

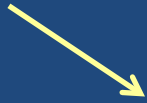
Synthetic Seismograms - an interesting story

Helen Isaac

Friday, February 13, 2015

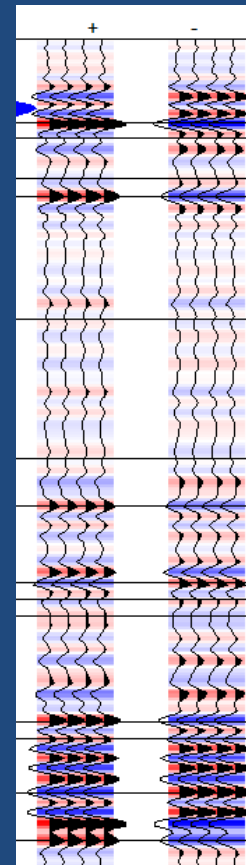


Digitized well logs (sonic, density)



Reflection coefficients

*



Synthetic seismogram software

Syngram (CREWES) PC PP&PS synthetics

Geosyn (IHS) PC PP synthetics

Geoview (HR) Linux PP&PS synthetics



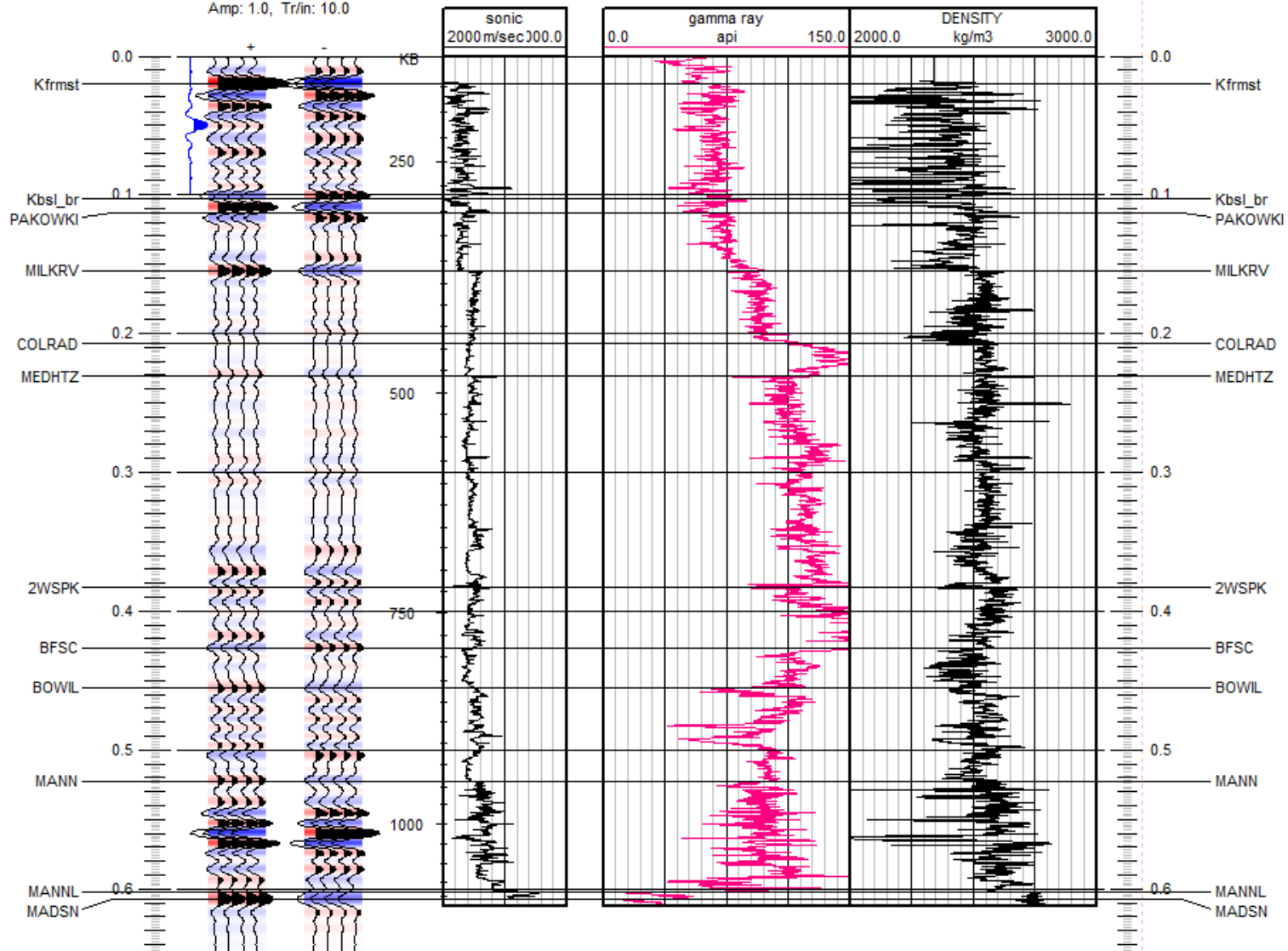
Time range: 0.0 to 0.663 secs
Sample rate: 0.5 ms

Model 29202
Zero offset synthetic (P-P)
Attribute: Amplitude
Ref Coef: P Son., Den.
Filter: 5/10-80/90 0 Phase
Amp: 1.0, Tr/in: 10.0

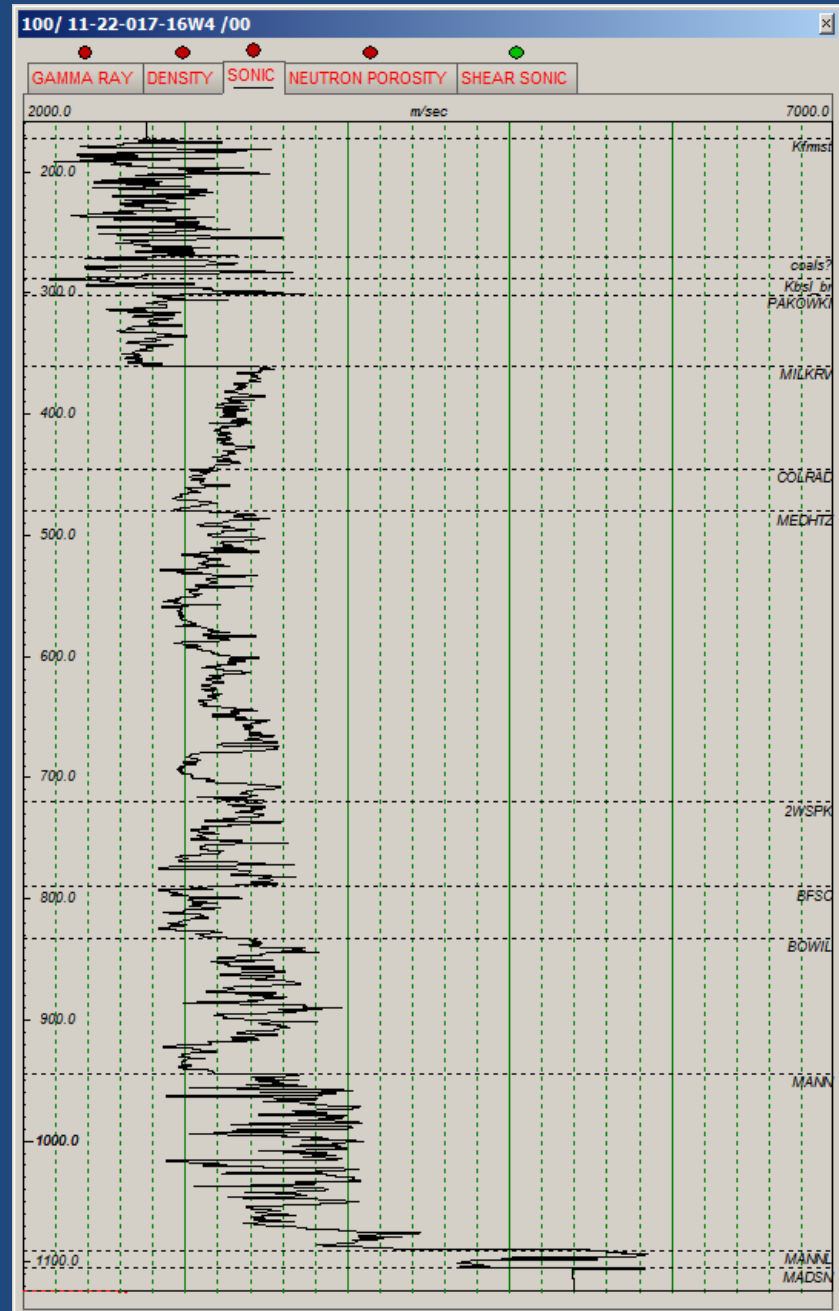
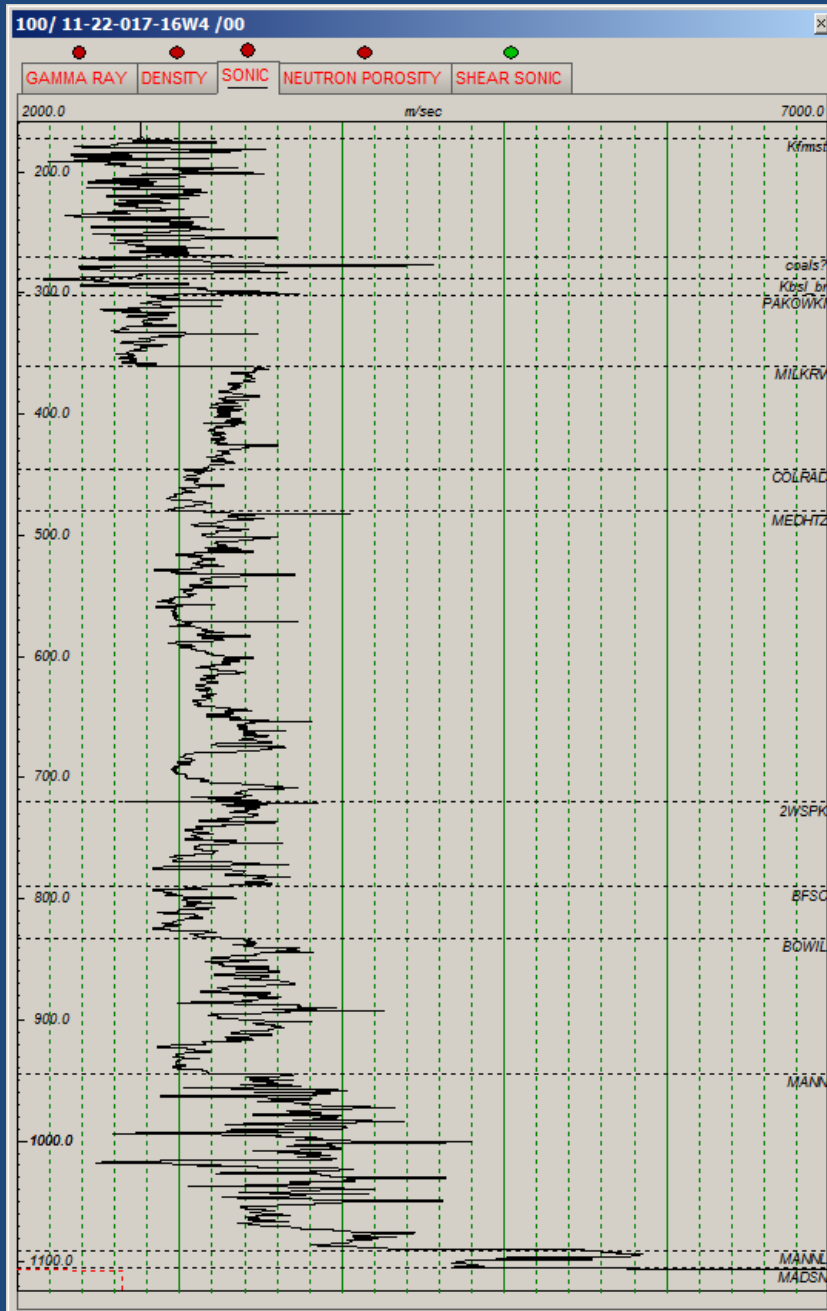
Sonic

gamma

density



Log editing screen



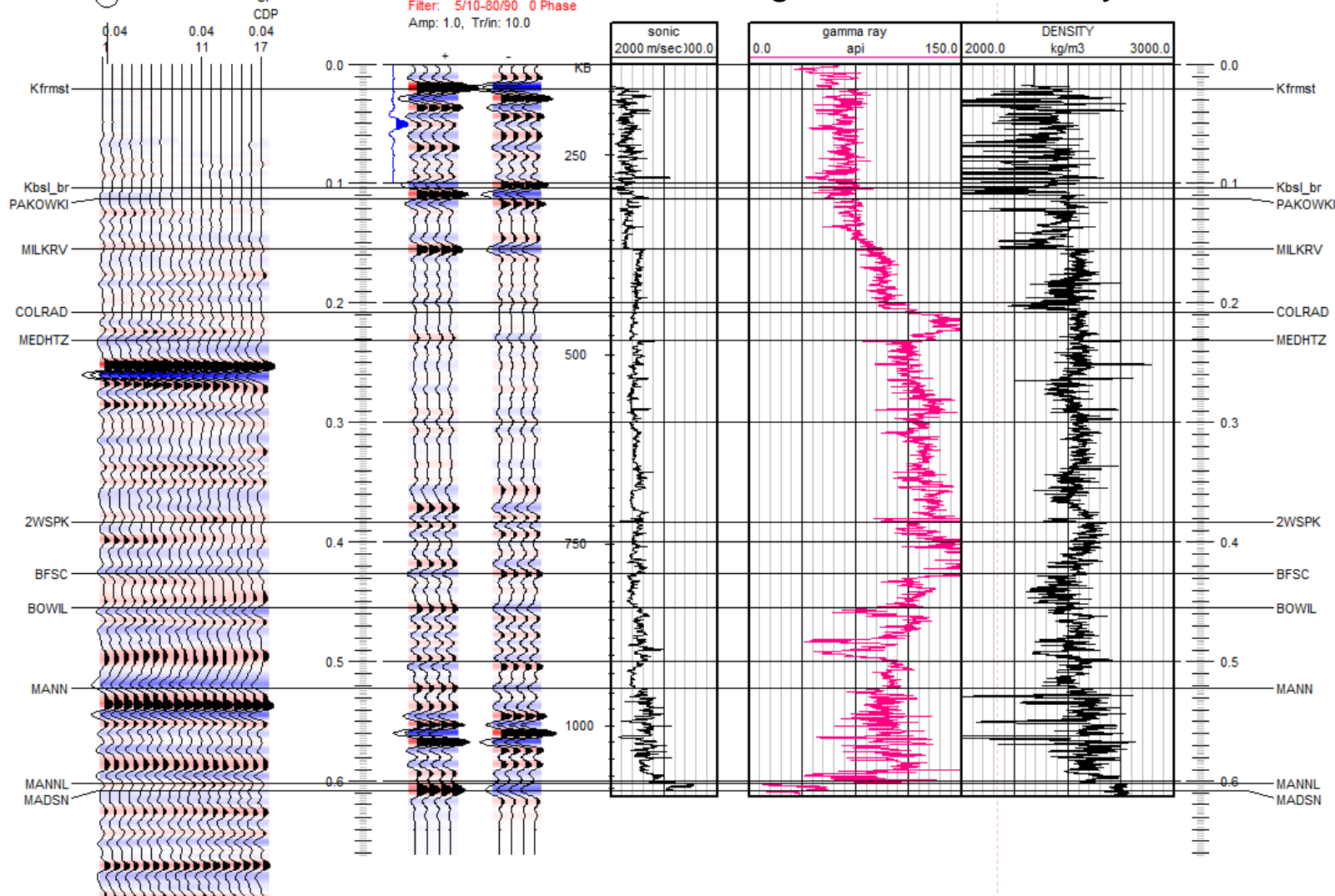


Time range: 0.0 to 0.663 secs
 Sample rate: 0.5 ms

line41.sgy
 Underlay display attribute: Amplitude
 Trace display attribute: Amplitude
 Amplitude: 1.00 Normalization: Peak
 Sample rate: 2.00 ms
 Vertical scale: 10.00 inches/sec
 Traces/inch: 12.000
 Phase rotation: 0 degrees

Model 29202
 Zero offset synthetic (P-P)
 Attribute: Amplitude
 Ref Coef: P Son., Den.
 Filter: 5/10-80/90 0 Phase
 Amp: 1.0, Tr/in: 10.0

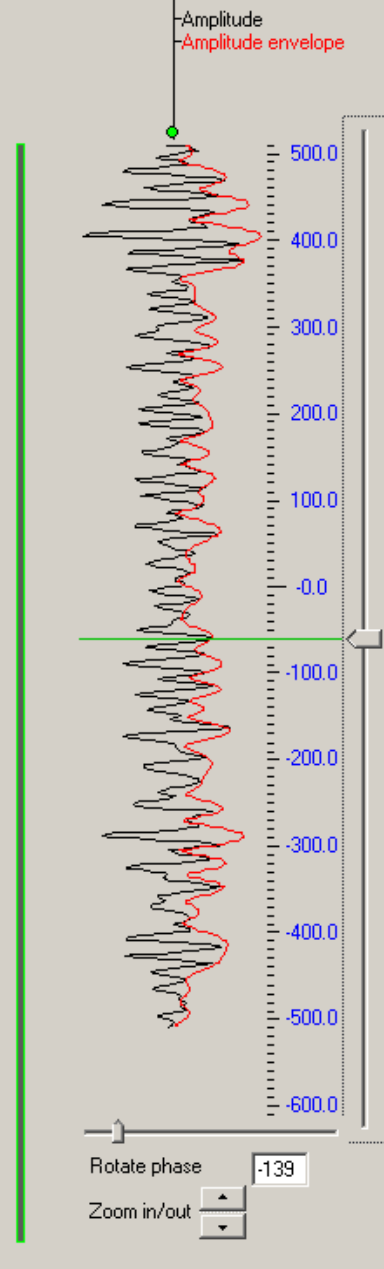
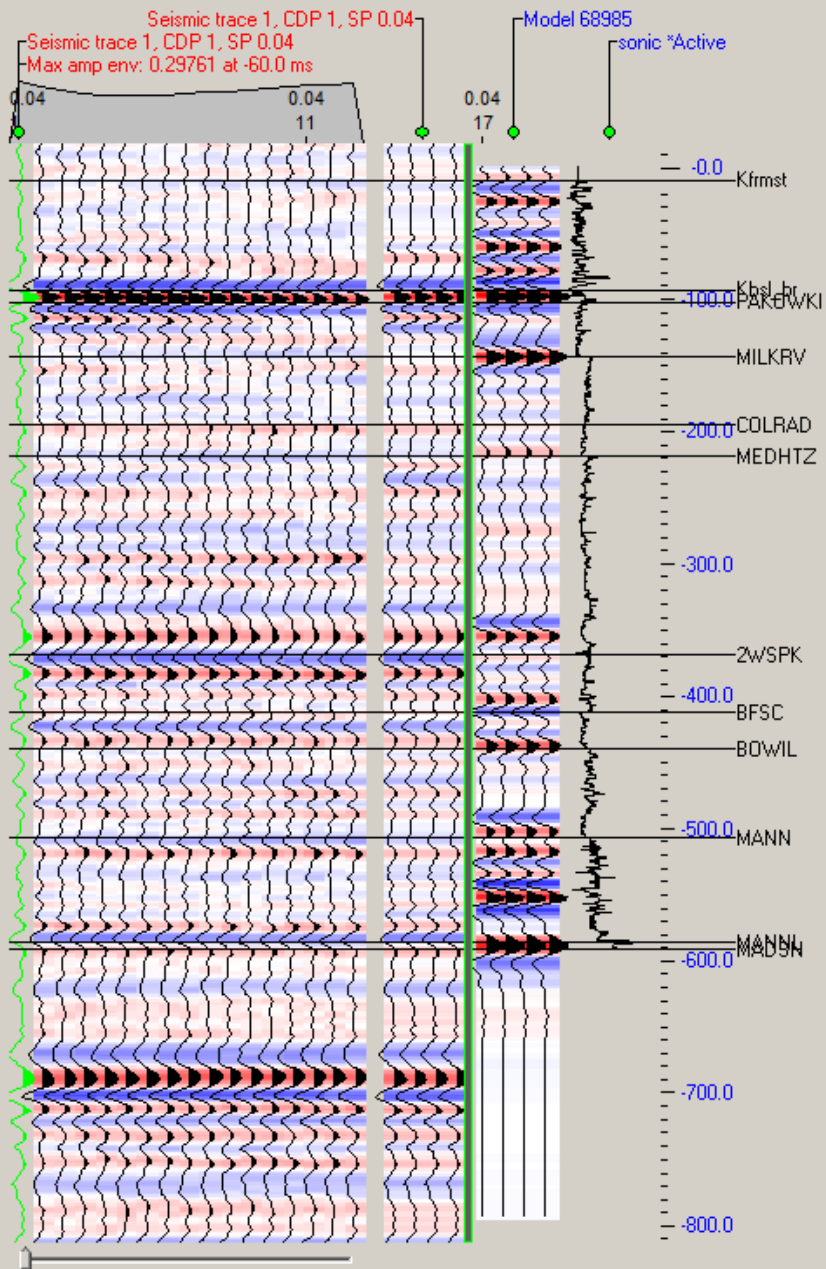
Sonic gamma density



line41.sgy

Model data

Cross correlation function



Zoom in/out [up/down arrows]

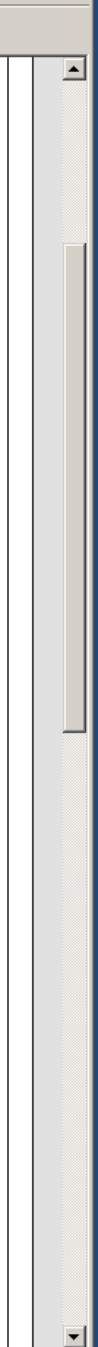
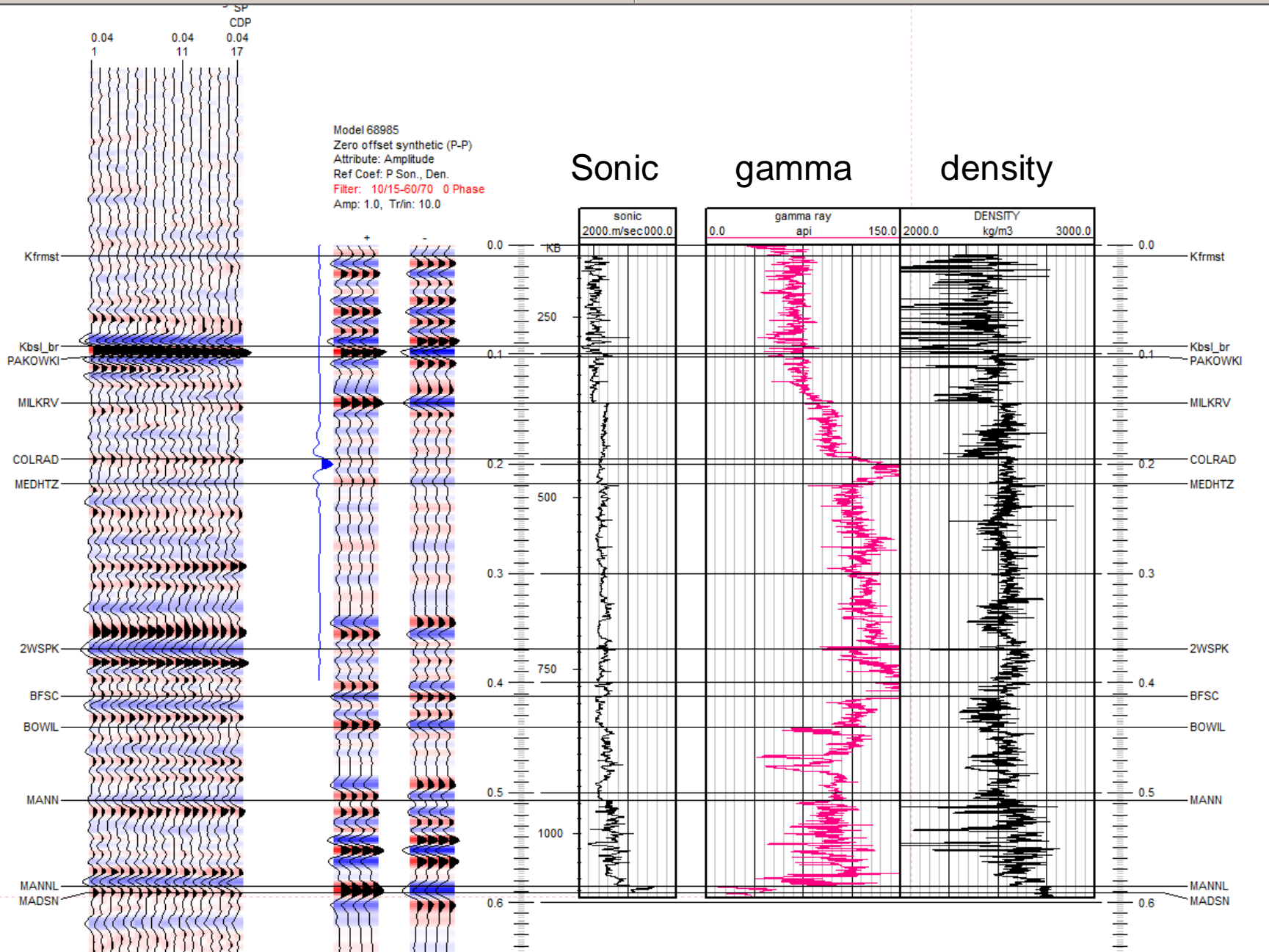
Stretch / Squeeze

Display properties

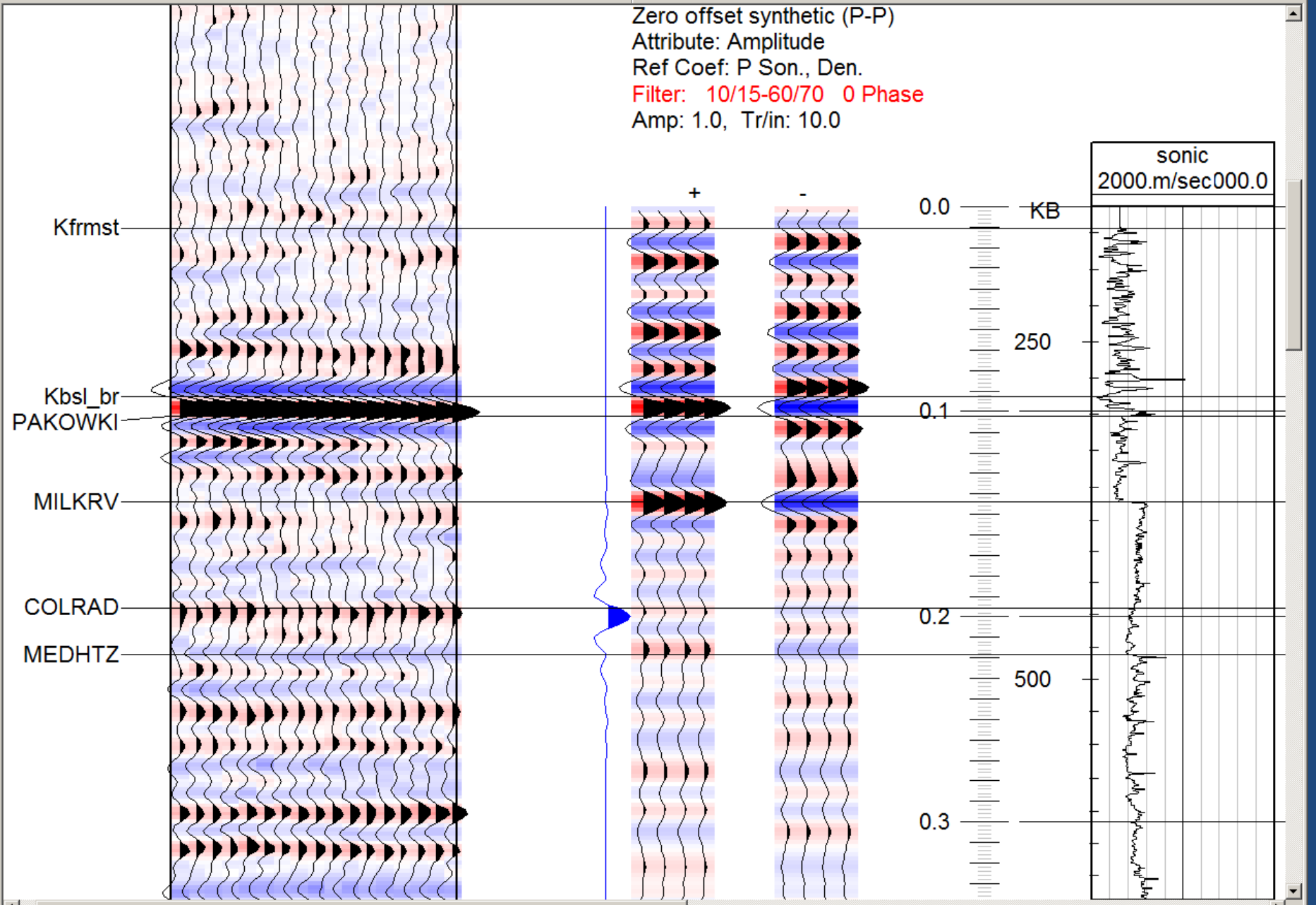
OK

Cancel

Help



Zero offset synthetic (P-P)
Attribute: Amplitude
Ref Coef: P Son., Den.
Filter: 10/15-60/70 0 Phase
Amp: 1.0, Tr/in: 10.0



sonic
2000.m/sec000.0

0.0 KB

250

0.1

0.2

500

0.3

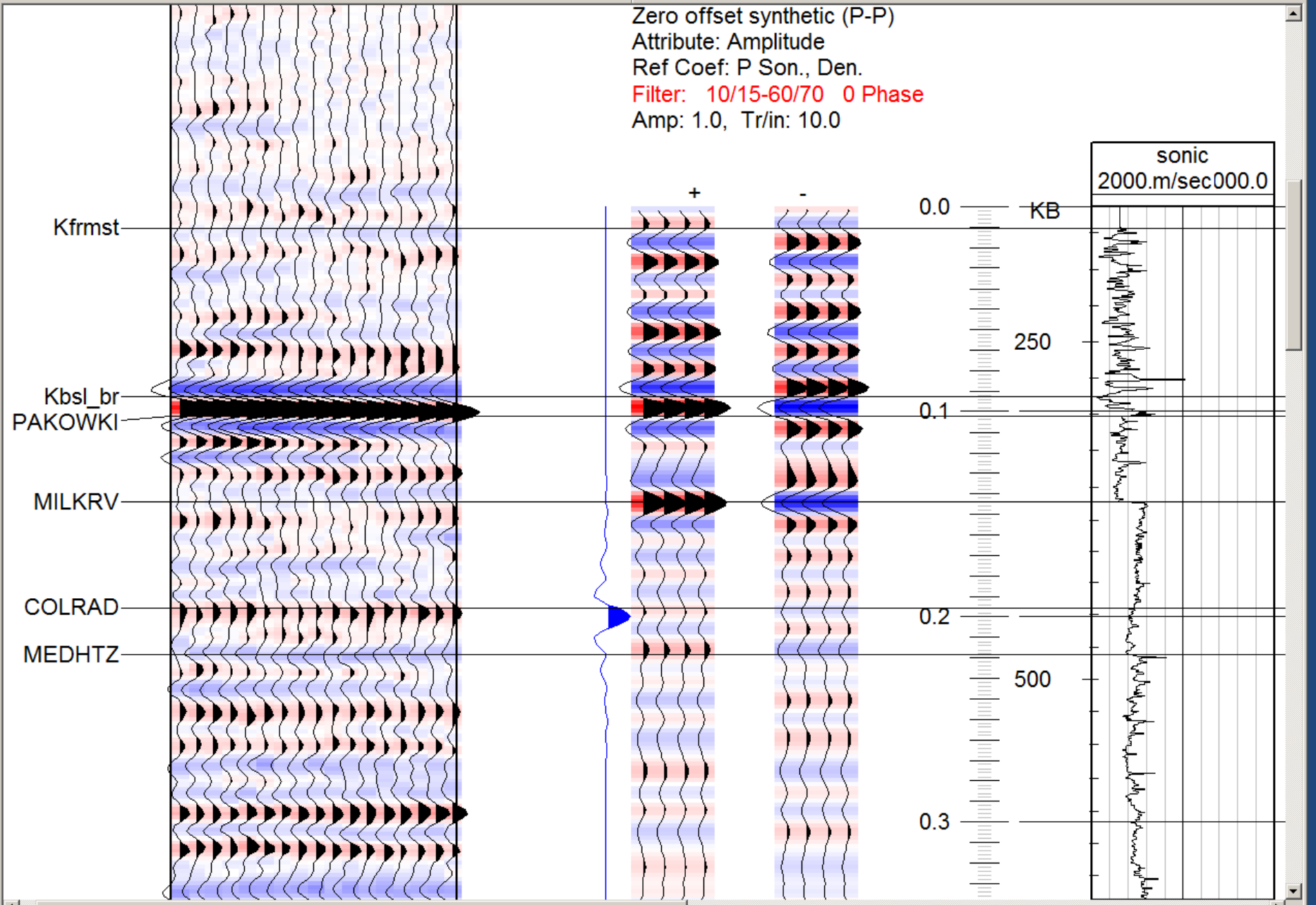
So, what is causing this?

Were the sonic logs digitized incorrectly?
scale change?

Check the original raster images of the sonic logs

No, they look OK

Zero offset synthetic (P-P)
 Attribute: Amplitude
 Ref Coef: P Son., Den.
 Filter: 10/15-60/70 0 Phase
 Amp: 1.0, Tr/in: 10.0



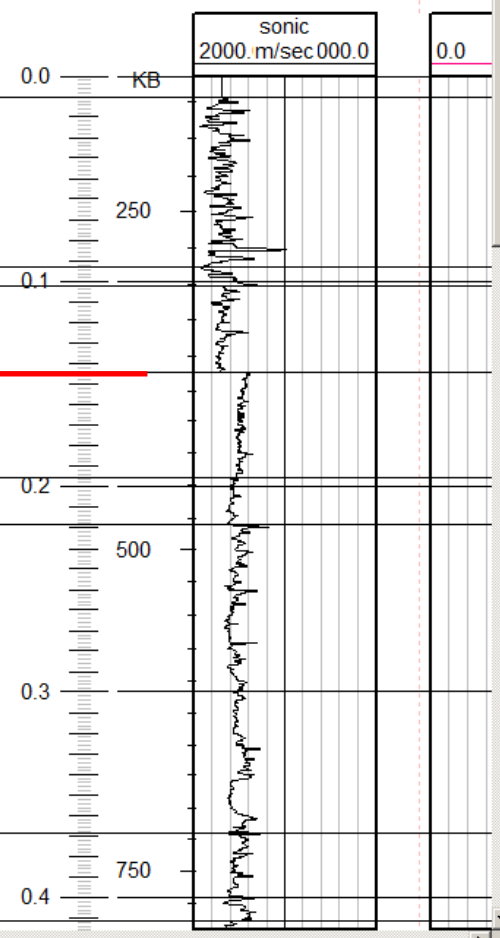
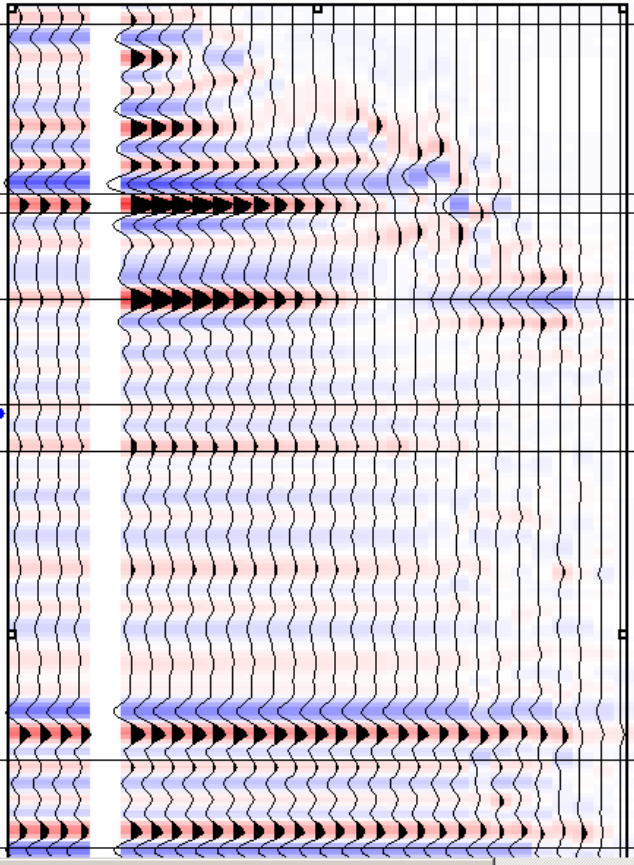
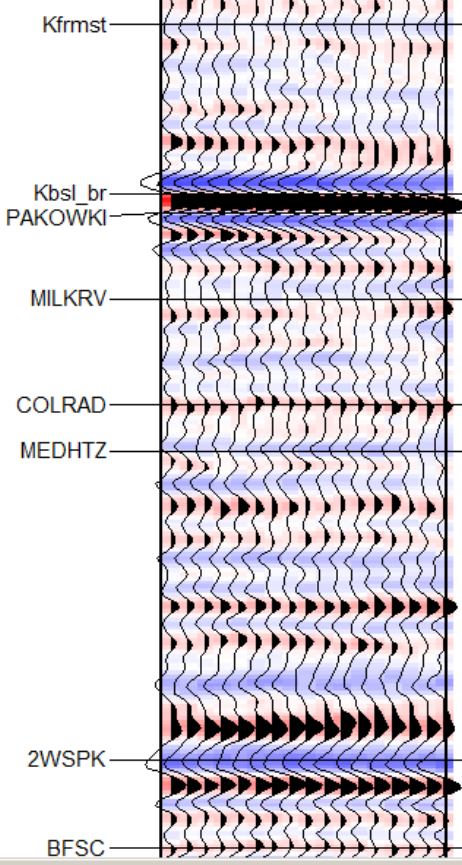


CDP
0.04 0.04 0.04
1 11 17

Model 68985
Multi offset model (P-P)
Sum offsets: A [1 to 8] + B [9 to 15] + C [16 to 25]
Attribute: Amplitude
Ref Coef: Shuey
Filter: 10/15-60/70 0 Phase
Amp: 1.0, Tr/in: 10.0
Ray trace: Full
NMO corrected: Yes, Stretched: No
Bin width / height: 1.0 m by 2.0 ms
Incident angle mute: < 0 and > 90 deg.
Near offset: 0.0 m, CDP int.: 12.5 m

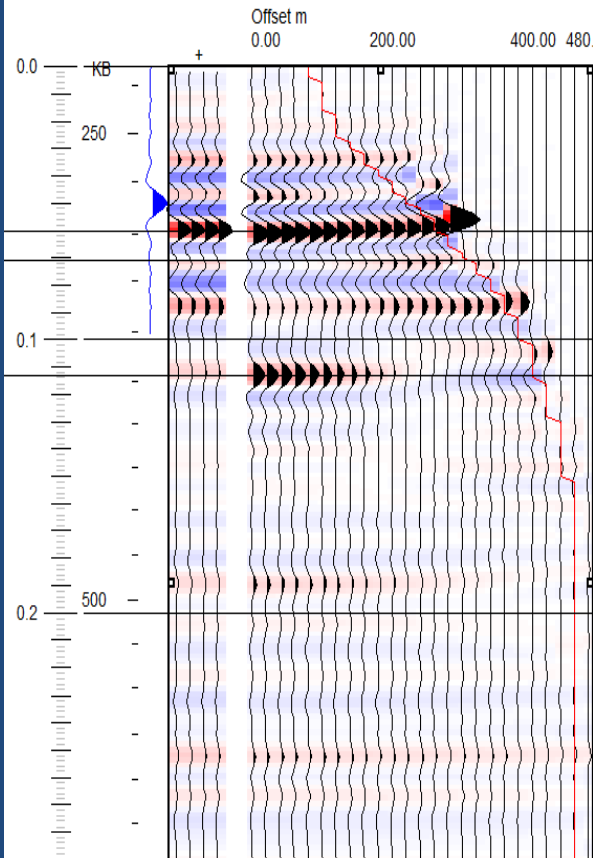
Well with calculated S log

Offset m
0.00 250.00 500.00 600.00



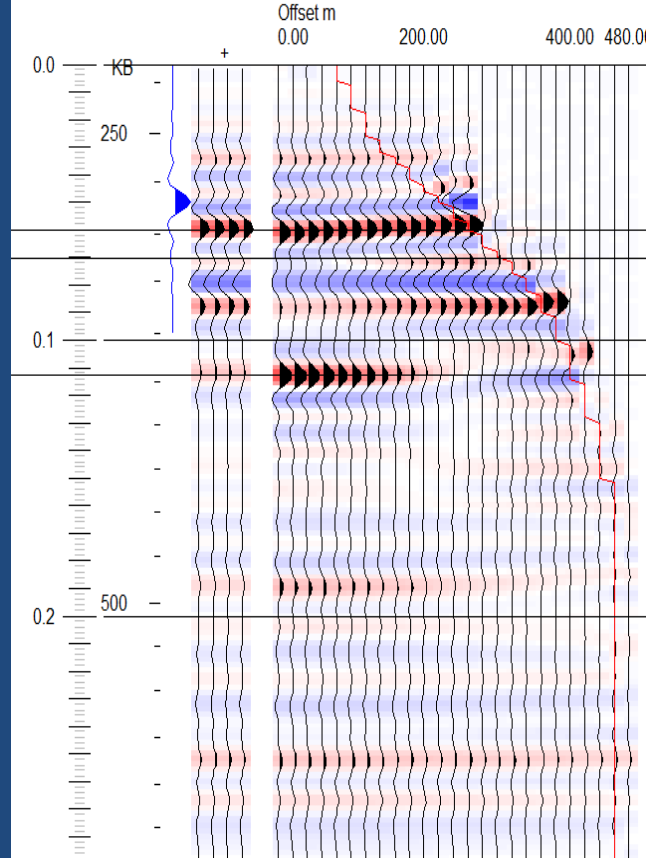
Shuey

Multi offset model (P-P)
Sum offsets: A [1 to 8] + B [9 to 15] + C [16 to 25]
Attribute: Amplitude
Ref Coef: Shuey
Filter: 5/10-80/90 0 Phase
Amp: 1.0, Tr/in: 10.0
Ray trace: Full
NMO corrected: Yes, Stretched: No
Bin width / height: 1.0 m by 2.0 ms
Incident angle mute: < 0 and > 60 deg.
Near offset: 0.0 m, CDP int.: 10.0 m



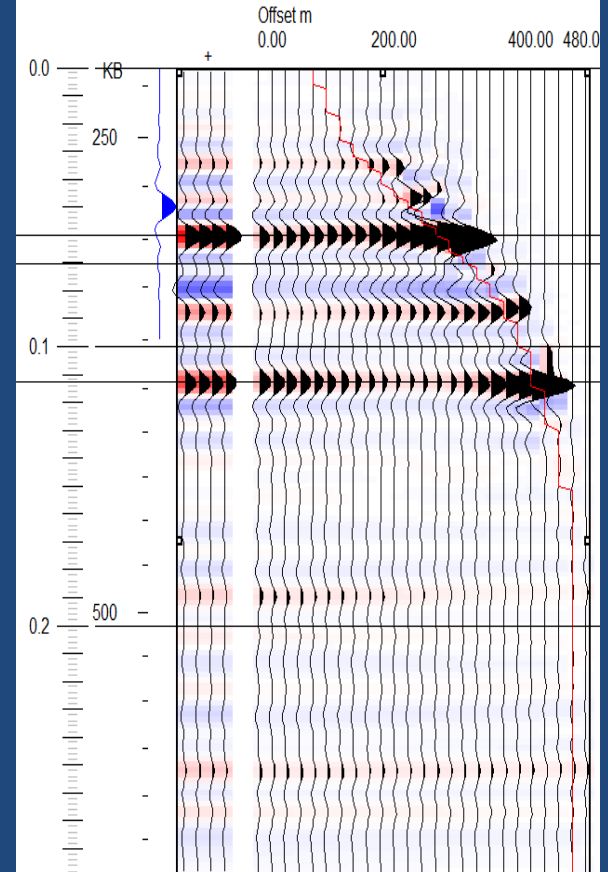
Aki-Richards 2 term

Multi offset model (P-P)
Sum offsets: A [1 to 8] + B [9 to 15] + C [16 to 25]
Attribute: Amplitude
Ref Coef: Aki-Richards 2 term
Filter: 5/10-80/90 0 Phase
Amp: 1.0, Tr/in: 10.0
Ray trace: Full
NMO corrected: Yes, Stretched: No
Bin width / height: 1.0 m by 2.0 ms
Incident angle mute: < 0 and > 60 deg.
Near offset: 0.0 m, CDP int.: 10.0 m



Aki-Richards 3 term

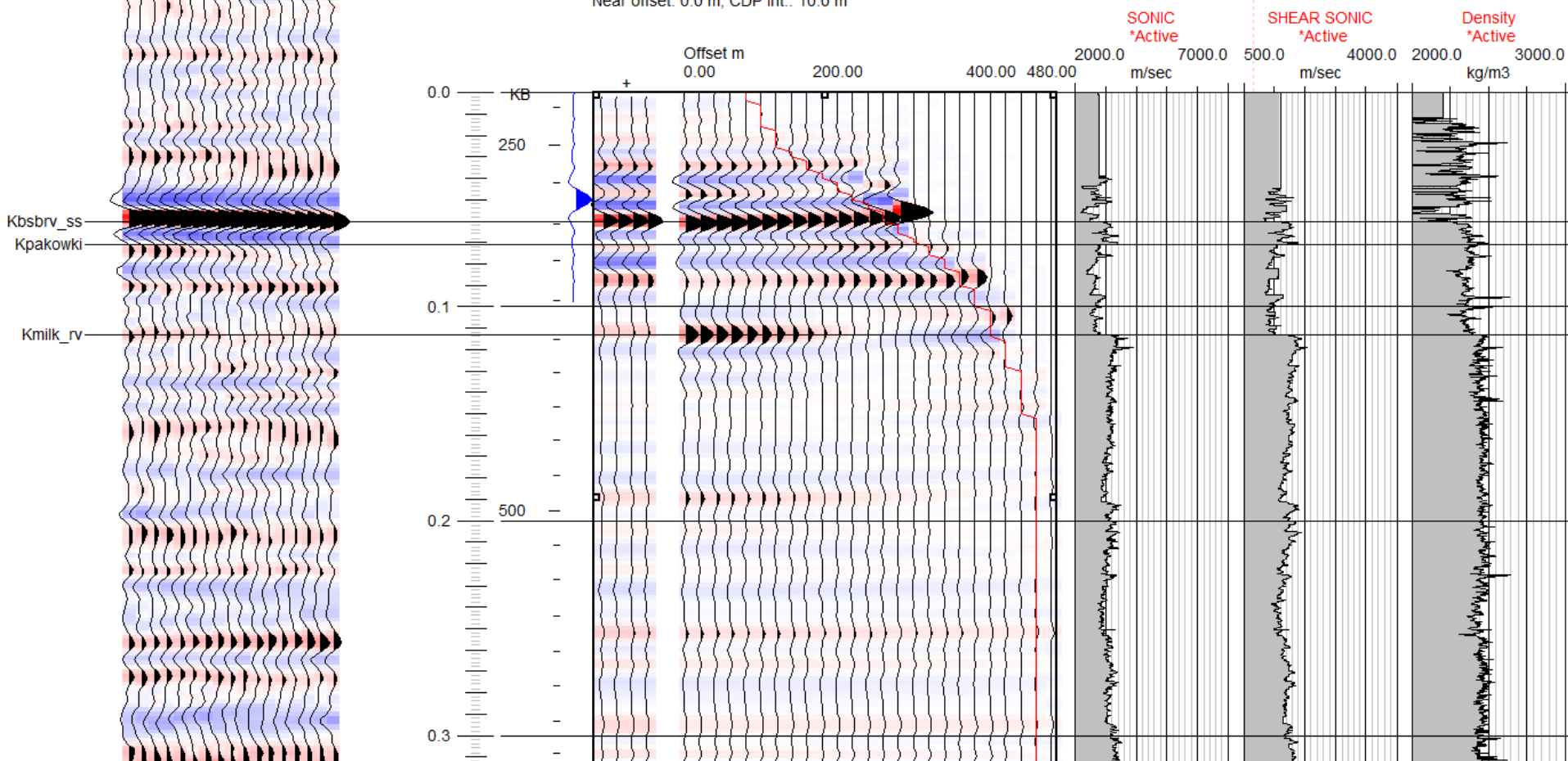
Multi offset model (P-P)
Sum offsets: A [1 to 8] + B [9 to 15] + C [16 to 25]
Attribute: Amplitude
Ref Coef: Aki-Richards 3 term
Filter: 5/10-80/90 0 Phase
Amp: 1.0, Tr/in: 10.0
Ray trace: Full
NMO corrected: Yes, Stretched: No
Bin width / height: 1.0 m by 2.0 ms
Incident angle mute: < 0 and > 60 deg.
Near offset: 0.0 m, CDP int.: 10.0 m



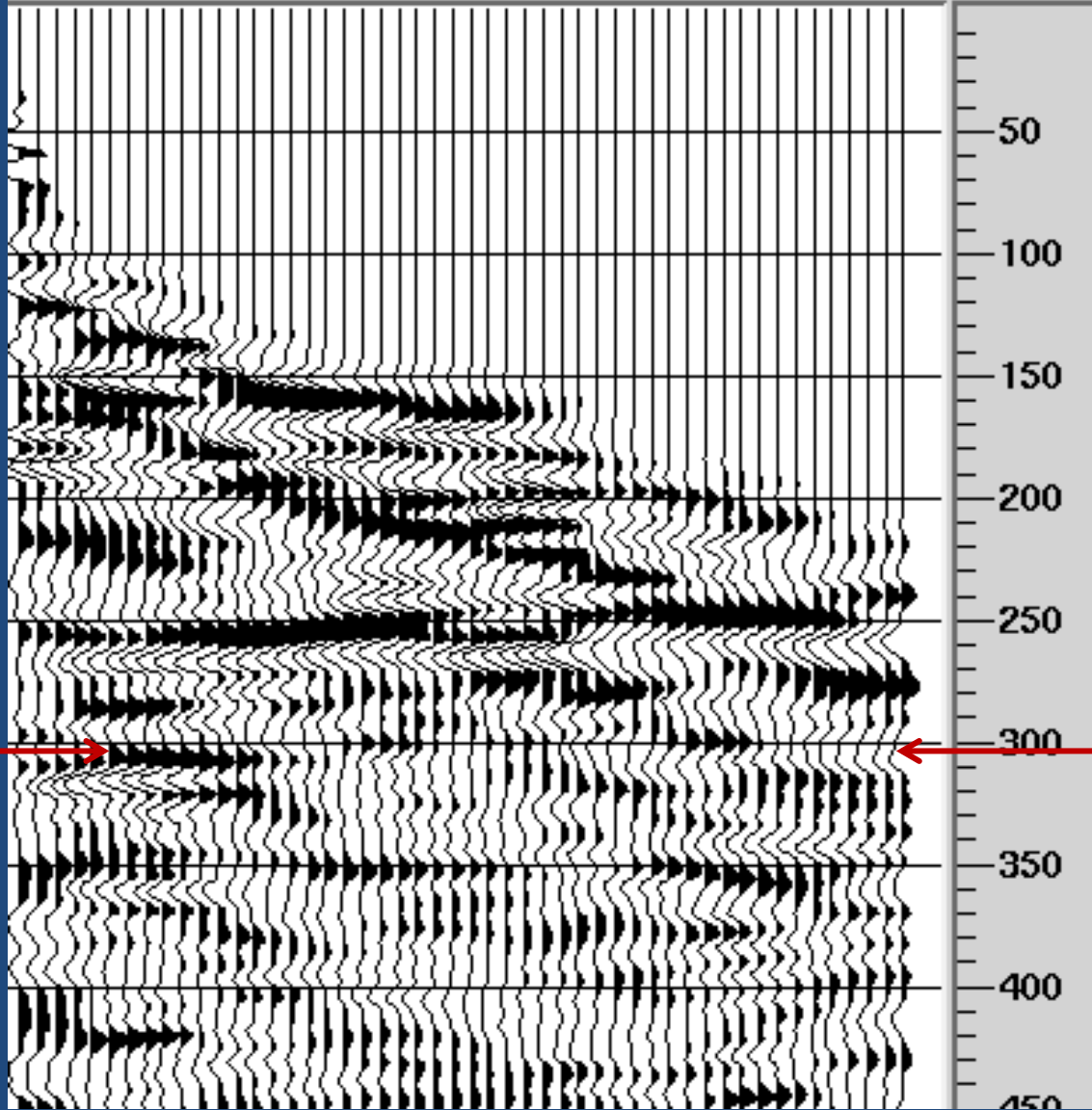


Multi offset model (P-P)
 Sum offsets: A [1 to 8] + B [9 to 15] + C [16 to 25]
 Attribute: Amplitude
 Ref Coef: Shuey
 Filter: 5/10-80/90 0 Phase
 Amp: 1.0, Tr/in: 10.0
 Ray trace: Full
 NMO corrected: Yes, Stretched: No
 Bin width / height: 1.0 m by 2.0 ms
 Incident angle mute: < 0 and > 60 deg.
 Near offset: 0.0 m, CDP int.: 10.0 m

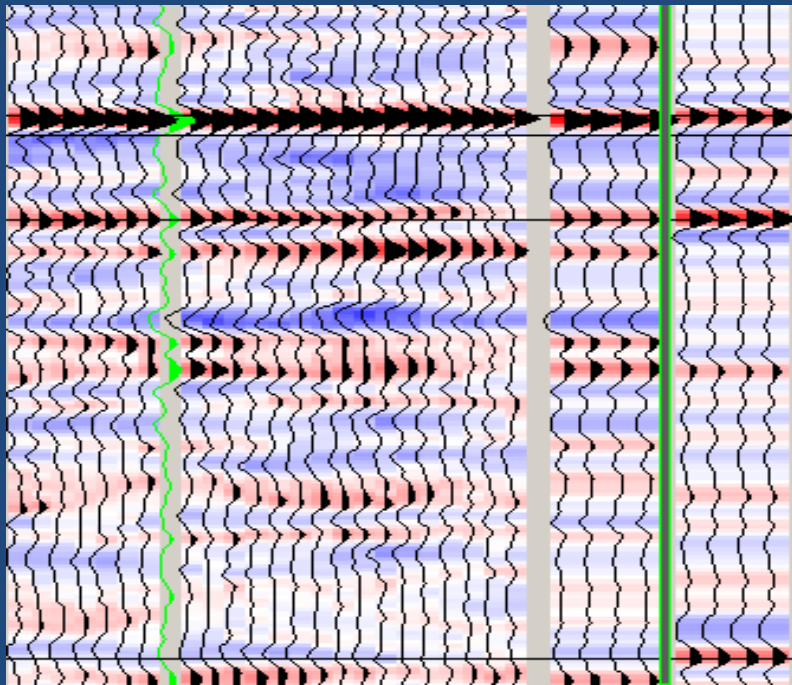
Well with dipole logs



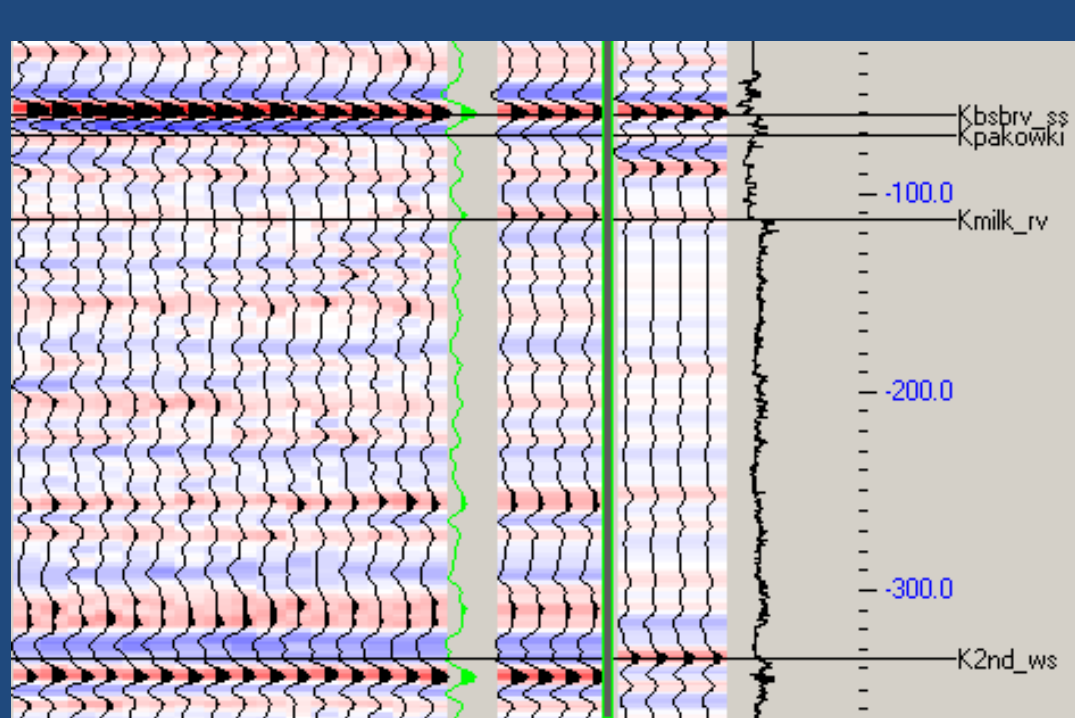
0991 269.9417 416.4581 471.3632 618.8215



Near offset stack 0-250 m z/o synth



full offset stack m/o synth



Discussion

What did we see?

Poor tie between zero-offset synthetic and seismic data at top Milk River

What did we do?

Investigate why

What did we find?

Default zero-offset synthetic was not appropriate

Multi-offset synthetic showed a change in polarity with offset at top Milk River

Multi-offset stacked seismic data had to be tied to a multi-offset synthetic

Near offset stack a better match to zero-offset synthetic

Acknowledgements

Halliburton/Landmark (Promax)

IHS (Geosyn)

CREWES sponsors