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Remote Sensing of the Environment
GEOG/GEOL 4093
Fall Semester 2011

Lab Exercise #3 09/16/2011
Due: 09/23/2011

Part I: Concepts

(1) Name two types of aerial cameras and discuss their difference? (2)

(2) Can we use Near Infrared enhanced Black and White film to map surface temperatures? (2)

(3) Indicate how effective each wavelength would be for studying the Earth's *surface* from a satellite platform. Use the following terms: *very good*, *good*, *ok*, *fair* or *poor*. Also list the atmospheric constituent (if any) that is most responsible for attenuating each wavelength. (4)

	Wavelength	Utility for studying the surface?	Primary attenuating atmospheric gas
a.	1500 nm	_____	_____
b.	800 nm	_____	_____
c.	400 nm	_____	_____
d.	8 mm	_____	_____

(4) For each of the following attributes, indicate whether polar orbiting or geo-stationary satellites (if either) would be inherently superior? Also indicate *why* you made that choice. (5)

a. Spatial resolution:

b. Total spatial coverage:

c. Temporal resolution:

d. Ability to study high-latitudes:

e. Transmission of data to the ground:

(1) Explain the term *sun-synchronous orbit* (what is it and why is it used?). Compare this to a *geostationary* orbit. How are they different and what is each used for? (3)

(2) Using the absorption curves given for the filters below, how would you block the radiation less than 500 nm on panchromatic film? What reason is there for blocking these shorter wavelength? The values on the X-axis range from 200 nm to 900 nm in increments of 100 nm. The Y-axis shows transmissivity with 100% shown at the bottom, and 0.1% at shown at the top (the Y-axis scale is logarithmic) (2)

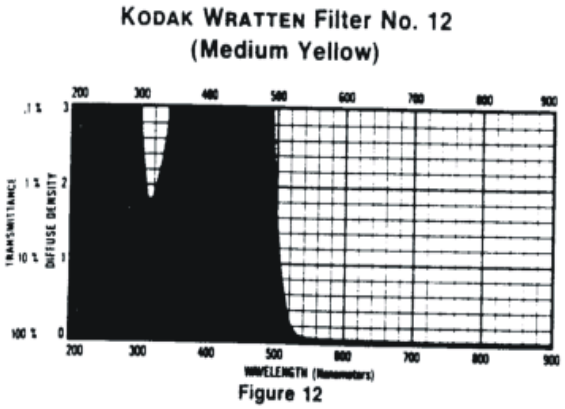

Figure 12

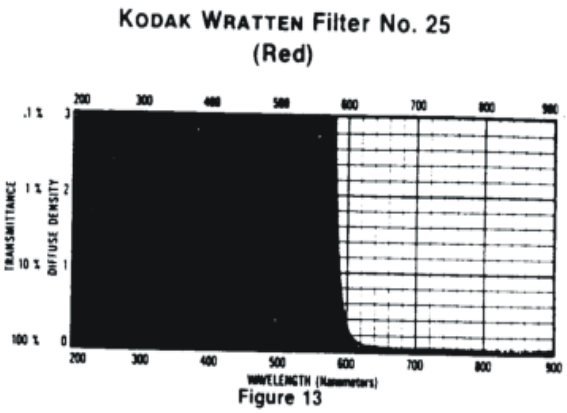

Figure 13

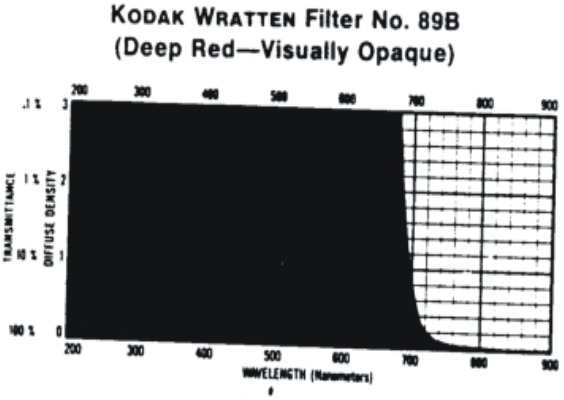

Figure 14

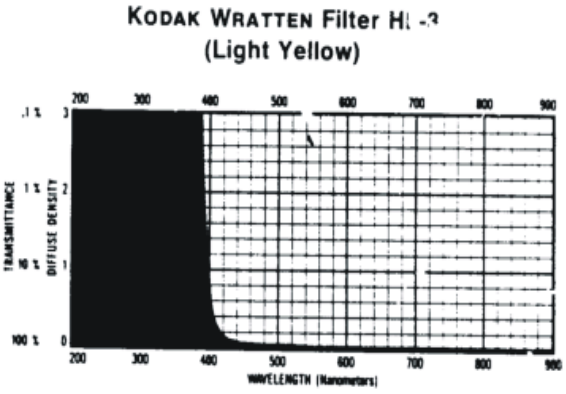

Figure 15

Part II: Landsat TM imagery and color composites

Navigate to *Z:\Geog Files\Hart\rs4093*, the remote sensing class folder "*rs4093*" in Geography server. Copy the folder "*Lab_3*" to *"D:"* drive.

Launch ENVI. Open the image file "D:\lab_3\bo_tm_bsq.512x512x7.img". This image contains all 7 bands of a Landsat TM image of Boulder.

In the *Available Bands List* window, select "RGB Color". Assign Band 4 to R (red), Band 3 to G (green) and Band 2 to B (blue). Click *Load RGB*. This will create and display what is known as a "False-color composite image." These images are often used in image analysis.

(3) What features stand out in this false-color composite? What colors do these features appear? (Choose at least 3 different land-cover types to describe). (3)

(4) What portions of the electromagnetic spectrum are mapped to which colors? (Be specific.) (3)

Play around with various band combinations and try to create a "true-color" image. Note that satellites do not take pictures of the ground so you cannot create an image that will look like a photograph, but using some clever color mapping you can create an image that looks as close to a photograph as possible.

(5) What bands did you use to create a "true-color" image? Which colors did you map these to? Why do these bands work? (Be specific about spectral regions.) (4)

Band 6 of Landsat TM is a thermal band. Unlike the other 6 bands that have a 30 m pixel size, the thermal band has a 120 m pixel size. Display Band 6 in gray scale.

(6) What features are lost at this resolution? What features are still apparent? (2)