Remote Sensing Laboratory
Lab Assignment #9
DEM APPLICAITON
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Data

b3b4all.ers: **Landsat**

     Channel1: 1979 MSS B5

     Channel2: 1979 MSS B7

     Channel3: 1987 TM B3

     Channel4: 1987 TM B4

     Channel5: 1992 TM B3

     Channel6: 1992 TM B4

     25m gird spacing

msk2vc2   **cloud and shadow mask**

rivbed   **riverbed**

workyear   **workyear (construction year)**

wsm25   **watershed area mask**

1. Calculation of NDVI

NDVI = (NIR' – R')/(NIR' + R') *100 + 100
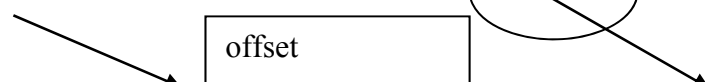
NIR' = NIR – Offset_NIR

R' = R – Offset_R

recommended Offset

Year	Offset_NIR	Offset_r
1979	0	4
1987	3	11
1992	8	14

Save as dataset

Example: Calculating vegetation index of 1979 LANDSAT MSS data using BANDMATH

$$VI_{1979} = (((b2-0)-(b1-4)/((b2-0)+(b1-4)))*100+100$$

offset

Scaling

2. Correction of NDVI

Select a **set of ROIs** representing bare land and undisturbed forest, which give the lowest NDVI and the highest NDVI, respectively.

Example:

Date of Data	Bare Land	Forest
1979	83.10	158.31
1987 (reference)	97.15	175.17
1992	96.49	173.79

CorrectedVI = (VIref_max–VIref_min)/(VItarget_max–VItarget_min) * (VItarget–VItarget_min)+VIref_min

Sample BANDMATH:

$$VI_{79cor}=((175.17-97.15)/(158.31-83.10)*(VI_{1979}-83.10)+97.15$$

After the correction, average of the ROI of target images should be the same with reference image.

Example:

Date of Data	Bare Land	Forest
1979	97.10	175.31
1987 (reference)	97.15	175.17
1992	97.49	175.79

3. Extraction of average of VI for each work year and each elapsed time

Step 1: Mask out cloud and shadow, and riverbed from the corrected NDVI.

- build mask from "**msk2vc2**" and apply mask to corrected VIs.
- build mask from "**rivbed**" and apply mask from above.

Step 2: Calculate the average of NDVI for each year, using the image file **"workyear".**
- open/display corrected and masked NDVI
- open tools
    define ROI
        click options
            select Band Threshold to ROI
                select "workyear" for input file
                    enter min and max threshold
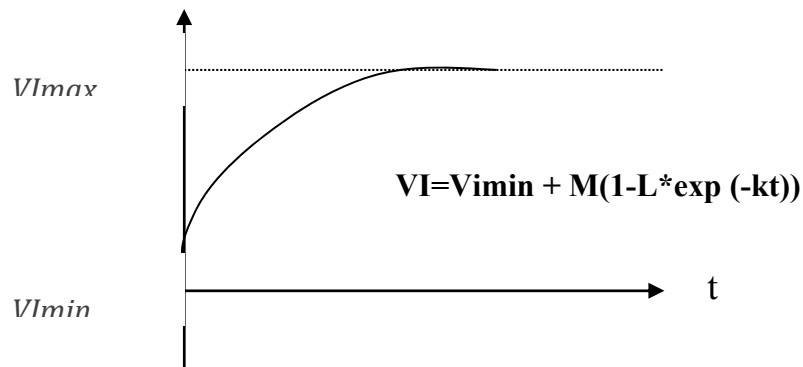- from ROI tool, click options, select Stats for all region

Step 3: Show the result as a table: Workyear v.s. NDVI at each year
Example:

Year	1979	1987	1992
57	142.44	149.66	144.63
58	114.94	122.44	122.26
..			
91	--	--	17.74

Step 4: Convert the table into elapsed time v.s. NDVI

Elapsed time (years)	1979	1987	1992
1			17.74
2			62.38
..			
34			144.63

4. Determination of parameters of the restoration model

$$VI = VImin + M (1 - L e^{-kt})$$

VI = VImin + M (1 – L e^{-kt})
M = VImax – VImin
(VImax – VI)/M = L e^{-kt}
ln((VImax – VI) / M) = - kt + ln L

Apply least square error method on
y = ax + b
where
y: ln ((VImax – VI)/M)
x: t
a: -k
b: ln L
Determine a and b

$$a = (\sum x^2 \sum y - \sum x \sum xy) / (n \sum x^2 - (\sum x)^2)$$

$$b = (n \sum xy - \sum x \sum y) / (n \sum x^2 - (\sum x)^2)$$

and calculate L, k

Calculate regression on each year and averaged NDVI.

Determined equations and parameters to be shown as equations and graphs

4. RESULT

5. DISCUSSION AND CONCLUSION: