Comparison of Albedo, Temperature, and NDVI among Different Cover Types in Connecticut

Presentation on June 30th
Ziyan Chu
Objective

- Land cover types: Conifer, Deciduous, Grass, Urban and Water

- Objectives:
  - Surface Temperature (Kelvin)
  - Albedo
  - NDVI
Landsat Image

- Landsat 7 ETM+, SLC (Scan Line Corrector) – on
  - 8 bands totally
  - 2 thermal band

- Landsat 4-5 TM
  - 7 bands totally
Methods

- Images through a year: Mar, Apr, June, July, Aug, Nov
- Land cover: conifer, deciduous, grass, urban, water

Step:
- Create polygons (ROI) for each land cover type
- Use the polygons from one image for other images
- Calculate the average value for each type of polygon
Landsat 7, SLC – on (741-RGB)

Mar
Landsat 7, SLC - on (741-RGB)
Landsat 7, SLC – on (741-RGB)

June
Landsat 7, SLC – on (741-RGB)

Junly
Landsat 7, SLC - on (741-RGB)

Aug
Landsat 7, SLC – on (741-RGB)

Oct 20
Landsat 7, SLC – on (741-RGB)

Nov, 1999
Polygons for Landsat 7 from the image in Apr

- Conifer
Deciduous Polygons for Landsat 7 from the image in Apr
Polygons for Landsat 7 from the image in Apr

- Grass
Polygons for Landsat 7 from the image in Apr

Urban
Polygons for Landsat 7 from the image in Apr

- Water
Landsat 4-5 TM (741-RGB)
Landsat 4-5 TM (741-RGB)

Apr
Landsat 4-5 TM (741-RGB)

- June
Landsat 4-5 TM (741-RGB)

- July
Landsat 4-5 TM (741-RGB)

Aug
Landsat 4-5 TM (741-RGB)

Oct 28
Polygons for Landsat 4-5 TM from the image in Apr

- Conifer
Polygons for Landsat 4-5 TM from the image in Apr

Deciduous
Polygons for Landsat 4-5 TM from the image in Apr

- Grass
Urban Polygons for Landsat 4-5 TM from the image in Apr
Polygons for Landsat 4-5 TM from the image in Apr

- Water
Calculation

- **Albedo_Liang**: Convert Landsat reflective band DN’s to reflectance. Use Liang method to weight reflectances and obtain overall albedo.

- **Albedo_Mean**: Convert Landsat reflective band DN’s to reflectance. Get the average value from all the bands.

- **Temperature (K)**: Convert Landsat thermal band DN’s to radiance. Then convert radiance to Temperature (K) by
  \[ \frac{1260.56}{\text{alog} \left( \frac{607.76}{B1} + 1 \right)} \]

- **NDVI**: \( \frac{(NIR-RED)}{(NIR+RED)} \)
Albedo comparison

Left: Landsat 7, Right: Landsat 4-5
Landsat 7

Albedo_Liang

Albedo_Mean

Temperature (K)

NDVI
Landsat 5

- **Albedo_Liang**
- **Albedo_Mean**
- **Temperature (K)**
- **NDVI**
Next step for temperature

- Get the sounding information to calculate the air temperature at 925m and 850m
- Calculate the air temperature for all the polygons (at different altitudes)
- See how much differences between air temperature and the surface temperature got previously (exclude the influence of warmer or colder days)
Thank You
Snow issue (Landdat 7)

- **Albedo_Liang (with snow)**
- **Albedo_Mean (with snow)**
- **Temperature (with snow)**
- **NDVI (with snow)**
Relative Temperature (Landsat 7)
Relative Temperature (Landsat 5)
Relative Temperature (with snow)

- **Albedo**: Liang vs. Mean (with snow)
  - Albedo vs. Month (March to November)
  - Data points for different months indicate varying albedo values.

- **Albedo Mean**: Conifer vs. Deciduous (with snow)
  - Albedo Mean vs. Month (March to November)
  - Graph shows albedo mean for conifer and deciduous trees over months.

- **Temperature (with snow)**
  - Temperature vs. Month (March to November)
  - Graph illustrates temperature variations for different months.

- **Relative Temperature (with snow)**
  - Relative temperature vs. Month (March to November)
  - Graph compares relative temperature for conifer and deciduous trees.
Localized Polygons (Replicas)
Replica 2
Replica 4
Replica 1

- Albedo
  - Liang
  - Tasumi
  - Average
- NDVI
- Relative Temperature

![Graph showing Albedo two calculations](image)

\[ y = 0.913x + 0.0055 \]

\[ R^2 = 0.9951 \]
Note: Altitude of Deciduous is higher than Conifer in this case.
Comparison of temperature variations between replica 1 and whole environment.

Graphs show temperature (relative) over months from March to November.

- Conifer
- Deciduous
- Grass
- Urban
- Water