**Reflex2DQuick – Ground Penetrating Radar**
*Sensors & Software Pulsekko/Noggin Data Visualization Tutorial*

1. Launch the application "Reflex2DQuick"



2. In the top left, press the "load" button



3. Under the "files of types" menu at the bottom of the dialog box, select "pulsekko"



4. Navigate to your raw datafile with the suffix "DT1" and open it.

5. You should be automatically presented with a dialog box – check the box next to "subtract mean(dewow)" then press "apply/close"
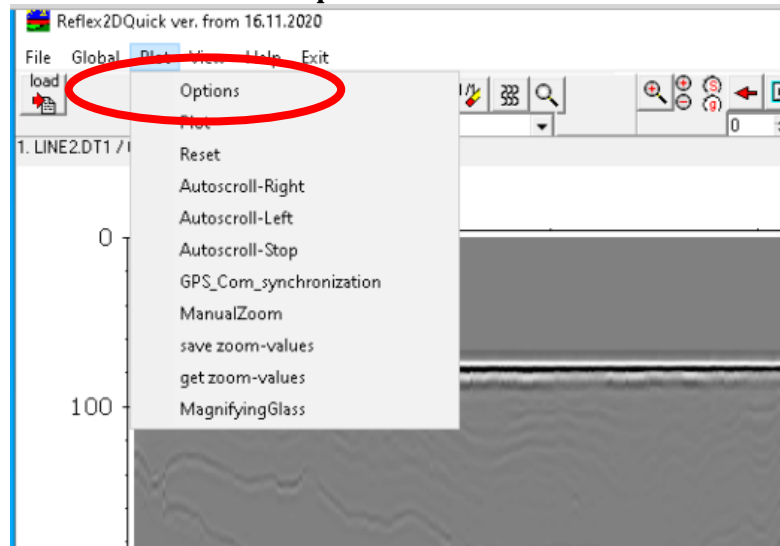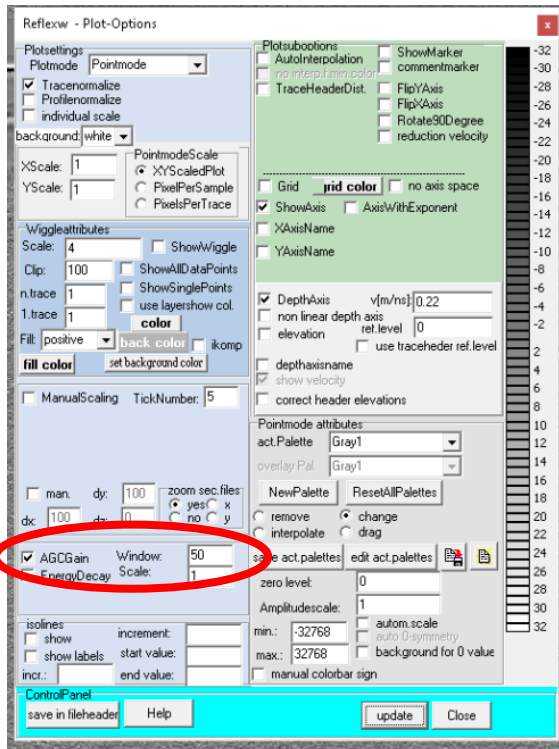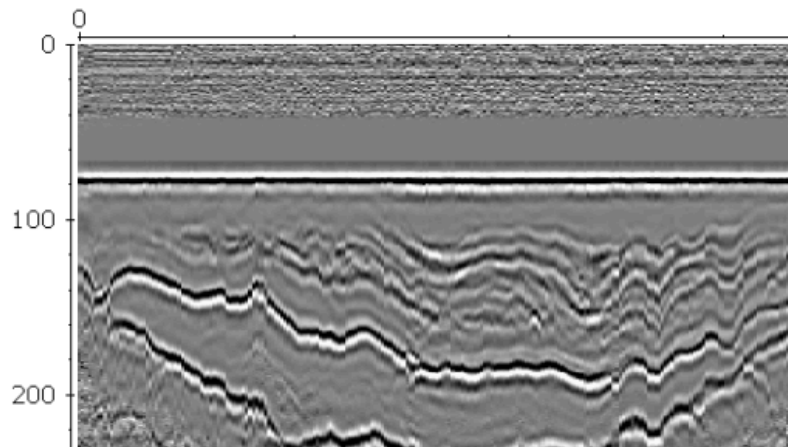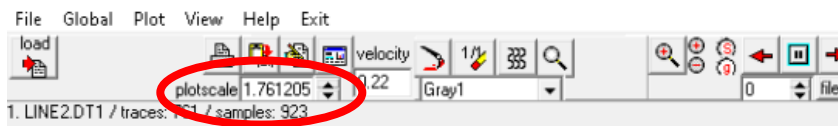
6. Next, go to the **Plot** menu and choose **Options**



7. On the left side, check the AGC checkbox and enter "50" into the "window" box. Press
   <u>update</u>, then <u>close</u>.

8. Finally, use the up and down arrows next to "plotscale" on the menu bar to increase or reduce the contrast on the image until you can see some structure.
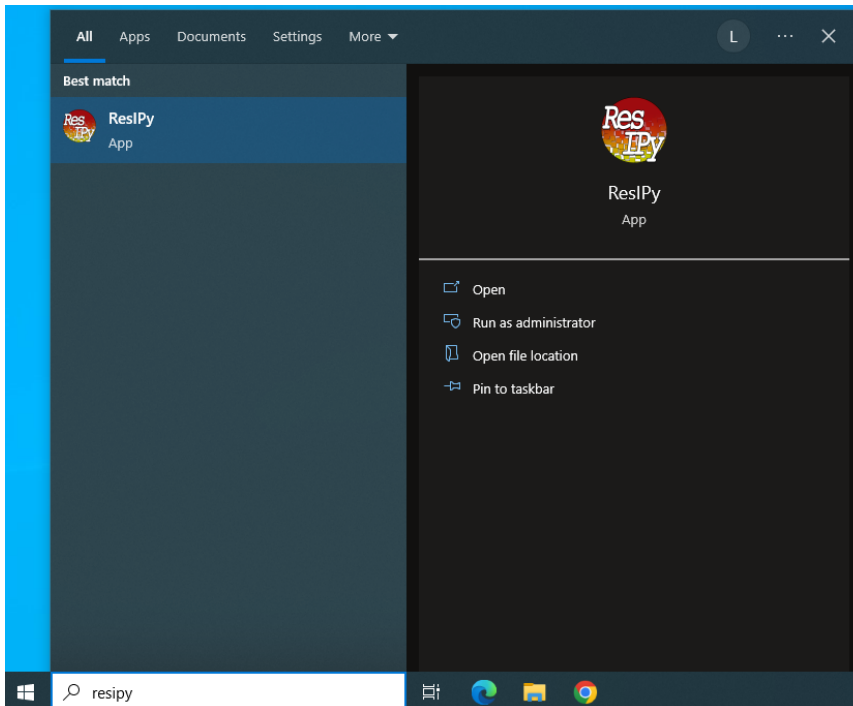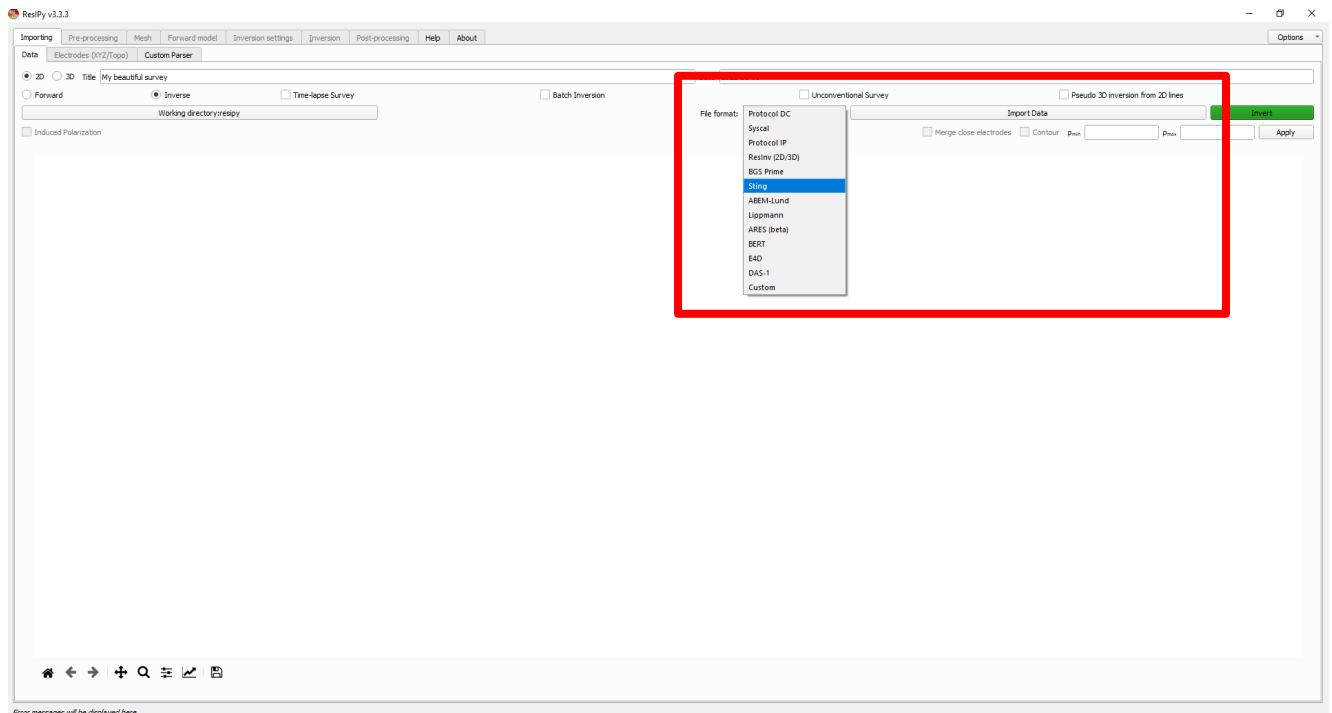
# ResIPy – Electrical Resistivity Tomography
## AGI Super Sting Data Inversion Tutorial
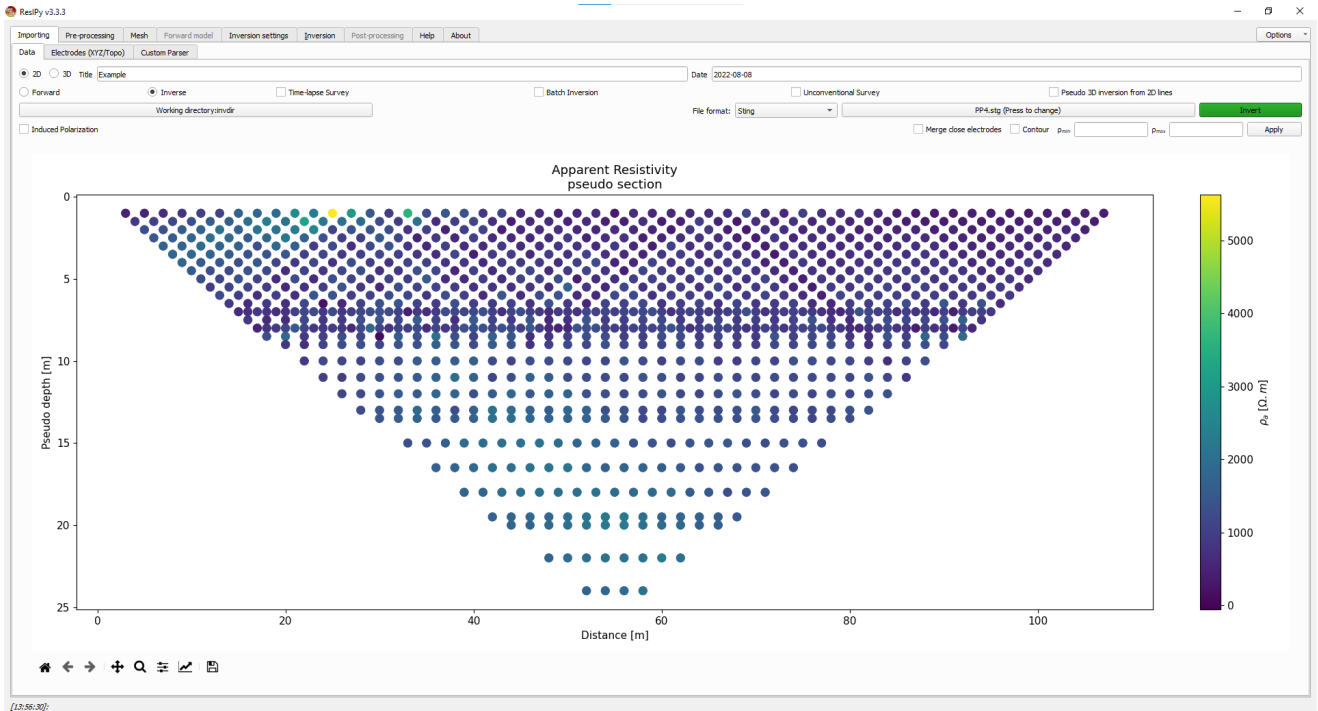
1. *Opening ResIPY/Uploading Data*

- Open ResIPY.



- Change the file format to **Sting** and click **Import Data** to find the *.stg* file you want to open.

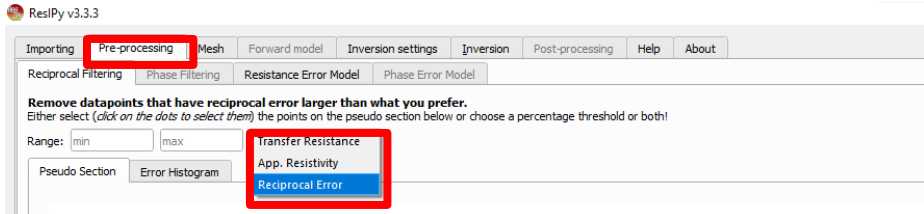● Your screen should now look similar to the below image.



● At this point, elevation data would typically be uploaded under the **Electrodes (XYZ/Topo)** tab. However, your dataset is from a nearly level surface, so this step will be skipped.
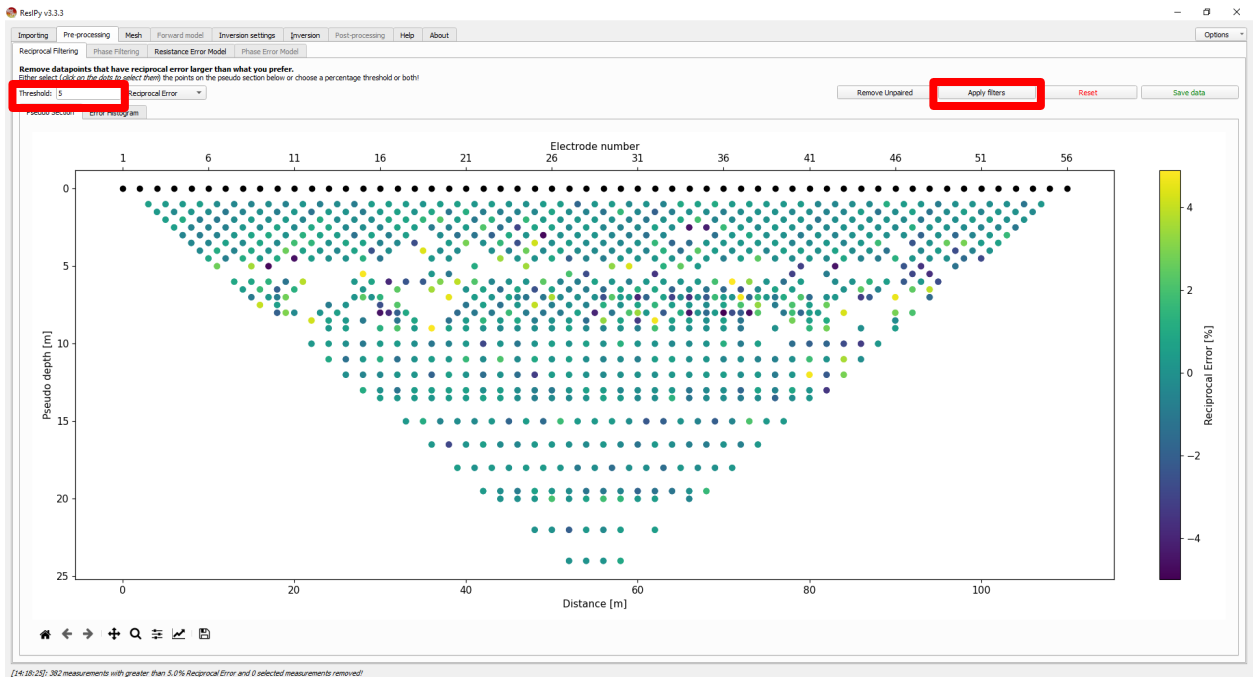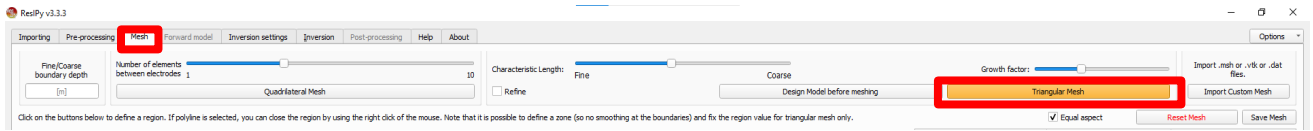


2.

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- Put **5** in the **Threshold** box left of the drop-down.

- Click **Apply Filters**.

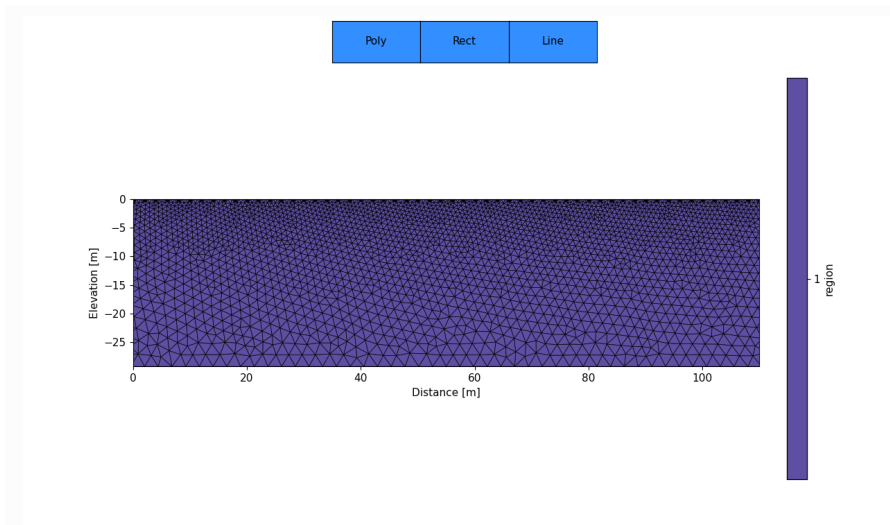- Your screen should look similar to the image below.



*3. Creating a Mesh*

- Click on the **Mesh** menu tab.

- Click on the yellow **Triangular Mesh** button.

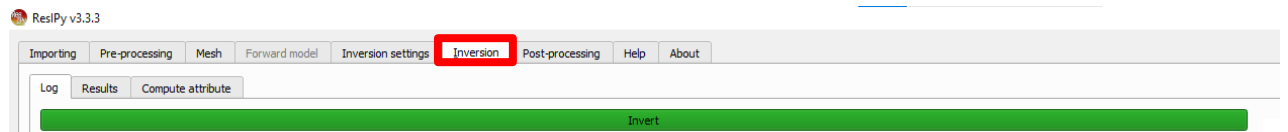- A mesh should be created that looks similar to the image below.



*4.  Inverting the Data*

- Click on the **Inversion** menu tab (Note: You most likely won't have to mess with the Inversion Settings tab).

- Click on the green **Invert** button.



- The screen will begin to populate with the inversion stats. The program is set to do a maximum of 10 iterations, but it usually shouldn't take more than 3.

- Once the inversion is complete, ResIPY will automatically switch to the **Results** tab with the completed inversion such as the picture below.
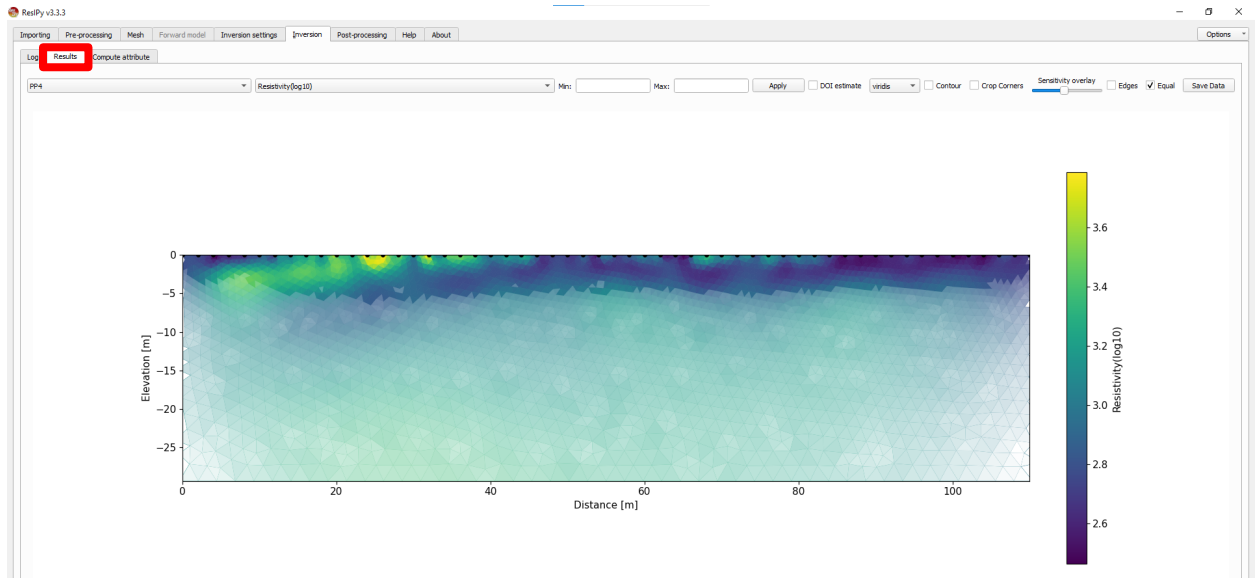


- You have now finished processing the resistivity data!
  - It is recommended you keep the data set to **Resistivity(log10)**, check **Clip Corners**, and choose the color scale you prefer from the drop-down bar.
  - The other features you can play with to see what each one does and ask questions.
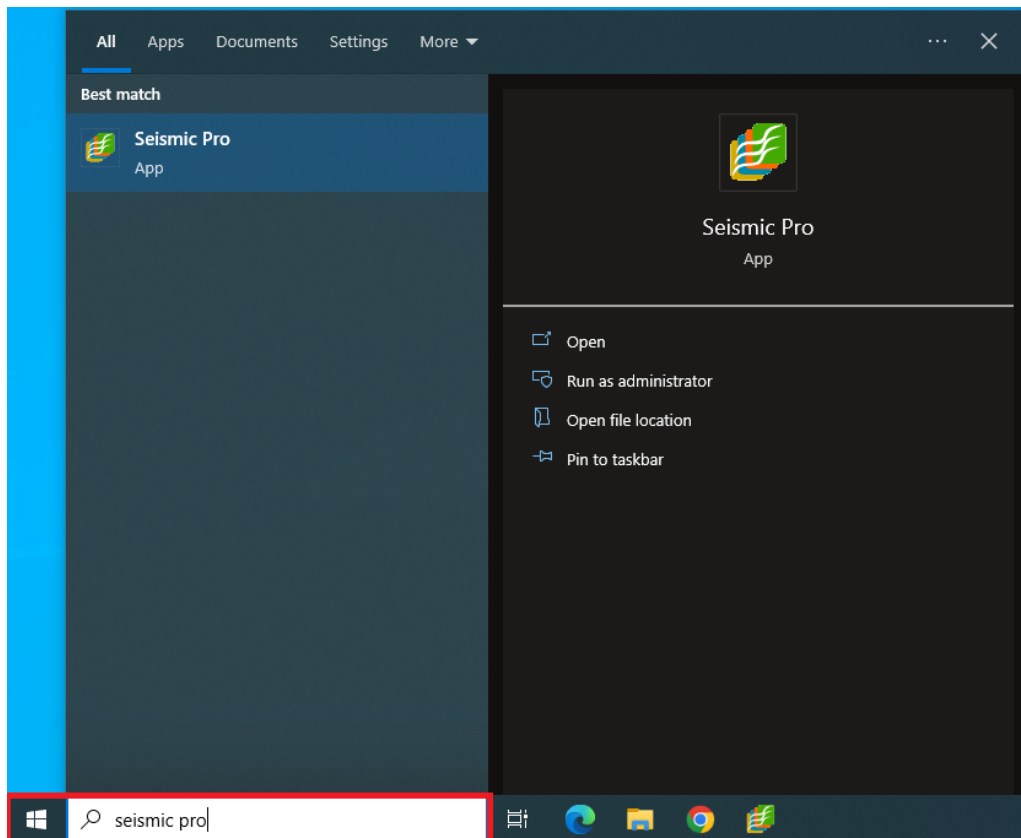
## Step 1: Insert Geogiga Dongle



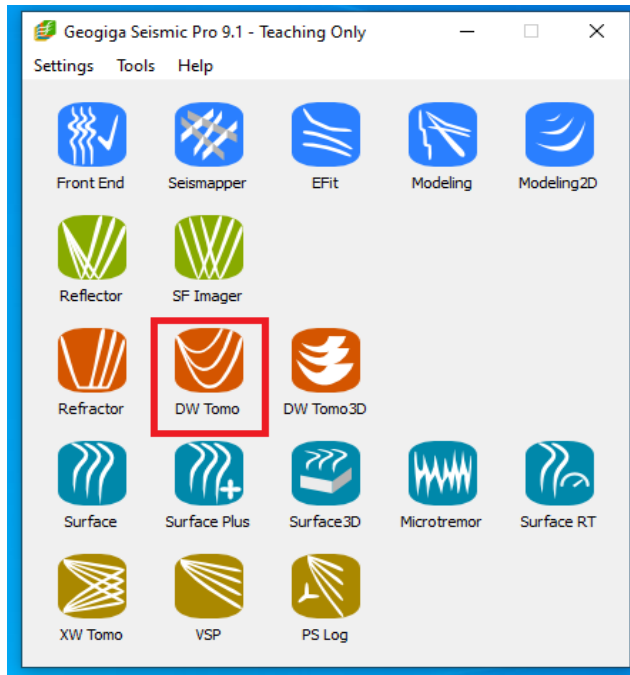- Insert the Geogiga Dongle into a USB port of the computer.

## Step 2: Opening Geogiga

- Click on the Windows key in the bottom left corner of the screen.
- Type in "seismic pro" in the search bar.
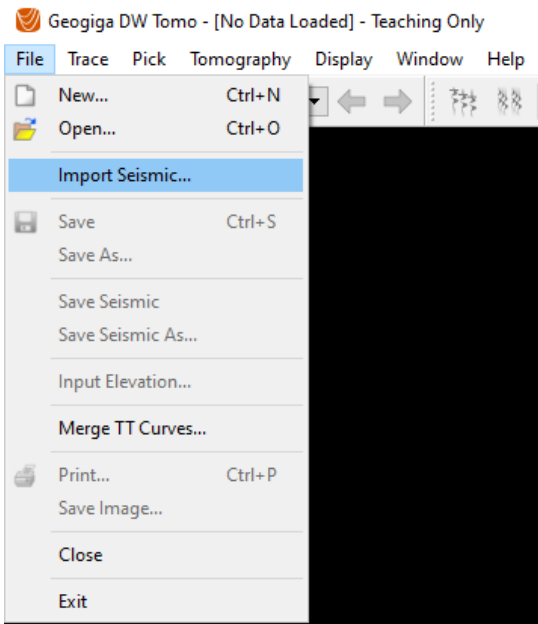- Click on the "Seismic Pro" app.

### Step 3: Opening DW Tomo
- After opening the **Seismic Pro App** the **Geogiga Seismic Pro** window will open up.
- Click on the **DW Tomo** box to open the **Geogiga DW Tomo** window.



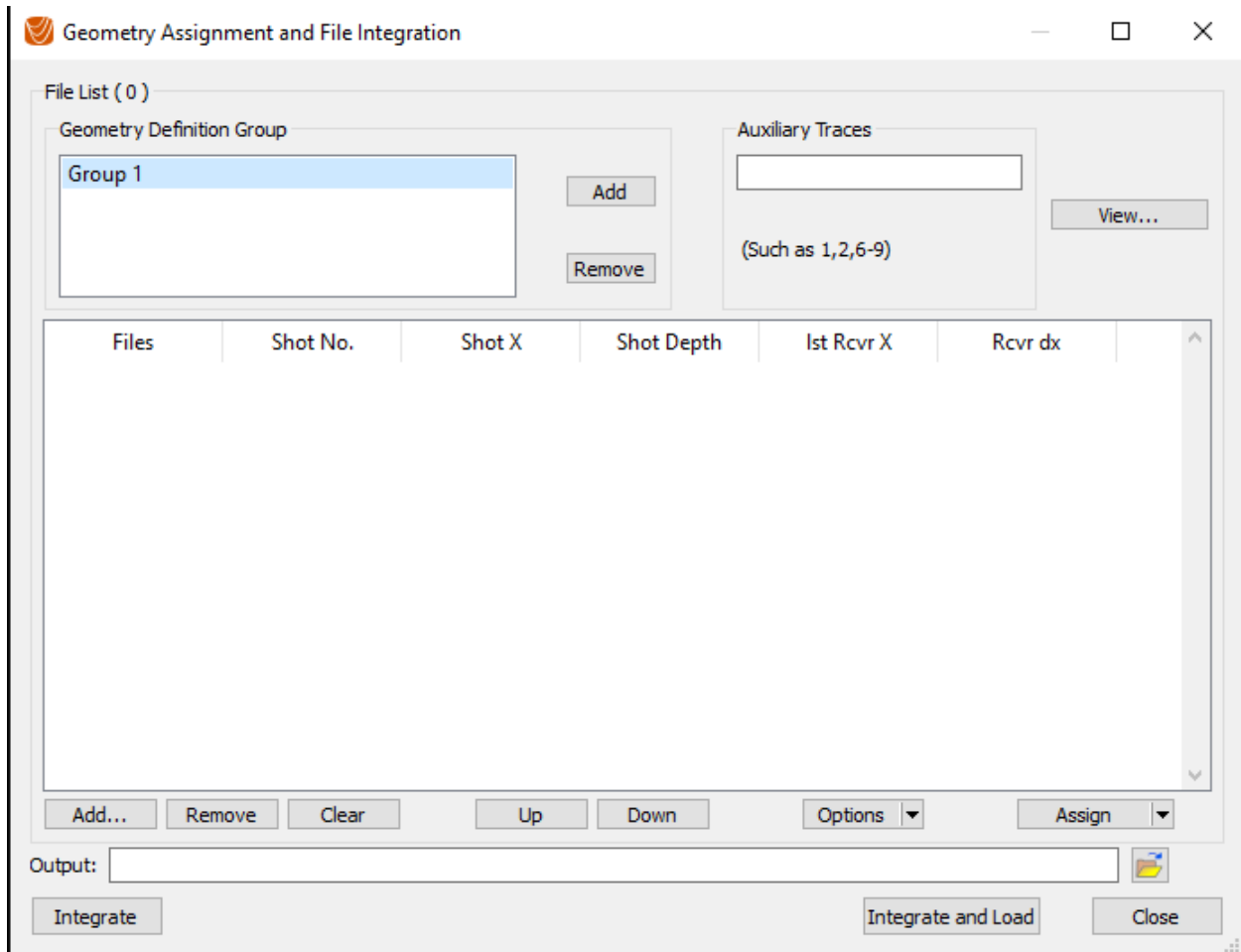### Step 4: Load in Seismic Data
- Click on the **File** tab in the top left corner of the **Geogiga DW Tomo** window.
- Click on **Import Seismic…** (third option from the top).
  - ●

- The **Geometry Assignment and File Integration** window will open up.
- Click on the **Add…** button in the lower left corner of the **Geometry Assignment and File** window. An **Add Files to File List** window will open.

- Find the file location of your seismic data and highlight all seismic shots that you wish to analyze.The seismic files should be **.dat** files.
- Once the relevant files are highlighted, click the **Open** box in the lower right corner of the **Add Files to File List** window.
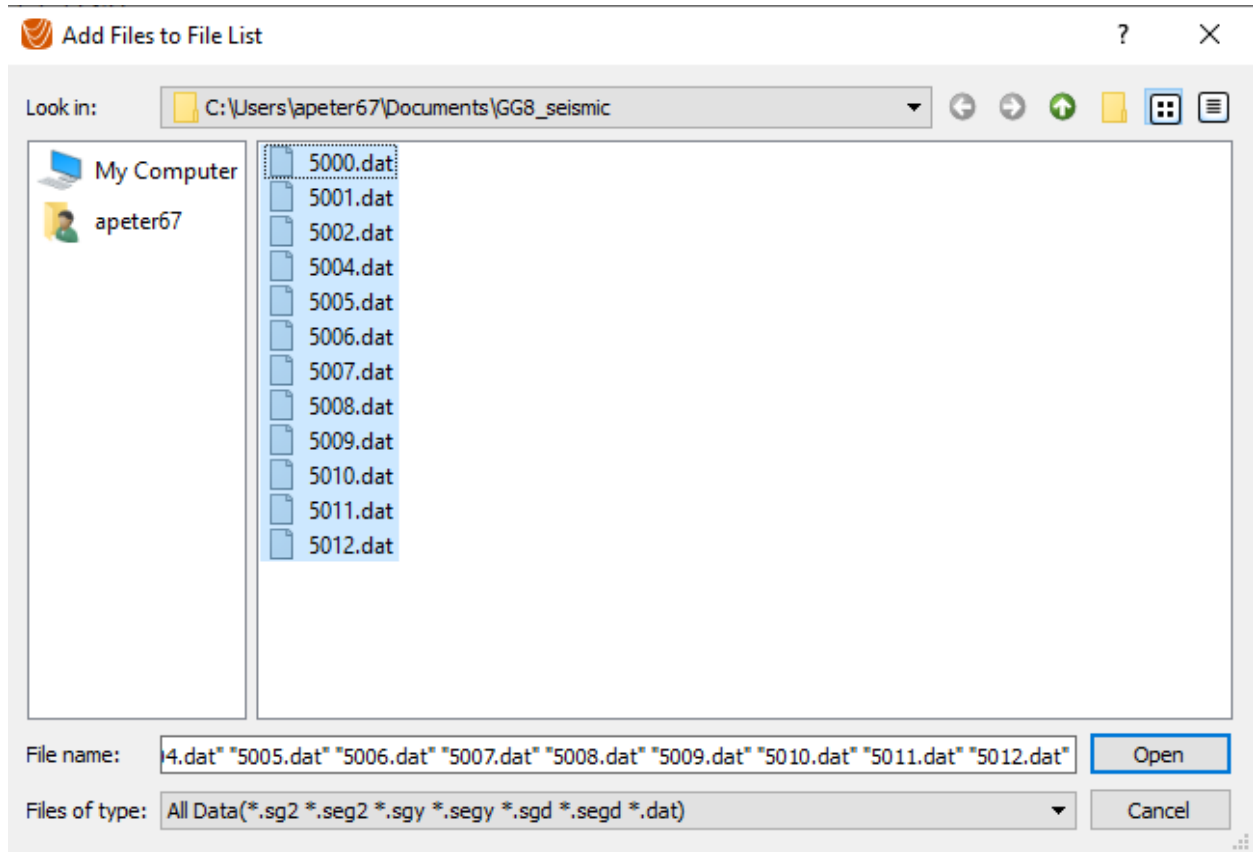
- The **Geometry Assignment and File Integration** window should be open and showing your selected files. Click on the **Integrate and Load** button in the lower right corner of the **Geometry Assignment and File Integration** window.
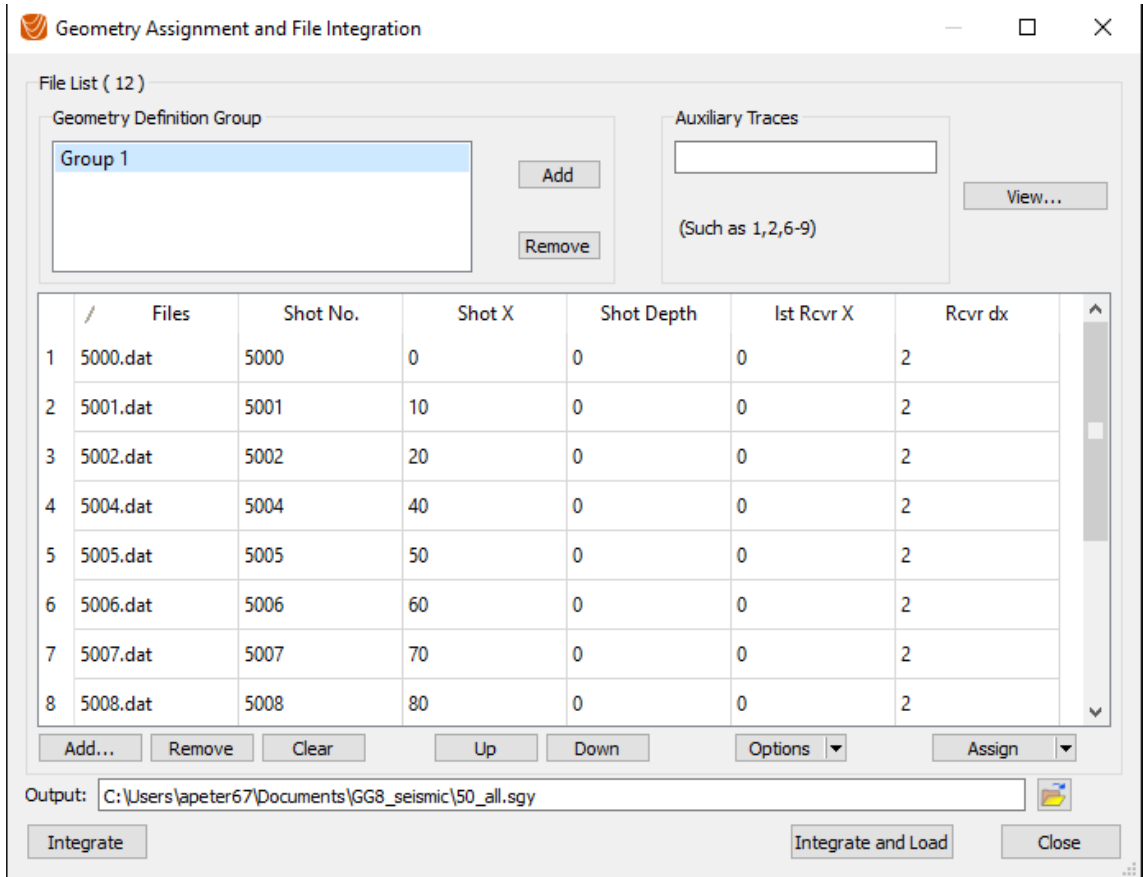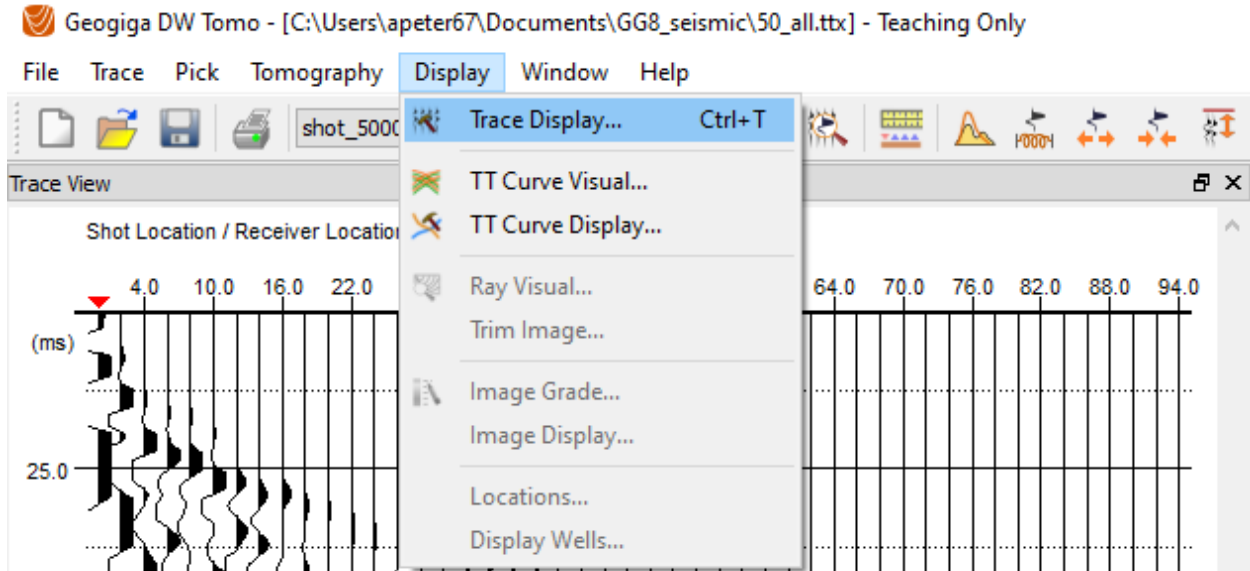


- An **Information** window will pop up. Click the **Okay** button.
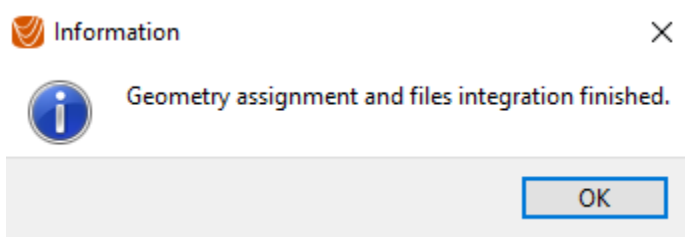
**Step 5: Shot Display**
- To change the display of the **Trace View** (the window displayed on the left), click on the **Display** tab in the top left then click on **Trace Display…** (first option of the drop down menu).



- The **Trace Display: Pick View** window will open. In the **Plot** tab of the **Trace Display: Pick View** window, choose the **Scale Type** to be **Trace RMS**, make sure the **Positive** and **Negative** boxes are check marked, choose colors for both **Positive** (usually green) and **Negative** (usually blue). Also, adjust the **Display Gain** to around 20dB. Click on the **Apply** box when finished with adjustments.
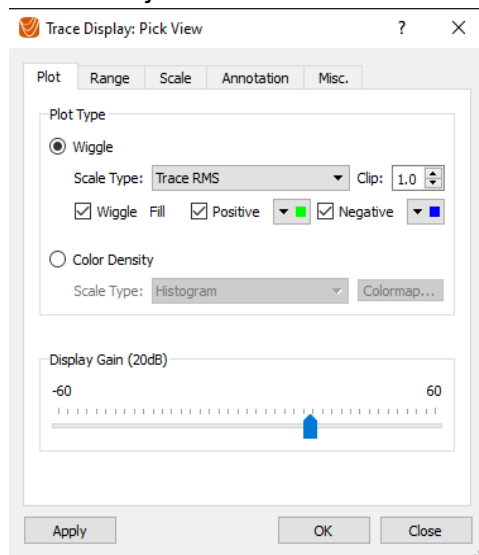
- Click on the **Range** tab of the **Trace Display: Pick View** window. In the **Time** section, change the **End** to 100 and click the **Apply** box. This will crop the y-axis of the **Trace View** window.
- Once done with adjustments, click the **Close** box in the bottom right corner of the **Trace Display: Pick View** window.
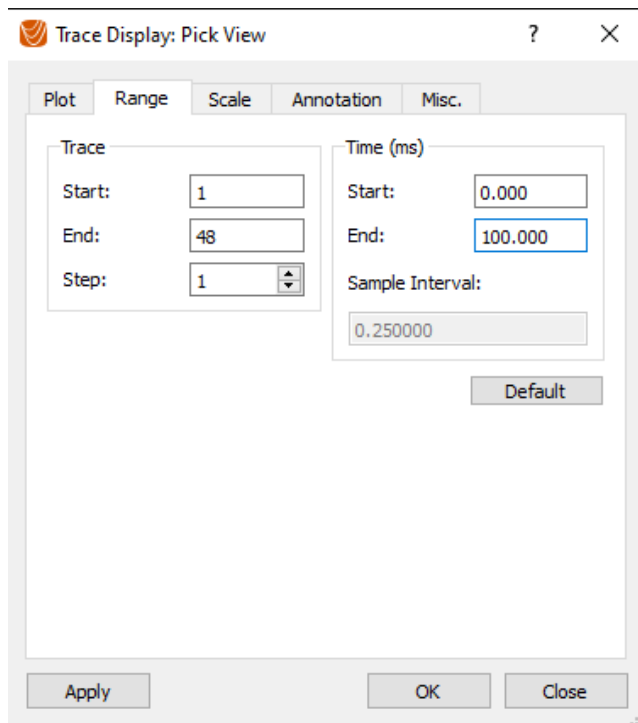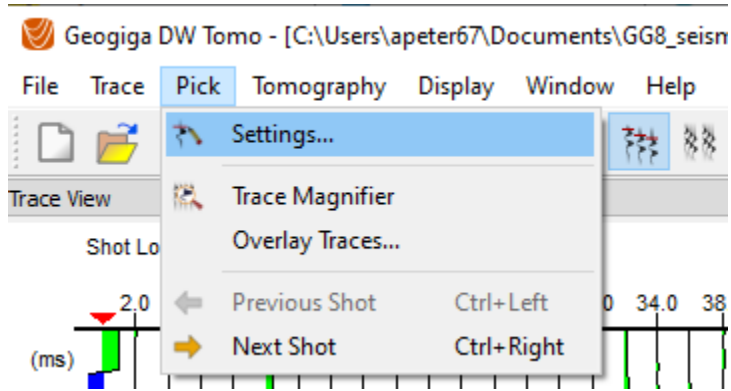
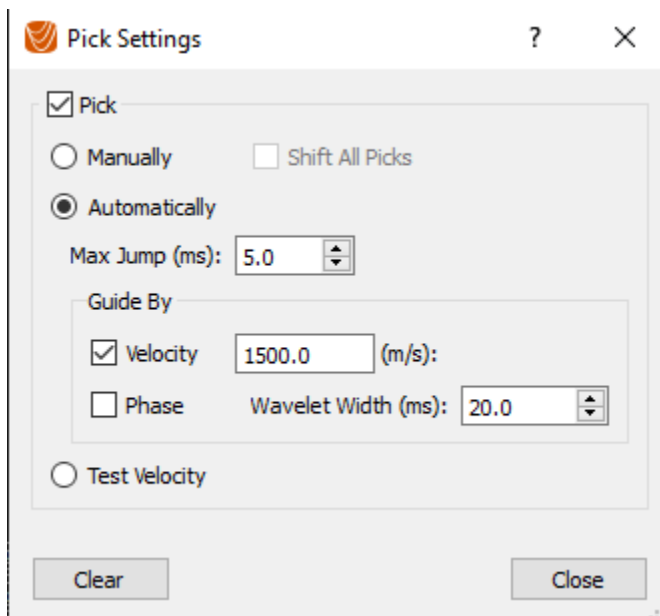● The **Geogiga DW Tomo** window should now look like the image below.
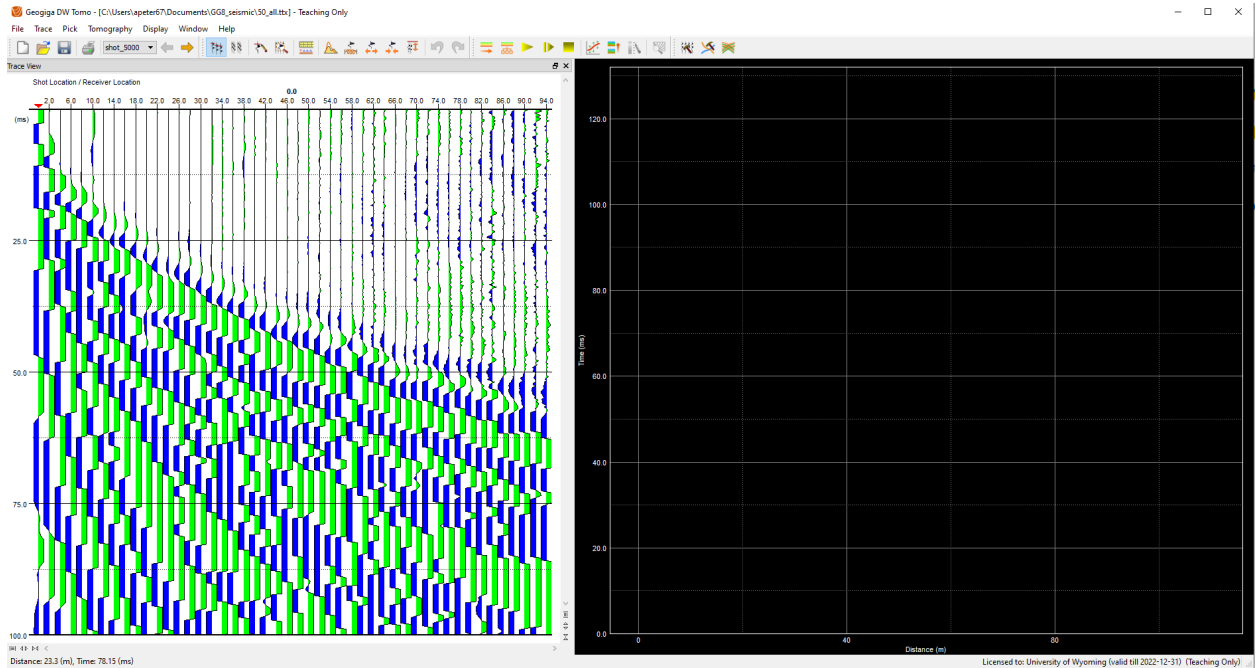
**Step 6: Picking First Arrivals**
- Open the **Pick Settings** window by clicking on the **Pick** tab in the top right corner of the **Geogiga DW Tomo** window. Click on **Settings…**, which is the first option.



- In the **Pick Settings** window, click the **Automatically** option.

- In the **Trace Display** window, click on what appears to be the first arrival for one of the geophone lines. This will cause red lines to appear on all the geophone lines and for a red ray to appear in the graph in the right window.
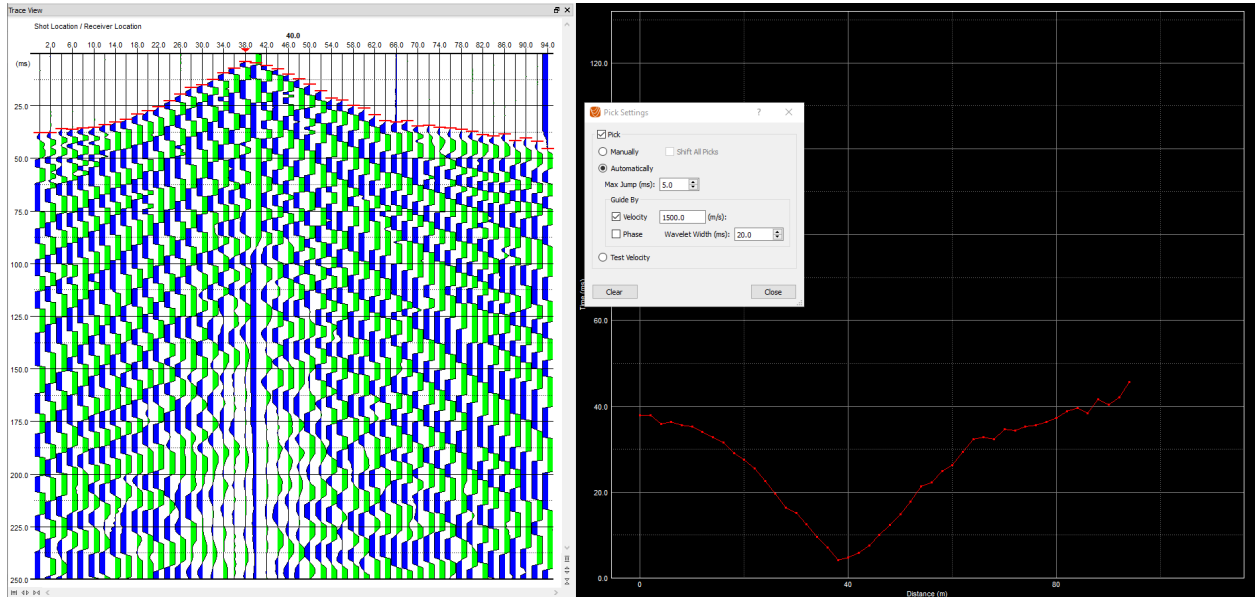


- To edit individual picks for each geophone, first click **Manually** in the **Pick Settings** window. Then click on the **Trace Magnifier,** which is below and to the right of the **Help** tab in the upper left corner of the **Geogiga DW Tomo** window.
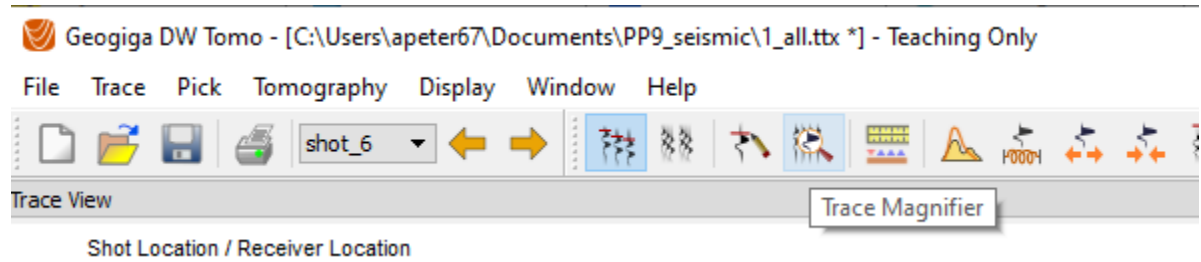
- Use the **Trace Magnifier** window to move the red line to the first arrival. You can do this either by clicking the red line in the **Trace Magnifier** window and dragging it into the correct position or simply by clicking the **Trace Magnifier** window at the point of the first arrival.
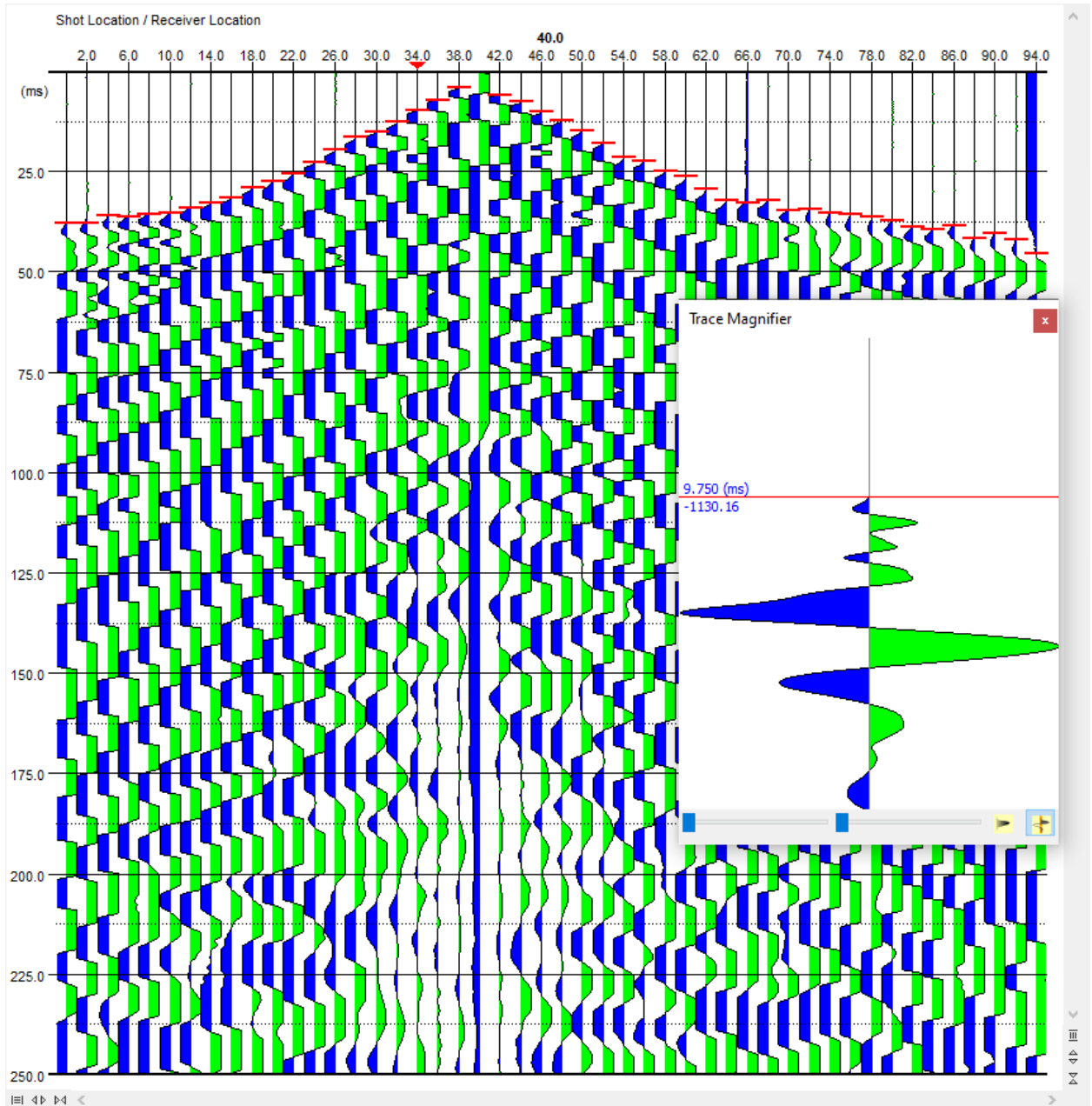


- To move between geophones, use the arrow keys on the keyboard, click on the red line of the geophones on the **Trace Display** window, or in the trace graph click on the point you wish to change.

- To change between different shots, use the arrow buttons in the upper left of the **Geogiga DW Tomo** window.
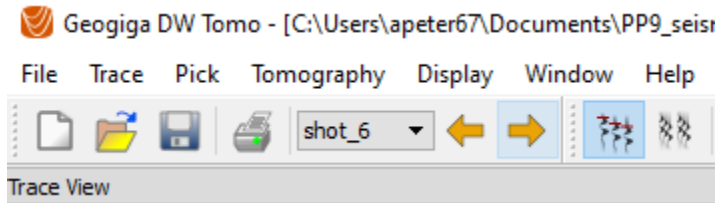


- Picking tips and Tricks
    - If one of the geophones is noisy or has bad data you can delete that point by pressing **Ctrl** and clicking on the picked red line on the **Trace View** window for that geophone. Make sure you are in **Manually** in the **Pick Settings** window or all your picks will get messed up!
    - For the geophone at the shot location the first arrival should always be 0.00ms.
    - The first arrival will be negative (blue) and to the left of the black line in the **Trace Magnifier** window.
    - You can use the sliders at the bottom of the **Trace Magnifier** window to adjust the zoom and amplification of the wave in the **Trace Magnifier** window.
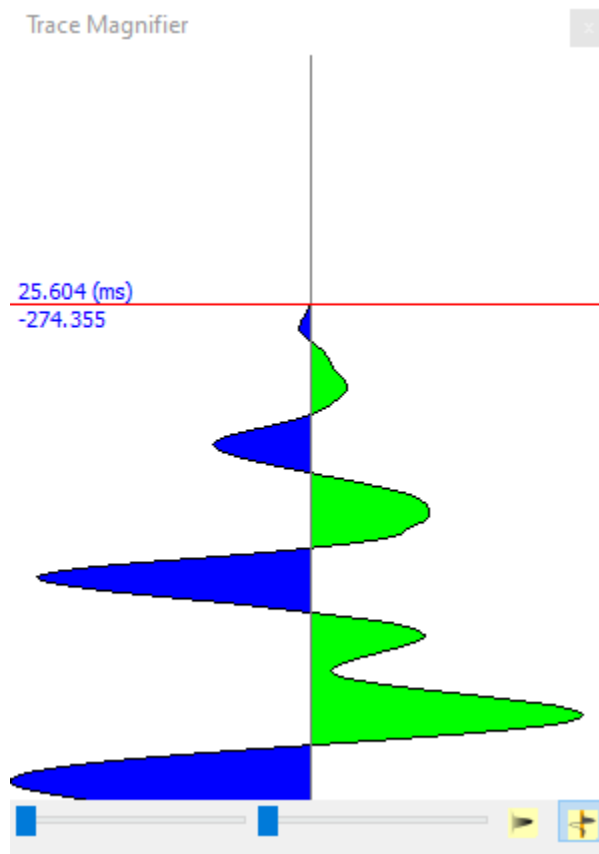
**Step 7: Adding Topography Data**
- Click on the **File** tab in the **Geogiga DW Tomo** window. Then click on **Input Elevation…**
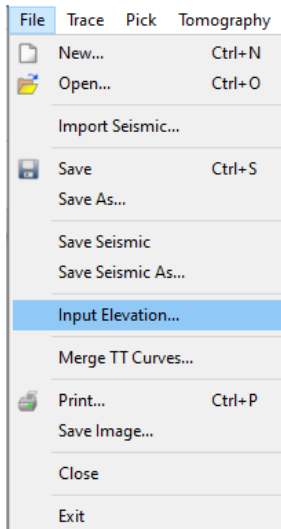


- The **Input Elevation** window will pop up. Copy and paste the geophone location and total elevation change into the **Slope Distance, Elevation** box. If instead you would like to use horizontal distance instead of the geophone location (which is equivalent to the slope distance), click on Horizontal Distance in the **Measure As** area.
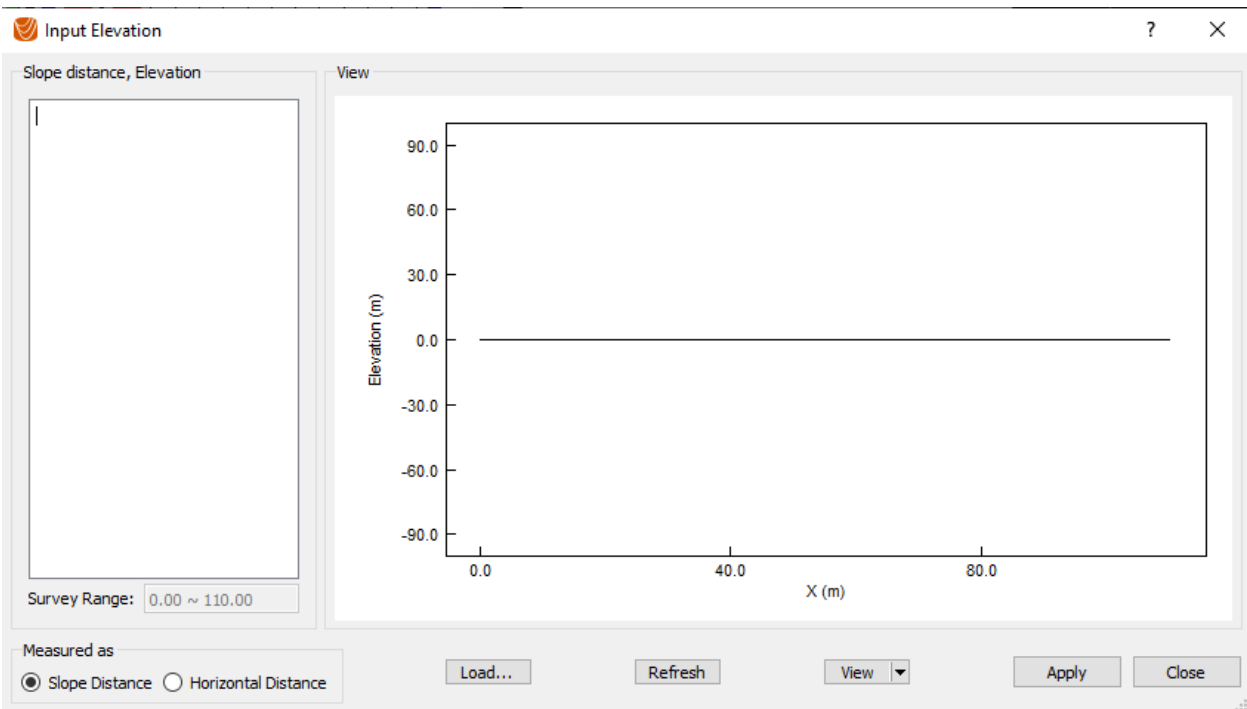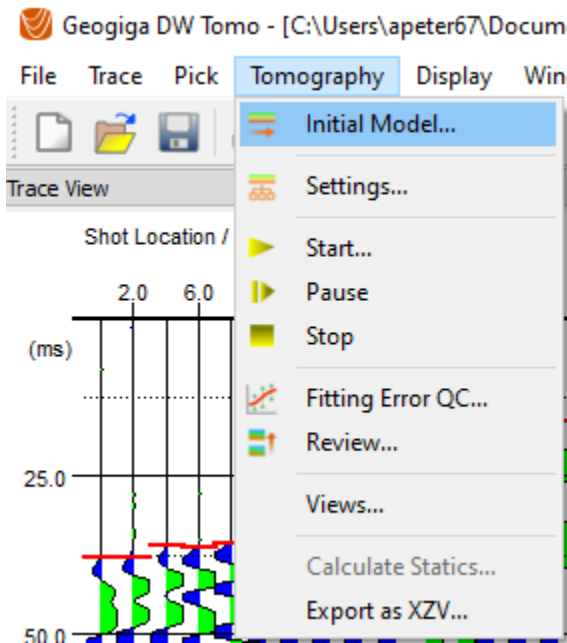
- Once the topography data is entered, click **Apply** in the lower right corner of the **Input Elevation** window. Make sure the topography is shown in the graph then close out of the **Input Elevation** window by clicking **Close** in the lower right corner.
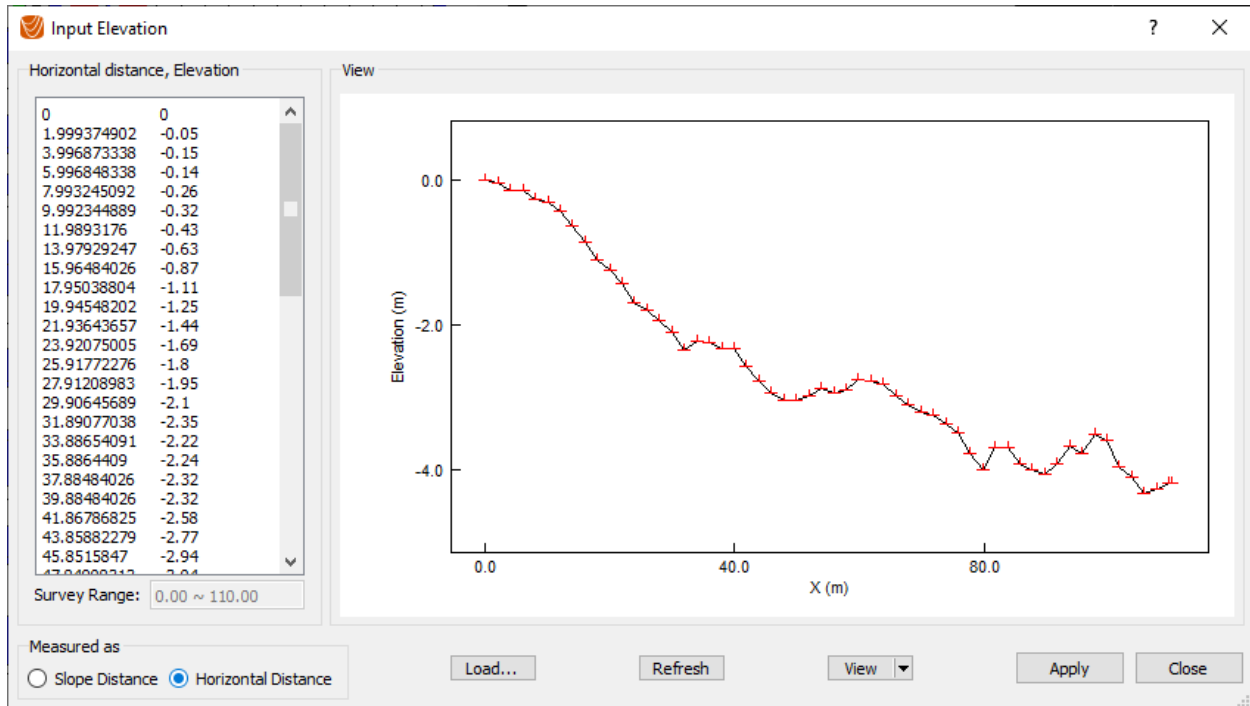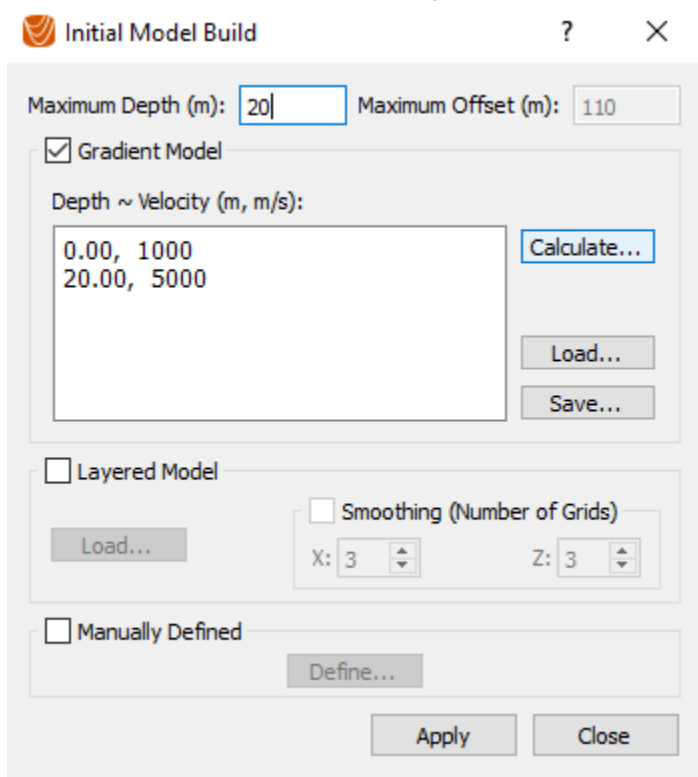
**Step 8: Starting the Inversion**

- Under the **Tomography** tab of the **Geogiga DW Tomo** window, click on the **Initial Model.**



- Click the **Calculate** box on the right side of the **Initial Model** window.

- In the **Build Initial Velocity** window, move the two red dots to where the red lines overlap the yellow as much as possible (it doesn't have to be perfect).
- Click **Apply** and then **Close** to exit out of the **Initial Model** window. This creates a base data set that the inversion is going to use as a starting point.
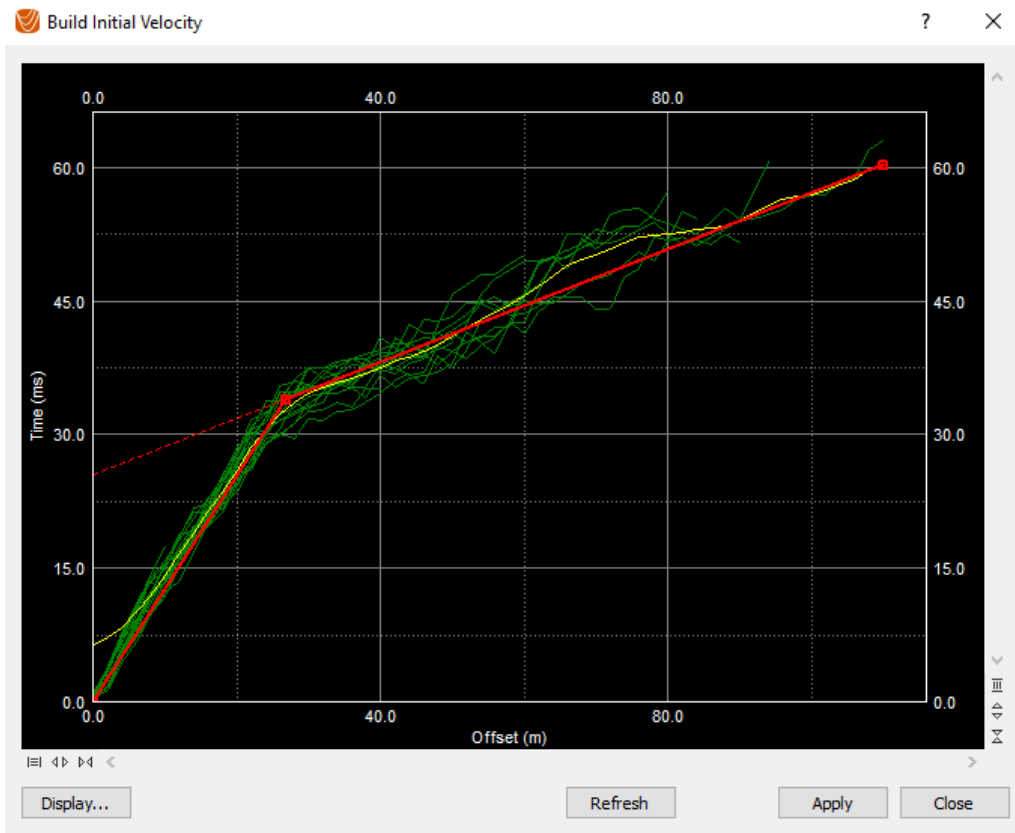


- In the **Initial Model** window, make sure that the depth and velocity of the initial model make sense. Once satisfied with the initial model, click **Apply** and then **Close** in the lower right of the **Initial Model** window.
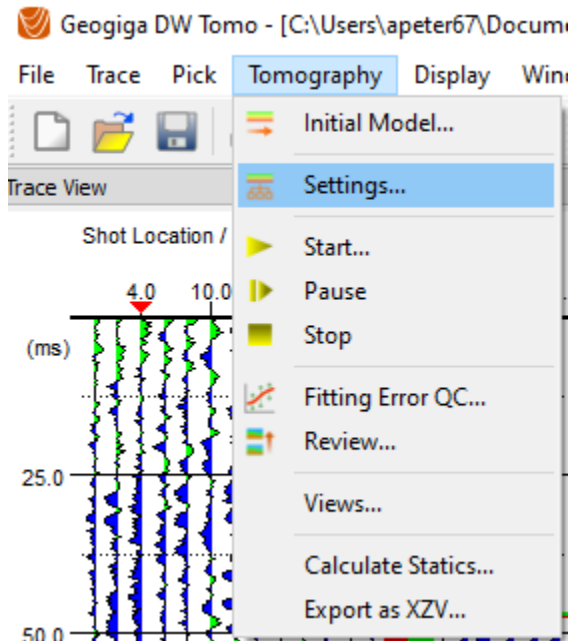
- Click on the **Tomography** tab in the **Geogiga DW Tomo** window and select **Settings,** which is the second option in the drop down menu.



- The **Tomography Settings** window will open. In this window, we will change some of the settings before starting the inversions.
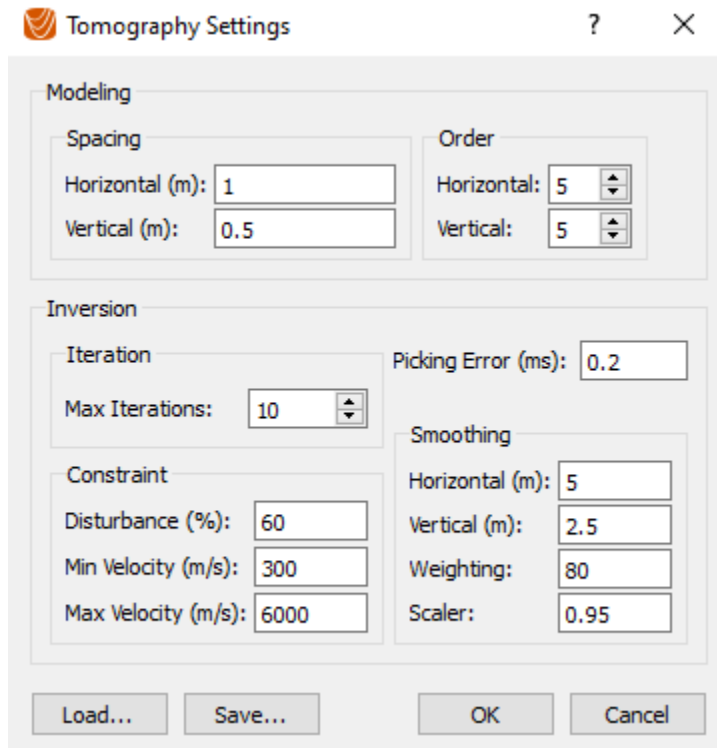


- In the **Constraints** section, adjust the **Min Velocity** and **Max Velocity** based on estimated geophysical properties of the survey area.
- Under **Smoothing,** change **Horizontal** to a number below 10. Start at 5 or lower and decrease as necessary to lower the fitting error.

- In the **Iterations** section, set the **Max Iterations** to 10 and click **OK** to close out of the **Tomography Settings** window. If a **Warning** window pops up, just click **Yes** to continue.
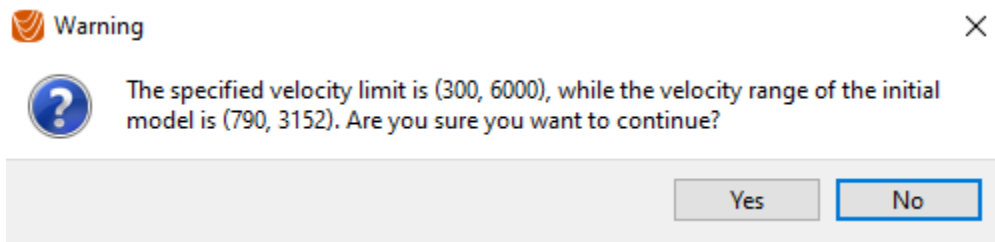


- Under the **Tomography** tab in the **Geogiga DW Tomo,** click on **Start…** (it will be the third option in the drop down menu). The window that opens will look exactly like the **Tomography Settings** window except instead of **OK** in the lower right corner it says **Start**.
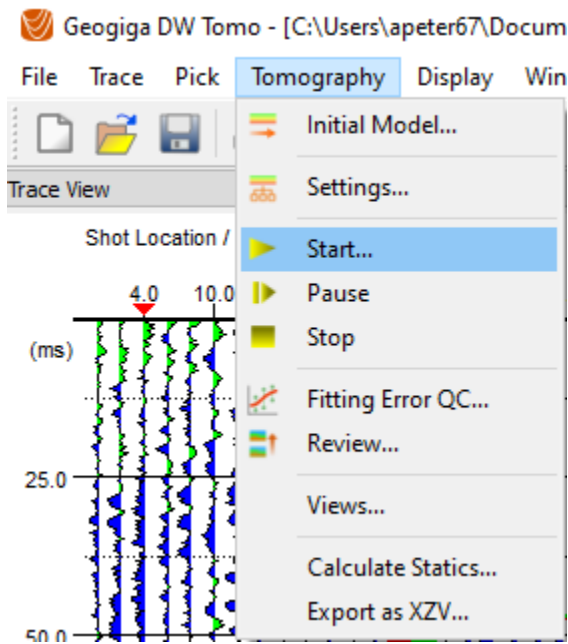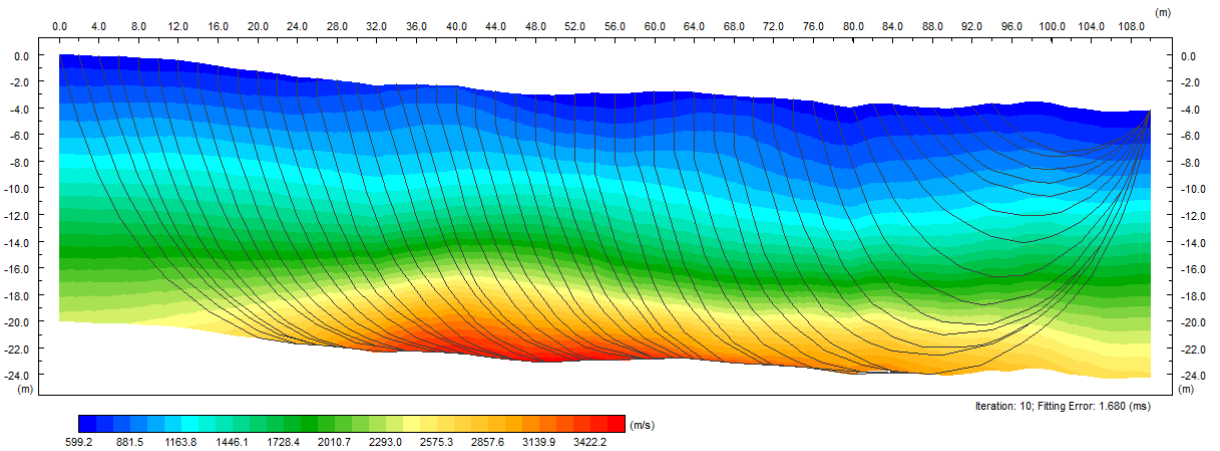


- Click the **Start** button to begin the inversion.
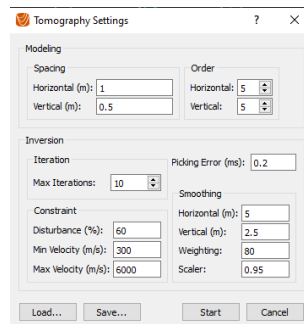
**Step 9: Final Results**

- Once the program has run through all 10 of the iterations, check the **Fitting Error** displayed at the bottom right of the screen under the model.



- It is best to aim for below 2 ms. If it is not below 2 ms, adjust the **Tomography Settings** to decrease the **Fitting Error**. For example, decreasing the horizontal smoothing or max velocity may decrease the **Fitting Error**.
- Under the **Display** tab in the **Geogiga DW Tomo** window, select **Trim Image…** in order to only show the model that has ray paths.
- To save your seismic picks, go to the **File** tab and click on **Save Seismic**. The picked data will be in the same file as the seismic shots. The picks will be a .ttx file.