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

Presentation on June 30th
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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)
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)
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
Polygons for Landsat 7 from the image in Apr

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

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

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

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

Urban
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 $\frac{1260.56}{\log((607.76 / B1) + 1)}$

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

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

Albedo_Liang

Month

Albedo_Mean

Month

Temperature (K)

Month

NDVI

Month
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)

**Albedo_Liang**

**Albedo_Mean**

- Conifer
- Deciduous
- Grass
- Urban
- Water
Localized Polygons (Replicas)
Replica 2
Replica 3
Replica 4
Replica 1

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

Albedo_two calculations

\[ y = 0.913x + 0.0055 \]
\[ R^2 = 0.99508 \]
Note: Altitude of Deciduous is higher than Conifer in this case.
Replica 1 vs Whole