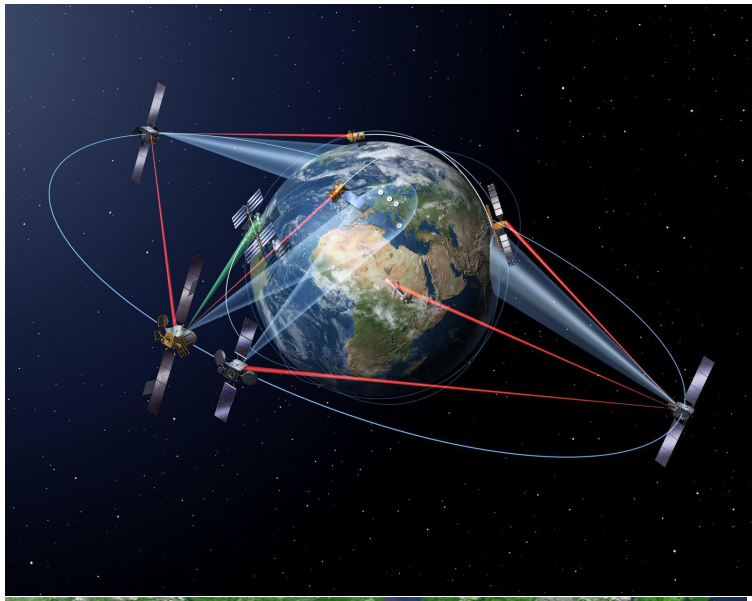
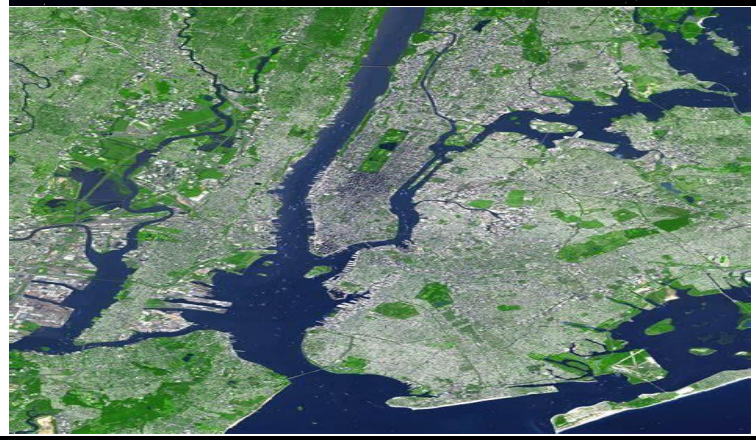
Downscaling Methodology For Satellite Land Surface Temperatures Over Urban Environments





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NOAA CESSRST Summer Symposium,
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Outline

WHY DOWNSCALING?

- High resolution LST for cities may improve prediction of heat indices and the effects of urban heat islands. Improving indices and understanding heat islands are crucial for sustainable and resilient urban environments.

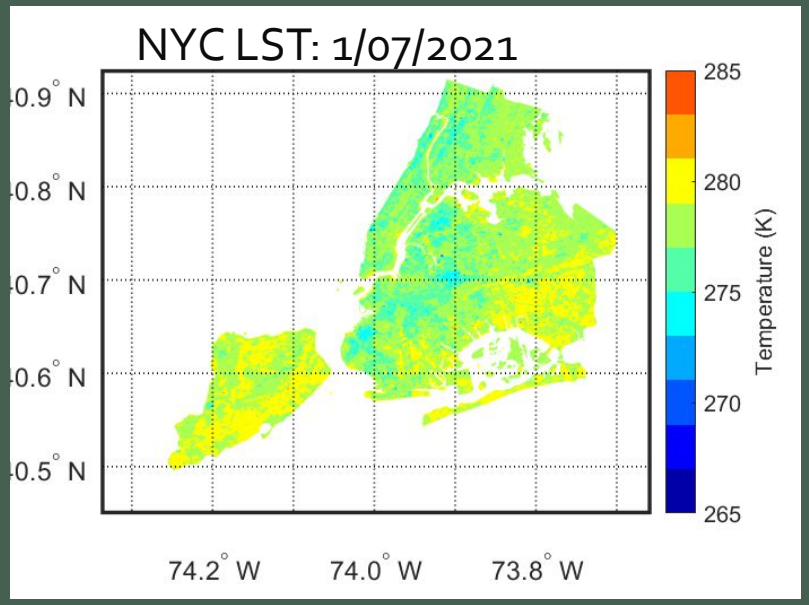
- There is no satellite that provides high spatial and temporal resolution data.

- Downscaling GOES-R LST to Landsat 8 spatial resolution will give high spatial and temporal resolution that could be used to study urban heat island

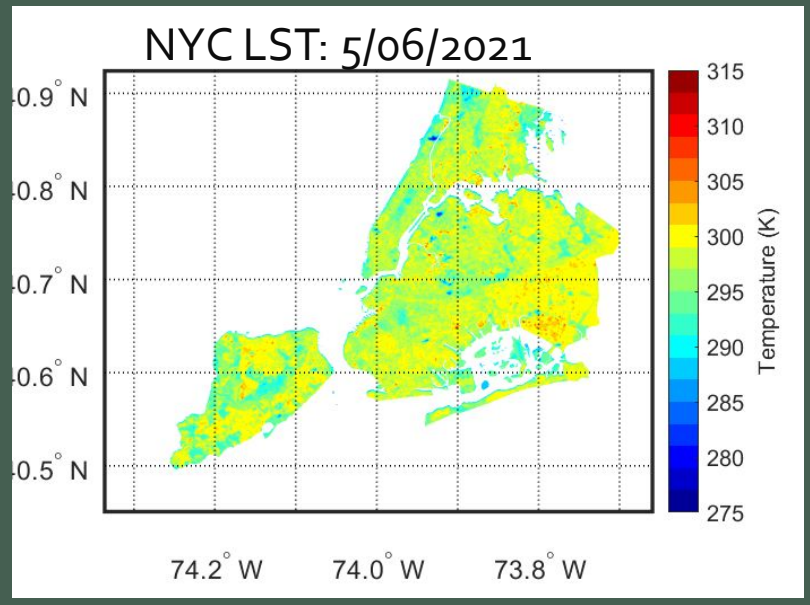
MATERIALS AND METHODS

- Download Landsat 8 data from the USGS Earth Explorer
- Subset the data of NYC using SNAP Software
- Using the following formula, $L_\lambda = M_L \times Q_{cal} + A_L$, we converted the raw data to spectral radiance
- The spectral radiance is converted into brightness temparature using the equation below $L_\lambda = M_L \times Q_{cal} + A_L$
- The Land surface temperature (LST) is obtained over NYC by dividing by the surface emissivity $LST = Tb/\varepsilon$
- Download NYC Landcover data from NYC open Data
- Convert the landcover from 3ft to 30m to 2km on SNAP

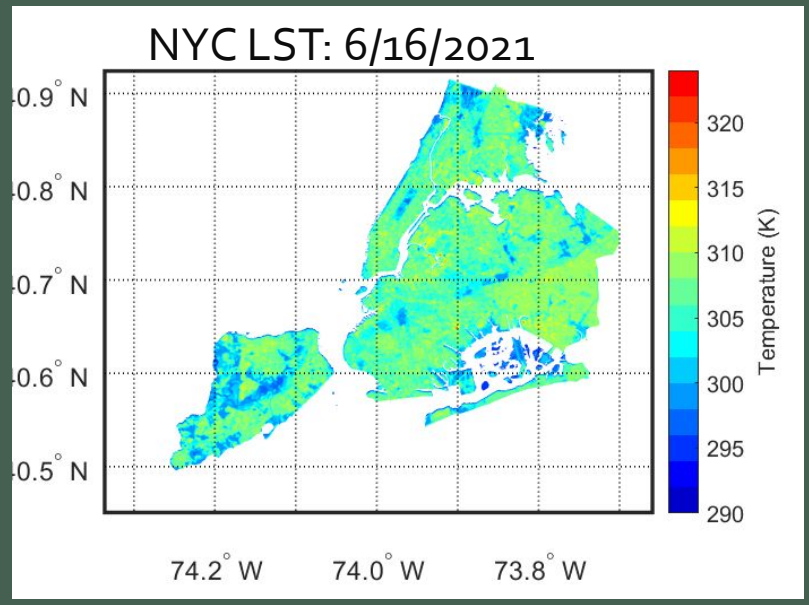
RESULTS



Winter

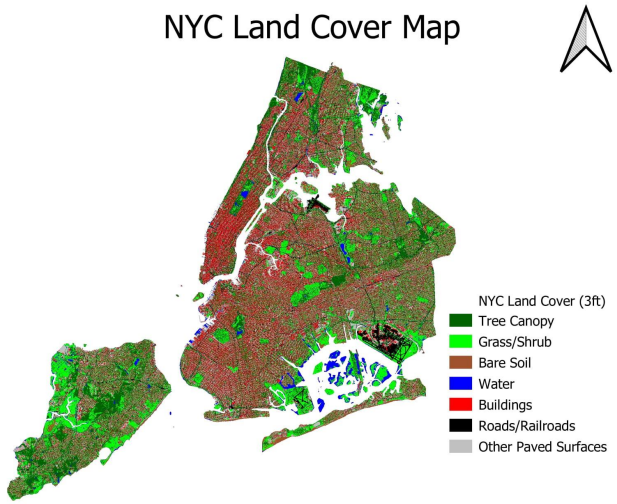


Spring

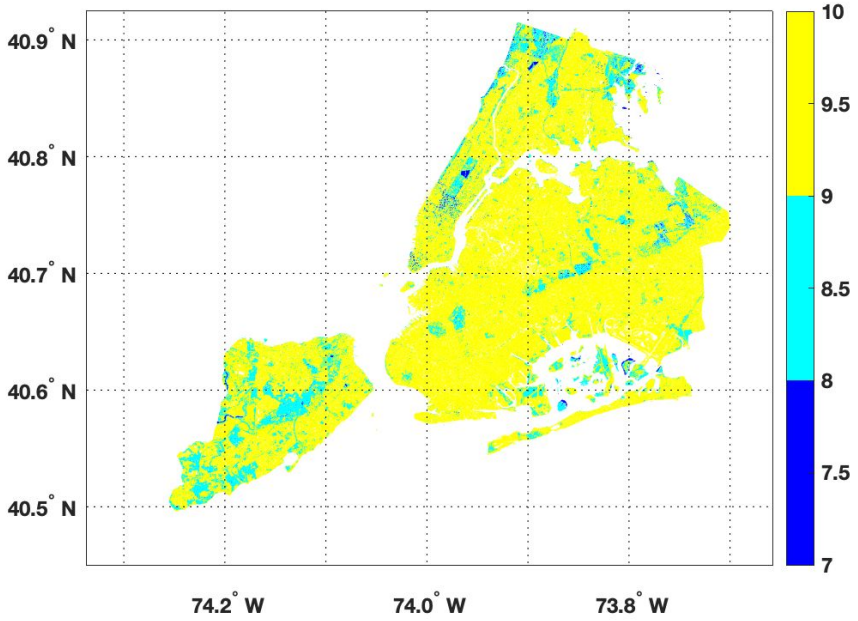


Summer

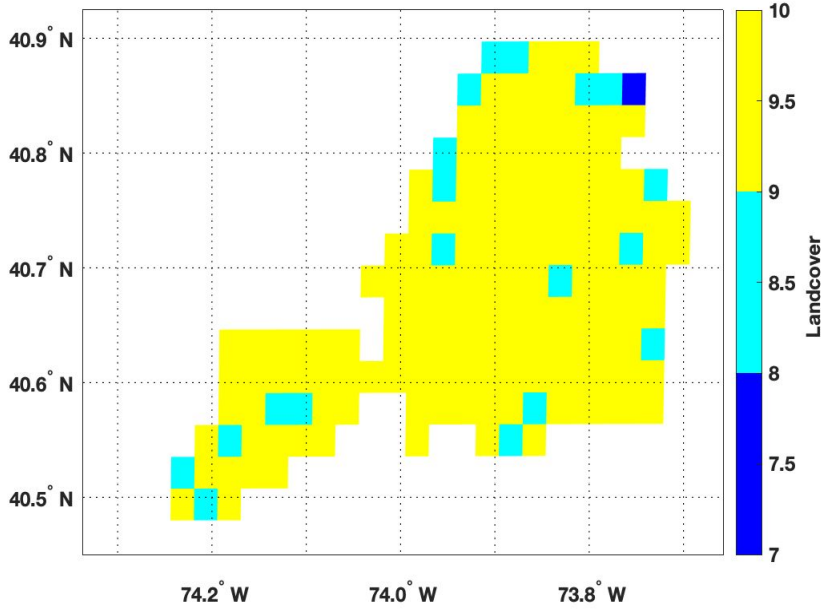
RESULTS



Landcover Map 30m



Landcover Map 2km



CONCLUSIONS AND PERSPECTIVES

- Regions with high concentrations of vegetation and regions along the coast remain coolest throughout the year.

- Regions with high building density, on the other hand, remain warmer than the surrounding area for the duration of the year.

Our group has several next steps in mind: Downscale GOESR LST to Landsat 8 spatial resolution

-We will collect in situ data using handheld and drone IR cameras from various locations in the city.

-We will also analyze and downscale GOES-R and ECOSTRESS data to Landsat 8 resolution. In-situ data and ECOSTRESS data will be used to validate downscaled data.

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THANK YOU