Individual TBL review

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What is the objective of their geophysical study?

A. Obtain a detailed topography of the interface between the shale and bedrock
B. Find the thickness of the alluvium
C. Identify gravel lenses within the alluvium which might be zones of high hydraulic conductivity.
D. All of the above.

What is the P-wave velocity for the direct arrival in Figure 2? Evaluate this from the arrivals on the seismic section and do not use the number provided in the box. Pay attention to units!!

A. 0.35 m/s
B. 348 m/s
C. 1.6 m/s
D. 1600 m/s

Velocity is 1/slope. The orange line indicates the direct arrival. The slope of the orange line is determined by choosing two points on the figure.

Slope = rise/run = (170 ms - 0 ms)/(60 m -0 m) = (0.170 seconds - 0 seconds)/(60 m -0 m) = 0.0028 second/m so v = 1/slope = 1/0.0028 = 353 m/s

Do you expect to observe this refraction event (which corresponds to the top of the water table) in the SH refraction data?

A. Yes because there is a change in the seismic velocity.
B. Yes because there is a boundary there.
C. No because SH-waves do not propagate through fluids.
D. No because there is no seismic velocity change.

Using Figure 4, what is the intercept time?

To determine the intercept time, extend the refraction to distance = 0 and use that time. For Figure 4, that's about 140 ms or 0.14 second. See the figure below where I extended the SH refraction using an orange line.

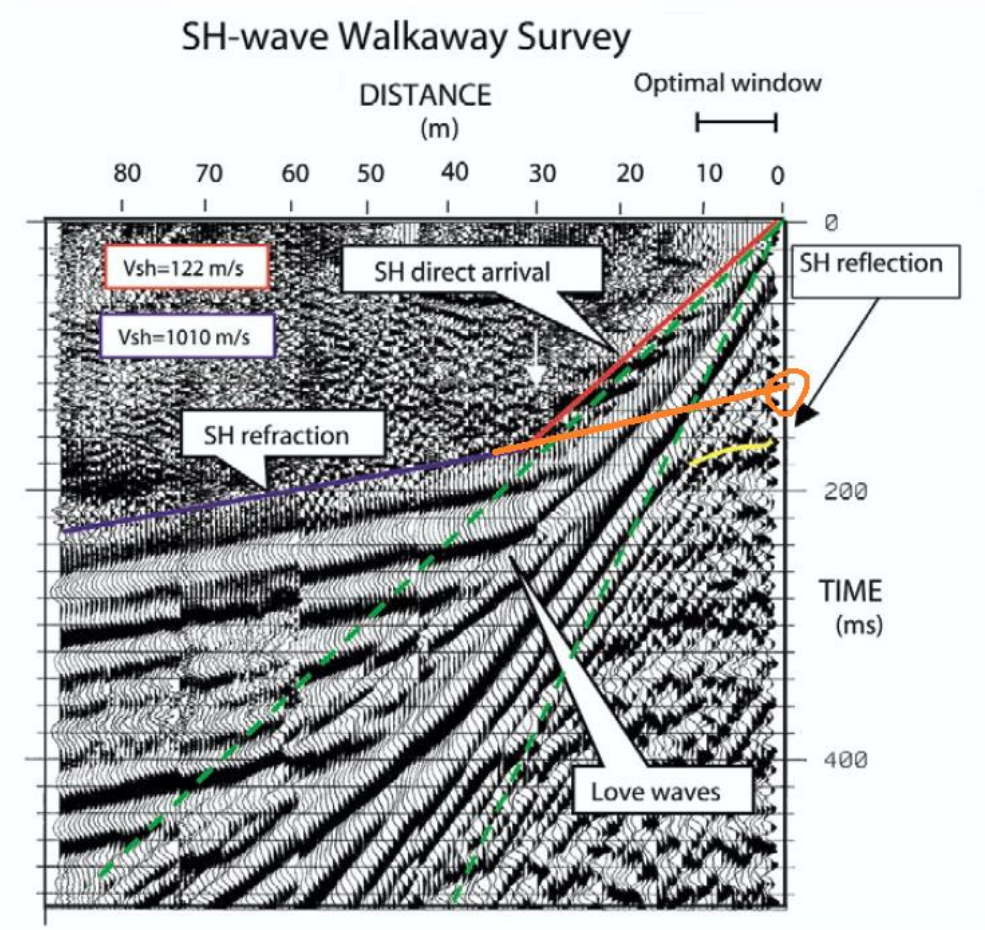

Figure 4. The *SH*-wave refraction (blue) crossover

Overall, what is the important information that was obtained from the refraction surveys?

A. The water table was imaged by analysis from the P-wave refraction survey.
B. The water table is about 1-2 m below the surface.
C. The top of the shale was imaged by the SH-wave refraction survey.
D. The top of the shale is about 10-15 below the surface.
E. All of the above.

Was the seismic refraction survey effective in finding the gravel lenses at the base of the alluvium?

A. No because the gravel lenses don't exist.
B. No because the gravel lenses are too small.
C. No because the gravel lenses do not have a refraction on top since their velocity is likely less than the overlying alluvium.
D. (a) and (c)
E. (b) and (c)

Team TBL review

In Seis_VerticalResolution, why do we not see anything on the seismogram using the default settings (figure shown below)?

- The densities and velocities are all the same, so there is no acoustic impedance change between the layers.

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In [2]: InteractSeismogramTBL()
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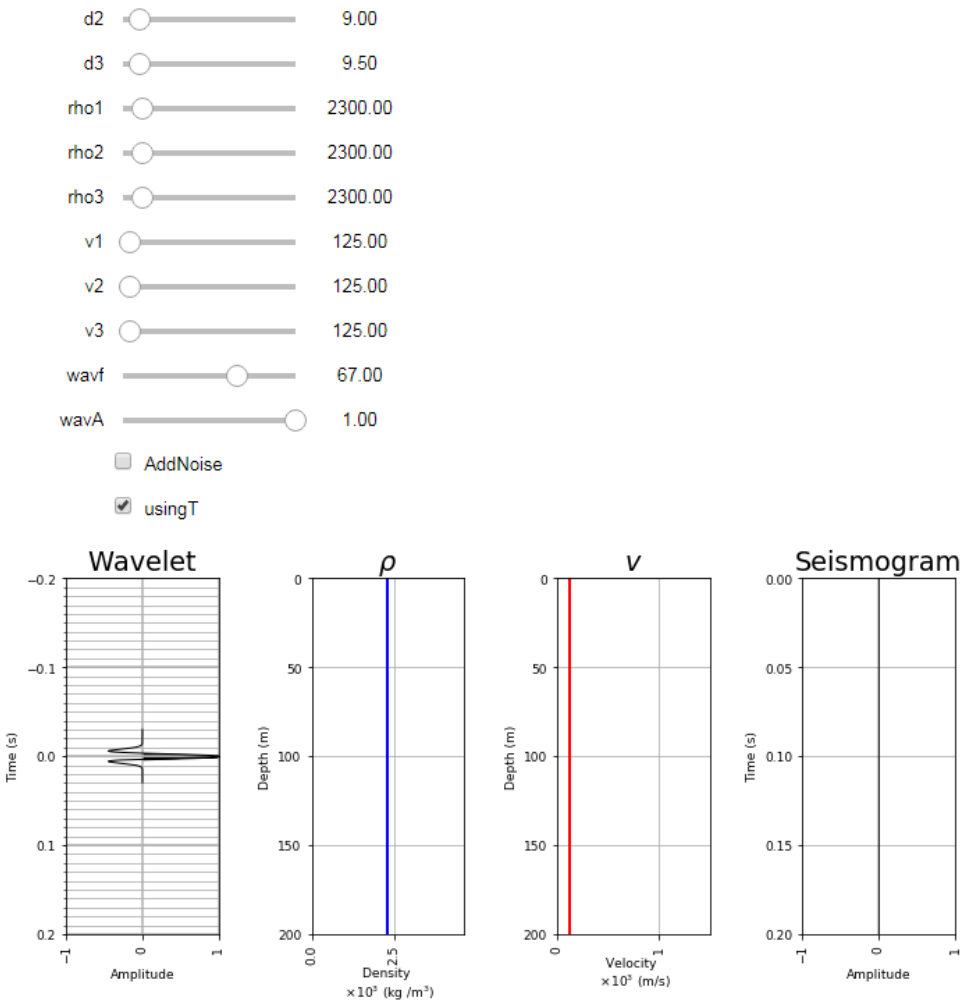

What if I change the density and velocity for layer 2 to 2875 g/m3 and 100 m/s? What happens to the seismogram?

- The acoustic impedance is still the same because 2300*125 = 2875*100 so we don't see anything on the seismogram even though we see the layers on the density (blue) and velocity (red) plots.

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In [2]: InteractSeismogramTBL()
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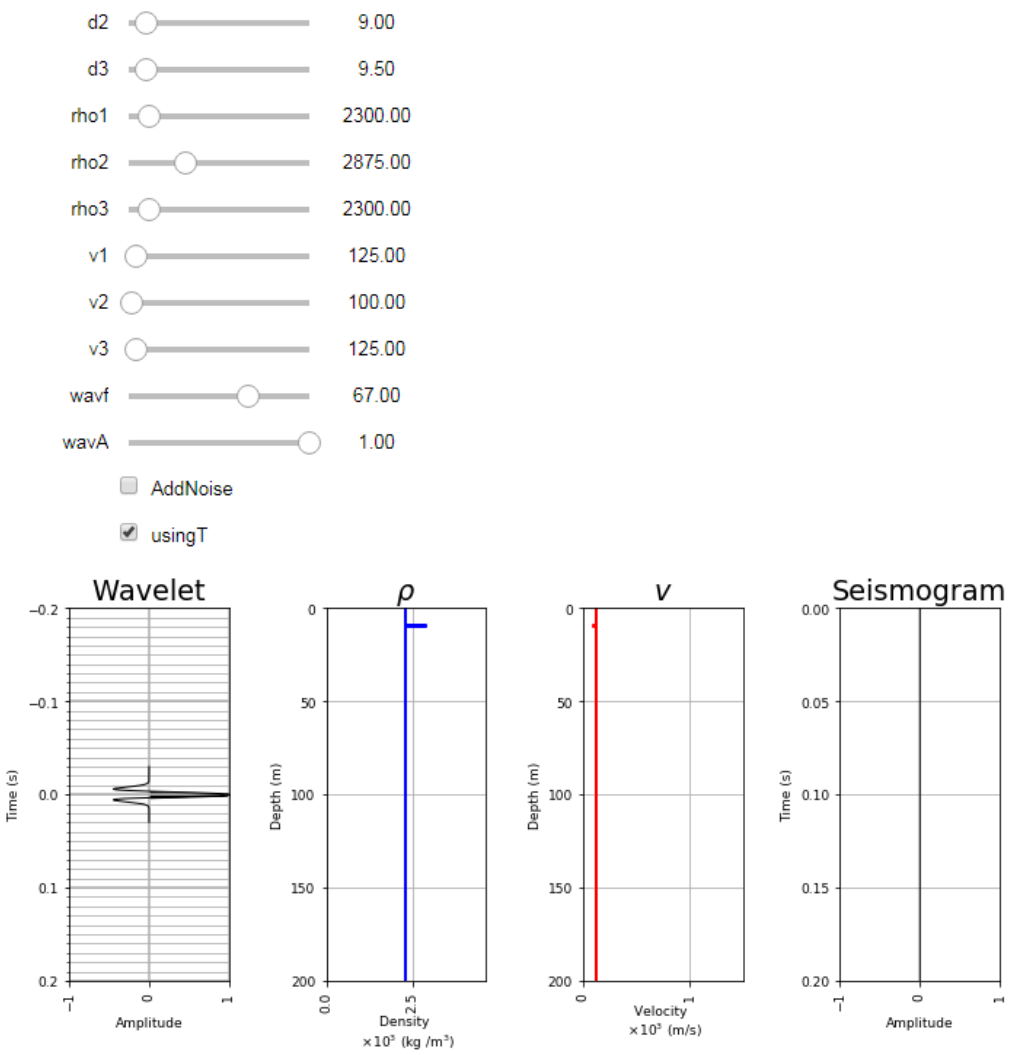
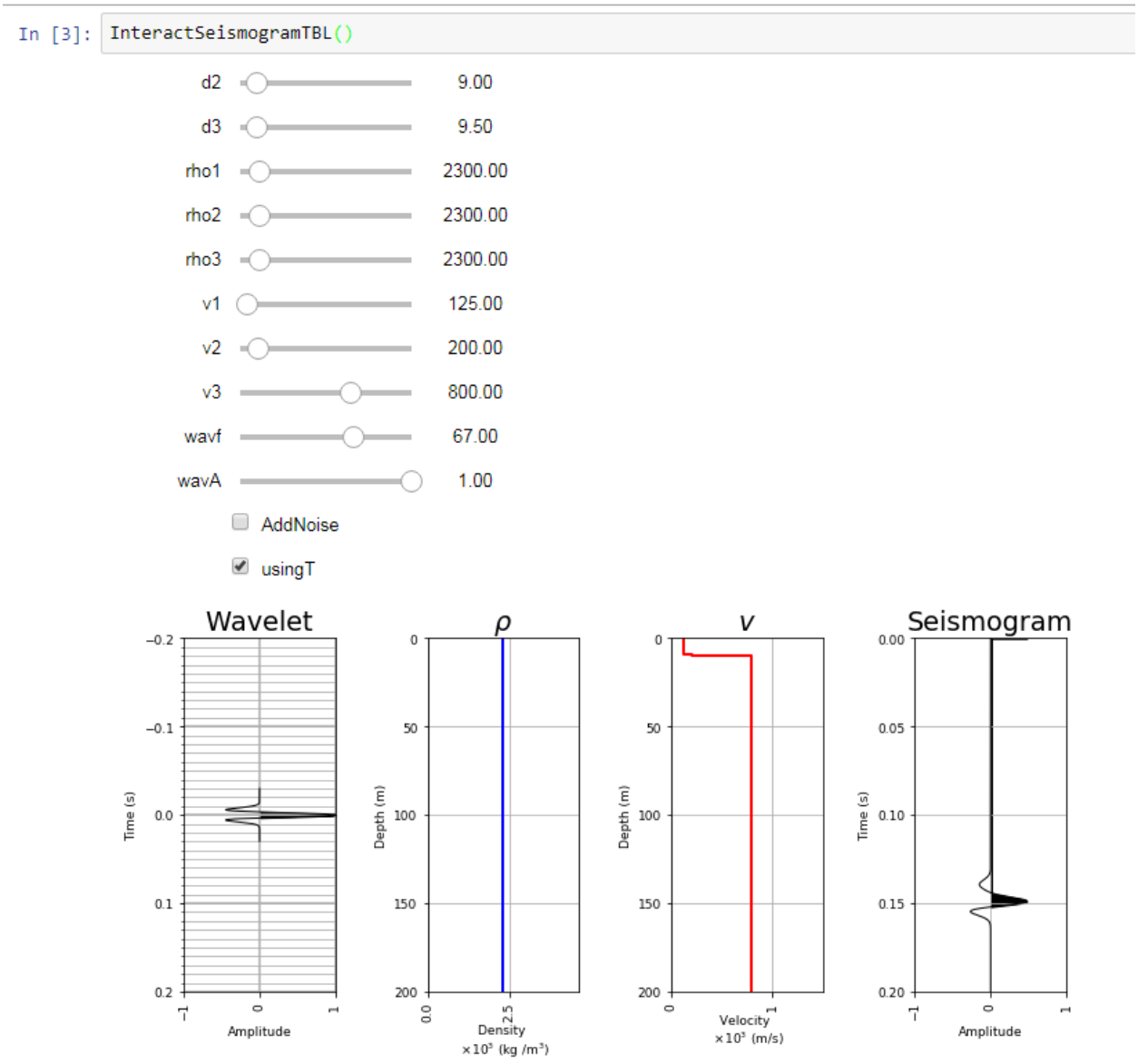


Why do we only see 1 wiggle on the seismogram when using v1 = 125 (alluvium), v2 = 200 (gravel), and v3 = 800 (shale)?

- The thickness of layer 2 (gravel) is so thin that the response from the alluvium-gravel interface and the response from the gravel-shale interface are smushed together.



- To see a distinct response from the alluvium-gravel interface and from the gravel-shale interface, we need to increase d3 to increase the thickness of the gravel layer (layer 2). In the figure below, d3 has been increased to 13.6 m and we now see two wiggles on the seismogram, indicated the top and bottom of the gravel layer. The response from the gravel-shale interface is bigger than that of the gravel-alluvium interface because there is a larger acoustic impedance contrast.

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In [3]: InteractSeismogramTBL()
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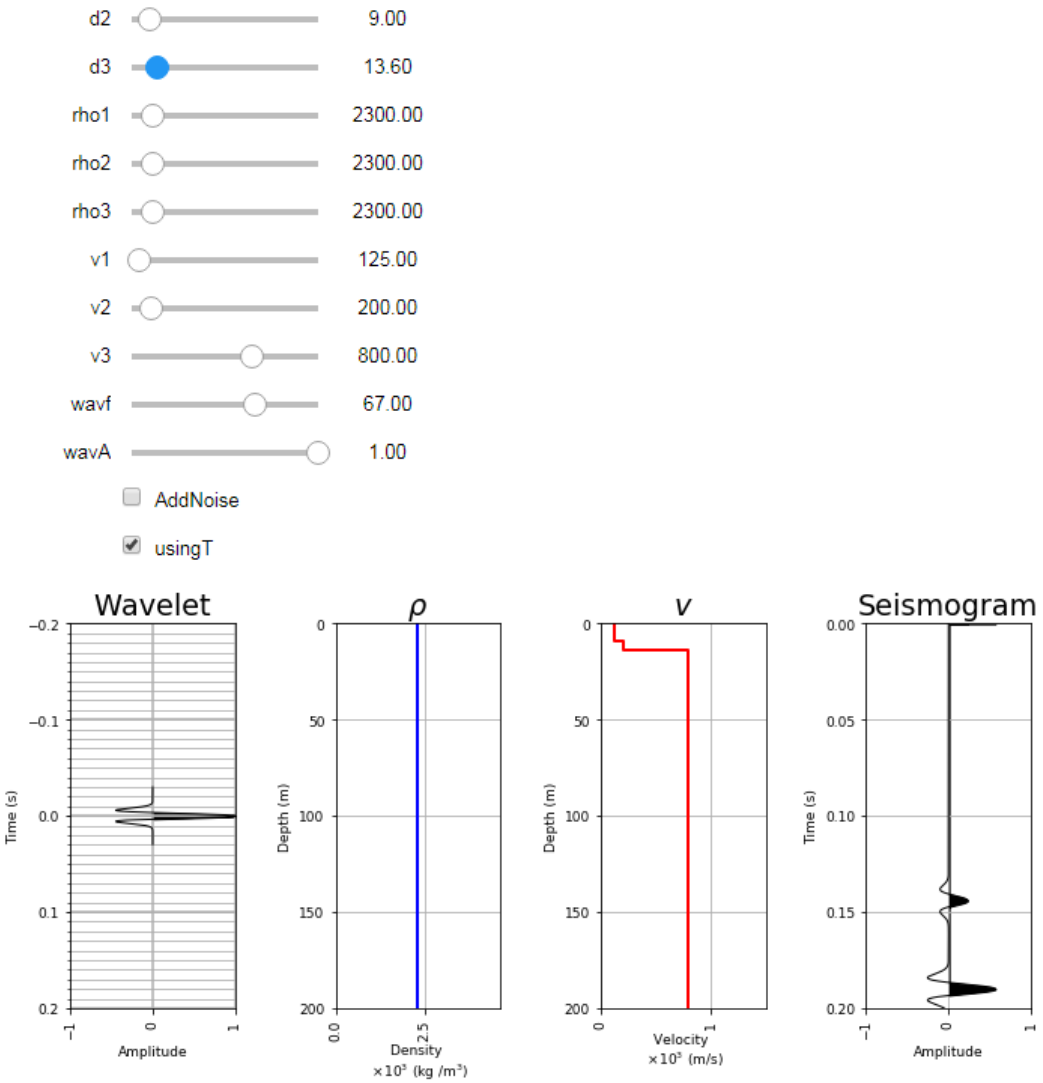

What is the wavelet on the left hand side? It never seems to change…

- The wavelet on the left is our input pulse (think of it as the source wave). It will change if you adjust the frequency of the wave (wavf) and the amplitude of the wave (wavA). Compare the images below and see how the wavelet changes. In turn, see how the seismogram changes due to a different input wavelet.

Frequency = 67 Hz and amplitude = 1

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In [4]: InteractSeismogramTBL()
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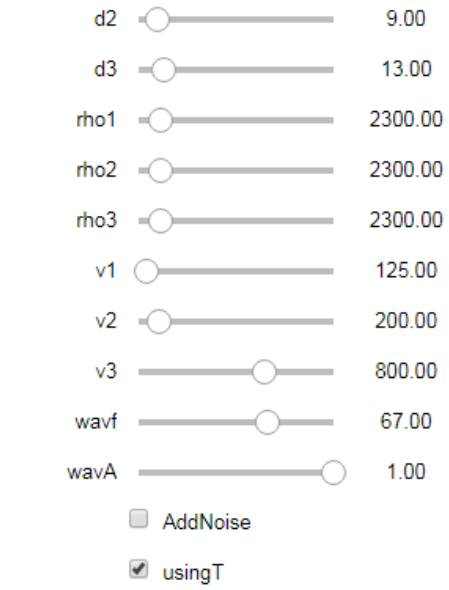

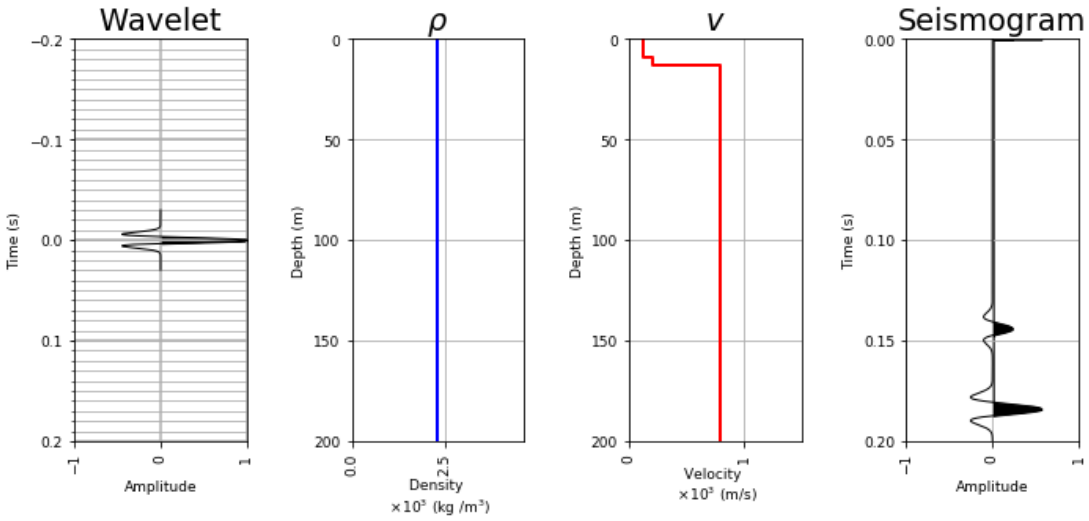

Frequency = 67 Hz and amplitude = 0.1

```
In [4]: InteractSeismogramTBL()
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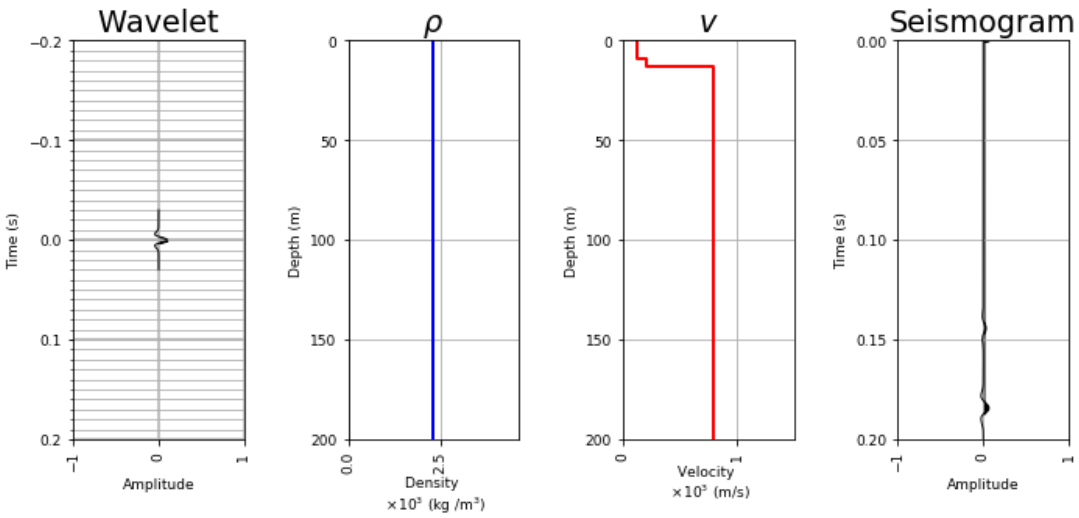
d2 9.00
d3 13.00
rho1 2300.00
rho2 2300.00
rho3 2300.00
v1 125.00
v2 200.00
v3 800.00
wavf 67.00
wavA 0.10
AddNoise
usingT



Frequency = 23 Hz and amplitude = 1

```
In [4]: InteractSeismogramTBL()
```

d2 9.00
d3 13.00
rho1 2300.00
rho2 2300.00
rho3 2300.00
v1 125.00
v2 200.00
v3 800.00
wavf 23.00
wavA 1.00
AddNoise
usingT