

Lab 11 Hyperspectral Section 1**Name:****Hyperspectral VNIR Datacube for Vegetation Analysis**

Upload the following files to the instructor:

“YourName_5_Spectral_Profiles” as a .png

YourName_3D_Datacube” as a .tif

Question 1: What is the name of the unique sharp increase in brightness (Data Value) between 680 and 745 nanometers?

Question 2: Why is the reflected brightness highest in the 520 – 600 nm range compared to the 400 – 520 nm and the 600 - 680 nm ranges?

Question 3: What causes the unique absorption feature for healthy vegetation that is between ~600 and 680 nm? (Hint: think about what is causing the higher reflectance values at shorter and longer wavelengths?)

Question 4: A. What is the calculated NDVI value for your brightest (most vigorous) pixel?

B. What is the calculated NDVI value for the gray terrain (in the color IR image gray may represent dormant, dry grasses and other ground vegetation)?

C. How did the program calculate NDVI?

Question 5: Discuss what happens to VNIR spectral profiles when you move from vigorous vegetation to no vegetation (barren terrain).

Question 6: A. Do you think there is new information and patterns in the classification map about vegetation, soils, barren ground, etc. that made our MNF and isoDATA effort worthwhile? YES NO

B. Do you see shadows in the classification map? If so, what class number represents many shadows?

C. What class number represents the most vigorous vegetation?

Lab 11 Hyperspectral Section 2**Name:****Hyperspectral SWIR Datacube for Geologic Mineral Mapping**

Upload the following file to the instructor:

“YourName_SAM_map” as a pdf (at the end of the lab)

Question 7: A. Do you find the absorption feature of alunite is *relatively* consistent between the pixels in the hyperspectral data set and the USGS Spectral Library? YES NO

Question 8: A. What mineral is represented by the green color in the USGS color map?

B. What is the wavelength of the absorption feature in both the hyperspectral data and in the spectral library?

Question 9: A. Do you find pixels with the deepest absorption feature at $\sim 2.21 \mu\text{m}$? YES NO

B. Do you find pixels with the “doublet” absorption feature? (two absorption features next to each other) YES NO

B. What is the wavelength for the deepest absorption feature for dickite and halloysite in the spectral library?

Question 10: A. What is the wavelength of the absorption feature for “muscovi1” (white mica) in the spectral library?

B. Describe the difference between the shape of the absorption feature of kaolinite and muscovi1 (white mica).

Question 11: A. What often happens to the depth of the first absorption feature in the kaolinite doublet ($\sim 2.16 \mu\text{m}$) when alunite is mixed in?

Question 12: A. What do you visually see as a reasonable number of MNF bands to use going forward? (relatively clean data, not much noise).

Question 13: A. What “Threshold Level” did you decide to use and how many MNF bands does the ENVI program recommend using going forward?

Question 14: A. What happens to the cloud when you load MNF bands 18-19-20 into the n-D Visualizer?

B. What does the 3D shape of the 18-19-20 cloud tell you about coherent spectral information and noise in these MNF bands?

Question 15: A. Using the “Spectral Analyst” tool, click on “Apply” and select “n-D Class Mean #9”. What three closely related clay minerals have the highest score?

B. Look at the profile of n-D Class Mean #9. What is the term used to describe the unique spectral absorption feature between 2.17 and $2.21 \mu\text{m}$?

C. Using the “Spectral Analyst” tool, click on “Apply” and select “n-D Class Mean #4”. What mineral has the highest score?

Question 16: Questions are based on the SAM classification map.

(Hint: Use the “Cursor Value” tool to query the class shown on your map)

A. Is Calcite located in the same place as on the USGS hyperspectral color map? YES NO

B. What is the “nD-Class Mean #3 class on the USGS hyperspectral color map?

C. Right-click on the “Classes” folder under the SAM map in the Layer Manager > *Select* “Statistics for all Classes”.

What are the three largest classes?

What are the three smallest classes?

D. Does your classification map show spatially coherent classes?
YES NO

Question 17: A. What is the SAM Rule value for the brightest pixel you find?

B. What is the SAM Rule for the darkest pixel you find?

C. According to the USGS color geologic map, what mineral is located where the Calcite SAM Rule map has the brightest pixels? (meaning spectra in these pixels are *very different* compared with calcite spectra).

D. Where are the darkest pixels located?