**Geo647**
**Seismic Interpretation**
**due Oct 14th**

**Part 1.** Paper
Look at the paper-based seismic reflection profiles.
1) Look at the header information at the right side of each line.
a) What is the sample rate?
b) With this sample rate, what is the highest frequency that can be observed?
c) Assuming a reasonable velocity for sedimentary rocks, what is the wavelength of seismic waves at this frequency?
d) The bottom of the section is at a two-way travel time of 5 seconds. How deep (below ocean bottom) is this? (assuming reasonable velocities)?

2) Identify the water/rock interface. Using the known velocity (1.5 km/s) of seismic waves in water, convert the two-way travel time to depths in meters. Next, plot the water on the accompanying map and contour.

3) Identify the basement/sediment interface (this is more difficult). Convert to depth and remember to subtract the travel time in water. What is an appropriate velocity? Post and contour the basement structure on the second map. Make sure that your basement depth is consistent where lines cross.

4) Identify a major fault(s) system on the seismic on several lines and mark on your basement map. Now infer what you think the fault structure is between the lines. What kind of faults are these? Support your argument.

5) Read the Bohannon and Geist article. Write 3 or 4 paragraphs summarizing the tectonic history of the borderlands covered by these seismic lines, as according to B&G. Write a paragraph explaining how what you see matches (or doesn't match their explanation. This should be integrated with the seismic lines and maps produced as part of part 2.

6) Based on these data, do you expect that active faulting (i.e. earthquakes) are possible offshore San Diego?

Turn in your maps and text answers.

**Part 2.** Computer-based
We will do most of our interpretation on Kingdom Suite, a PC-based package. We have a 10 seat (floating) license. The PC's in the lab have copies and also the PC at the back of my lab. For this exercise, the lab PC's ought to work okay. I think.

*Preliminary comments:*

1) I have tried to make these instructions reasonably accurate. It should be considered as a guide rather than a step by step recipe. However, due to the fact that I am not perfect and that my computer accounts differ some features may not work exactly as stated. Also I have not memorized every option of every menu.
2) We have had problems in the past with Kingdom Suite causing the PC's to freeze up. I think this may have been fixed (by an upgrade to the video card)). I could be wrong. To reduce the number of times it happens, run Kingdom Suite by itself. Look at only one seismic line at a time. Finally,

try to keep a Zen approach. Imagine that you are a Tibetan monk on Prozac. This is usually the best approach when dealing with computers anyway.

3) The j: drive is large and available for storing results, but also accessible to anyone, i.e. interpretations can be changed, deleted, etc.

With this in mind, select one of the PC's near the aisle on the right – it should have a copy of the data in the *j:* drive. Start Kingdom Suite (*Start-Programs-Kingdom Suite 7.1-Kingdom Suite*). You should get a new window with three options – project, view, and help. Select Project, Open project and go to the *j:* drive and click the folder *geo646*, then select *geo646.tks*. You should get something similar to Figure 1 (some details on the left may be different). The window on the left shows the various data types available. The primary ones for now are surveys, horizons, faults, and culture. Surveys refers to seismic data, horizons refer to mapped 'horizons' , and faults are faults. Culture is other data such as coastlines, north arrows, etc. All of the data is linked together in a database and can be mapped on a base map shown to the right.

The basemap shows the data. By clinking on the little x next to the lines in the survey list, they can be made to appear or disappear on the map. Click on the little scale bar at the top left of the basemap window ($4^{th}$ from left icon). Try changing the scale.

Go to project, author management on the main window at top. Type in your name under author name, then use the browse button to select the directory – use something in your D: drive. Whenever you do some interpretation, be sure to make sure that you are yourself. If that makes sense.

Now we want to see some seismic data. To do this, either left-click,display 2D line on the line representing Line 207 the basemap or double-click on the L207 on the survey list. Your choice. (Figure 2)

Click the little squiggles next to the arrow. What do they do? Click the little scale base and check the various options. Change the vertical and horizontal scales. Click on the color base editor next to it. Click on the little blue arrows – this should change the color scheme. Which do you like best? Try changing the start value and end value at the bottom to something else, like 5000 and –5000. Try zooming in – click on the magnifying glass plus sign, then click somewhere in the section, move the mouse, to make a rectangle and click again (it's sort of weird).

**Interpretation**. Now go to *Horizon, Horizon management, create*. Create a new horizon named seafloor and make it blue (or whatever color you want). Now, when you move the mouse to the seismic section the cursor changes. If you left click you should see a little menu that offers *Horizon: Pick* mode and *Horizon: Phase*. This is where you can go manual, full autopick, or something in between. Phase refers to whether you want a peak, trough, or zero crossing. Use *autopick 2D hunt* and *peak*. Then carefully position the cursor exactly on the seafloor reflection (you may want to zoom in a little, and left click). You should see a blue line extend. By selected clicking in missing spots, you should be able to fill it all in. Left click and select erase. Now by right clicking and sliding the mouse, you can erase and re-pick. Complete the seafloor pick all the way across. Close the seismic display by clicking on the upper left little box. Now click on the little blue/green icon on the basemap, select seafloor, and click okay. The line you just picked should show up in various colors. Click the solid color bar to add a scale and then change the color bar to 3D color effect (*color editor, little folder*). Pick seafloor on the other lines. Note that the horizons on intersecting lines appear as small circles, which may be off a little. Don't stress about small gaps at the ends too much unless you want to. Then click on the little contour

map on the basemap and make a contour map. Try to pick the basement as well and make a contour map. Note that it is more difficult (Figure 3).

Include images of the seismic lines, seafloor map, and basement map in your discussion of the B&G paper from part 1. All images should have captions.

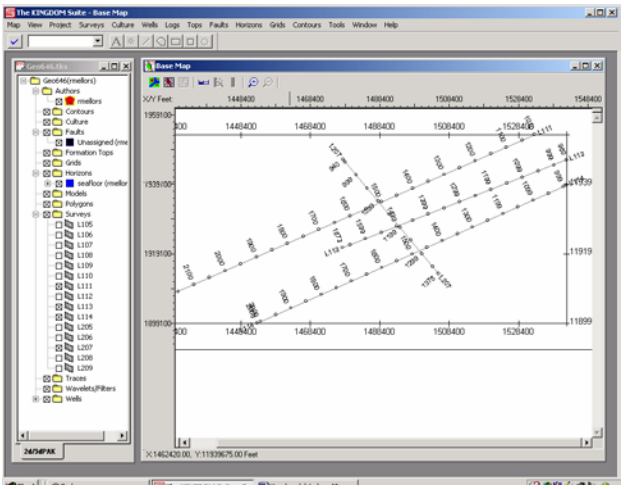

**Figure 1**. Basemap of Oceanside seismic lines.

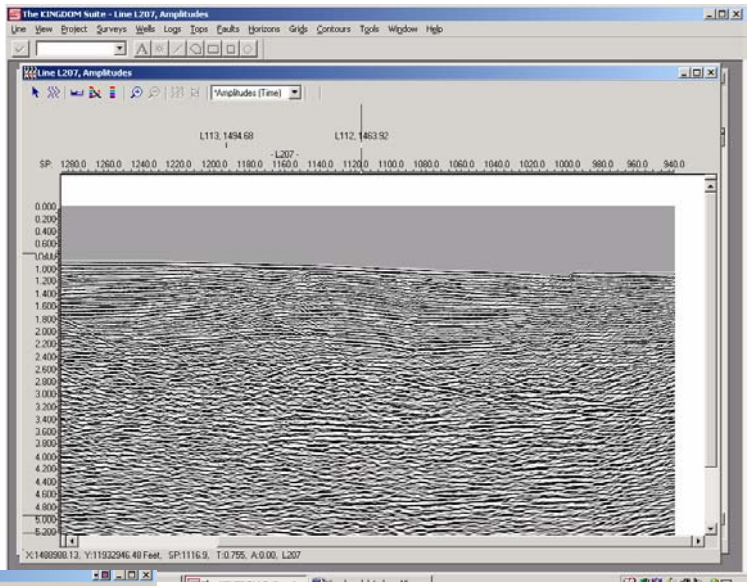

**Figure 2**. Seismic line from Oceanside data set.

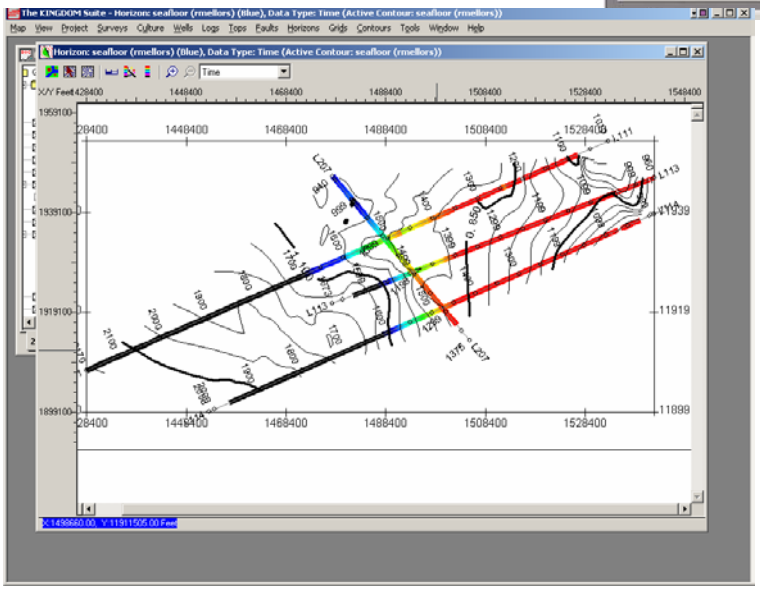

**Figure 3.** Contour map produced from seismic data.