Lab 2, Google Earth Exercise
Geology 212 Geologic Remote Imaging
Spring 2010
Brian Hausback, CSU Sacramento

This lab borrows exercises from several different sources, including:
Ernest S. To, David Tarboton and David Maidment, University of Texas, Austin

Brief Overview of Google Earth

Google Earth is one of the most exciting software packages to have come out in the past few years. Google Earth allows you to view the entire earth in 3D, and has enough detail that you can zoom in and view your own house! Each time you open Google Earth, it automatically connects to Google's servers, giving you access to terabytes of digital image and map data as well as geographical, political and social data. More than just a map and navigation tool, it also serves as a geographic web browser that allows you to share and find information that is linked to any area of interest.

Data Sources of Google Earth

The photographic maps available on Google Earth come primarily from two sources: satellites and aircraft. Google gets this imagery and other digital mapping information from sources such as TeleAtlas (http://www.teleatlas.com/Pub/Home) and EarthSat (http://www.earthsat.com/). Both these companies compile photographs and maps into digital form for commercial applications. Because of the different sources of data, the images come at different resolutions. Therefore, some areas of the globe appear crisp even at street level while others are blurry from a great distance.

According to Google, images are no more than three years old and are continually updated as new data becomes available. Google Earth also has digital terrain model data collected by NASA's Shuttle Radar Topography Mission (http://srtm.usgs.gov/) for certain parts of the world. This means one can view the Grand Canyon or Mount Everest in three dimensions, instead of 2D like other map programs. In addition, Google has provided a layer allowing one to see 3D buildings for some major cities in the US, such as New York City. Typically major cities in the United States, Canada and the United Kingdom are covered to street level, meaning you can zoom in and view road names and local businesses and get directions from here to there. The database has a good amount of information on Western Europe, as well, but the rest of the world is hit or miss.

Lab Objective: To explore some of the capabilities involved with air photo and satellite coverage available through the free Google Earth program.

Instructions: Click on the Start button, go into the Programs folder, then click on Google Earth. **When the program has initialized, enter 38.562050, -121.423410 in the Fly to Search box** in the upper left of the Sidebar. **Please use decimal degrees throughout this lab.** This will zoom into the Geology Bullding at CSUS. The program will put a large square placemarker symbol on the building. To turn off the symbol just click the check-box in the search menu for the latitude-longitude position you entered.

Do the same for your home by entering the street address, city and state.

Notice the "Layers" that can be selected in the menu box on the left. Be certain that terrain, roads, borders and populated places are checked. The sidebar with “Search”, “Places”, and “Layers” menus can be turned off or on with the click of the toolbar at the top of the page (circled below). This allows for a larger screen view image.

Toolbar Options:

In the dropdown menus choose Tools/Options/3D. Leave most of the 3D controls in their default settings. Note that you can choose between several options for the coordinate system to show location. I typically use UTM for my own projects. Elevation values can be shown in English or metric. Terrain Quality (resolution of the DEM) and Elevation Exaggeration (vertical exaggeration) can be changed for added effect of 3D viewing.

Navigation Essentials:

Left-button mouse dragging moves the position N-S, E-W
Scroll wheel zooms in and out (note this can be reversed in Tools/Options/Navigation)
Control + Scroll wheel rotates the view on a vertical axis.
Shift + Scroll wheel rotates the view on a horizontal axis (obliqueness).

To measure distances, click on Tools on the command line then select Ruler. Note that you can measure distance along a line or a path and that the units of measurement can be changed. To activate the ruler you give a single click to your start point and then drag the cursor to measure distances from that point. Alternately, create a placemark on your end point; start the ruler on your start point; then double click on the end point placemark in the Sidbar list called “Places”. On this FREE edition of Google Earth, you cannot directly measure area, but you can estimate of compute it from measurements that you make. On the Google Earth Plus program (cost is currently $20 annual subscription) you can do a number of additional things.

Notice that you can move the map by grabbing (left clicking the mouse) and dragging it over. With the controls at the upper right you can zoom in or zoom out, rotate, and tilt the view. There is a compass indicator on the map and an icon below (a blue button with a white "N") which will reorient the map so that North is up.

Under View on the command line you can also add a grid displaying latitude and longitude. Note that you can also identify the latitude and longitude by the pointer location at the bottom of the image.

Assignment: Use the Google Earth program to answer the following questions.

What is the distance, in meters, from the center of the Geology Building on the CSUS campus to the dome on the California State Capitol Building?

_____ kilometers _____ miles

What is the straight-line distance between the "Eiffel Tower, France" and the Arc de Triomphe in Paris, France, in kilometers?

_____ kilometers

Using Google Earth, what are the latitude and longitude of the "Arc de Triomphe, France" in Paris?

_____ _____

Please use decimal degrees throughout this lab.

With Google Earth go to each of these sites and do an oblique fly-around. Answer each of the following questions.

Mount St. Helens, WA

What is the latitude and longitude of the center of the older (1980-86) dome?

_____

The younger dome is also in the crater, just SE of the older dome. In oblique views in Google Earth, why does this dome not display any relief?

_____

_____

Go to View/Historical Imagery. Based on the historical imagery, when the younger dome began to grow?

_____

Sutter Buttes, CA

The tallest of the crags at the Sutter Buttes is called South Butte; latitude and longitude: 39.206246, -121.821217

What is the elevation of South Butte _____feet

What date was the most recent image taken?

Why is there so much more vegetation on the NE side of the peak than the SW side?

_____

Create a Google Earth Placemark (.kmz file) for the summit of South Butte and send it to me via email in our SacCT website, as an attachment.

Carrizo Plains, California

Fly to "Carrizo Plains, California". See if you can find the photographic area we looked at during the last lab. Look for the distinctive sag pond along the fault (give the location of the sag pond in latitude and longitude)

_____

Medicine Lake volcano, California

In the lab folder there a file called "GPS Medicine Lake Trip.gpx". These are the waypoints and tracks created on a handheld GPS device during my last Volcanology Class field trip. Drag and drop this file onto the screen of Google Earth and it will import the waypoint and track data into the program. These data will show up in the "Places" Sidebar. Double click on the Glass Mountain waypoint and try to find the ground cracks that we investigated during our last lab. What is the latitude and longitude of the summit of Glass Mountain?

_____

Gold Run, California

Fly to "Gold Run, California". About 0.8 miles NE of Gold Run the main Sierran rail line is on top of a strange narrow ridge immediately north of Hwy 80. Why do you think it was built on such a long narrow topographic feature and what caused this ridge to form? Clue: the white areas both north and south of the highway are hydraulic mining pits from gold extraction in the "auriferous gravels" which are lower Eocene Ione Formation stream deposits.

_____

_____

Optional Fun Stuff:

If you would like to take a world tour of known impact craters, open the Imapct Craters.kmz file on our SacCT site.