Well Log Analysis

Lab 02

GOPH 517 L01
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Summary

In this laboratory we are investigating well log data from three wells; "08-08-23-23TVD", "0/14-09-023-23W4 tvd" and "12-27-25-21", two of which were located on the Blackfoot field while the last one was 50km NE of Blackfoot. It is important to note that well 1409 lacks shear wave sonic though the depth range is much larger.

Part 1

Well 0808 Full Depth
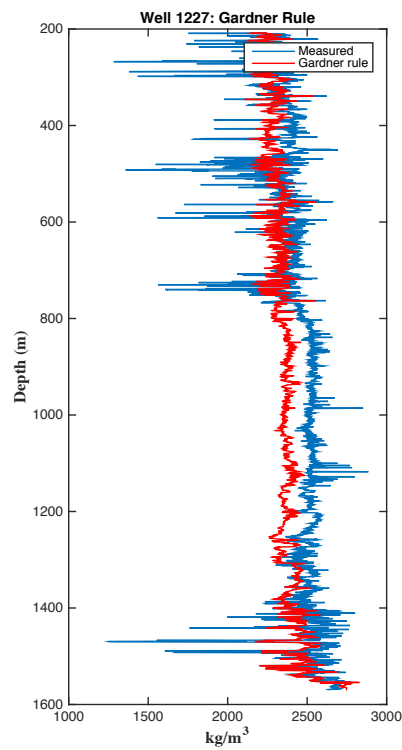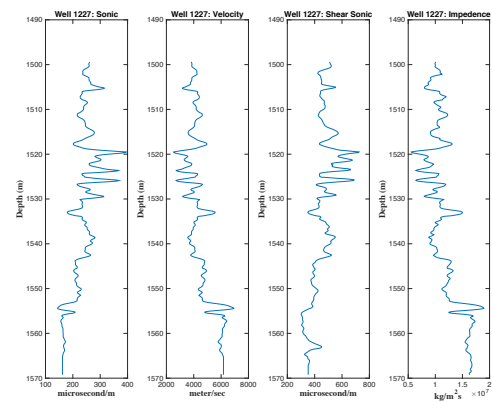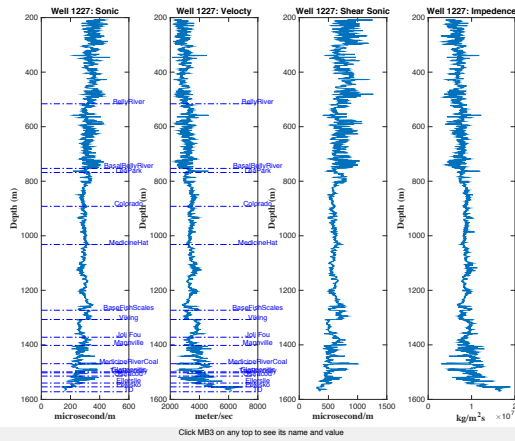
0808 Interval Depth
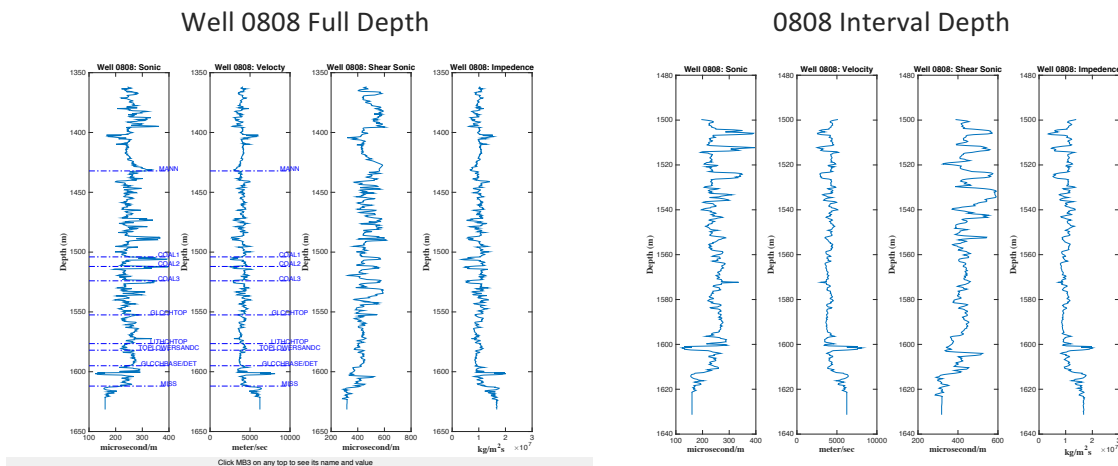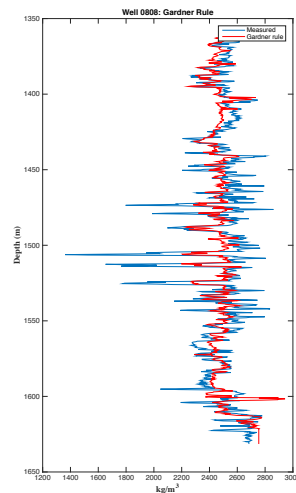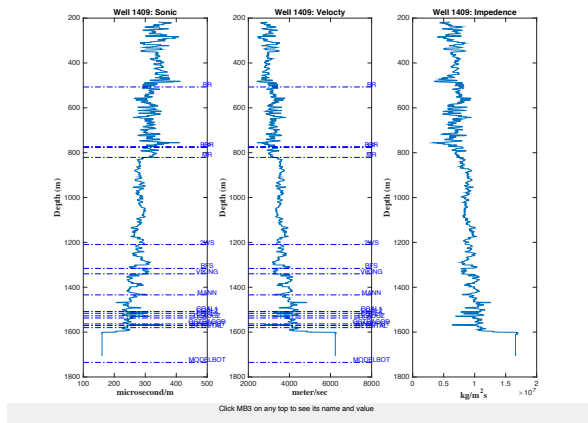

Gardner relation

Comments: min/max velocities are approximately 2500m/s and 8000m/s respectively. We can see that from the impedence graph that density and velocity are directly proportional (linear correlation). Looking at the Gardner plot, we can see that they compare moderately well except at extreme high values.
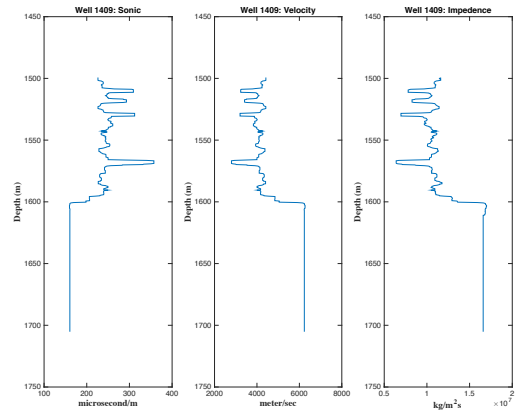
Well 1227 Full Depth

Click MB3 on any top to see its name and value

1227 Interval Depth

Gardner Relation

Comments: min/max velocities are approximately 2200m/s and 6900m/s respectively. Again, we can see that from the impedence graph that density and velocity are directly proportional (linear correlation). Looking at the Gardner plot for this well, we can see that the relation seems to fail at high density values and at times overestimates.
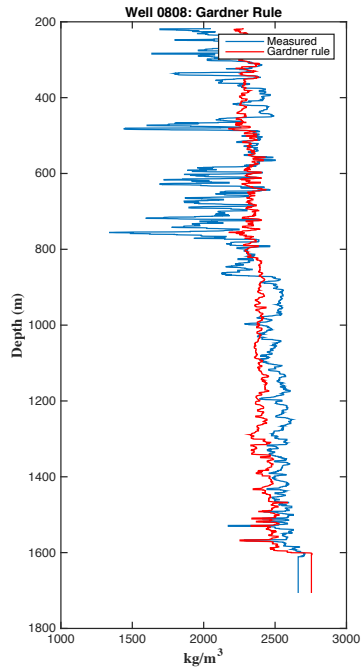
Well 1409 Full Depth
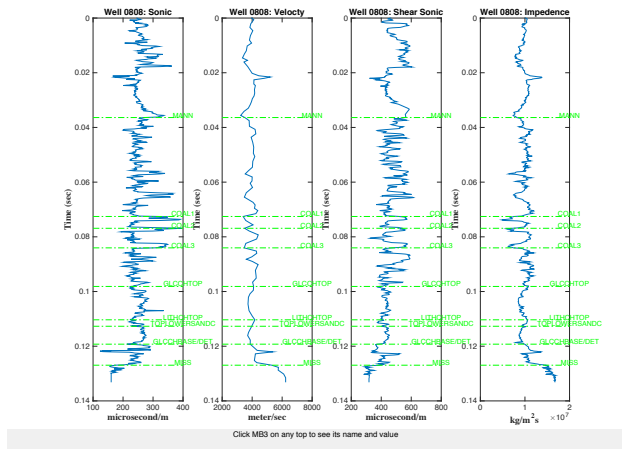

1409 Interval Depth

Gardner Relation

Comments: min/max velocities are approximately 2400m/s and 6200m/s respectively. Again, we can see that from the impedence graph that density and velocity are directly proportional (linear correlation). Looking at the Gardner plot for this well, we can see that the relation seems to fail at high density values and at times overestimates when actual density is low.
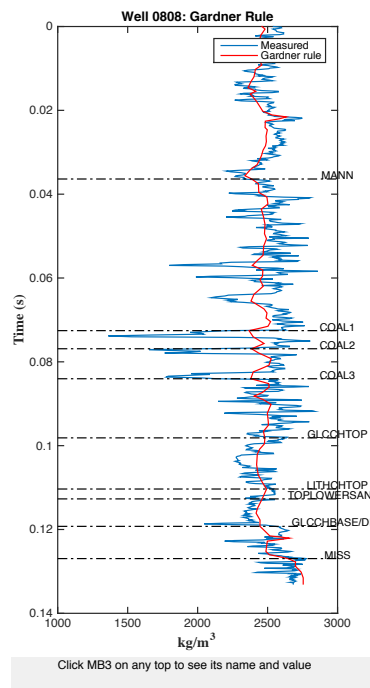
Part 2

Well 0808 Full Depth in Time

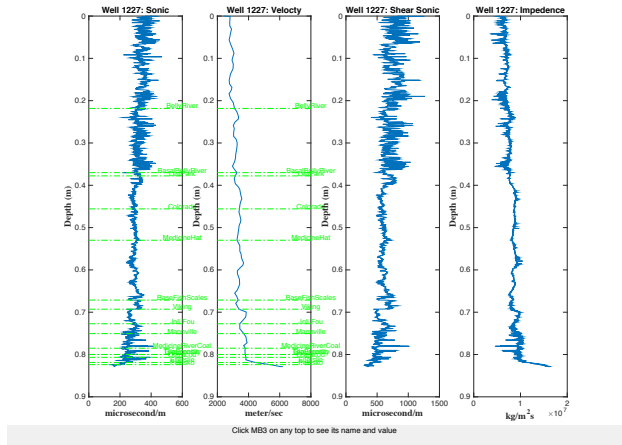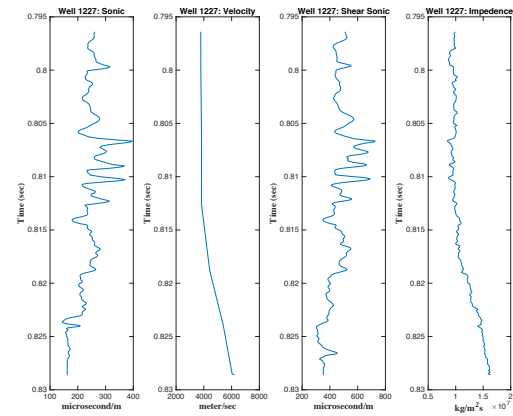### Interval Depth in time
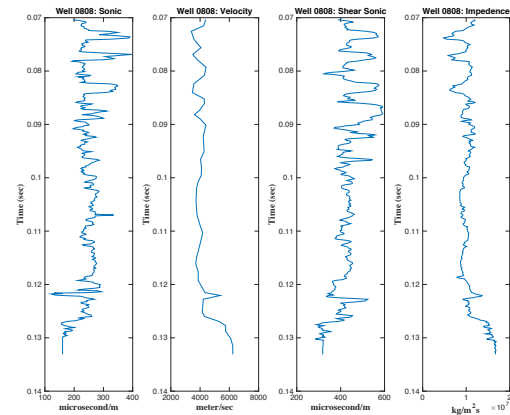
Gardner Relation

The two way travel time for well 0808 would be 0.14s to the bottom of the well. The interval time would be approximately 0.10s from Mann to Miss. These travel time won't be completely correct due to instrumental and human error.
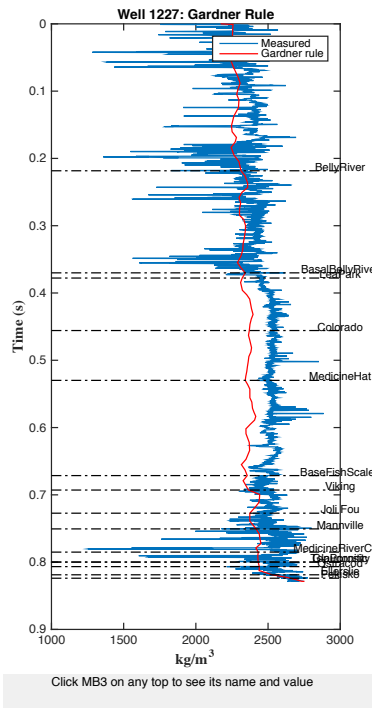
Well 1227 Full Depth in Time

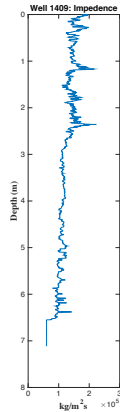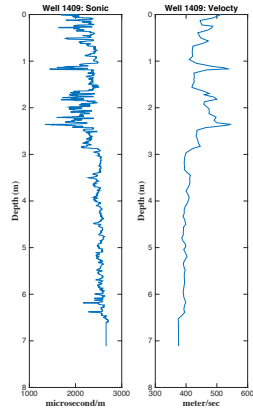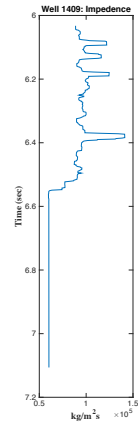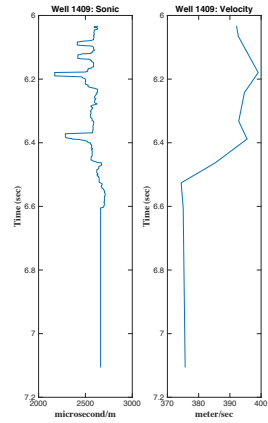## Interval Depth in time

Gardners Rule in Time

The two way travel time for well 1227 would be 0.9s to the bottom of the well. The interval time would be approximately 0.10s from Mann to Miss for this well as well.. These travel time won't be completely correct due to instrumental and human error.

Well 1409 Full Depth in Time   Interval Depth in Time

Gardner Relation in Time
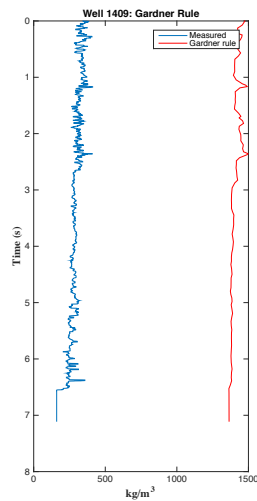
I may have made an error calculating these curves. I got a very high travel time value of 9 seconds and perhaps matlab code may have been not correct as the gardner relation above seems to be extremely off as well. However, looking at this curve, I got 9 s for travel time to the bottom of the curve and 6 seconds from Mann to Miss for this specifc well, 1409.

Part 3
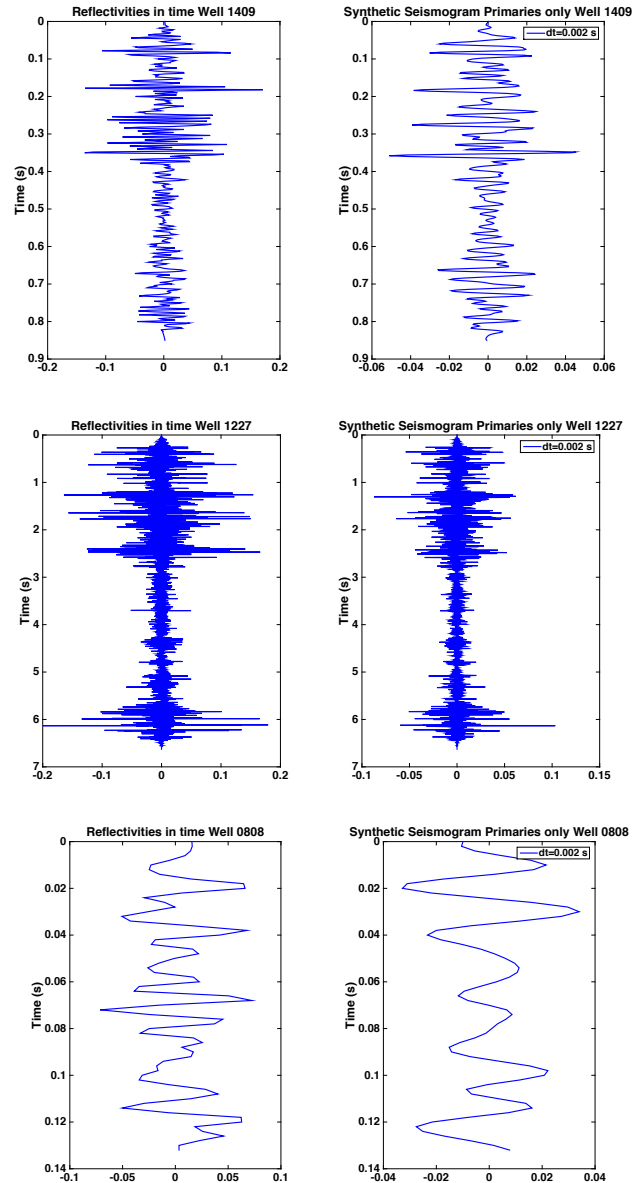
The Manville to Missisipian interval can be more easily distinguished in the upper two wells, as it appears from 0.4s to 0.7s in 1409 and 2.5s to 5.6s in 1227. Because well 0808 is a very small depth range, it is hard to see much detail in that log sample.

Part 4

Reflectivities in time Well 1409

Primaries with Transmission loss only Well 1409

Multiples only

Primaries + Multiples

Reflectivities in time Well 1227

Primaries with Transmission loss only Well 1227

Multiples only

Primaries + Multiples

Reflectivities in time Well 0808

Primaries with Transmission loss only Well 0808

Multiples only

Primaries + Multiples
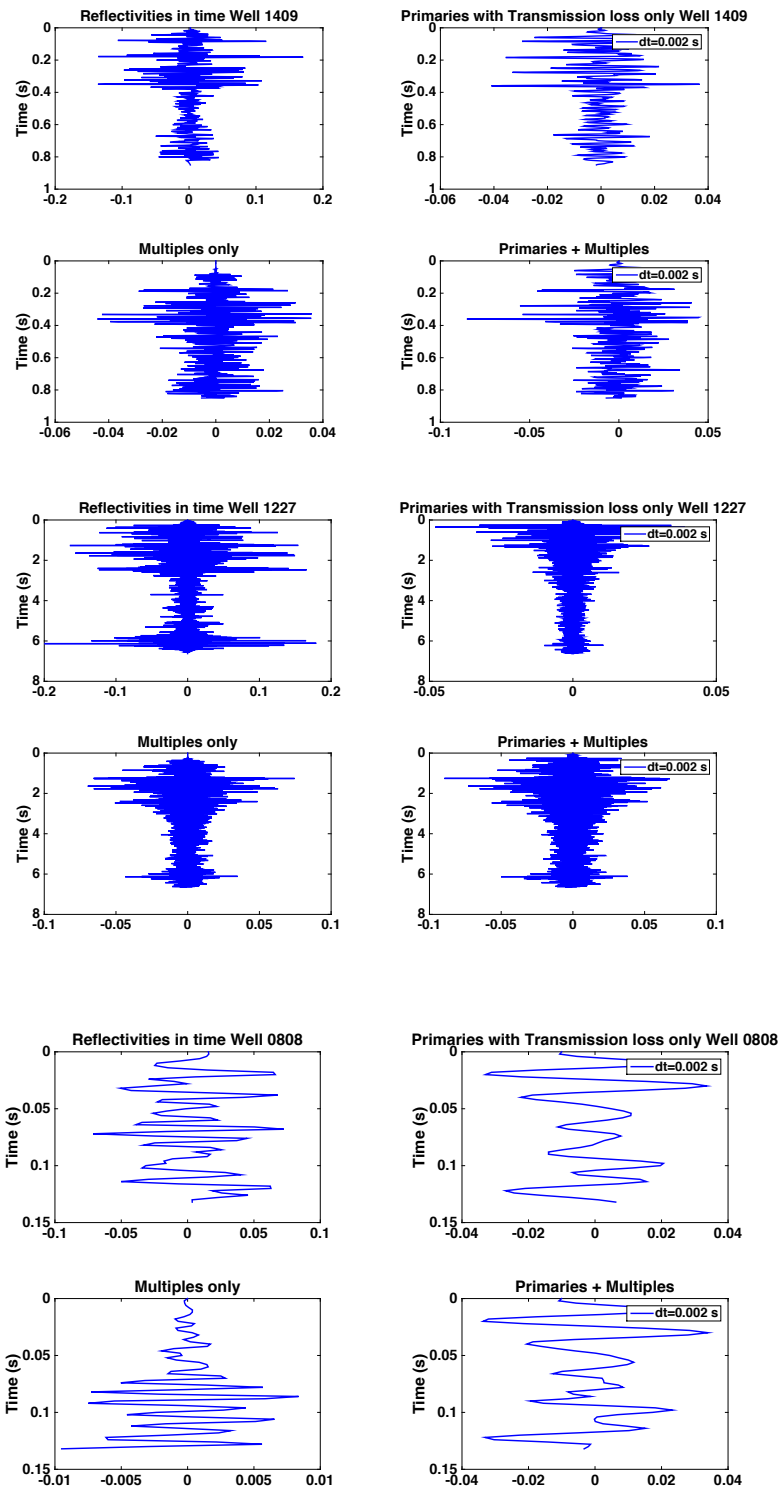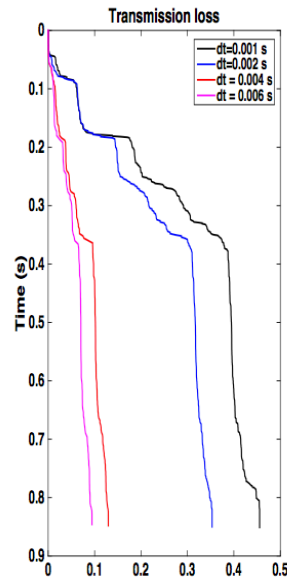
Transmission Loss

Smaller time interval Dt means more layers, which leads to more terms being multiplied in the transmission loss formula. Since the terms being multiplied in the transmission loss formula are smaller than one, smaller interval time thus leads to larger transmission loss, as can be clearly seen in graph above.

Discussion Topic 3

Indeed, the inclusion of multiples is very crucial to exploration seismology. These events have undergone more than one reflection. They are produced in the data gathering process when the signal doesn't take a direct path from the source to the geologic event and finally back to the receiver on the surface. This causes the signal to arrive back at the receiver at an erroneous time, which, in turn, causes false results and can result in data misinterpretation.

In wells 1409 and 1227, the strong multiple effect observed is a reasonable prediction of real data. In reality, free surface multiples and internal multiples occur which the interpreter must be mindful of. Seeing a strong multiple effect thus in these wells can paint a picture of this phenomena which occurs in real world application.

Works Cited

Glombick, P., Hathway, B., Mei, S., Banks, C., Hay, D., and Prior, G., 2010, Mapping the Belly River

Group in Alberta. AER, Alberta Geological Survey. Geocanada 2010 Conference.