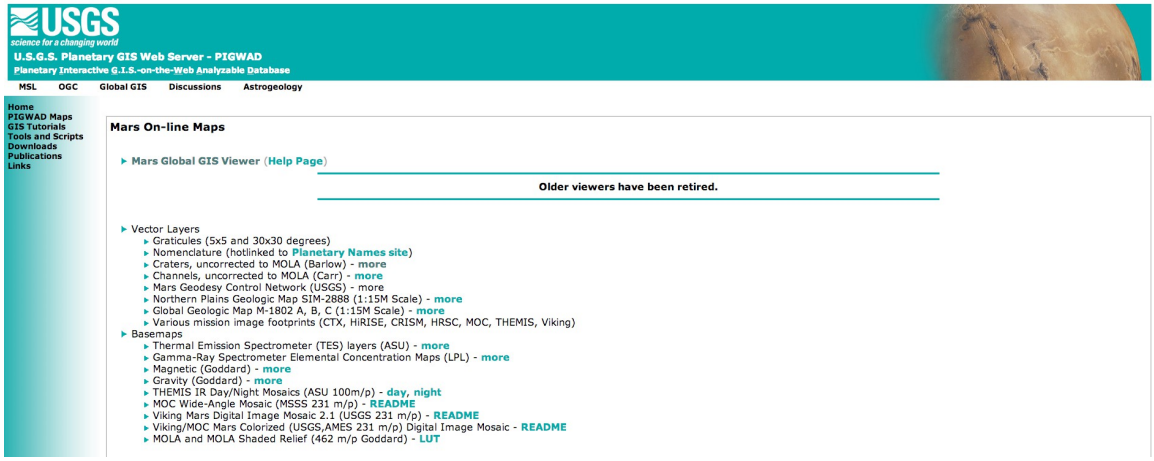
Earth and Planetary Sciences 110 **Due week of May 26, 2014**
Exercise #5: Mission to Mars

The new space race has begun. Agencies all around the world plan for sending humans to Mars. The first step in planning such a mission: locating a suitable place to land. Comparing the diameter of Mars, it is approximately one-half the size of that of Earth's. However, Mars has no oceans like Earth, so the amount of land measures almost the same. This makes for a great deal of land to choose from! **What do you think would be important for a landing site to have? What should be avoided?**

Your assignment is to identify a possible landing area on Mars. Make a **list** of what you believe are the **most important factors** to consider in choosing a landing site (you can ignore engineering constraints here). Be sure to **write down your reasons for your choices** and go back to them when selecting your site. The goal of this exercise is to take what you've learned about the terrestrial planets and achieve an understanding of the complexity of Martian geology by exploring images of the Martian surface.

NASA and other space agencies already sent unmanned probes to Mars and other planets to do some preliminary surveying. Numerous different sites allow you to "browse" the Martian surface, but here we recommend the **U.S.G.S. Planetary Interactive GIS-on-the-Web Analyzable Database (PIGWAD).**
http://webgis2.wr.usgs.gov/Mars_Global_GIS/

After navigating to the site, click on Mars Global GIS Viewer (top of the page).



Note the site uses sophisticated GIS/Java coding, so can be very slow depending on your choice of browser and computer. Be patient as things load. You may want to try different browsers, updating the ones you normally use, or a different computer (consider updating Java as well). A variety of datasets are availble, so we encourage you to play around with the interface before starting the assignment.

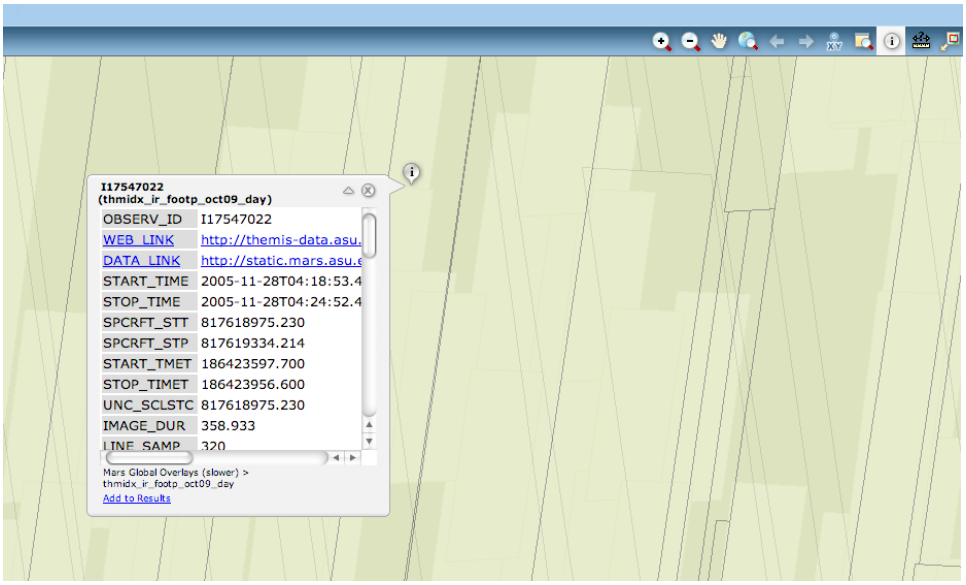
Finding a good area for your study is really important! You will want to choose an area with the following technical characteristics:

1. It contains a wide variety of features.
2. It's neither too big to scrutinize for opportunities or danger, nor too small to have features of interest.
3. Numerous higher resolution images are available (see next step).

The first PIGWAD page you will see has an image map of the whole planet at the center, a layer panel to the left, and a tool panel to the upper right. In the layer tree, make sure the top layer (Mars Global Overlays) box is checked, otherwise layers will not load. Use the pan tool (hand) to move around or zoom using the + and – magnifiers (the mouse scroll wheel will also work).

PIGWAD uses a lower resolution basemap, so you will need to find high-resolution images to carry out your landing site selection. Activate the "THEMIS" layer under "Image_Footprints" (you can check out the other image types, but THEMIS provides the best resolution and coverage combination). We also recommend that you activate the "Graticule_5x5_degrees" layer and to make sure you have zoomed in to a relatively small area to avoid overcrowding of the screen. Green rectangles will appear for each individual image obtained by the THEMIS (http://themis.asu.edu/) instrument for the area.

To obtain information for each image, make sure the current active layer on the left panel is THEMIS. Click on the "i" button on the upper right panel, then on the image footprint (green rectangle) you would like information about (if this doesn't work try refreshing the page). A new menu will show up with the image(s) information. Click on the "WEB_LINK" column to open the image. This will open a new window with the image and its information. Take a look at the image and decide if it fits your ideal characteristics for a possible landing area or if at least it will help with your decision. If so, you should **download** the image, preferably as **jpeg** format, and record the **center latitude** and **solar longitude** from the table. Please select at least 2 images to support your preferred landing site.



Assignment: What to submit:

- A **2-3 page summary of your landing site and findings**, including the list of factors to consider in choosing a landing site. Your summary should contain sound scientific reasoning as to why you chose this site (not just “it looks cool to explore” even though it may be true!). Some critics have said that it is too risky to send human beings on these missions, that only robots should be sent. Do you agree? Why or why not? Would you go?
- The **list of all images** you used to select your landing site with their image number, center latitude, and solar longitude. This could be done as a table with three columns: image number, center latitude, and solar longitude. If an image is too large for paper, include the url.
- One image that best supports your decision. Please include the image in your report (e.g. using "insert from file" or "copy/paste" into document, or print as a separate file).

- The ExoMars mission, a joint ESA-Russian venture, will launch soon for Mars. Also, MarsOne, a private non-profit mission, plans for a permanent settlement on the “Red Planet”. What sites have been selected? How do their criteria for sites differ from each other? From yours?