EE/GP140-The Earth From Space- Winter 2008 **Handout #19**
Lab Exercise #4

Today we'll be working with some radar images produced using the methods you've been learning about in class this week. We'll compare images produced using different wavelengths and polarization types, and see how we can combine them using color schemes to produce useful images.

1. Turn on the computer monitor and log in using your Leland account and password.

San Francisco Area

2. Download the Ex. 4 zip file from the web site, and unzip the folder onto the desktop. Open MultiSpecW32.exe.

3. Open SF800X1175-tif. This is a radar image of the San Francisco area. At first glance it may look similar to other images from the Bay area, but there are some important differences.

4. Select 'Processor', 'Display Image', and write down channel descriptions. The channel descriptions are somewhat cryptic. The first letter tells us the wavelength (L=~24 cm, C=~6 cm), the second letter tells us the polarization of the transmitted signal (H = horizontal, V= vertical), and the third letter tells us the polarization of the receiver measuring the returned signal. What do each of these channels tell us?

5. Again select 'Processor', 'Display Image', and then select 'Side-by-Side Channels'. Adjust the size of the window, and the zoom if necessary, so that you can see all three images.

6. By looking at the three channels, can you tell the direction of illumination? How?

7. Why is the bay black in these images?

8. Why is the area south of Market Street extremely bright in channel 1, but not in the other channels?

9. Return to the 3 Channel Color image.

10. How can you explain the red "spot" just east of the city?

11. Why are some areas of the image white?

12. Look at the dark blue areas around the edges of the bay. Why are these areas blue?

13. Close this image.

The Mississippi River

14. Open SRL2-Miss-tif. Write down the channel descriptions. This image displays the Mississippi River along the Louisiana/Mississippi border (the river is the border). The area of the image is approximately 23x40 km. North is upward and to the right.

15. Display the image as 'Side by Side Channels'

16. Locate the main river channel. What are the other elongate black areas?

17. Does the image of 'C' band look like the image of the 'L' band? How? How are they different?

18. Explain the presence of the rectangular black objects in the C band image. Why aren't they bright like the rest of the farmland?

19. What are the main differences between the LVV and the LVH? Is this what you'd expect?

20. Go to the three-color image.

21. Why is the flood plain green? What does it suggest about the plants growing there?

22. Why are some parts of the farmland dark purple while others are a lighter pink?

23. Close this image.

Mount Vesuvius

24. Open SRL1-Vesuvius-tiff.TIF.

25. Locate Mt. Vesuvius. The central cone should appear a dark purple. Note that the cone is surrounded on the north and east sides by the old crater rim.

26. Locate the cluster of craters that are along the left side of the image.

27. Switch to 'Side by Side Channels'. Write down the channel descriptions.

28. From what direction is the illumination coming?

29. Why does channel 3 show less contrast than the other channels?

30. Why is the left side of Mt. Vesuvius bright in channel 2, but not in channel 1? Aren't they using the same wavelength?

31. Switch back to the 3 Channel Color image.

32. Why do some areas appear red?

33. Why is the left side of Mt. Vesuvius green?

34. What is the grayish region to the south of Mt. Vesuvius?

35. What are the purple and pink streaks to the east of Mt. Vesuvius?

36. Close this image.

Central Africa

37. Open SRL2-Karisoke-tiff.TIF. This image shows a volcanic field in central Africa along the borders of Rwanda, Zaire, and Uganda. The area of the image is approximately 56x70 km. This area is home to the endangered mountain gorillas; only 650 remain in the world. The green patch to the center left of the image is a bamboo forest where the mountain gorillas live.

38. Write down channel descriptions.

39. Display as Side by Side Channels.

40. What is the direction of illumination?

41. What are the light areas surrounding the volcanoes? (see Channel 1). Why can't you see these features in channels 2 or 3?

42. Look at the irregular dark masses trending roughly N-S. What are these? Why don't they appear in all bands?

43. Why is the bamboo forest green? Notice that the green patch is where LHV and CHV are less intense, rather than where CHH is particularly strong.

44. Go back to the 3 Channel Color image and look at the terrain. What can you learn about the topography from the image?

45. Close this image, exit MultiSpec.

Creating a multichannel radar image

46. Open matlab, and read in the three files sfvalley1.2000, sfvalley2.2000, and sfvalley3.2000. Each is a radar image of the San Fernando Valley in LA and the line length of the images is 2000 pixels. Channel 1 is LHH, channel 2 is LHV, and channel 3 is CHV.

47. Combine these three images into a multichannel radar image. Experiment with different combinations to find the one that best allows you to visualize different features on the ground.

48. Can you explain why different regions have different colors? Speculate with the class on differing characteristics of the regions of different colors.

49. This is a large image, but you can zoom into various sections to see different places.

50. Save this image and turn it in as part of this week's homework. You can print it out and attach it to your homework (preferred), or you can email the electronic version to the TA if you do not have access to a color printer.

After looking at this image, shut down matlab and log out of the computer.