As mentioned in class, for this assignment you will need to use GeoMapApp (go to geomapapp.org) to collect information from this database to explore and answer questions about plate tectonics. You will also continue to develop your abilities to produce high-quality graphics that are professional and help you visualize global and regional phenomena and processes. These skills are appropriate for you, and should be retained as part of your portfolio for the senior capstone course.

As described in class, you must:

1) Explore GeoMapApp, and the various tools and data sets that are made available. You can either download the application to your PC or you can use the java version directly on the web.

2) After you have explored the program and various datasets, you will want to produce a nicely labeled and annotated map of earthquakes globally using the earthquake dataset in the portal menu. Explain what this map actually shows. What is the pattern observed? Why are earthquakes produced where they are? Why are some earthquakes shallow, while others are deeper? Where are the majority of the shallow earthquakes? Where are the deeper earthquakes? What does that tell us geologists?

3) Using the basemap menu, turn on the Geophysical/Tectonic Maps and the World Lithospheric Map. This will put a colored map on top of the base digital elevation model map and your earthquake location map. Using the Layer Manager, you can change the order of the maps so the earthquakes is on the top. Then change the opacity of the lithospheric plate map by sliding the rule so you can see parts of all layers of the map. Export this map to PowerPoint. How does this series of superimposed maps help your answers in question 1? Explain what is being shown.

4) In the basemap menu, go all the way down to the bottom of the list and turn on the Seafloor Thickness Map (NGDC). This will bring up a layer that is color coded to show the accumulated thickness of sediment on the seafloor. Export this map to PowerPoint. To access the legend for the map, click on the legend button on the layer manager panel. It will lead you to a website where you can copy the legend. How does sediment thickness vary in the oceans. On the ocean floor (i.e. not on the continental shelf) what is the pattern? Where is the thickest sediment? Where is the thinnest sediment? What does this indicate? How does this correlate with the data about sea-floor age?

For the next section, you might also be interested in looking at the World Stress Map (located in the same section as above). As you zoom in on the map you will see a series of symbols that are used to demonstrate divergent stress, convergent stress, and transform stress, etc. To learn about the symbols, click on the information button in the layer manager and it will take you to the website that explains more details.

Post Script Note:

When looking at the world stress map, you will note symbols all over the map. The key to the symbols is on the website, but in hard to see area. So to help you out, here are some pointers.

1) Pay attention only to Red, Green and Blue markers. Ignore the others.

2) Red open circles indicate normal faulting. Normal faulting as we will learn later is due to extension stress. So this is due to divergence. Although you will notice evidence of a few other colors along divergent plate boundaries, you should see a dominance of red circles relative to any other.

3) Blue closed circles indicate thrust faulting. Thrust faulting is from compression and is evidence of convergence or squeezing of crust in those areas. Compression can occur close to MOR's because of what we discussed earlier (Hot Ridge Push). Pushing rock out of the way results in some compression as the rocks move. Blue closed circles should be prevalent in convergent settings (mountain belts, trenches, etc.) - again you will see other symbols there too, but look around.

4) Green half circles tell you about Strike Slip faults. Strike slip faults are transform or shear faults where motion is sideways. Although you are looking at a 2D map, remember reality is that the Earth is nearly round, so you have curvature of the Earth to contend with. Compression here, divergence there will result in some aspects of shear too. So although this is not as simple as it might seem, you should look at the proportion of data to support your observations.

5) Again using the portal menu, access the Seafloor Magnetic Anomolies dataset. This will show strips on the sea-floor. You can learn about the bands by clicking on them. Down in the lower left of the window you will see the age for that particular band. Spend time clicking on the bands in different areas and look for patterns. Export the map as above and explain what the strips show. Label a series of them with their age. Using GeoMapApp - measure their width and try to calculate a rate of spreading. Then explain how they formed, and what they indicate about plate tectonics.

6) Select 8 different geographic features and zoom in to demonstrate:

2 - Convergent Plate boundaries (one oceanic and one continental)
2 - Divergent Plate boundaries (one oceanic and one continental)
2 - Transform Plate boundaries (one oceanic and one continental)
2 - Intraplate tectonic features (one oceanic and one continental) that help demonstrate plate tectonic movements.

As you identify these features in GeoMapApp - export a map showing the distribution of earthquakes, a bathymetric/topographic profile drawn perpendicularly across the feature, and the location of your cross-section. These are to be assembled in PowerPoint, labeled, captioned, credited (citation), and otherwise annotated to show: geographic location, plate tectonic features, direction of plate movement, etc.

For each of these features you need to include an explanation of where earthquakes are located and what they tell about the feature. Also explain how the feature is formed (what processes, what forces, etc.).

7) As you wrap this all up, take a few minutes and provide a slide at the end that explores what you have observed and learned through this exercise. How did you benefit from this assignment and what topic(s) do you want to learn more about?