Grand Canyon Sedimentary Stratigraphy Extra Credit

Due dates:

Tuesday/Thursday Class, due Tuesday Dec. 10th AND Wednesday Class, due Dec. 11th

Sedimentary Stratigraphy - The science of sedimentary rock strata that is concerned with all characteristics and attributes of rocks in terms of: depositional origin, arrangement, geographic distribution, relative age, and what this tells us about the evolution of the depositional basin through time.

The goal of this assignment is to familiarize yourself with the sedimentary rock units (strata) that comprise the Grand Canyon and to learn how to construct an **oblique view geologic map** and **stratigraphic column**. We will be utilizing *Google Earth* for this lab so we will need to: 1) get your personal computer set up with the program**, 2) utilize computers in the library, or 3) make arrangements with me to get set up to use Earth Science computers located in S45.

**If using your own computer you can download Google Earth at: http://earth.google.com/

Set up:

1) You will also need to **download the two KMZ files from the webpage,** which are posted below the Grand Canyon lecture PDF. 1) Once downloaded, double click on the KMZ file called KMZ file called *Grand Canyon Stratigraphy Overview*. This will launch Google Earth, if not already running, add a location to your Temporary Places, fly you to the Grand Canyon (Elev. 23 km), and add labels to the different layers of the canyon discussed in class. 2) When you double click the second KMZ file called *South Rim View*, you will be zoomed into the canyon giving you a close-up view of the south wall (Elev, 2.94 km). This view is similar to the image provided on the next page of this document.

2) 1) We will use the *Metric System* for this lab so you will need to set Google Earth to Metric. Go to the Menu Bar → Google Earth→ Preferences → here you will find a box under Show Elevation. Select Meters, Kilometers. Also set Vertical Exaggeration to "1".

Your First Task: Complete the oblique view geologic map on the next page (Figure 1). As an example, I have already mapped-in the Vishnu Schist and the Tapeats Sandstone. Now you draw in the contacts between the other labeled formations. I have started each of the unit contacts for you and labeled the units. As can be seen from the Tapeats Sandstone these contacts will not be straight lines do the to complexity of the canyon walls, but cliff formers should be easy to spot throughout the canyon. Use the *Google Earth* controls to explore the Grand Canyon stratigraphy to aid in identifying the different geologic unit adding lines that separate the strata. **Units map not be continuous due to the perspective of the image**. After you have completed the line work lightly shade each of the units a different color.

Your Second Task: You will now construct a stratigraphic column, which is a graphical representation of the rock strata that highlights relative position, rock type, and thickness of each geologic unit. See an example of what you are attempting to construct on page 244 of our textbook (Cherincoff and Whitney ed. 4th). I have constructed a graduated column, in metric system for you to use (Figure 2). You will need to use Google Earth to calculate the **thickness** of each of the units and add them onto the column. **Do not include the Vishnu schist as I have already included it. Start at the base of the Tapeats Sandstone and work your way up.** To determine the thickness, using Google Earth, place the pointer at the top and the bottom of each of the units to determine the elevation of the base and top of each geologic formation (**in meters**); the **thickness** is the difference between the two. Add units to figure 2 from the bottom to the top; thickness on figure 2 is cumulative starting at zero for the base of the Tapeats Sandstone. The **width** of each geologic layer on the stratigraphic column will be determined by the **rock type** written at the bottom of the stratigraphic column (see Vishnu schist example).

Your Third Task: Answer the following Questions

1) From your column, which of the sedimentary units is thickest?
2) Which of the sedimentary units takes up the most area on the geologic map (Figure 1)?
3) Why does the thickest unit not take up the most area?

Figure 1: View of the South Rim of the Grand Canyon

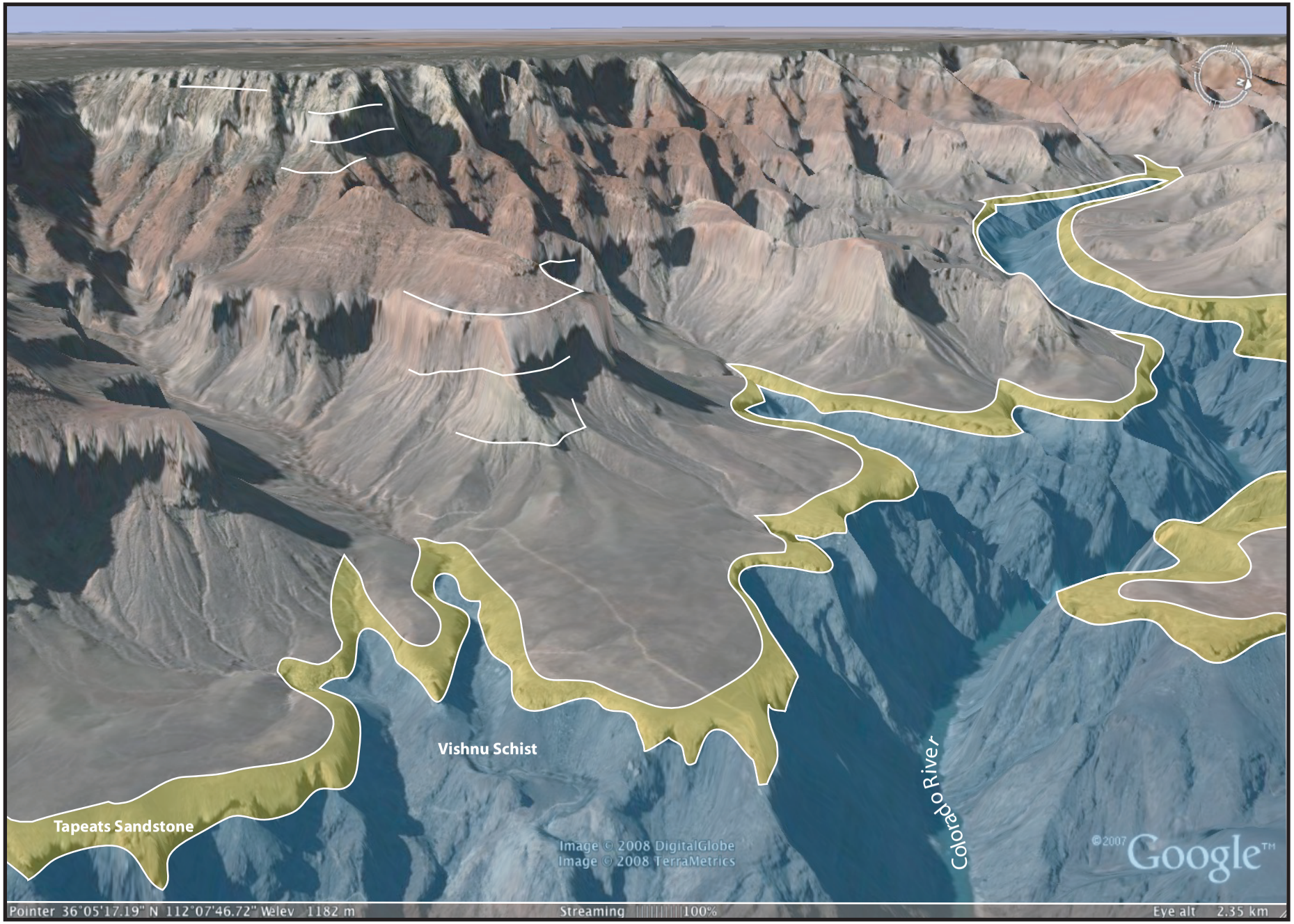

FIGURE 2. Grand Canyon Stratigraphic Column