Geol 335.3

LAB 8: Seismic processing using Vista:

Data Loading, Data Sort Orders, and Displays

This lab introduces you to several representations of seismic reflection data using Shlumberger Vista software. Vista is a popular, easy to use, smaller-scale commercial software system for visualization and complete processing of reflection seismic data.

Before you begin, copy to yourself this zipped archive. This file is about 100 Mb. Unpack it into some folder and locate files "Field_school_2010_NEW.sgy" and "Field_School_2010.geom".

1. Loading the necessary files into Vista

1. Logon into a Windows computer and open Vista 10.
2. Go to File –> New Project
3. Navigate to your cabinet directory, create a directory called "Lab9", and save the project as "VistaLab".
4. The project type is 2-D Survey and the units are meters. The VSP survey box should not be checked. Click ok.
5. Click on  in the upper left corner of the Project Data List window. Notice a new 2-D DATA dataset was created. Now we will import data into the data set.
6. Click and hold  to import data to the dataset. There are several import options. Choose SEG-Y. Navigate to file "Field_school_2010_NEW.sgy" and select it. Click Ok on the subsequent window that pops up. A window with information about the import will be open; you can close it.
7. You should be back at the Project Data List and the new data set you created in step 6 is now named "Field_school_2010_NEW".
8. Click on the icon next to data  . Click Load on the subsequent window. This brings up the geometry window – you should see a spreadsheet.
9. The geometry is not complete for this survey, we need to load an additional geometry file to get all of the information about receiver locations. Click and hold on  to read a geometry file. Choose the first option. Navigate to the same place as step #7. You will find "Field_School_2010.geom", open it.

2. Calculating CMP bin fold

Now that the geometry has been loaded, we will attempt to calculate the CMP (common midpoint) bin fold number.

10. Click on view surface display  . This displays the locations of all the shots and receivers along the line. It will most likely look like a big mess of numbers and squares. Begin by resizing the icons using the Shot and Receiver default icons  . Use a symbol size of 1 and don't draw lines. Under Stn Labels deselect Draw Station Labels. There are too many and create too much clutter. At any time you can zoom in by clicking and dragging a box anywhere on the screen and zoom out by double clicking. Notice the line is not exactly North-South – this is not a problem.
11. Now click on the CMP bin defaults icon  to generate CMP bins. Change the X-Line bin spacing to 10.5 – this doesn't change anything on a 2-D survey, just makes the bins easier to see. Make sure Lock Spacing is deselected. Deselect Center on In-Line and click "autocalculate". If the X-Line spacing changes back to 1.5 change it back to 10.5 and then click ok. You should now see bins along the line. There should be two bins between two receivers.
12. Now calculating the fold is very easy, click the calculate fold/offset icon  . You'll notice the bins fill up with colours. These colours correspond to the number of folds in the bin. Zoom out a bit and you should see two fold peaks (reddish areas) towards the ends of the line. Normally peak fold count occurs in the middle of the survey. Due to the special nature of the survey we have higher folds near the end. If you adjust the CMP bin defaults you may need to re-calculate the fold.
13. Another place you can go to get a good illustration of the folds along the line is the sub-surface fold  .
14. Also try the view stacking chart  . This gives you a great visual representation of the survey and explains why fold are greater towards the end of the line. Pick a shot (red dot) and scan horizontally to see the number of receivers recording. This is shot fold. Now scan vertically. In this survey it should be half as many as the shot fold. This is the receiver fold. Now, if you can, scan orthogonal to the shot line. This is the CMP fold – it should be half the receiver fold or one quarter the shot fold. Why is the receiver fold half the shot fold for us?
15. Write the binning info to the file header by clicking and holding on  . Click the  button on the window that pops up to close the log. You can now close or minimize the geometry window.

3. Viewing different representations of seismic data

16. In the Project Data List click  to enter the seismic data view. On the left, find  and click and hold. Select shot order.

17. Double-click on the tab in the lower-left corner of the plot panel, and in the resulting pop-up window, select “74: SHOT_POINT_NO 224”.
18. On the “MAIN SEISMIC TOOLBAR”, click the “Seismic Data Plot Parameters” button (the leftmost one). In the popup, first choose “Views” tab, and set 4 Horizontal views. This will make Vista display 3 trace gathers at a time, side by side.
19. Now, choose “Process” tab, check the “Apply Ormsby Filter” box, and set its frequency parameters of the best filter you designed in the previous lab. Click OK to apply the changes to the display. Afterwards you can enable/disable it simply using “f” key.
20. The traces are now displayed by “shot gathers”, and spaced according to trace sequential numbers within the gathers. Note that the source-receiver offsets are plotted along below the sections. Make a hard copy of the plot.
21. (20% if got this far) On the “MAIN SEISMIC TOOLBAR”, click the “Plot Trace Mode” button  to change the plot trace mode to offset. The traces are now displayed at a horizontal scale proportional to their source-receiver offsets. Make a hard copy of the new plot.
22. (5%) Explain why the offset sections would have gaps or spaces whereas the original sections did not have them.
23. Return to one view per screen. Using the “Sort Display Order” button, change the sort order to “Receiver”. By double-clicking on the tab below the plot, select a receiver in the middle of the line. Use N or P to get to a spot with nice reflections near 800 and 500 ms.
24. (20%) Make a hard copy. Describe what you see. What is the difference from the shot gather view? Why are there fewer traces and broader gaps in each of the 2 receiver gathers? Are the slopes of refractions different from what they are in shot gathers? You may want to zoom in, make another hard copy, or draw additional lines on the plot.
25. Using the “Sort Display Order” button, switch to “CMP Bin Order” display. Again, by double-clicking on the tab below the plot, select a CMP near the middle of the line, and use P and/or N to get a good view.
26. (30%) Make a hard copy in OFFSET scaling and describe the plot. What is the difference from the shot and receiver gather views? Compare the numbers of traces in the gathers. Why do the CMP gathers contain about ½ of the traces in receiver gathers? Are the slopes of refractions different from what they are in the other gathers?
27. (20%) Return to the Shot Order. Click on “Seismic Data Plot Parameters”, and go to “Options” tab. In “Display Type” pull-down, you will find several typical types of seismic displays. Try all of them.

Hand in

Make paper, PDF, or PNG copies of the most important displays and explain their ideas. Note that the other displays are combinations of these three basic modes.