PLANETARY GEOLOGY - MARS

Due May 9, 2012

In this lab, you will examine and interpret Mars data from two instruments on the Mars Reconnaissance Orbiter:

The Compact Reconnaissance Imaging Spectrometer at Mars (CRISM) [http://crism.jhuapl.edu/] – 0.36 to 3.92 microns, 6.55 nm per channel, ~16-20 m/pixel.

High Resolution Imaging Science Experiment (HiRISE) [http://hirise.lpl.arizona.edu/] – 3 channels (blue/green = 400-600 nm, red = 550-850 nm, nir = 800-1000 nm). 30 cm/pixel at 300 km altitude.

1. **Open CRISM image frt00003e12subset.** This map-projected image has been spectrally subset to include data from 1.0014 – 2.6021 microns. Use z-profiles and the techniques you have learned in the course to identify the major minerals present in this scene. Hints: there are both primary igneous minerals and clay minerals here. A list of clays (phyllosilicates) that have been found on Mars includes, nontronite, illite, kaolinite, chlorite, saponite, muscovite, montmorillinite. There is also a small outcrop of another mineral that on Earth is often biogenic.
   a. Plot the z profiles of the major spectral units in the scene. On each, list the characteristic absorptions of the spectra. Please indicate the location (pixel x,y) for each profile you plot.
   b. Plot candidate mineral library spectra alongside your z profiles to support your mineral identifications.
   c. Create an RGB image or a classification image that highlights the distribution of the major spectral units.

2. **Open HiRISE image PSP_002176_2025_RED.JP2.** This is a single band image of the red channel and is 25 cm/pixel. Using the CRISM and HiRISE data, examine the outcrops of the major spectral units you identified above.
   a. Describe the meter scale morphology of each of your major spectral units (e.g., is it layered, fractured, etc). Write a description akin to what you would write if you examining the outcrop in the field.
   b. Examine at least one contact between the major material units (a nice place to look is e.g., near 14348, 29045). What is the stratigraphic relationship between the units? Justify your answer.
   c. Based on your analysis, what is the geologic history of the rocks in this area? Is this a good place to go look for water on Mars? Why?