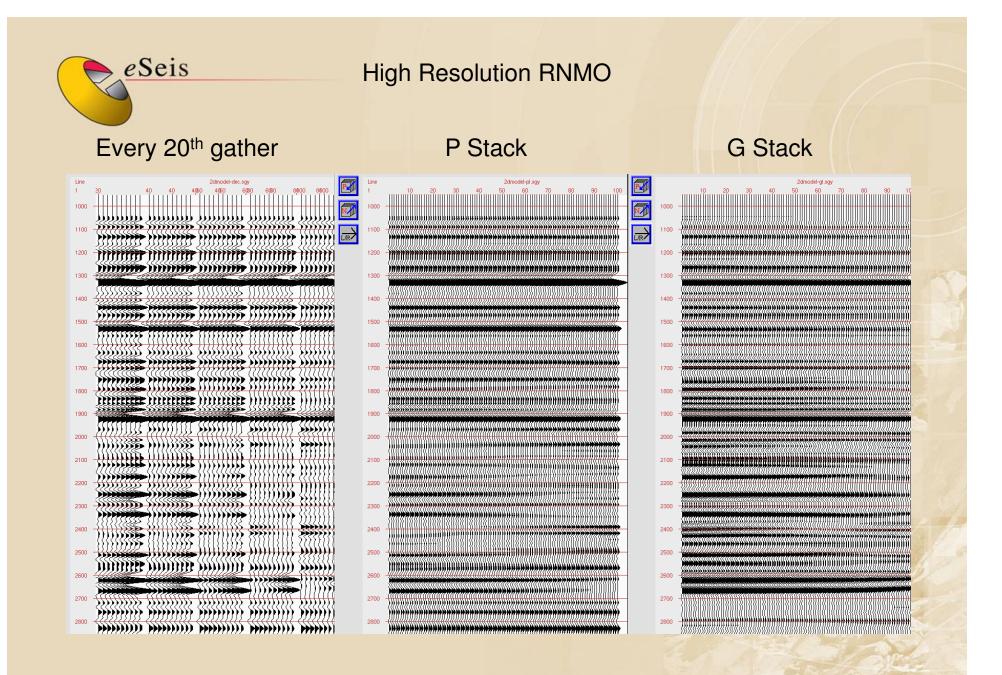
## Automatic High Resolution NMO

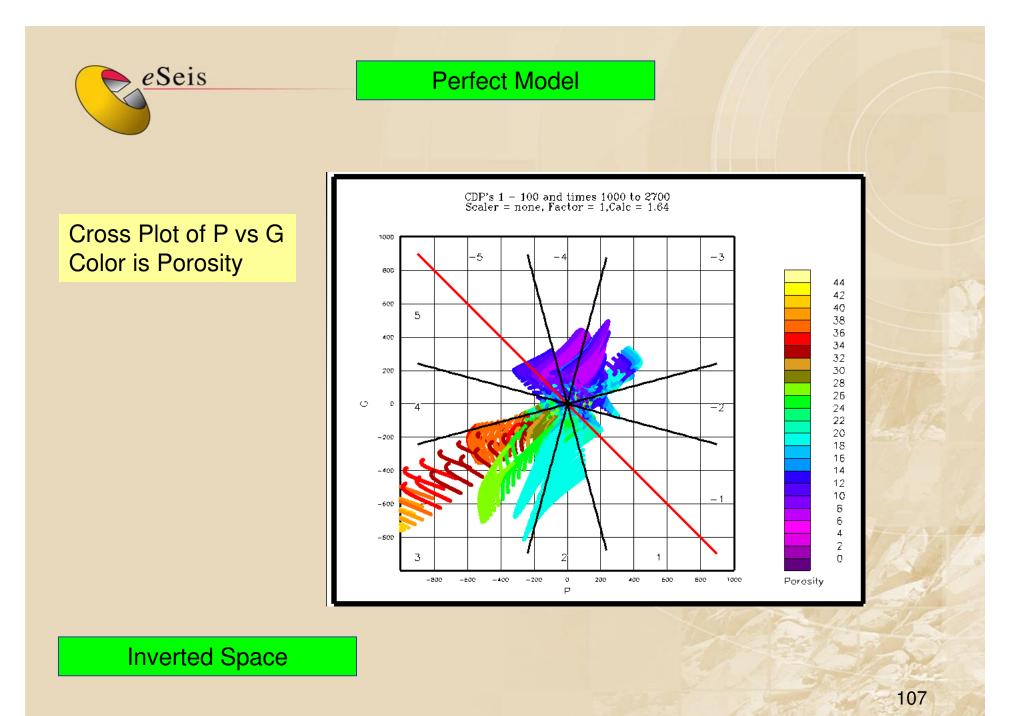
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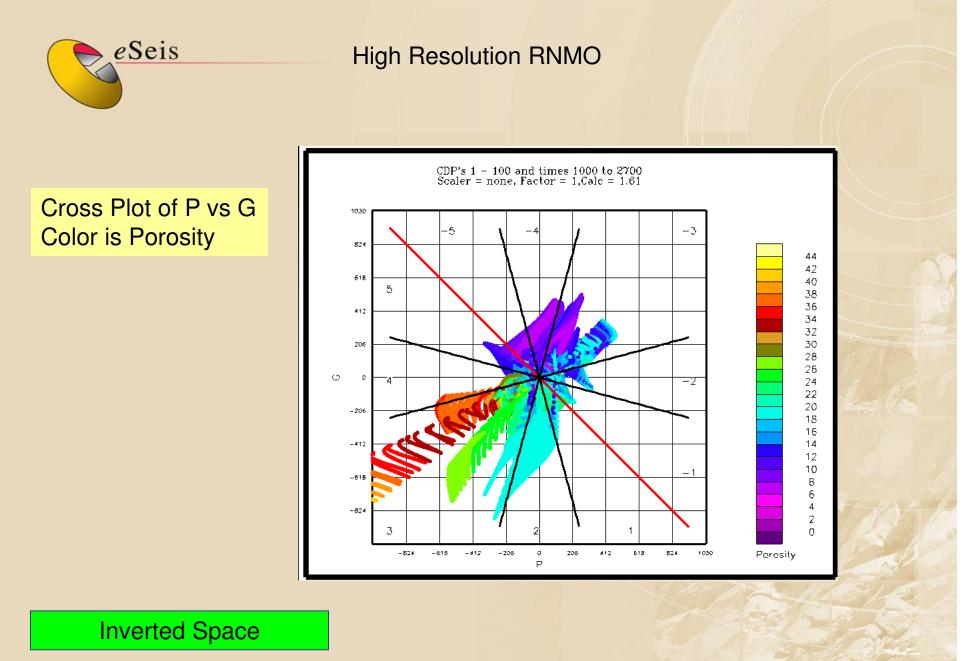
Every 20 <sup>th</sup> gather		
	Near Stack	Far Stack
2dmodel-dec.sgy 20 40 40 40 40 60 60 60 60 60 60 60 60 60 60 60 60 60	Line 2dmodel-near.sgy 1 10 20 30 40 50 60 70 80 90 100	2dmodel-far.sgy 10 20 30 40 50 60 70 60 90 10 1000
······································		
		<ul> <li>100 (Патанализикания и полновителя и полно </li> </ul>
	1300	1300
	1400	1400
		1500
		2000
		210
	200	2200
		2300
	2400	2400
	2500	2500
	200	
	2700	2000

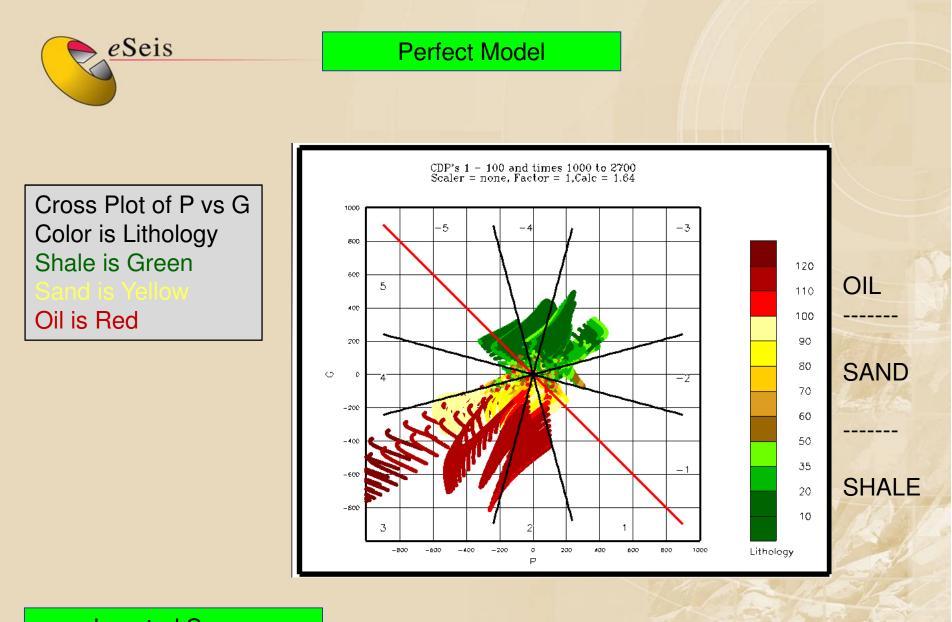


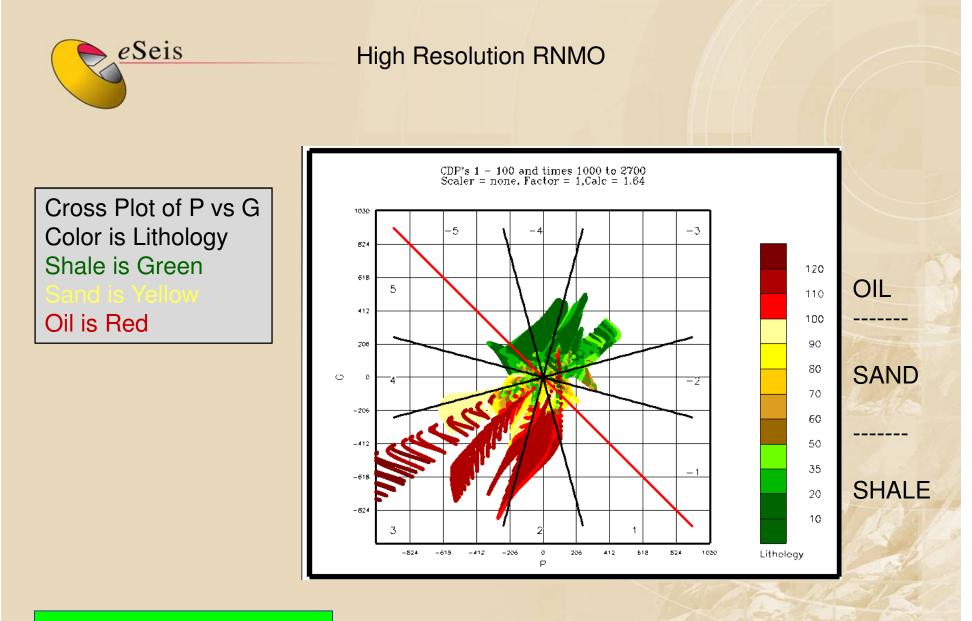
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
e 2dmodel-dec.sgy 20 40 40 400 400 600 600 800 800 800 00	Line 2dmodel-pLagy 1 10 20 30 40 50 60 70 60 90 100 1000	2dmodel-gl.sgy         30         90         10           10         20         30         40         50         60         70         80         90         10           1000
$^{\circ}$		
	1200 - 100000000000000000000000000000000	1200
	1900	
······································	2000	2000
→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→	2100	
>>>>>>>>>>>>>>>>>>>>>>>>>>>>		2200
	2300	
»	2400	2400
		2000
**************************************		2700 2800

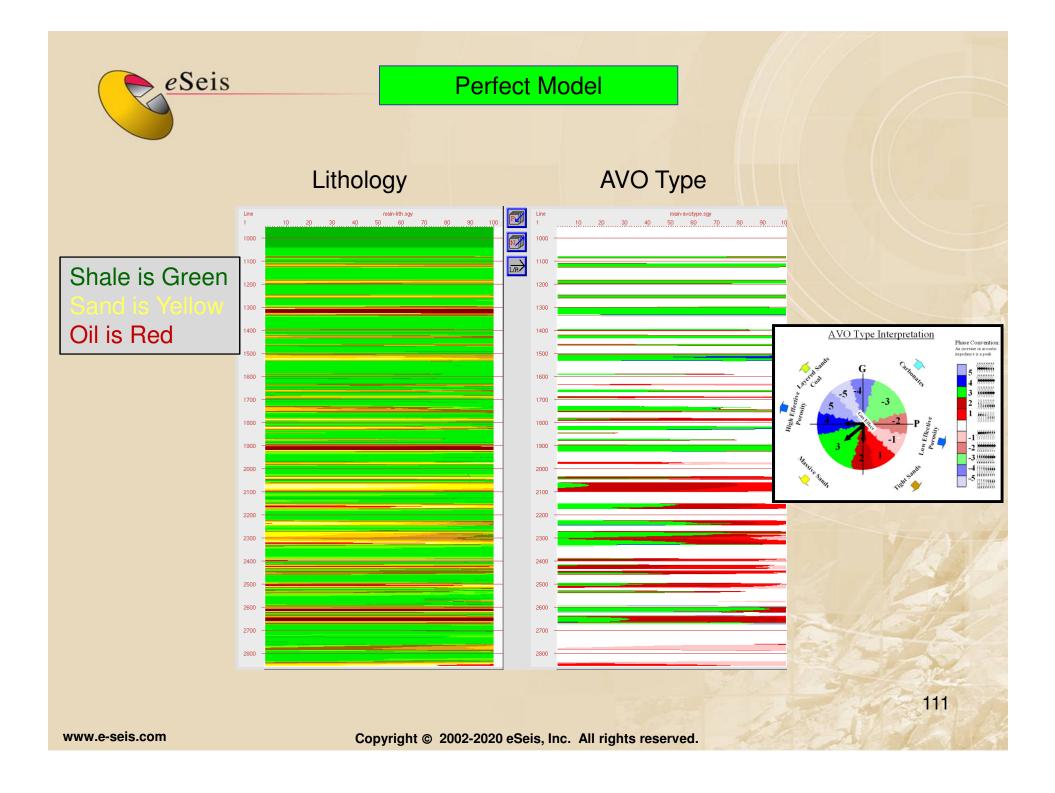


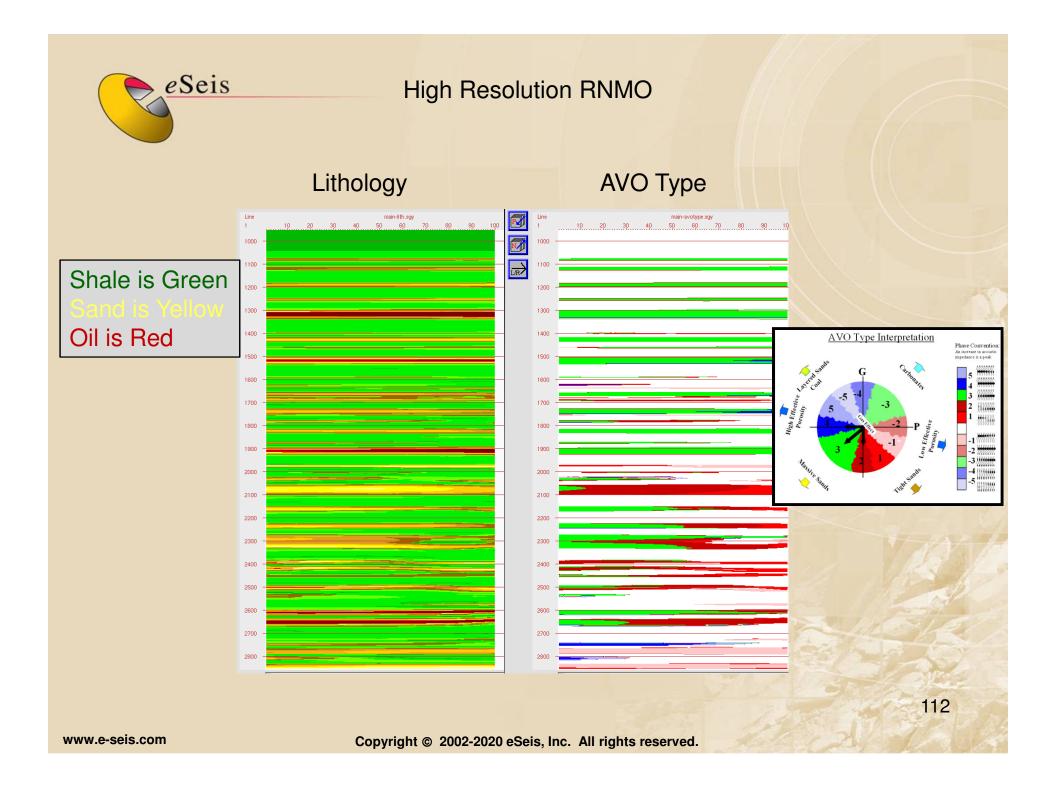


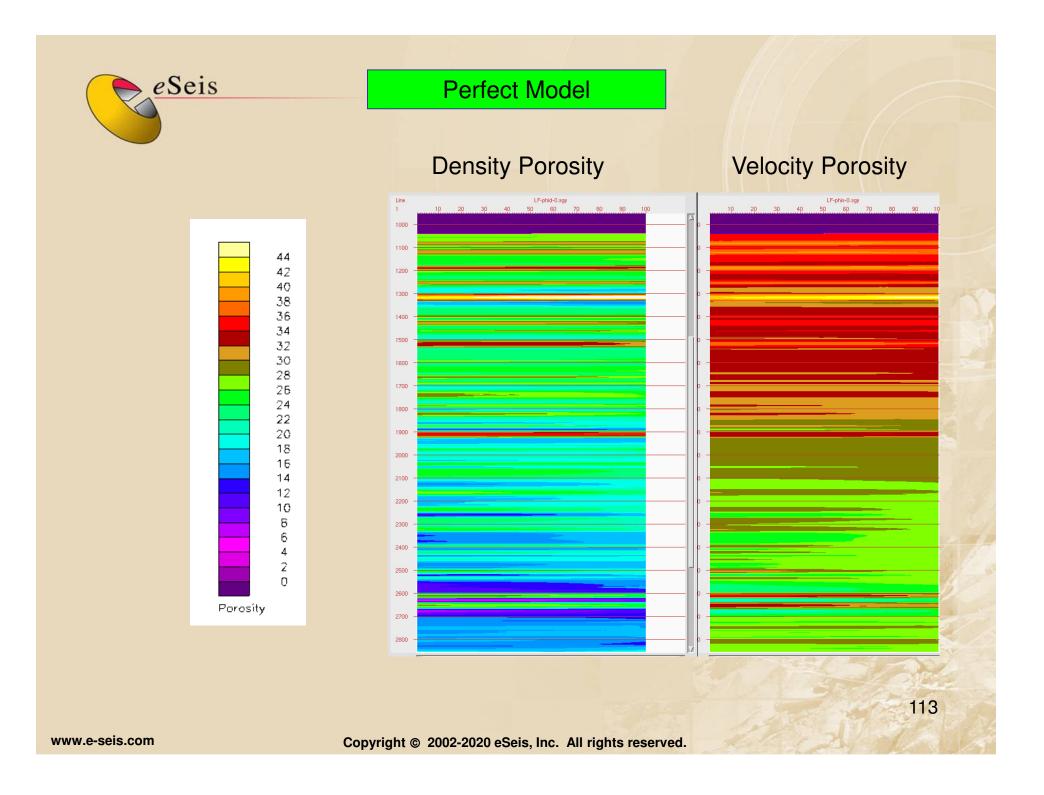


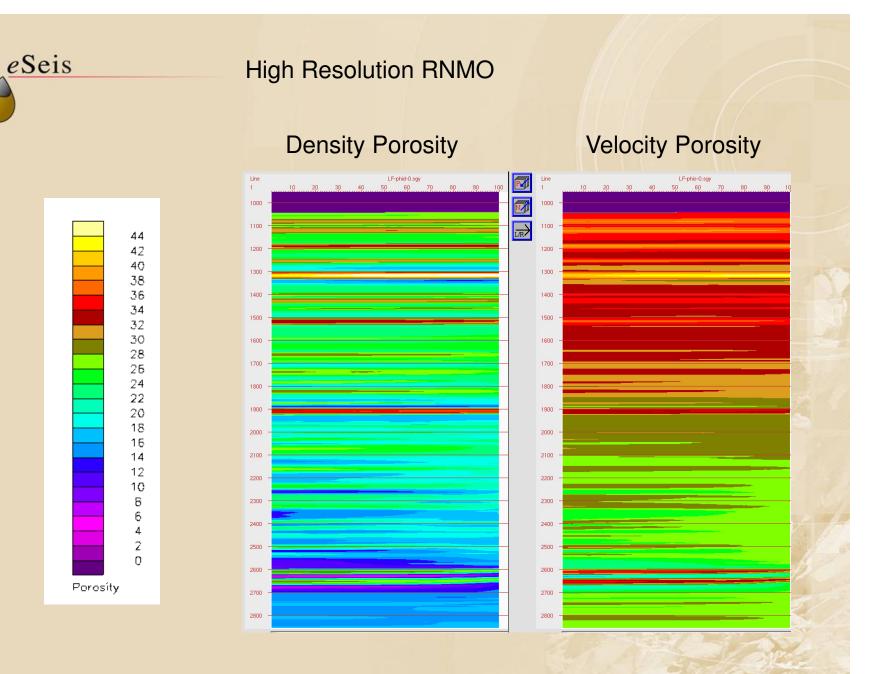








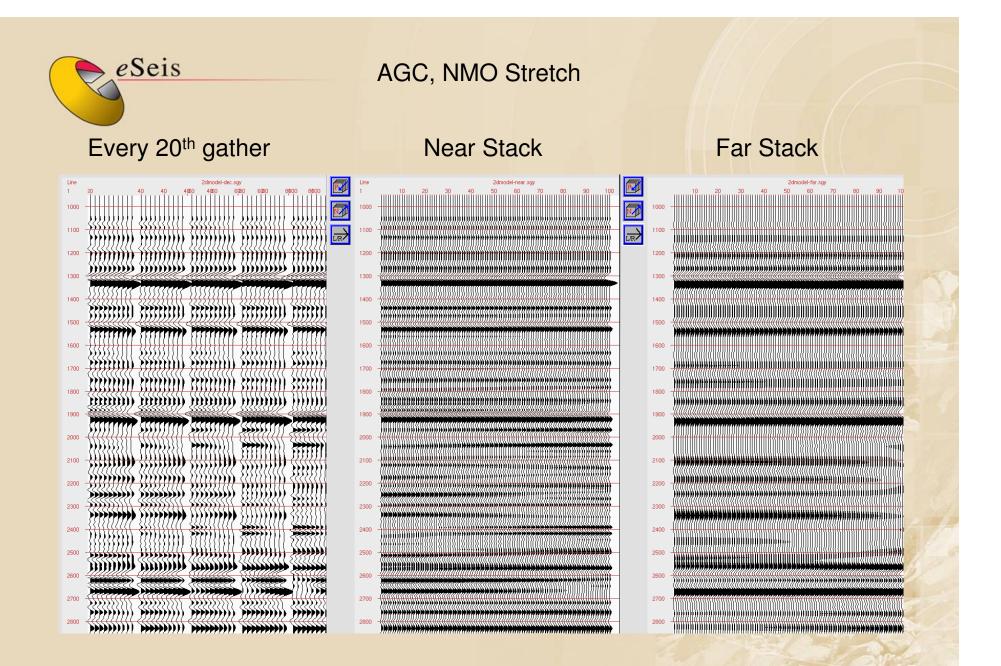




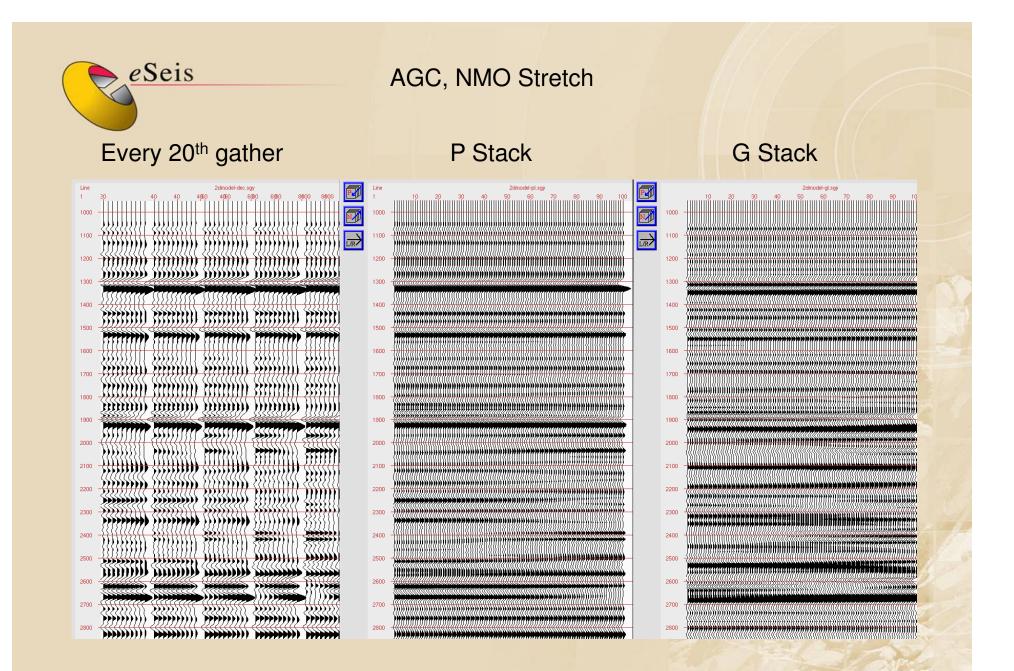


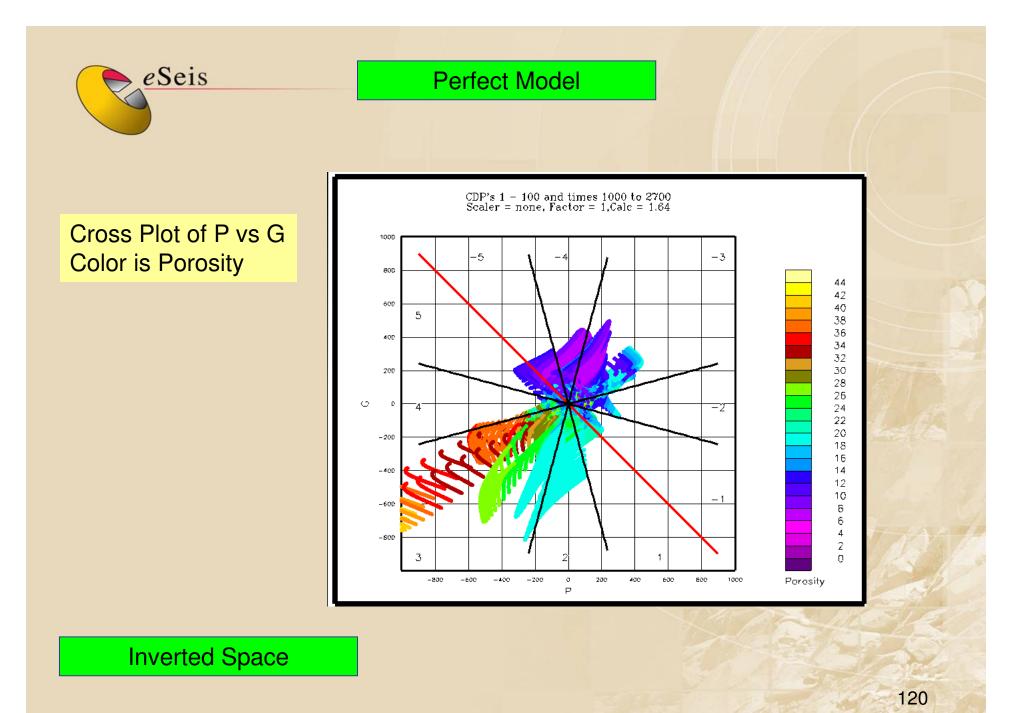
### AGC, NMO Stretch

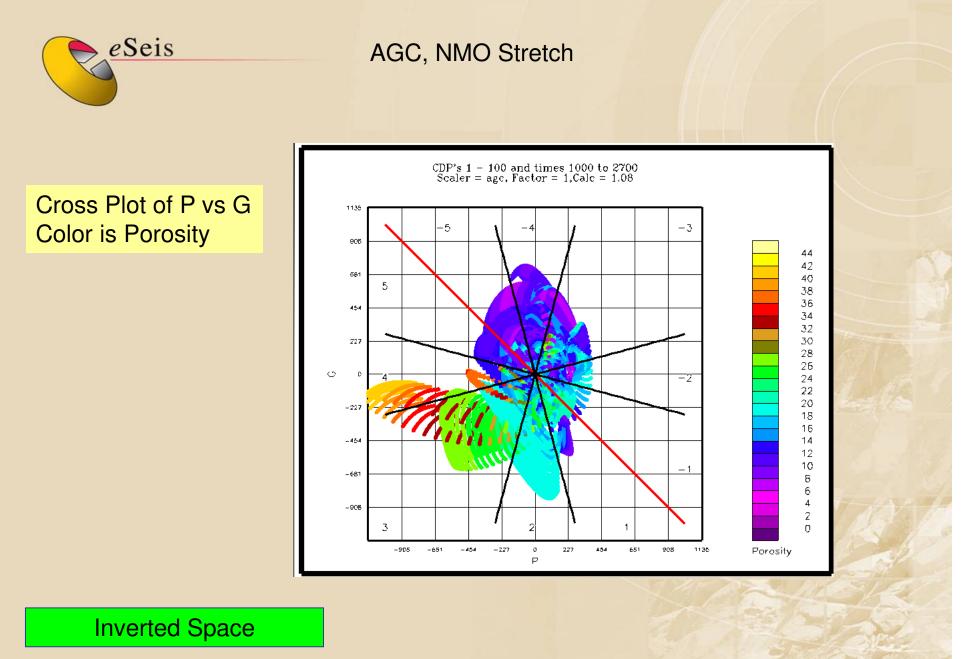
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
ne 2dmodel-dec.sgy 20 40 40 4050 6050 6050 8000 8000	Line 2dmodel-near.sgy 1 10 20 30 40 50 60 70 80 90 100	2dmodel-far.sgy 10 20 30 40 50 60 70 80 90 10
<ul> <li></li></ul>		
■ ↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓	1400	1400
	1500	
······································	2000	200
		2100
		2400
		2500
	2700	200
<sup>8</sup> <del>3979977777 9797777777 9979777777 9799777777</del>		

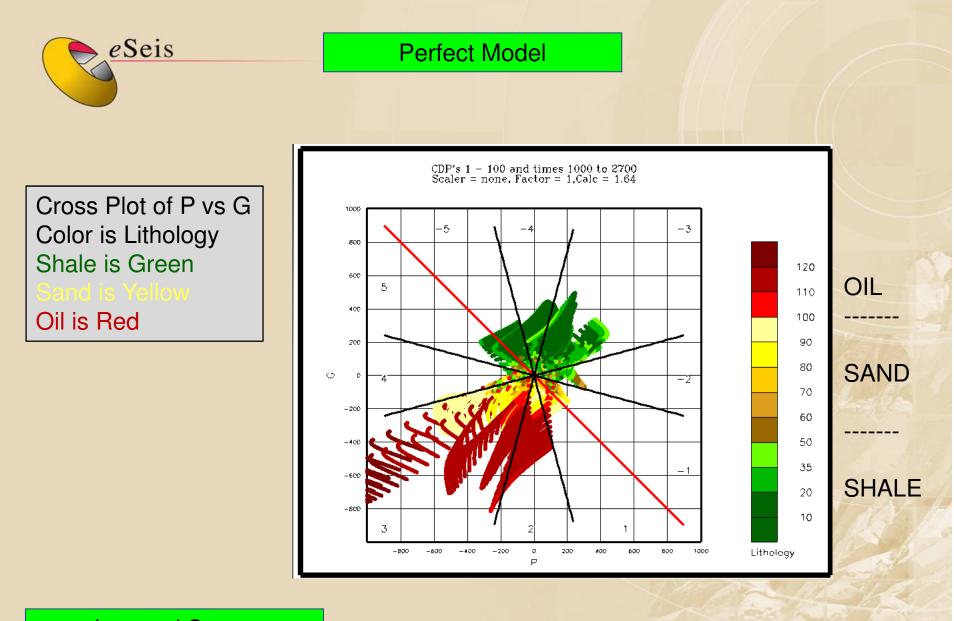


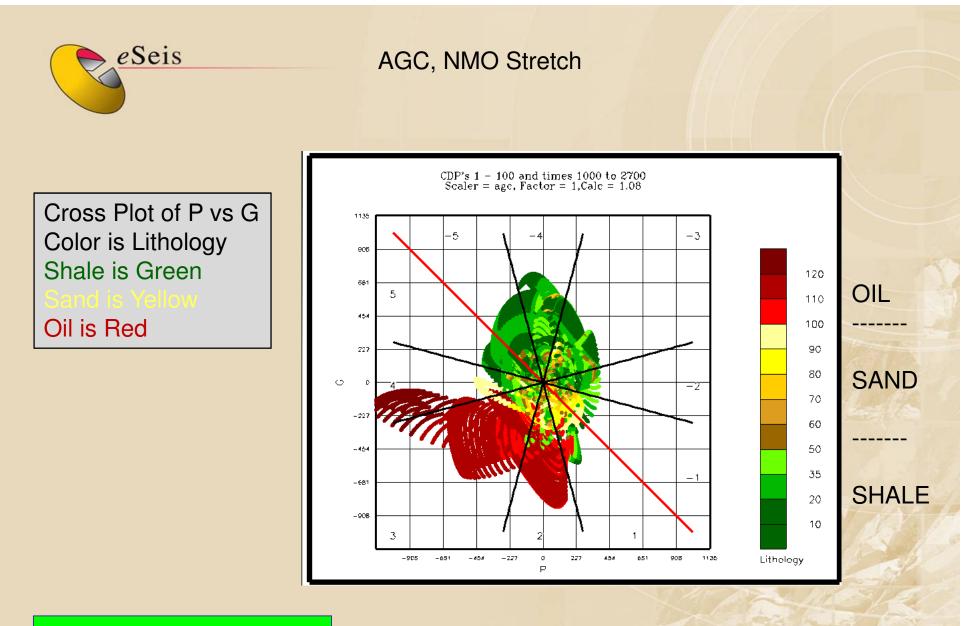
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ne 2000 40 40 400 400 600 600 600 600 600 60	Line         2dmodel-pl.soy           1         10         20         30         40         50         90         70         80         100           10         20         30         40         50         90         70         80         100           10         20         30         40         50         90         70         80         100           10         20         30         40         50         90         70         80         100	2dmodel-gl sgy         30         40         50         60         70         80         90         10           I000
	1500	1500
	1400	1400
	1500	
**************************************		
	1700	
······································		2100 <b>LEGERARDEREDEREDEREDEREDEREDEREDEREDEREDERE</b>
	2200	2200
	2300	
	2400	2400
**************************************	2500	2500
		200
700		2700

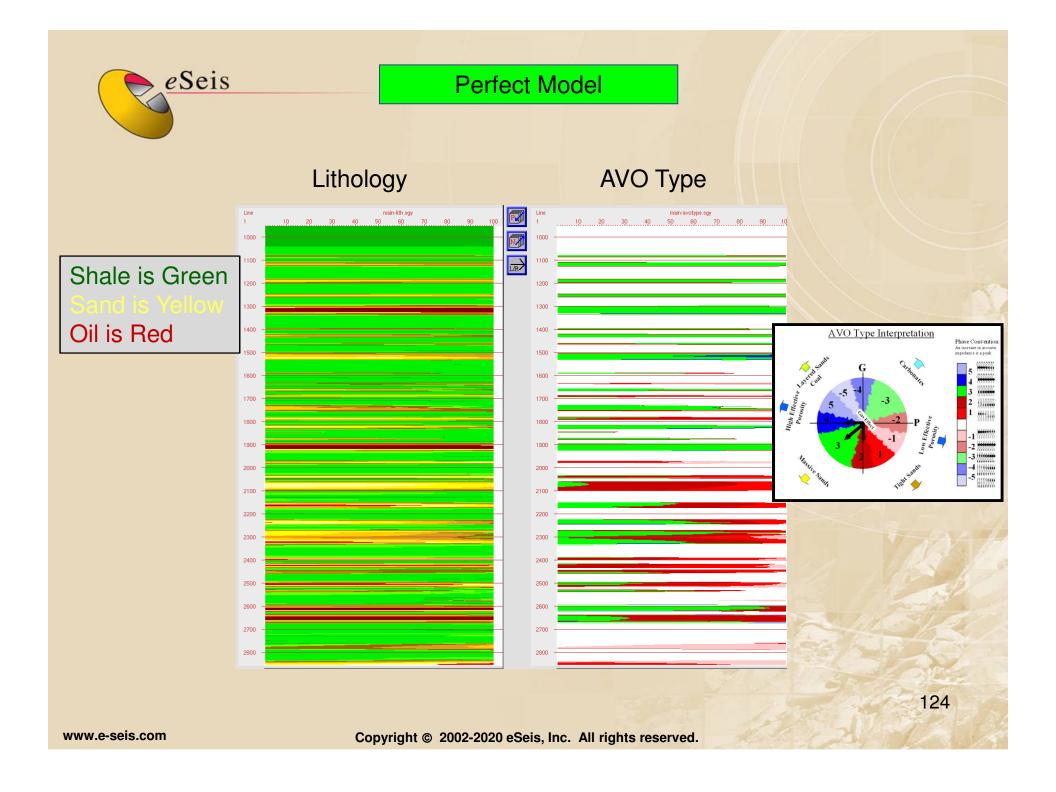


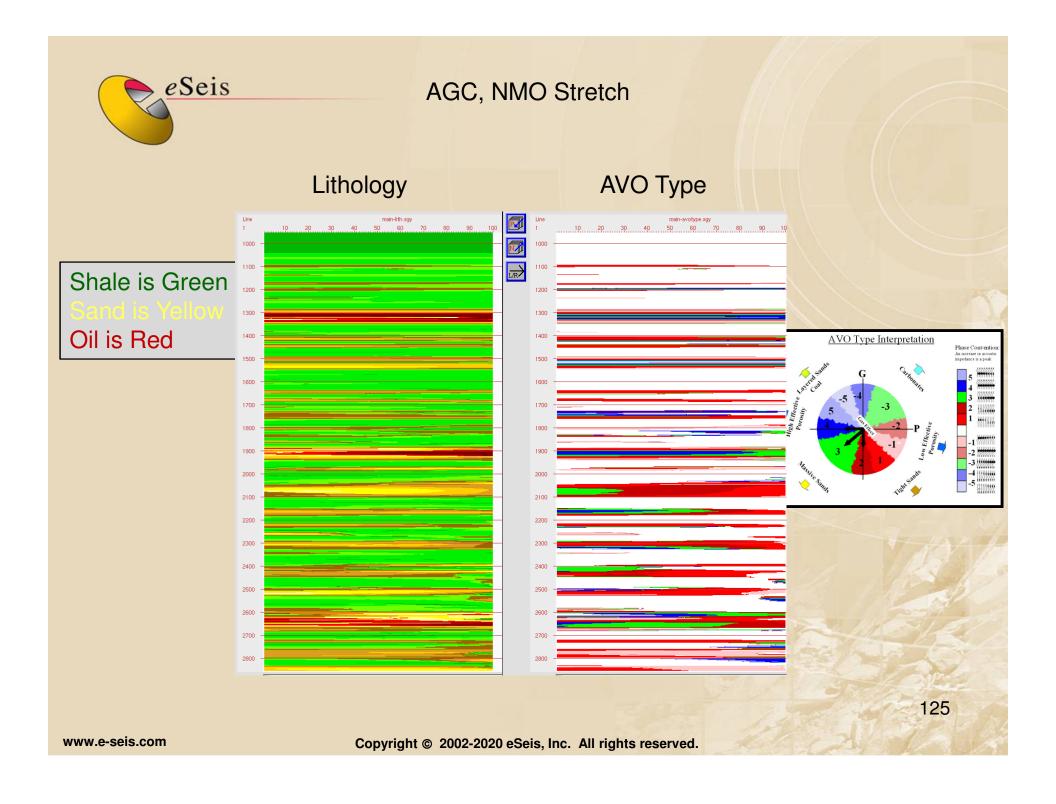


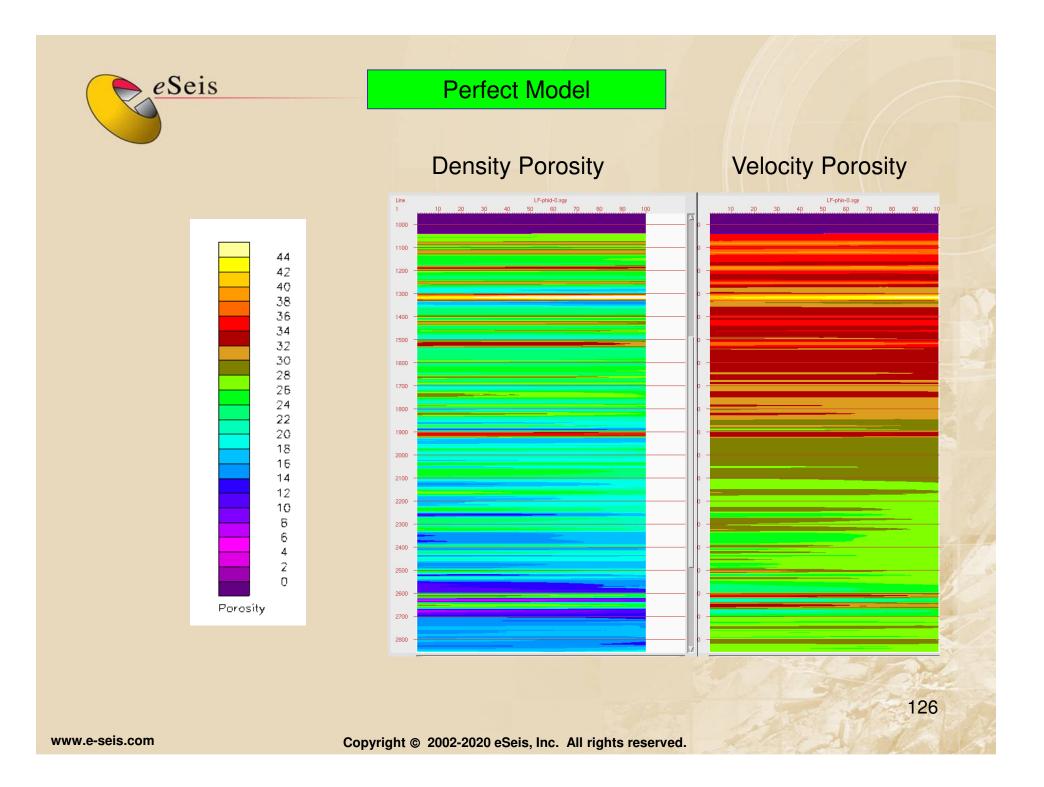


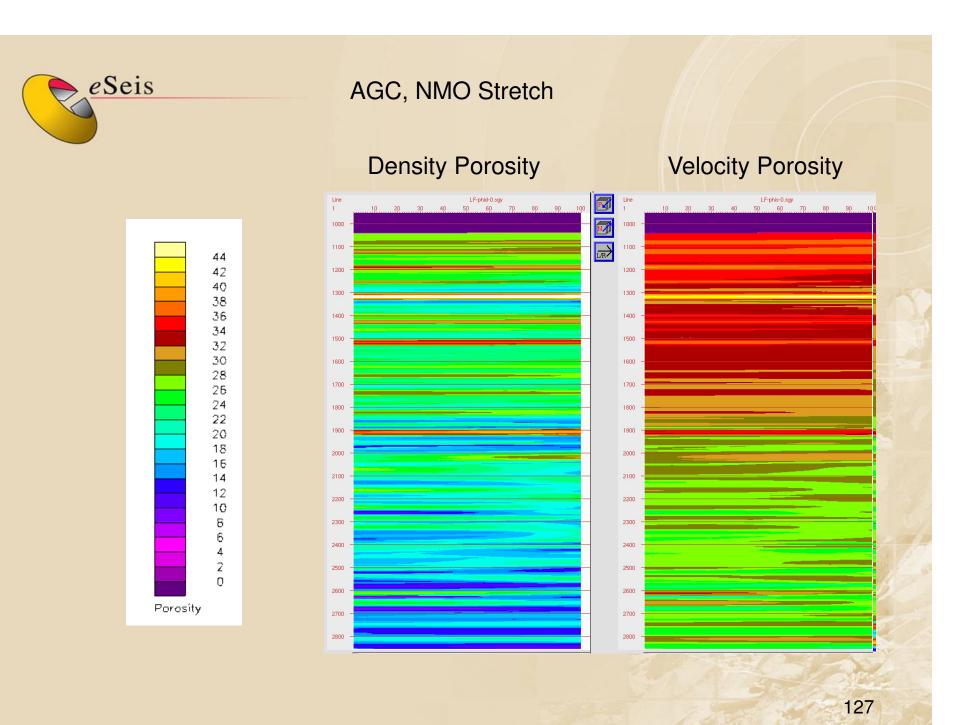










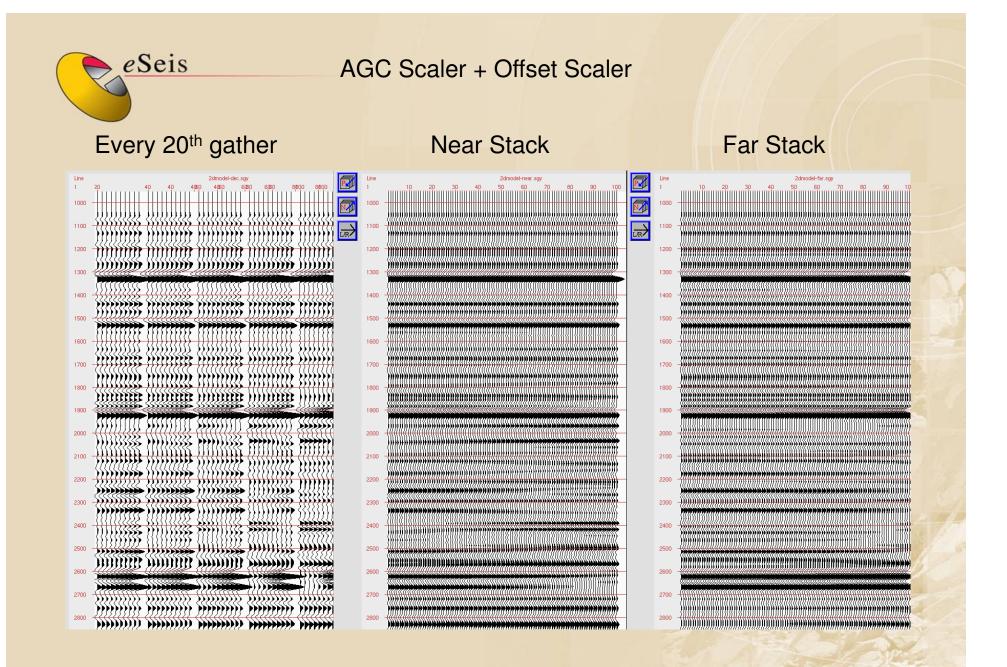




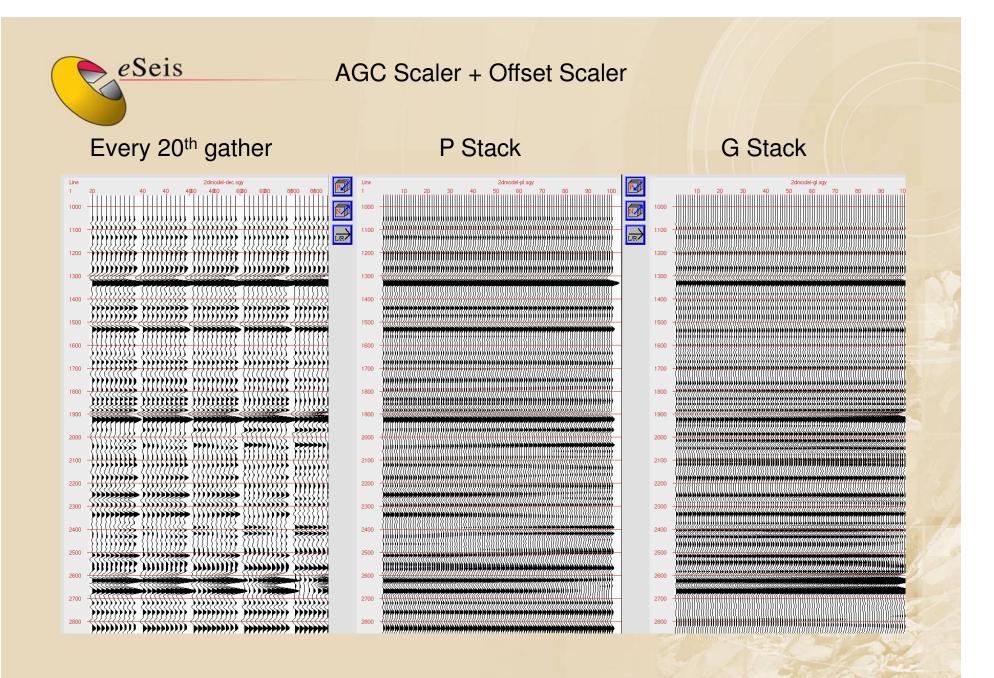
# 1000ms AGC Scaler Then Apply Offset Scaler to Correct

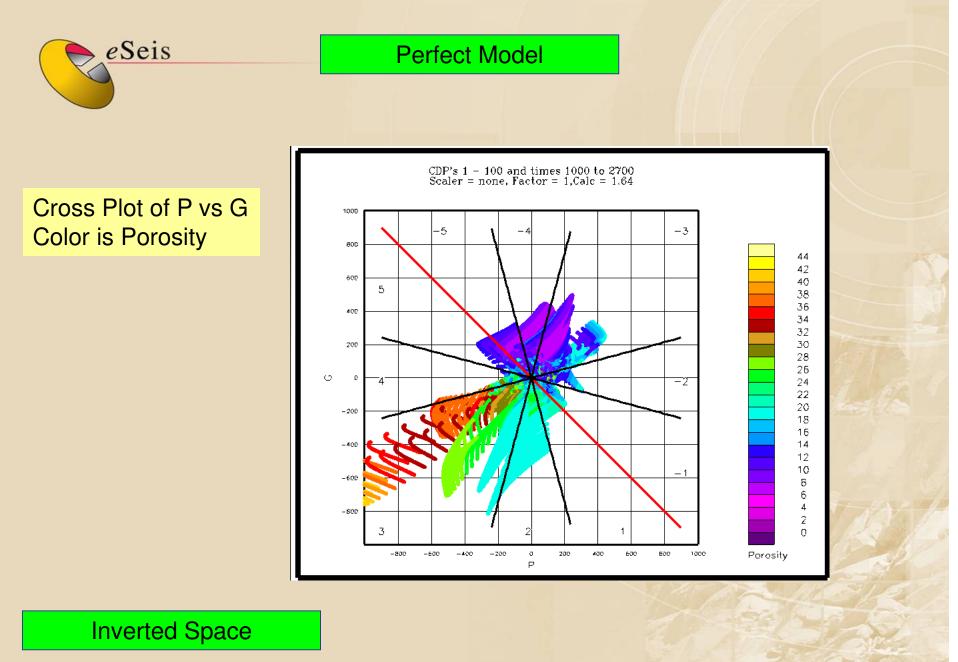
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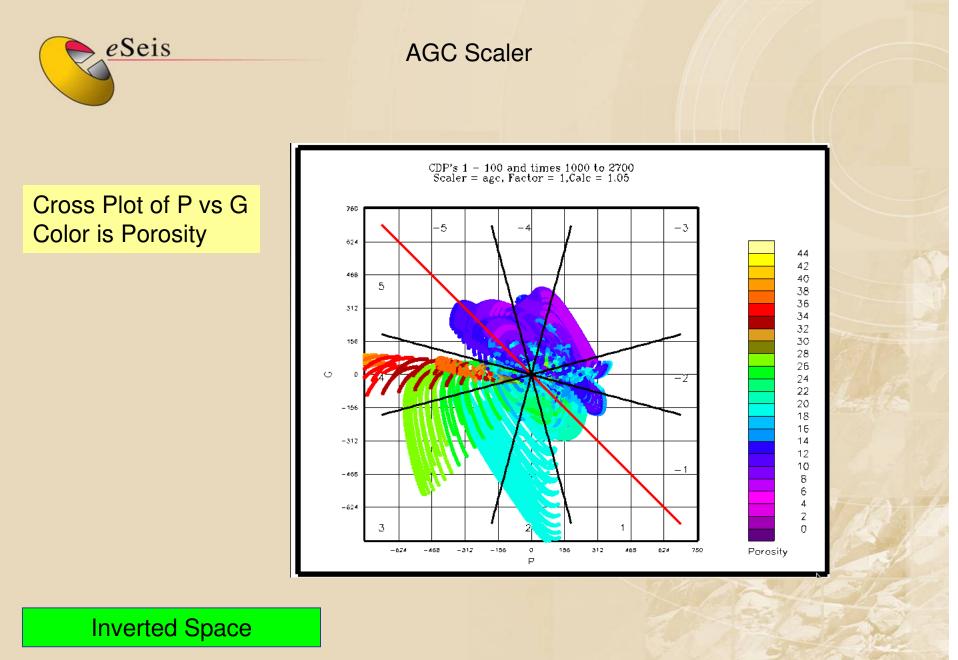
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
ne 2dmodel-dec.sgy 20 40 40 4050 6050 6050 8000 8000	Line 2dmodel-near.sgy 1 10 20 30 40 50 60 70 80 90 100	2dmodel-far.sgy 10 20 30 40 50 60 70 80 90 10
<ul> <li></li></ul>		
■ ↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓	1400	1400
	1500	
······································	2000	200
		2100
		2400
		2500
	2700	200
<sup>8</sup> <del>3979977777 9797777777 9979777777 9799777777</del>		

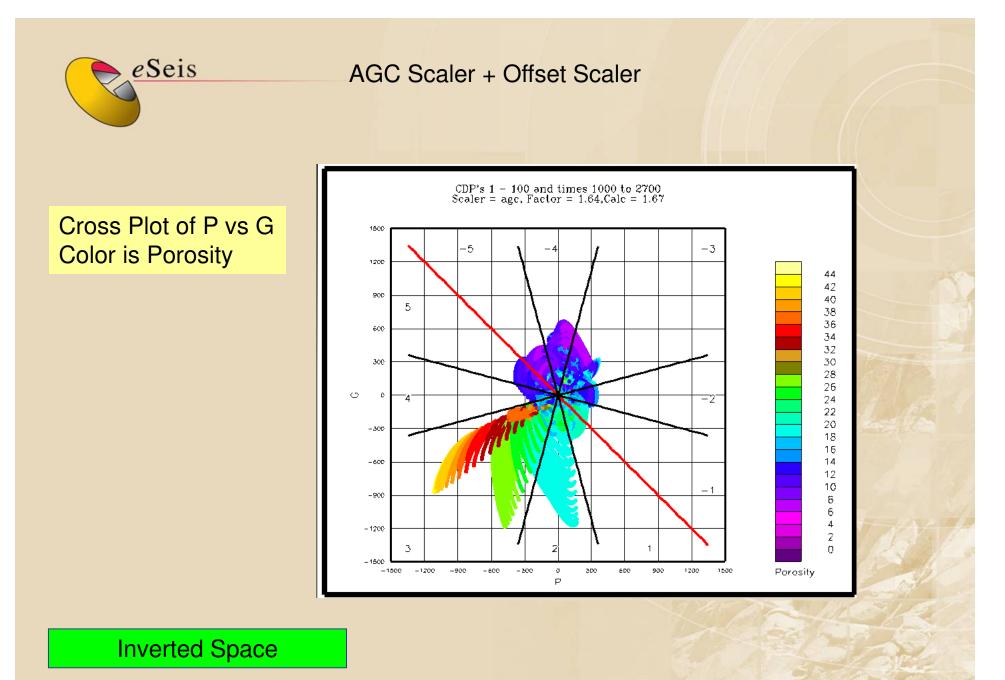


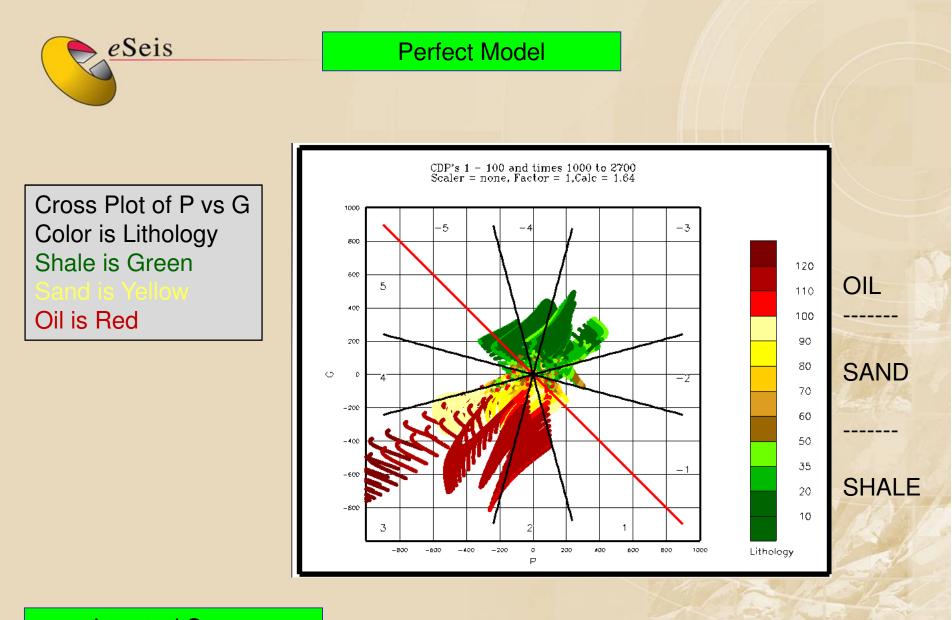
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ne 22(model-dec.sgy) 20 40 40 4050 6050 6050 6000 8000 	Line 2dmodel-pl.sgy 1 10 20 30 40 50 60 70 80 90 100 1000	2dmodel-gl.sgy           10         20         30         40         50         60         70         90         10           1000
	1200 - 100 -	1200 -
	1700	
→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→	200	
	200	2200
	200	200
	2400	2400
500		
		2600
	2700	2700
**************************************		



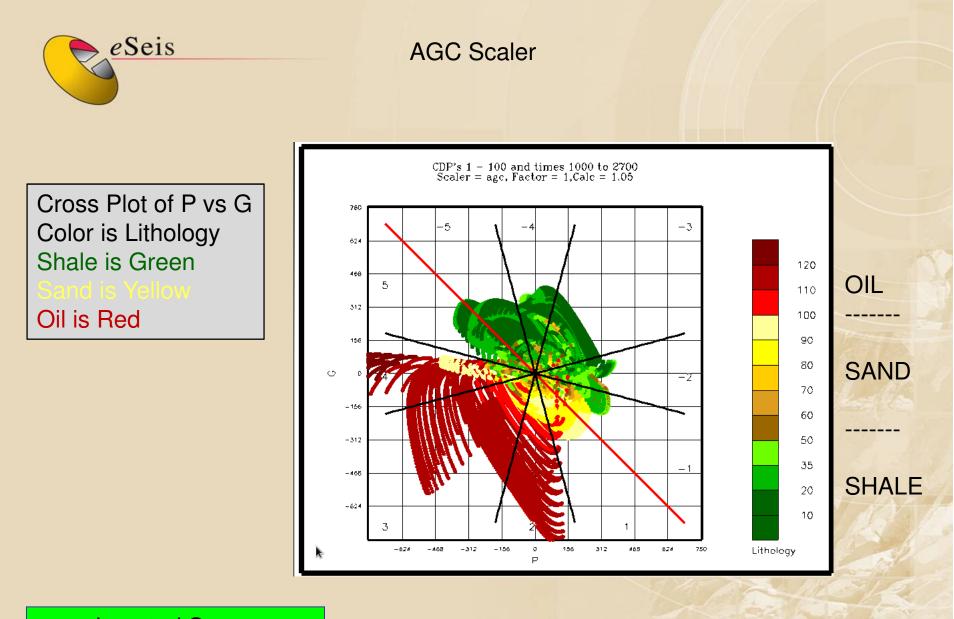




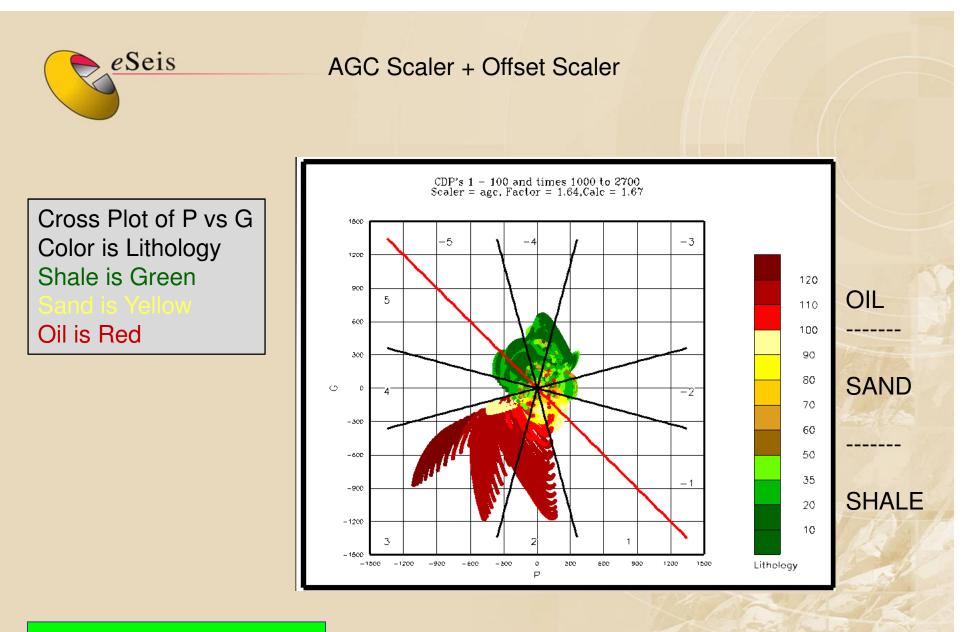


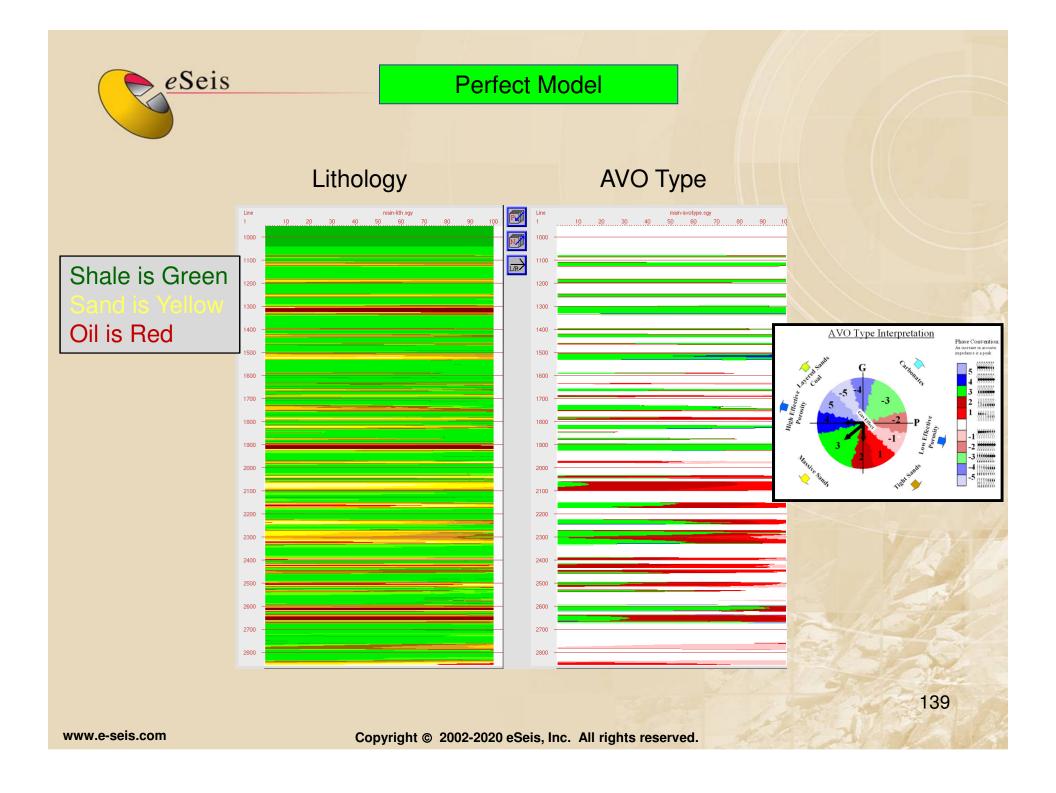


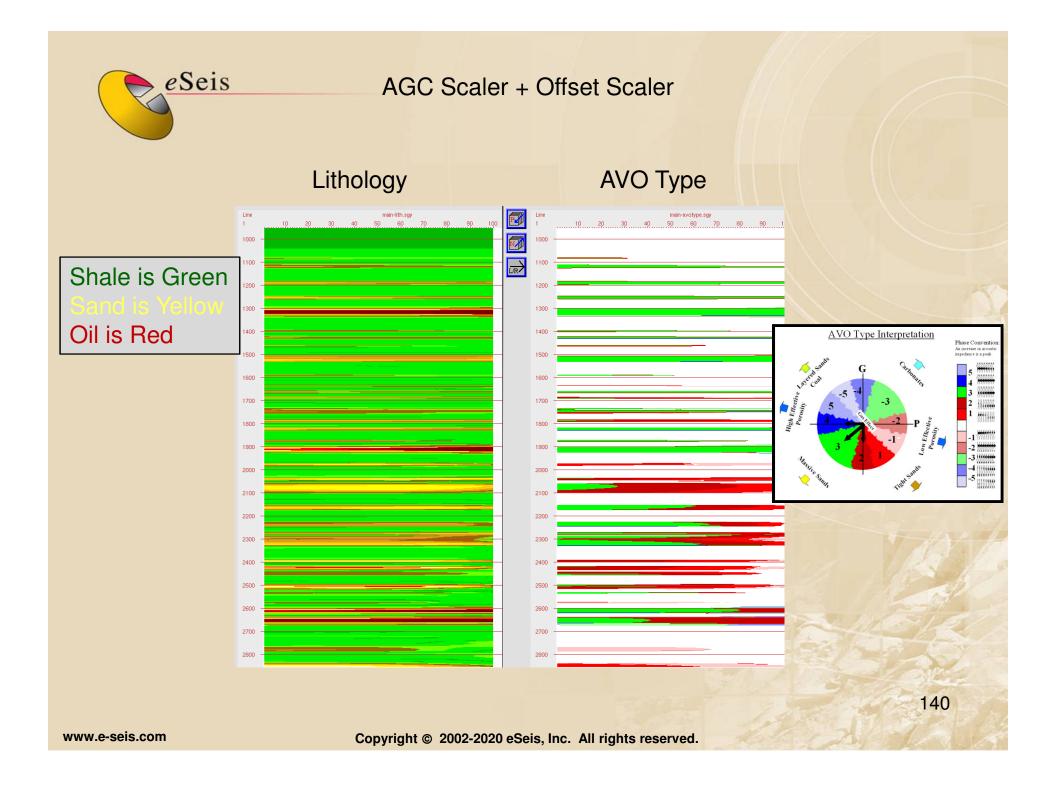
136

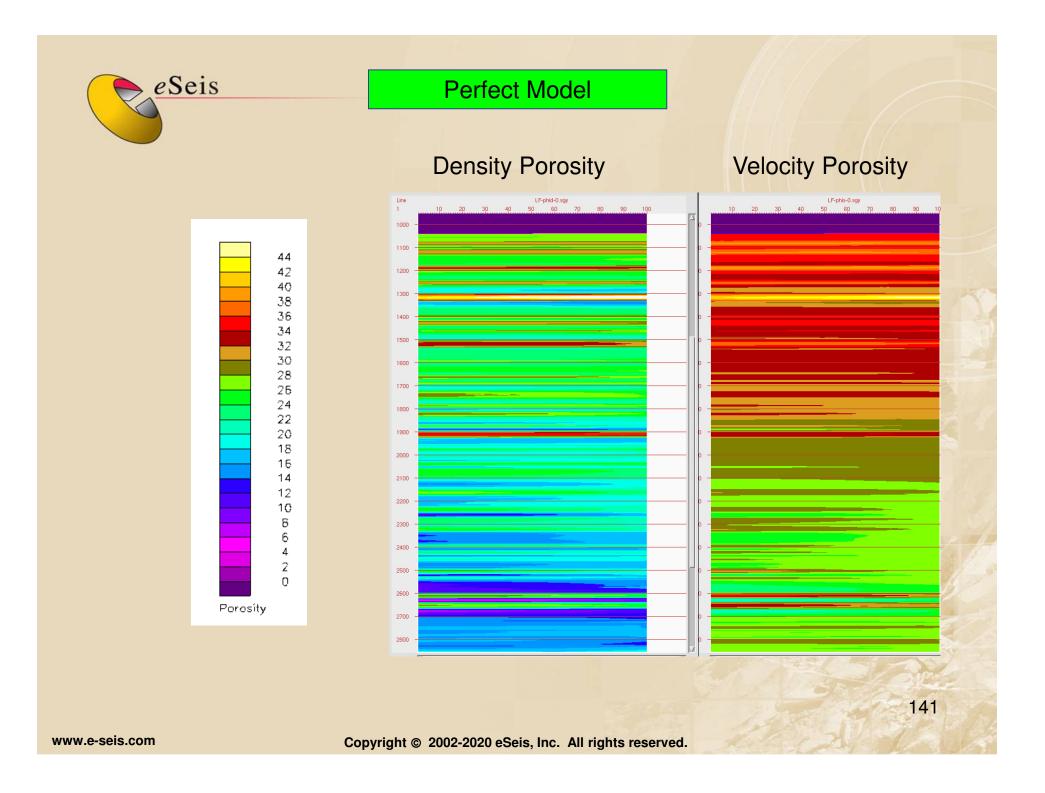


137



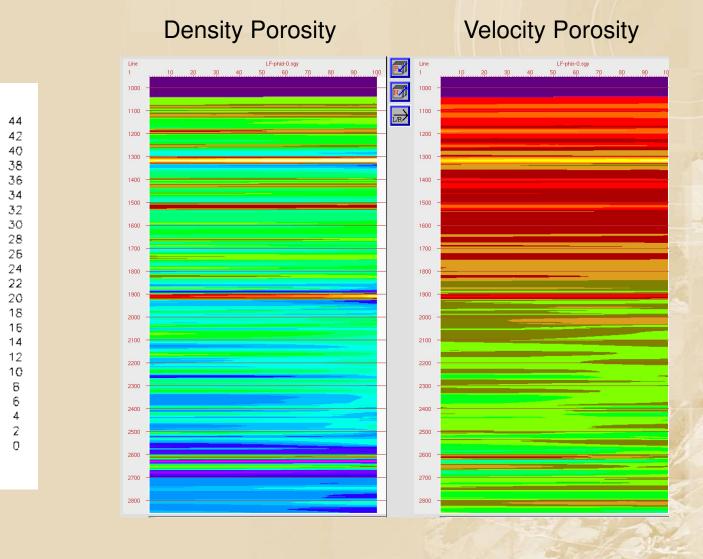








### AGC Scaler + Offset Scaler



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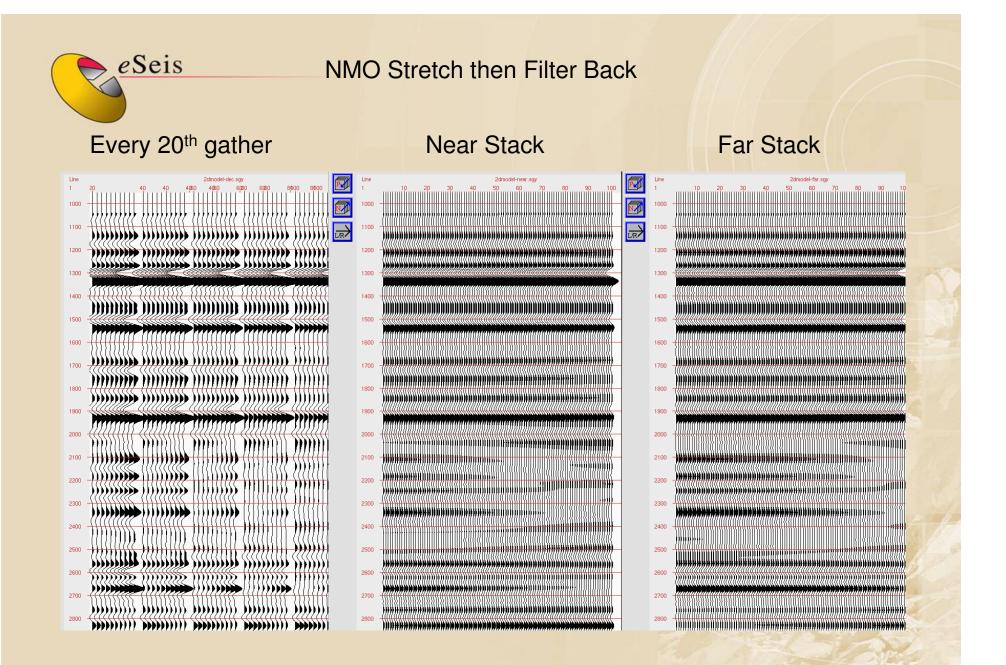


## NMO Stretch Then Filter Back to Far Offset Frequency Content

eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
ne 2dmodel-dec.sgy 20 40 40 4050 6050 6050 8000 8000	Line 2dmodel-near.sgy 1 10 20 30 40 50 60 70 80 90 100	2dmodel-far.sgy 10 20 30 40 50 60 70 80 90 10
<ul> <li></li></ul>		
■ ↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓	1400	1400
	1500	
······································	2000	200
		2100
		2400
		2500
	2700	200
<sup>8</sup> <del>3979977777 9797777777 9979777777 9799777777</del>		

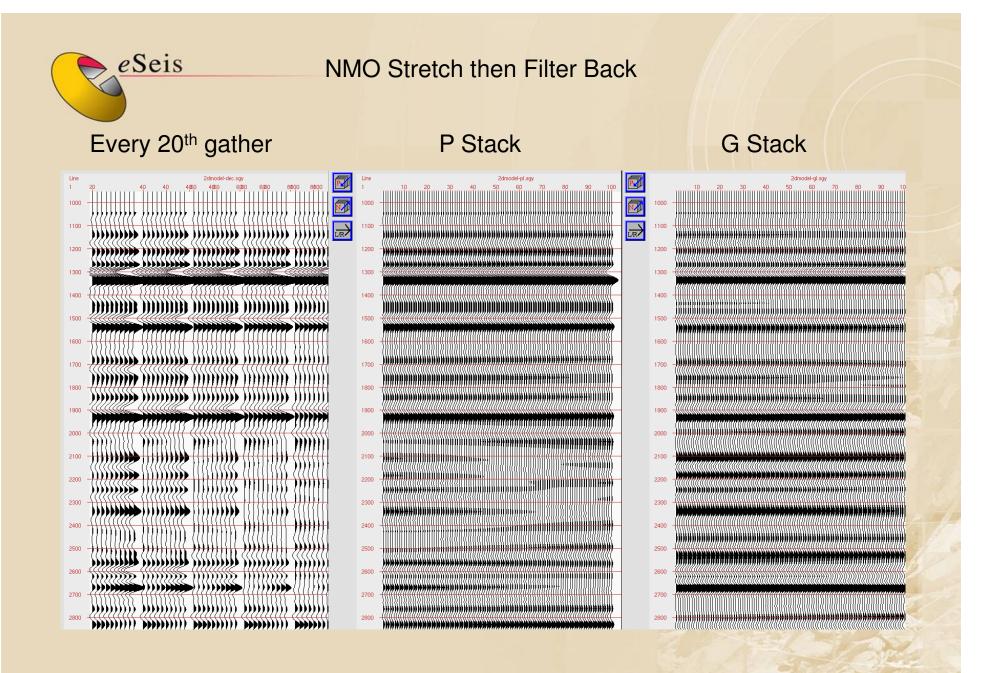
eSeis	NMO Stretch	
Every 20 <sup>th</sup> gather	Near Stack	Far Stack
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		2dmodel-far.sgy           10         20         30         40         59         60         70         80         90         10           1000
	1900	
200	2000	

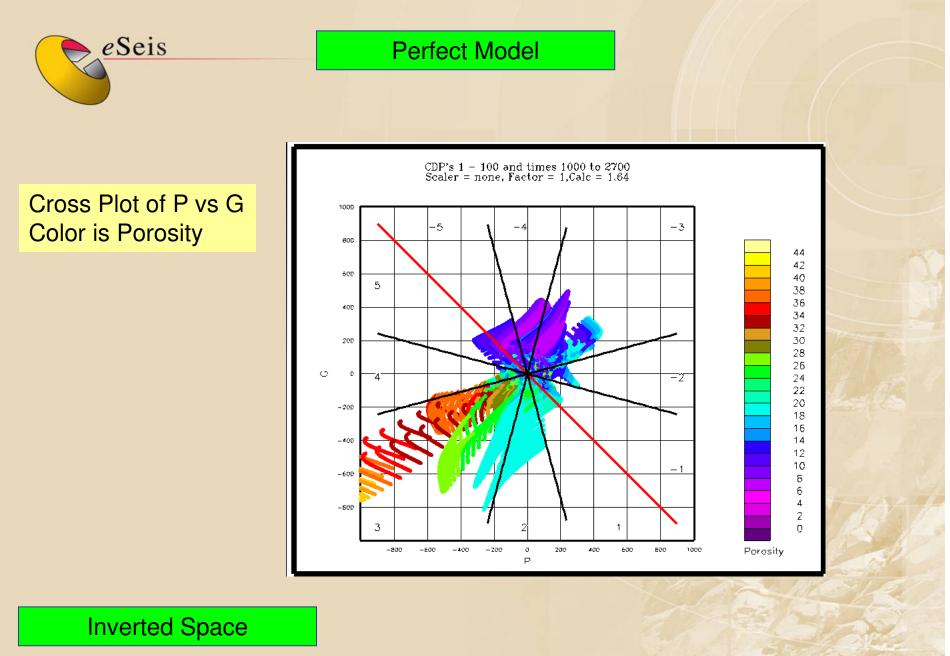
#### www.e-seis.com

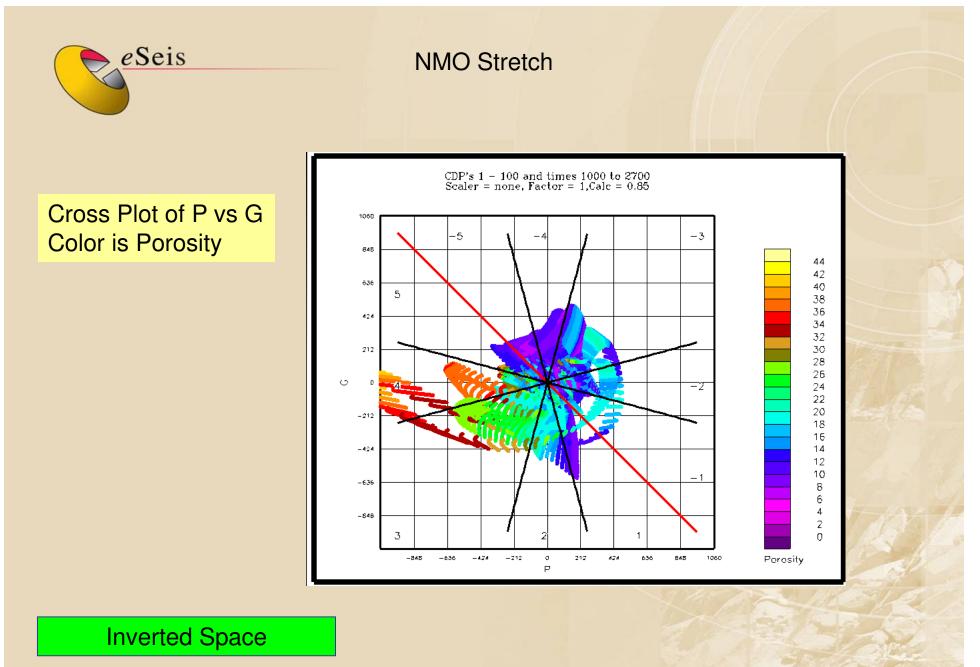


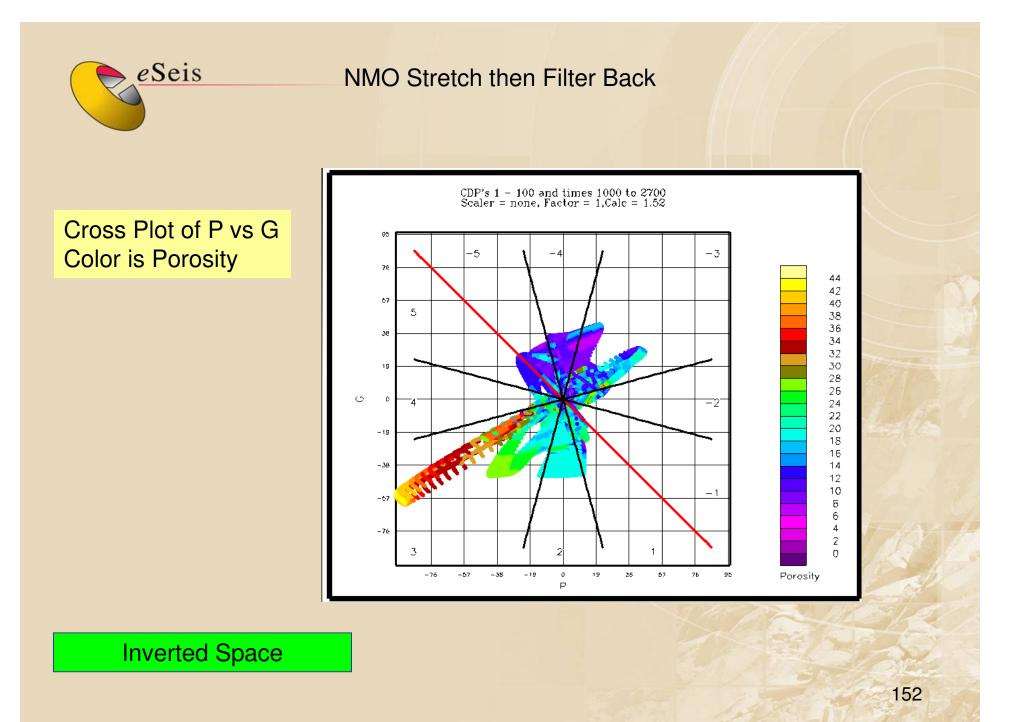
eSeis	Perfect Model	
Every 20 <sup>th</sup> gather	P Stack	G Stack
ne 2000 40 40 400 600 600 600 600 600 600 60	Line 2dmodel-p1.sgy 1 10 20 30 40 50 80 70 80 90 100 1000	2dmodel-gl.sgy           10         20         90         40         50         60         70         80         90         10           1000
······································	1100	
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□	1200	1200
	1300	1900
	1400	1400
	1500	
		1800
		1900 -
····	2000	2000
	2100	2100 - <b>182831851851851851851851851851851</b> 851851851851851851851
	2200	2200
	2300	
	2400	2400
······································	250	250
		2000
	2700	2700
	2000	2000

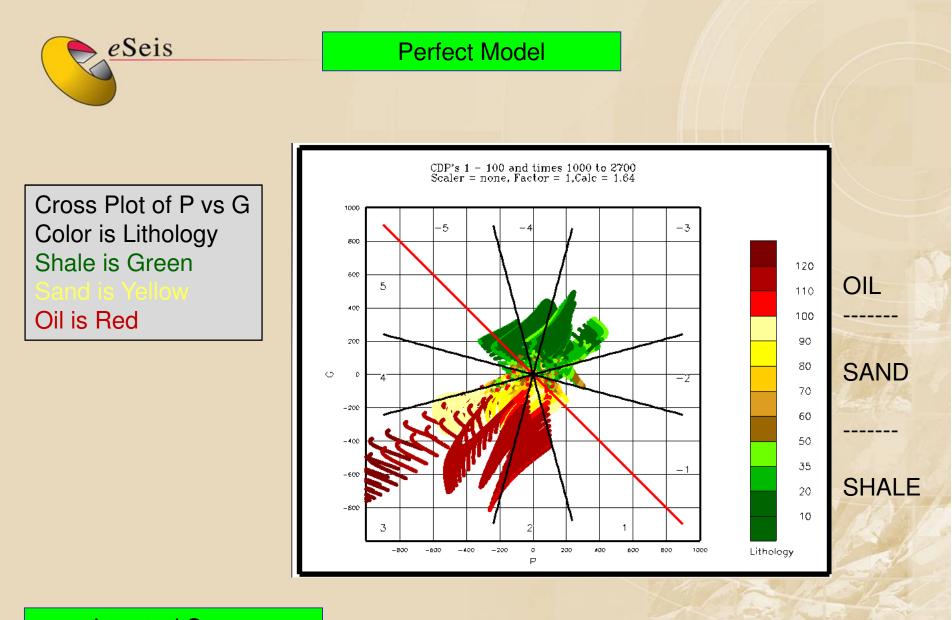
eSeis	NMO Stretch	
Every 20 <sup>th</sup> gather	P Stack	G Stack
Line 2dmodel-dec.sgy 1 20 40 40 4050 4050 6050 6050 8000 8000 8000	Line 2dmodel-p1.sgv 1 10 20 30 40 50 60 70 80 90 100 1000	20 20mode⊱gLsgy 10 20 30 40 50 60 70 80 90 10 700 1000 1000 1000 1000 1000 1000 1
1200 <b>THINKING THINKING THINKI</b>		
		1500 -
	1000	
· · · · · · · · · · · · · · · · · · ·	2000	
2500	2500	
	2000	
2000 <b>2000 1000 1000 1000 1000 1000 1000</b>	2000	2000





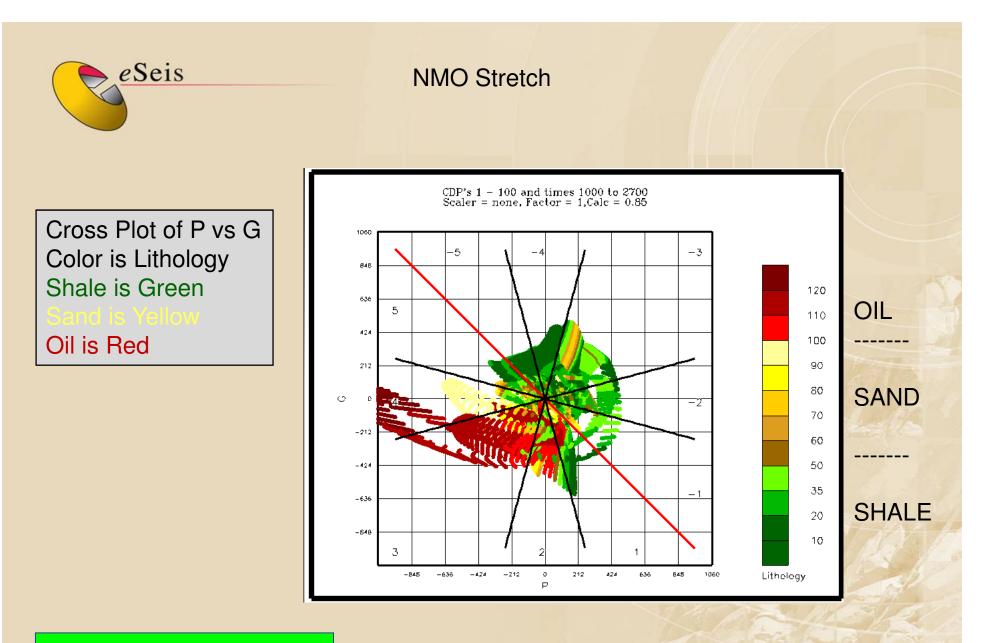




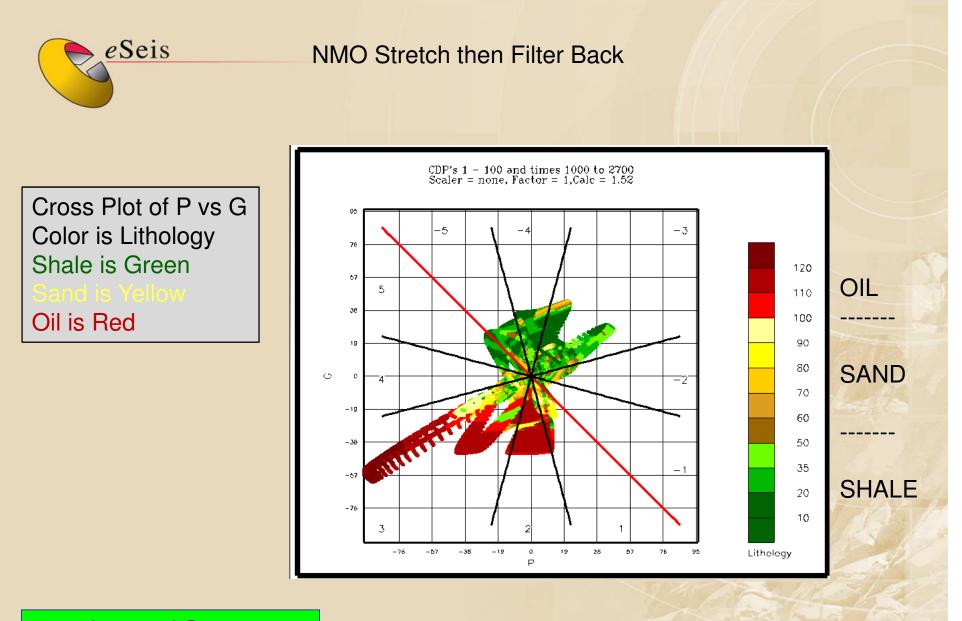


**Inverted Space** 

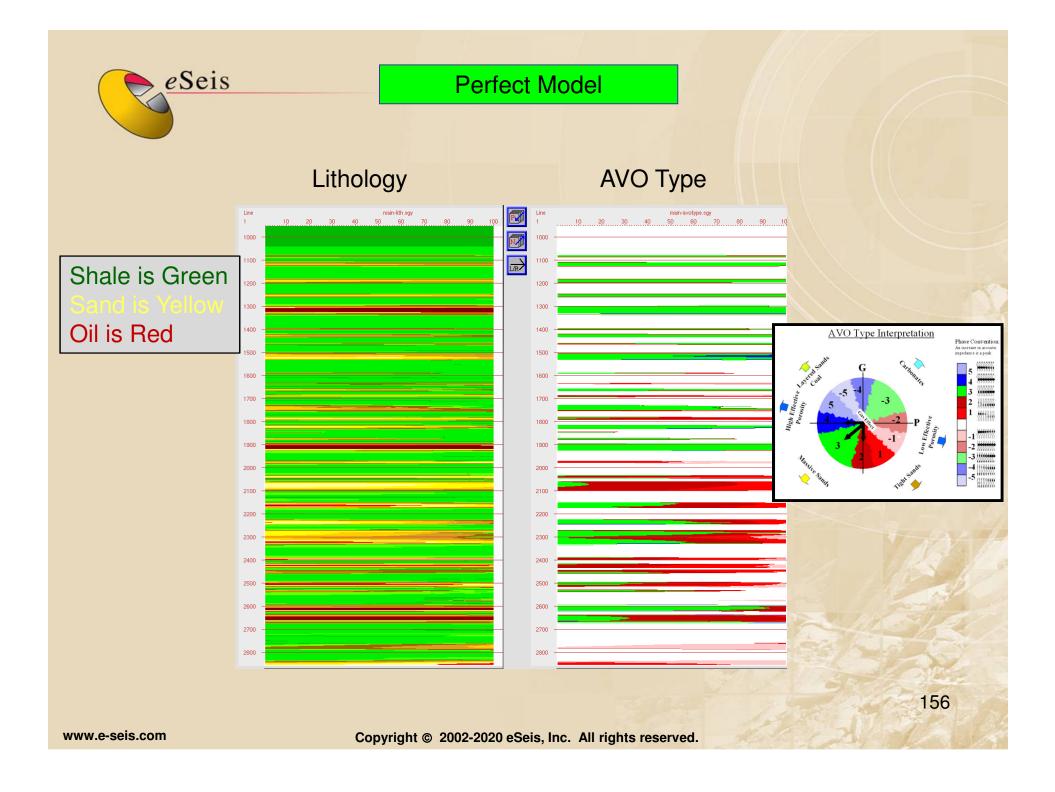
153

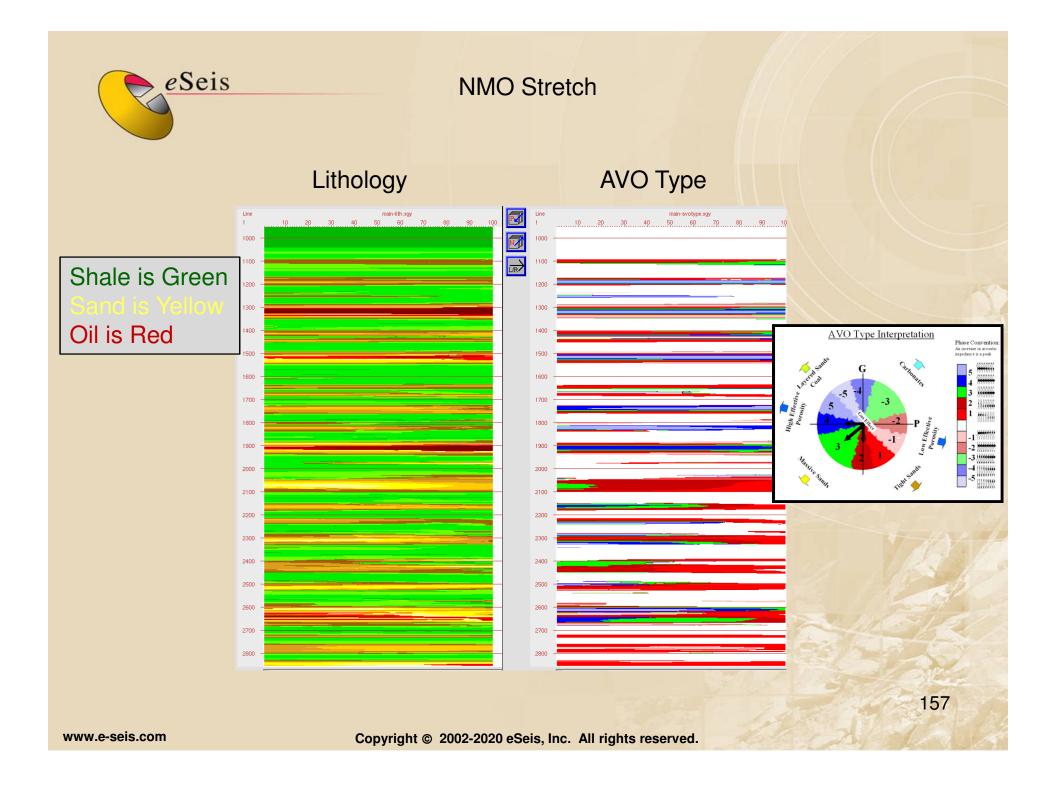


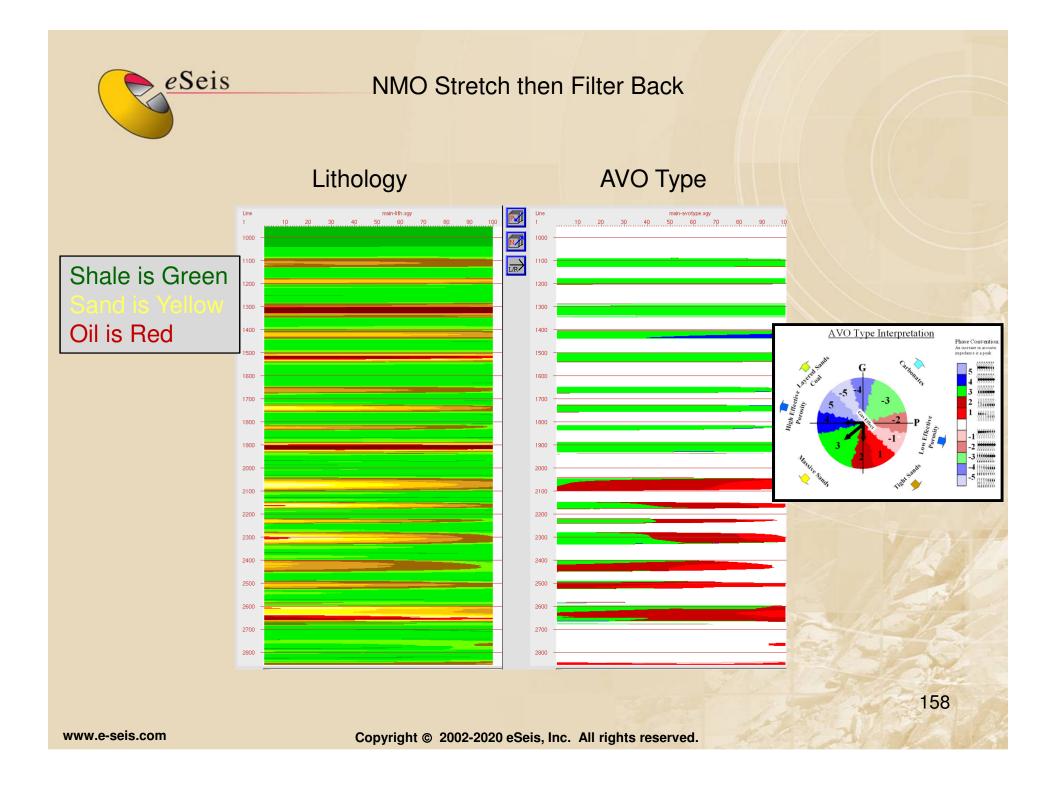
**Inverted Space** 

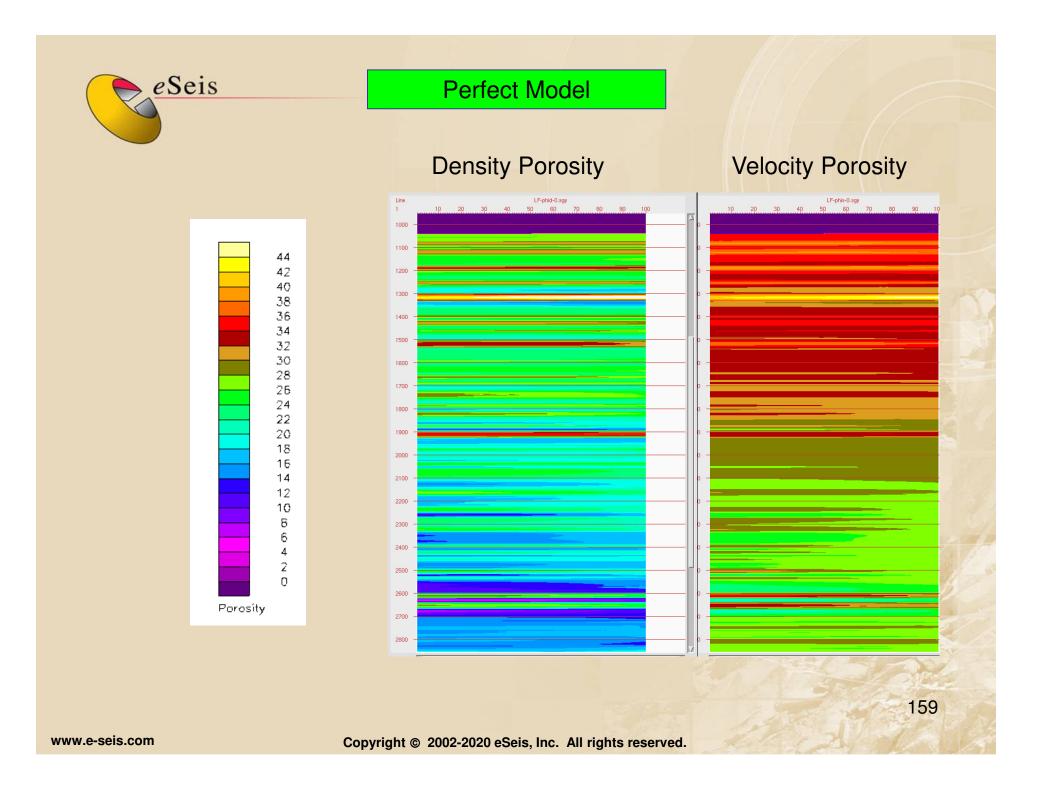


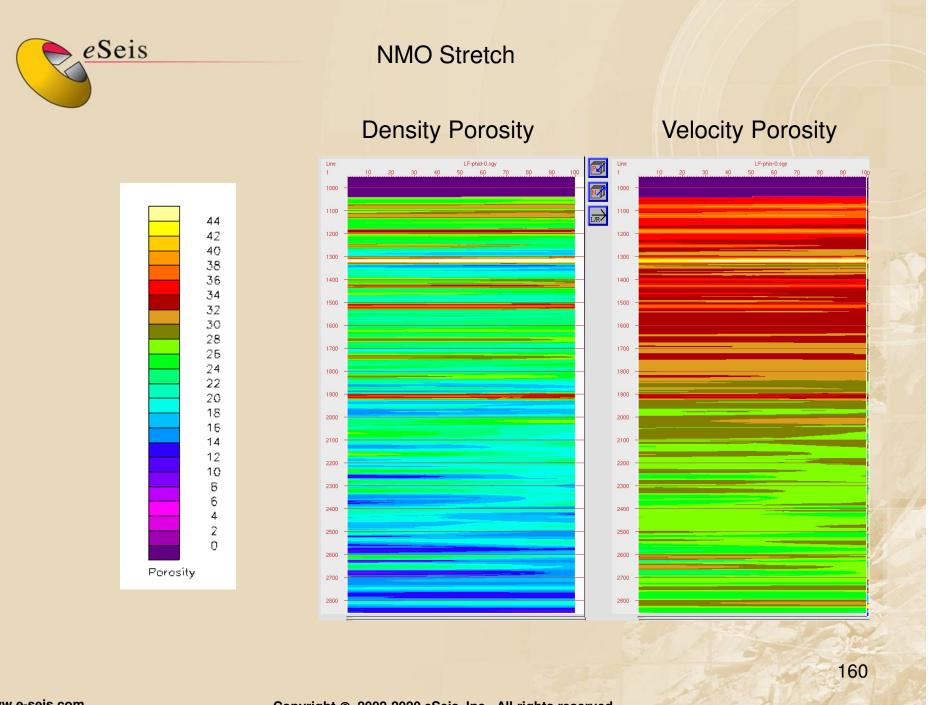
**Inverted Space** 







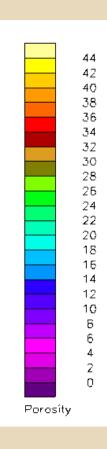




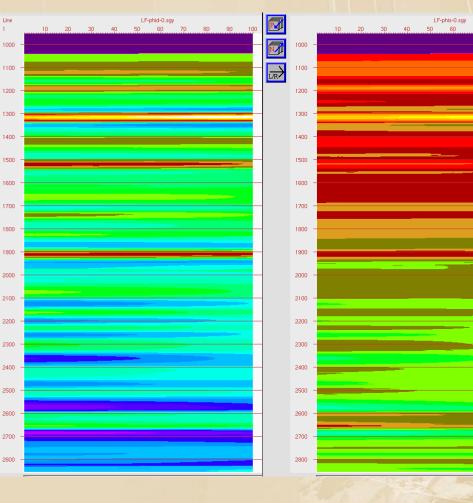
## NMO Stretch then Filter Back

## **Density Porosity**

## Velocity Porosity



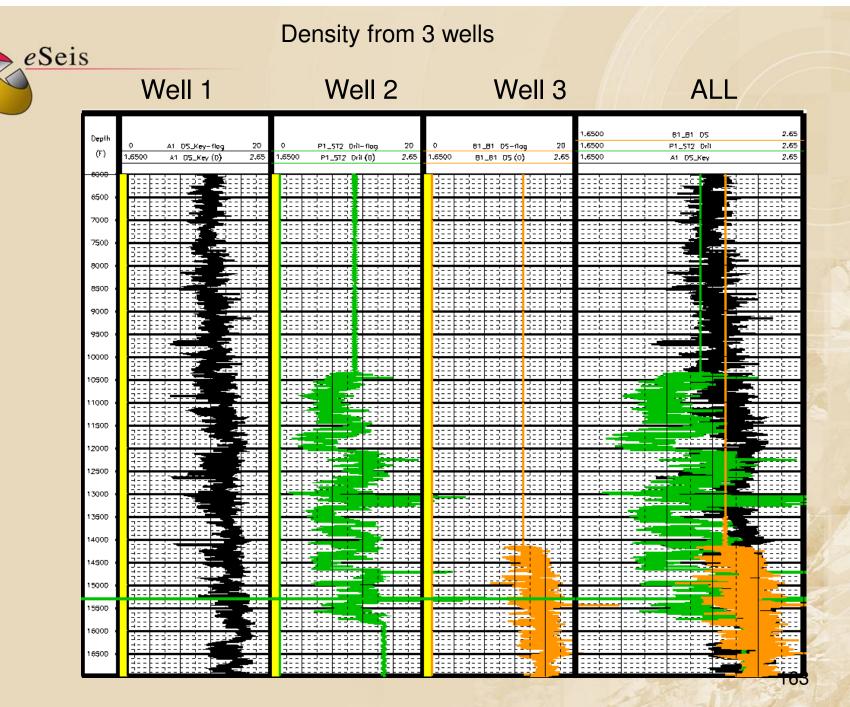
eSeis

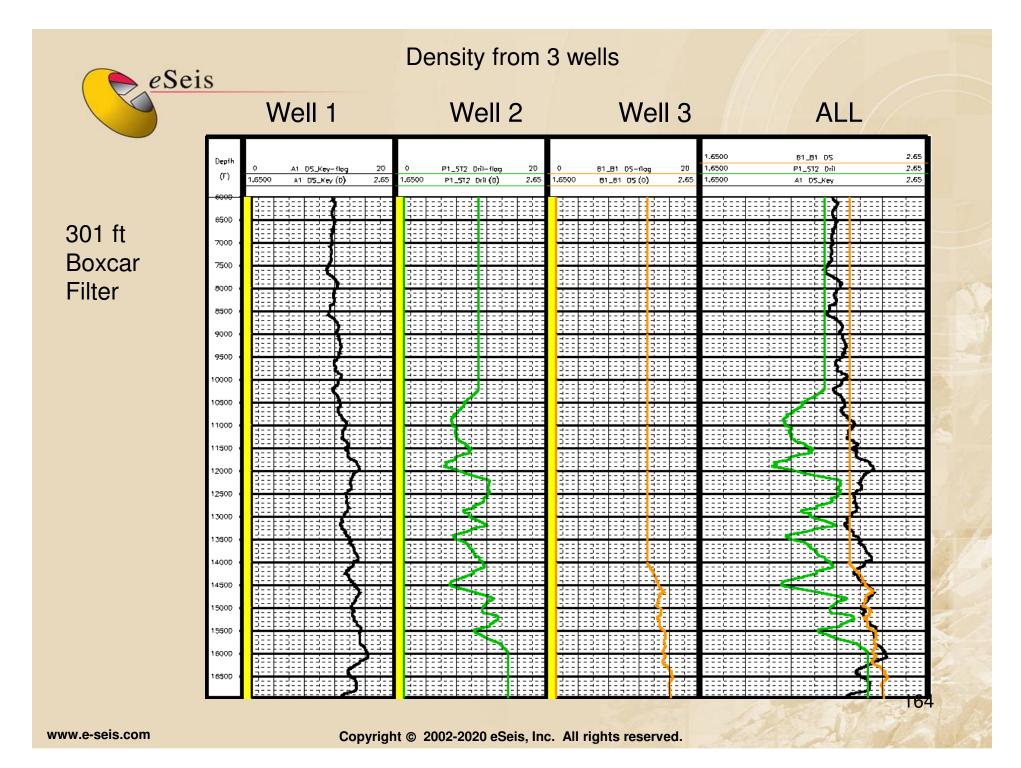


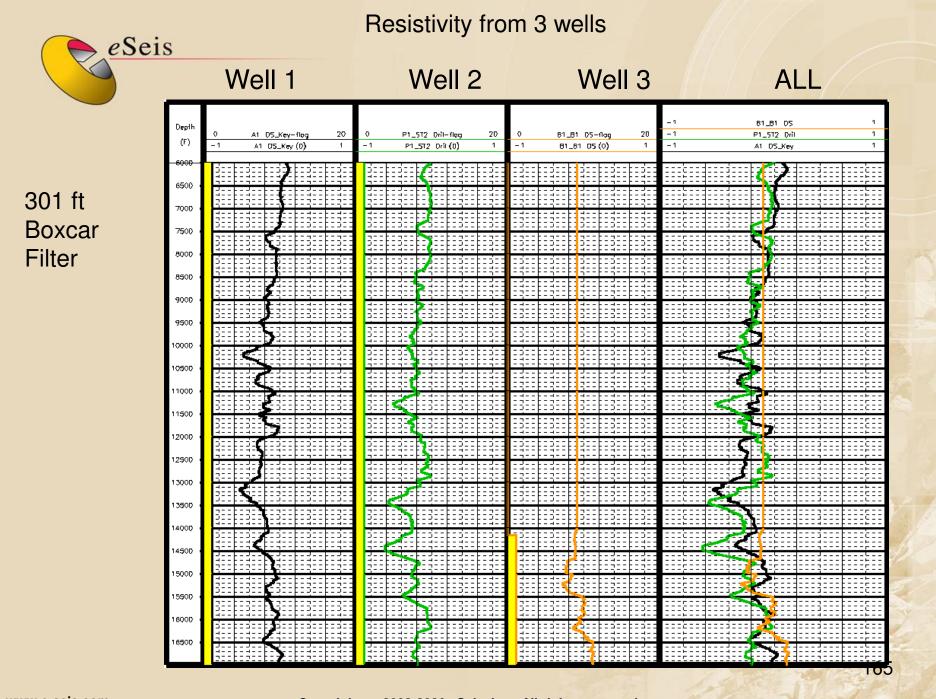


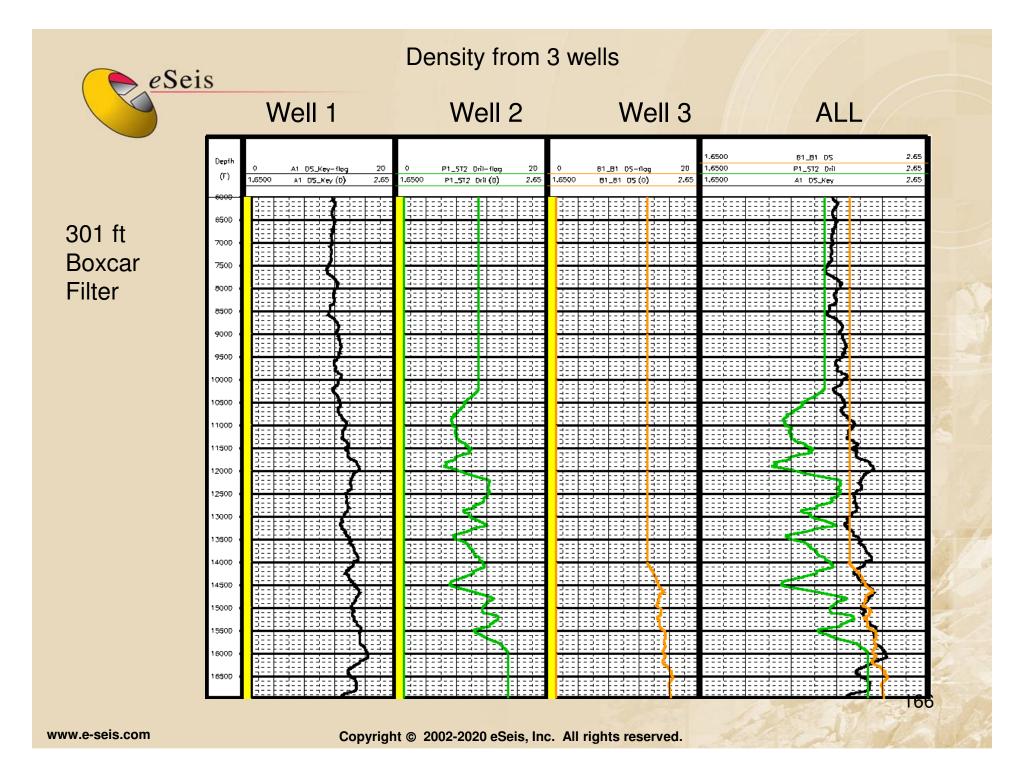
# **One Last Point**

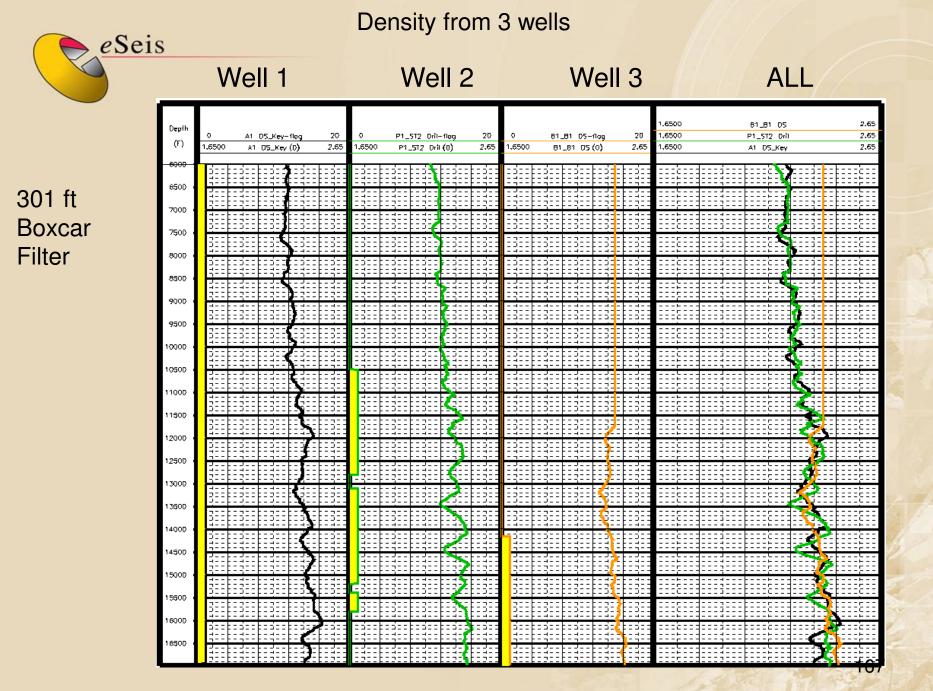
# Logs are Very Often Bad







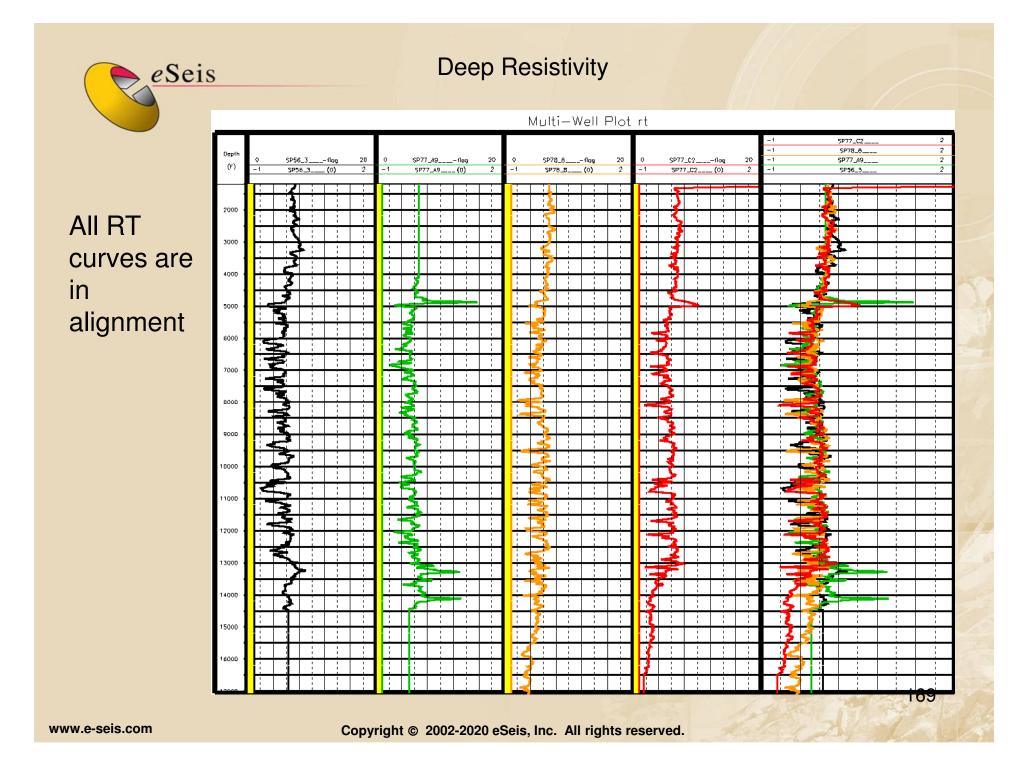


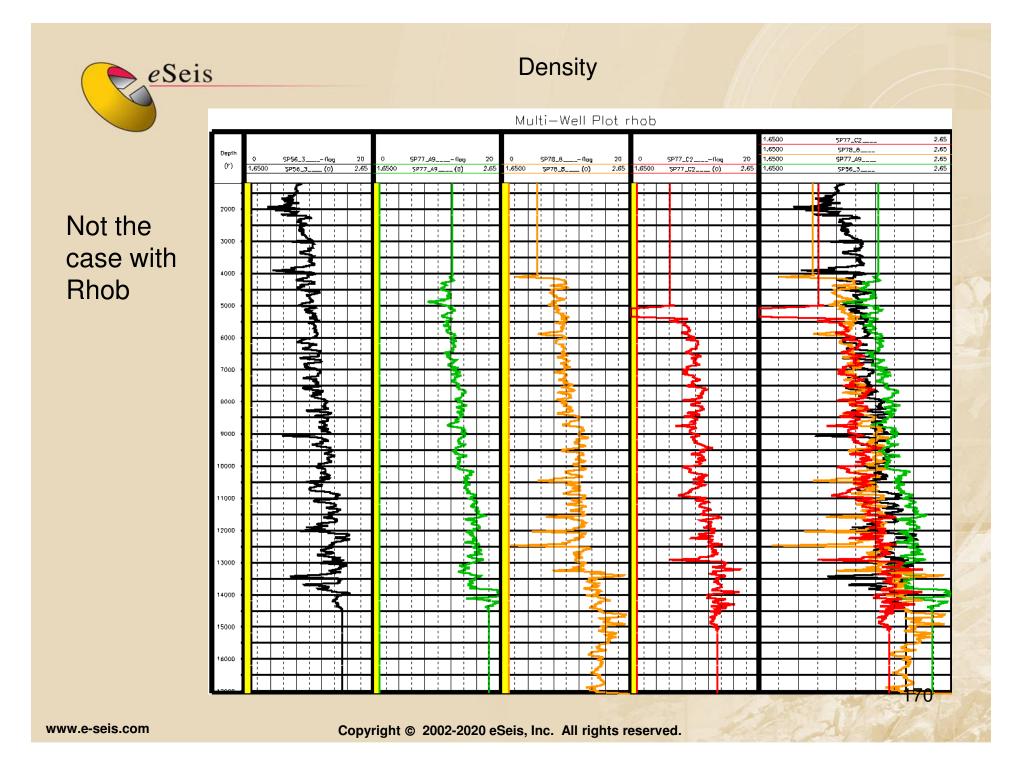


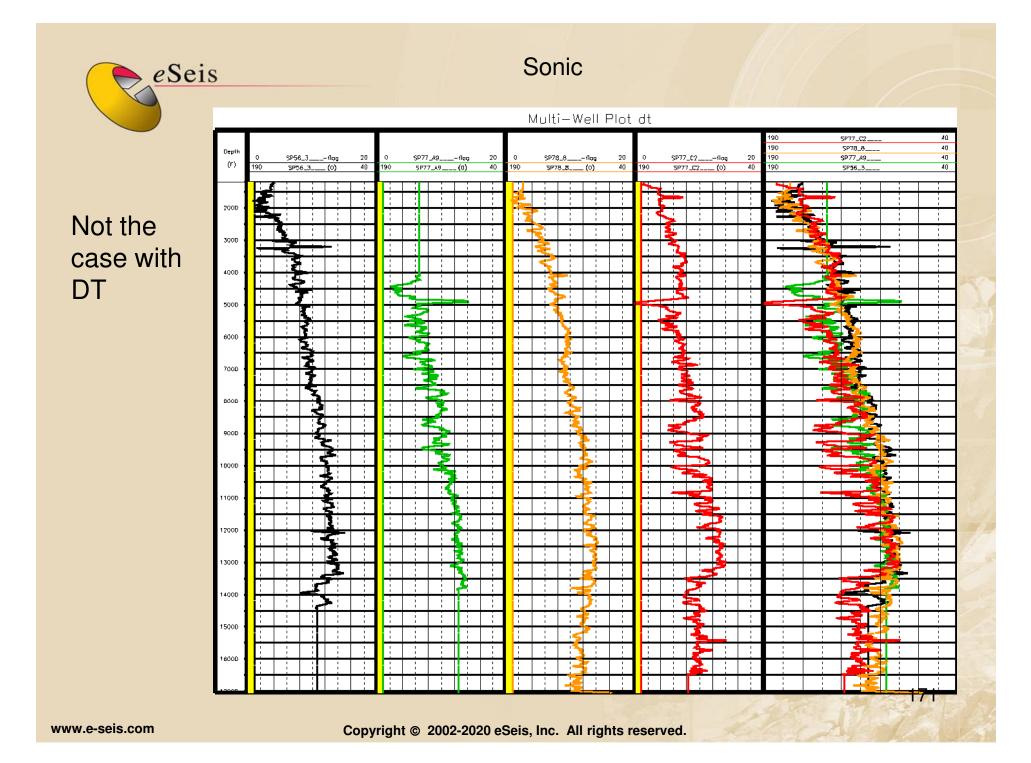
www.e-seis.com

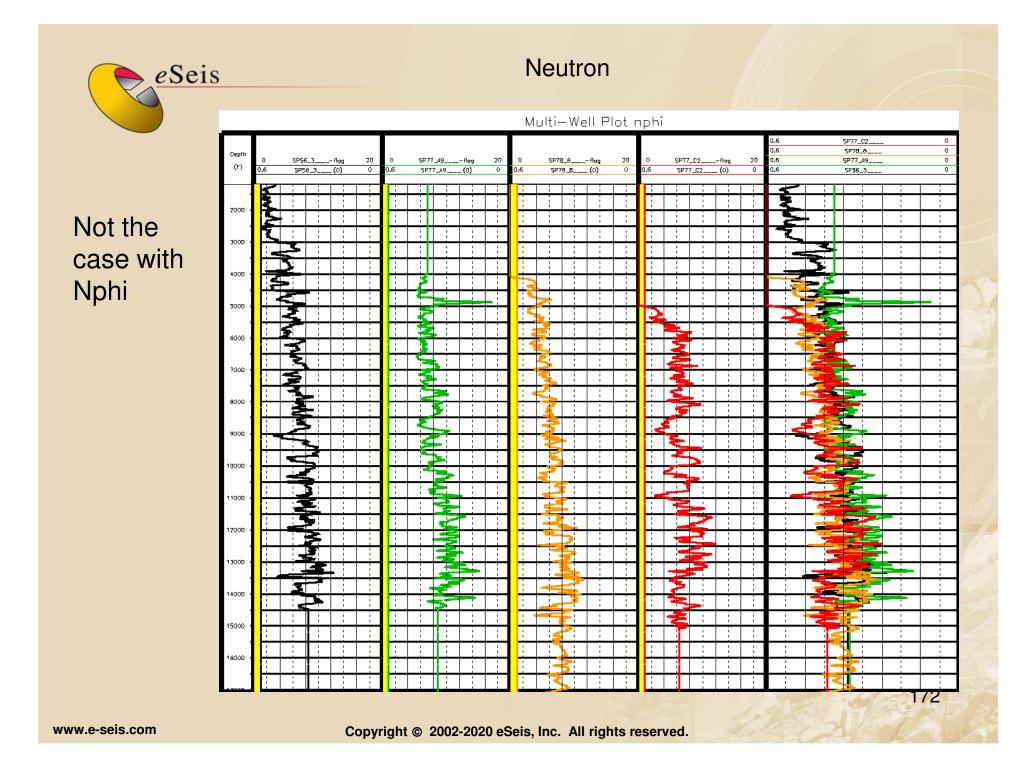


# Example Two



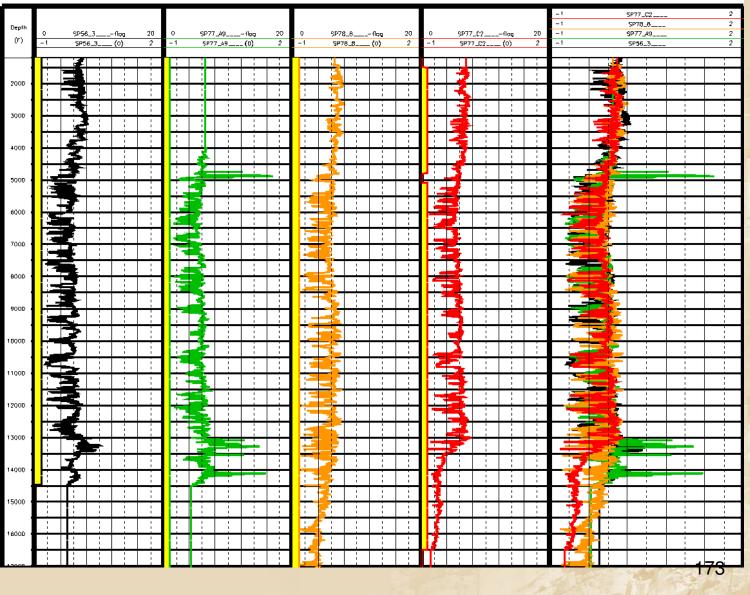








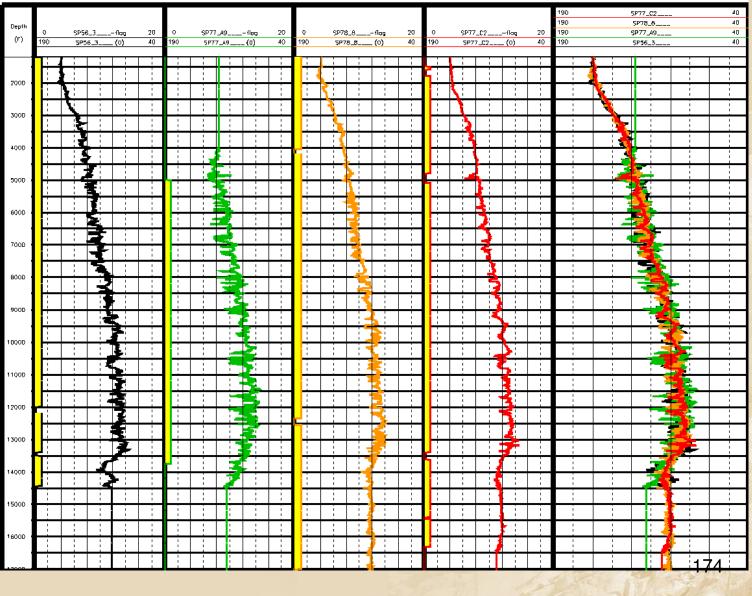
## **Deep Resistivity**



Multi–Well Plot fmrt

eSeis

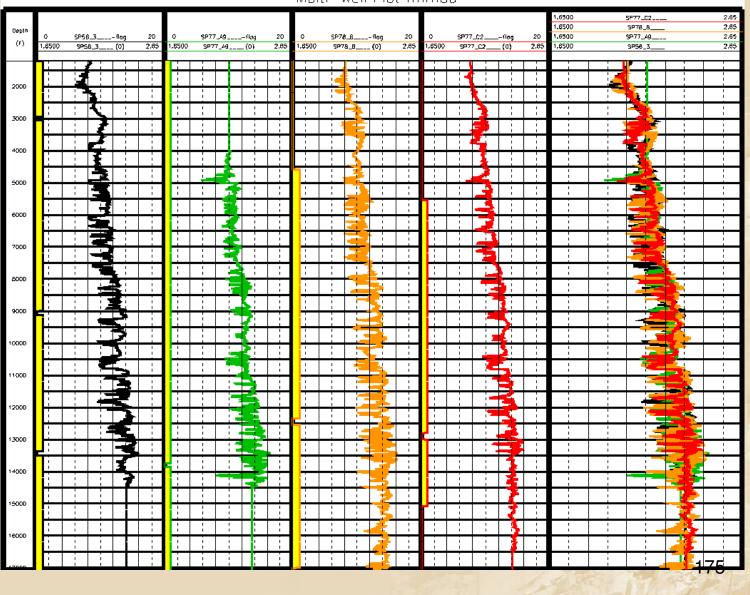
### Sonic



#### Multi–Well Plot fmdt

eSeis

### Density

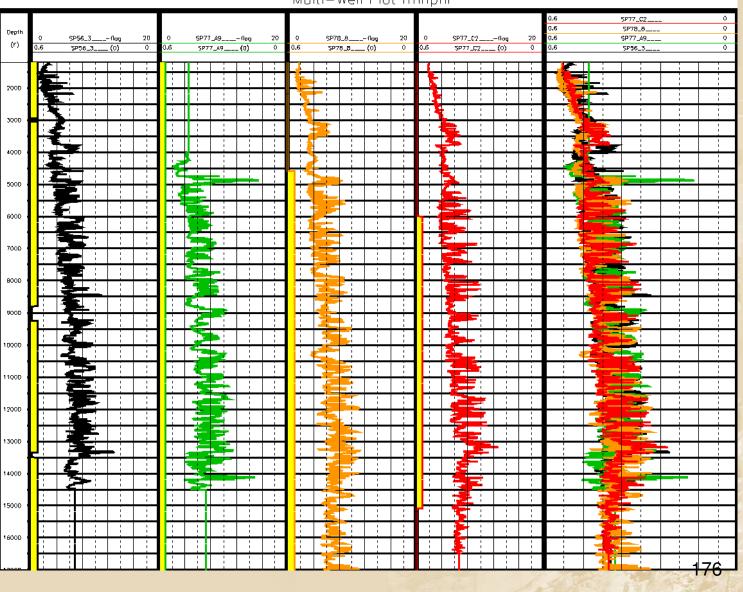


#### Multi–Well Plot fmrhob

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### Neutron

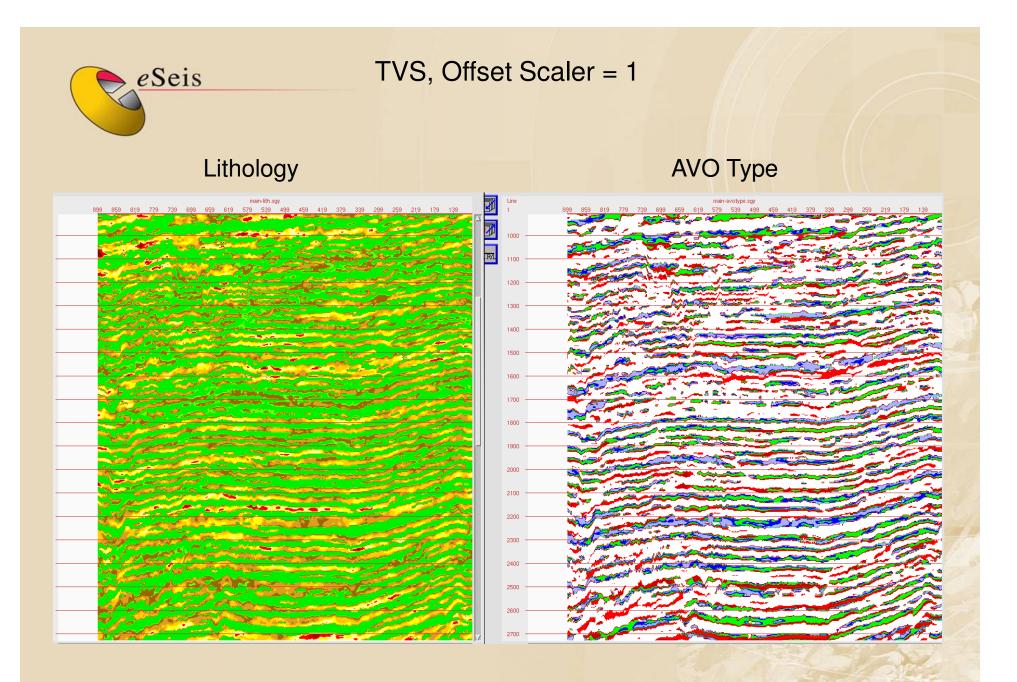


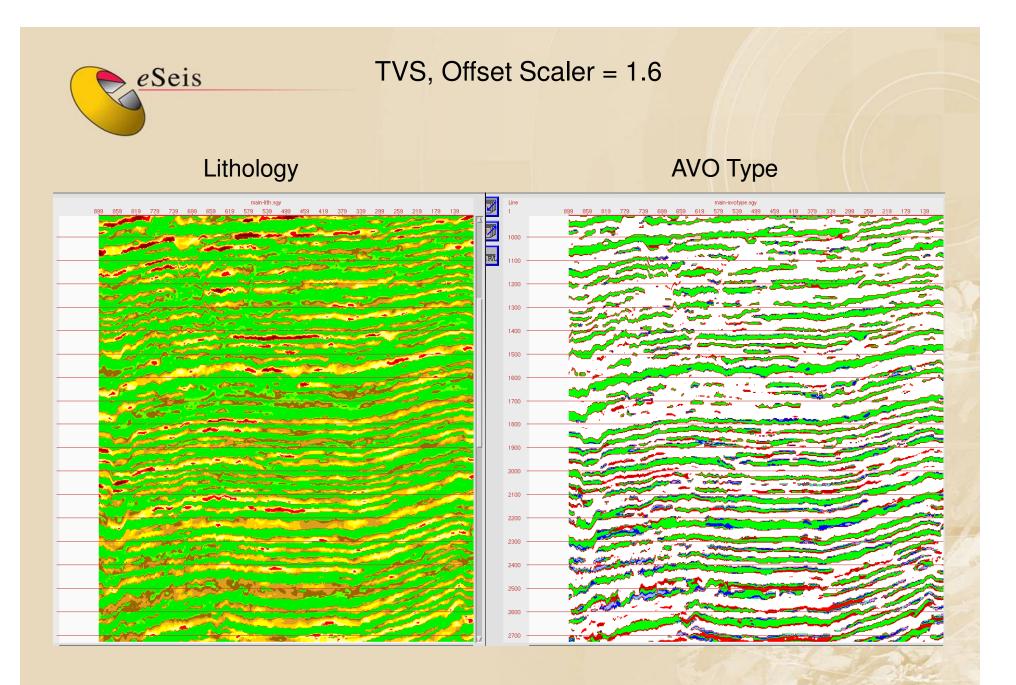
Multi-Well Plot fmnphi

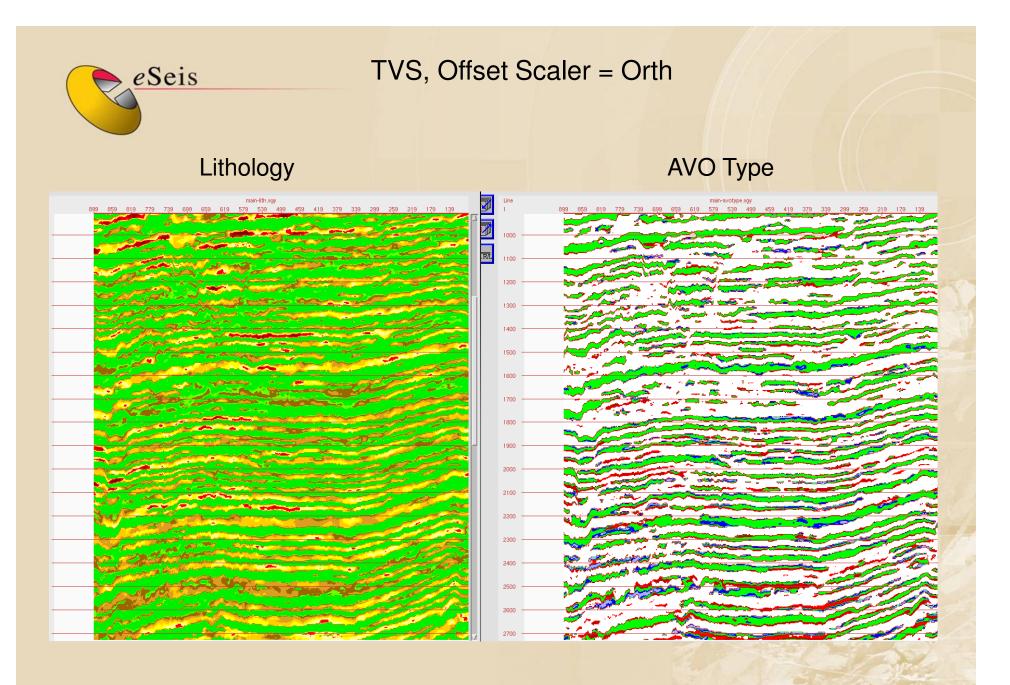


# Conclusions

- 1) The necessary evils of processing can make or destroy a prospect
- 2) QCing gathers by looking at the gathers isn't good enough
- 3) Well control provides an understanding of the type of AVO responses expected although be very careful of log data quality
- 4) Cross plots are the best way to examine the offset response
- 5) Inversions to lithology and AVO types are useful QC tools

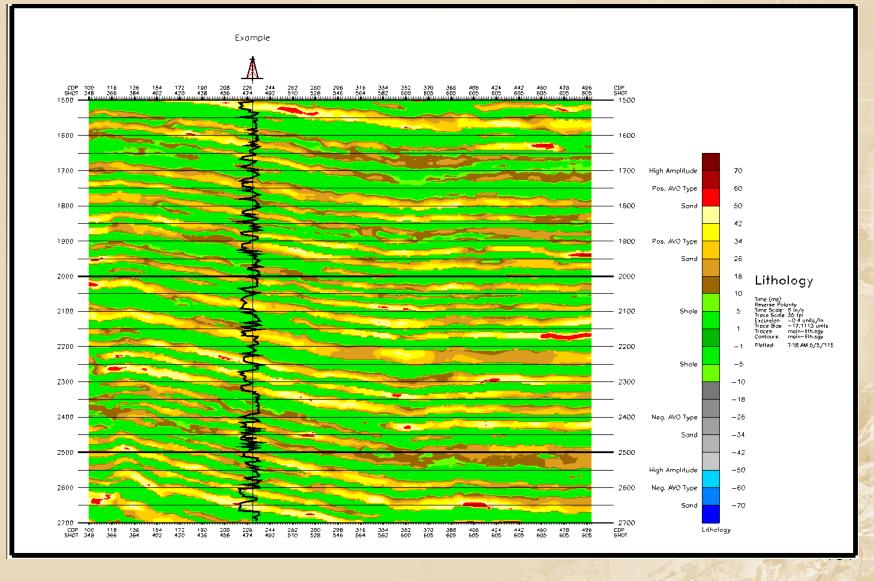




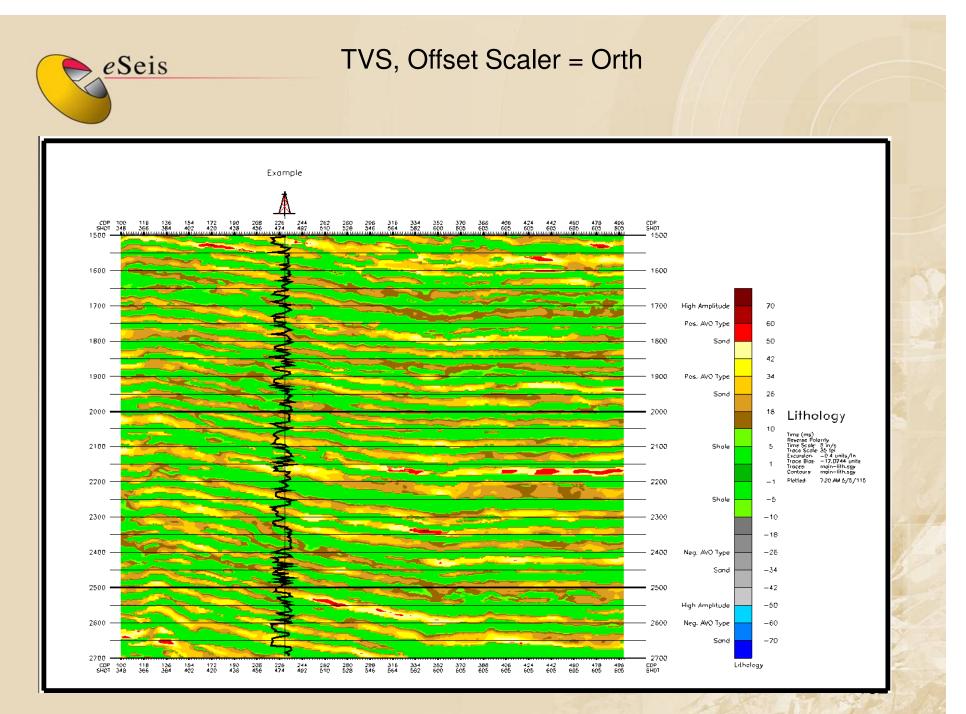




# TVS, Offset Scaler = 1



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