

Modeling of Urban Heat Island

Looking through more cities

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Candidate Causes for UHI

- Known thoughts:
 - Decreased longwave radiation loss and increased absorption of solar radiation and longwave radiation (canyon effect)
 - Anthropogenic emission of heat
 - Reduction of evapotranspiration
 - Increased storage of sensible heat within urban materials
 - Reduced transfer of heat

What else?

- Any factors else other than these traditional causes?
for example,
 - City forms?
 - Background Environment?
 - ...
- In order to address this question, we looked through more cities to establish the intuition

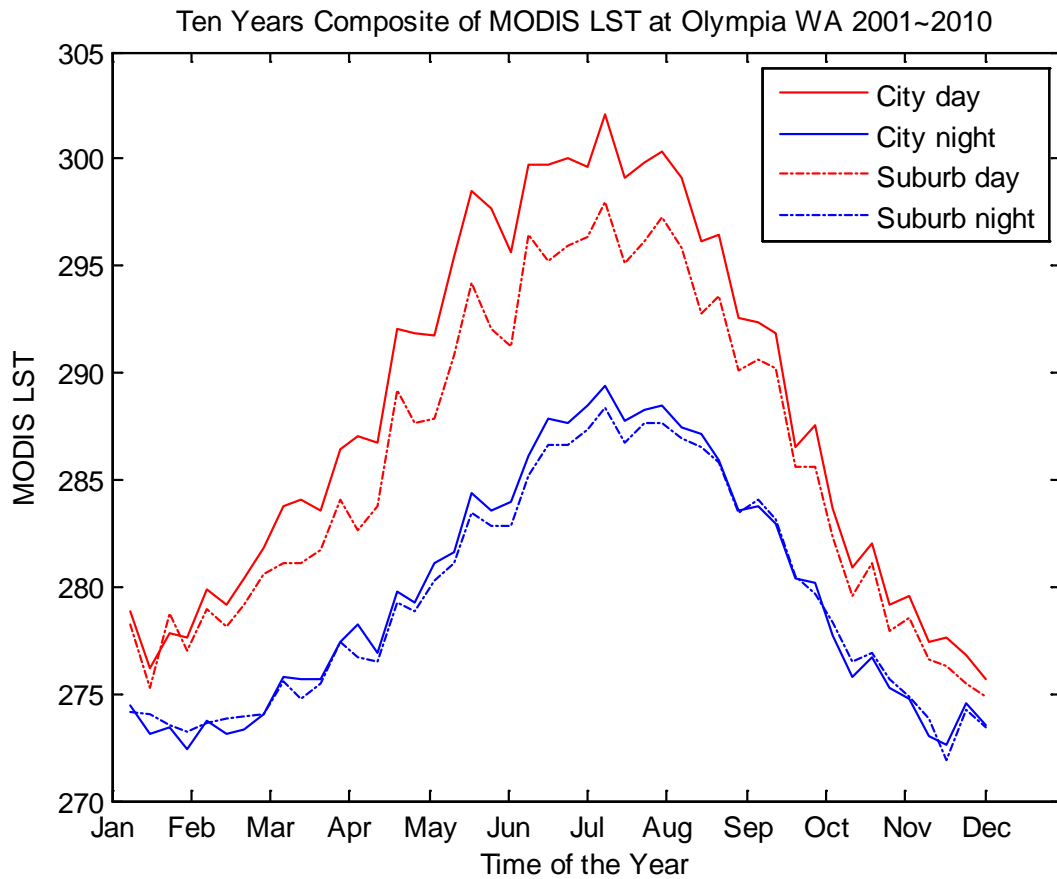
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- Data: MODIS Terra LST 8-day Composite
- Cities: One city of each state in the US (Capital or large city of each state)
- Ten years' composite analysis of each city
- When selecting pixels to calculate the UHI Intensity:
 - avoid large water bodies
 - avoid altitude difference
 - avoid latitude difference
 - choosing the large enough cities
 - Median value of the selected pixels

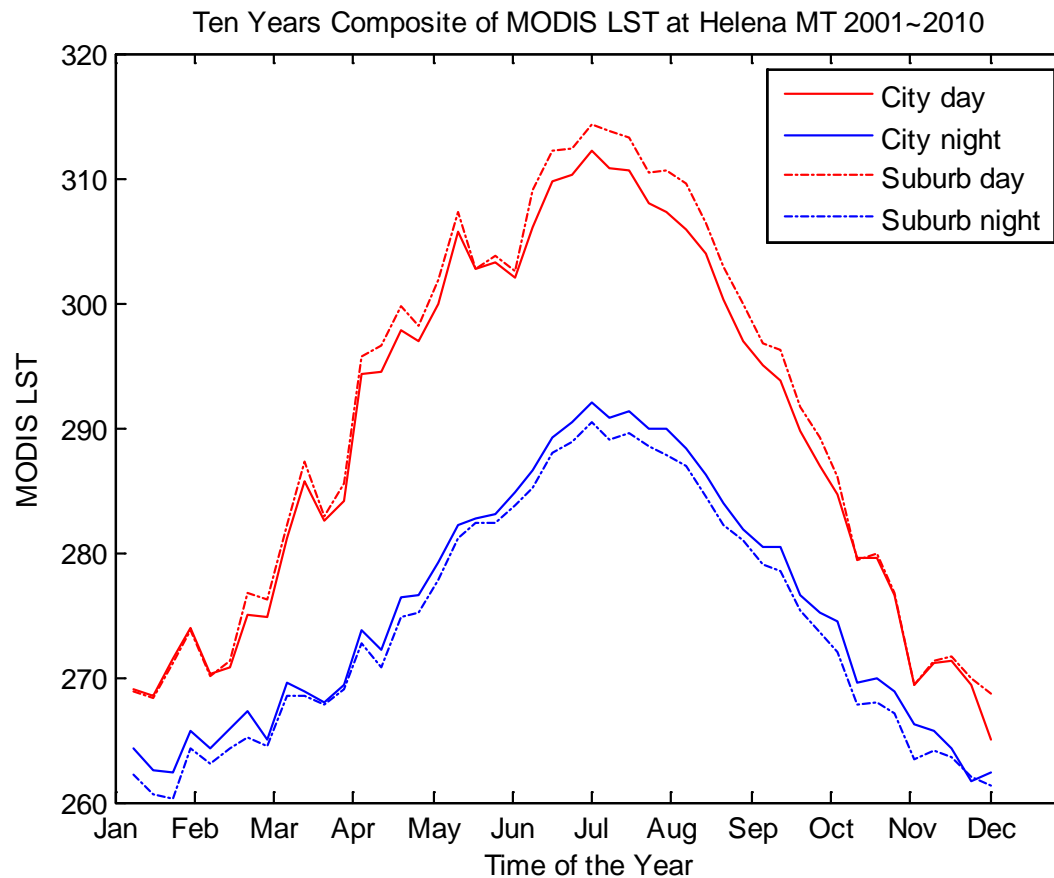
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- Why using median value:
 - could avoid the few extreme numbers which would affect the mean value.
 - the extreme numbers could be the pixels of lake or river in the city or rural area.

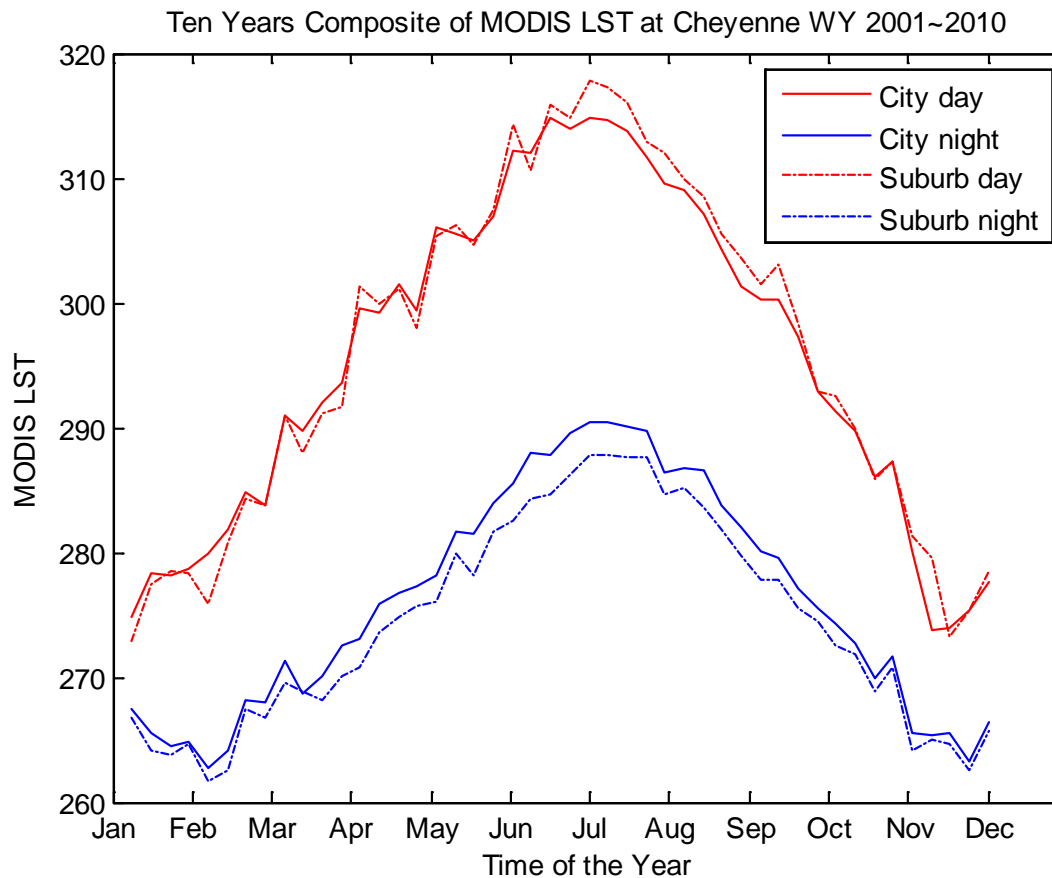
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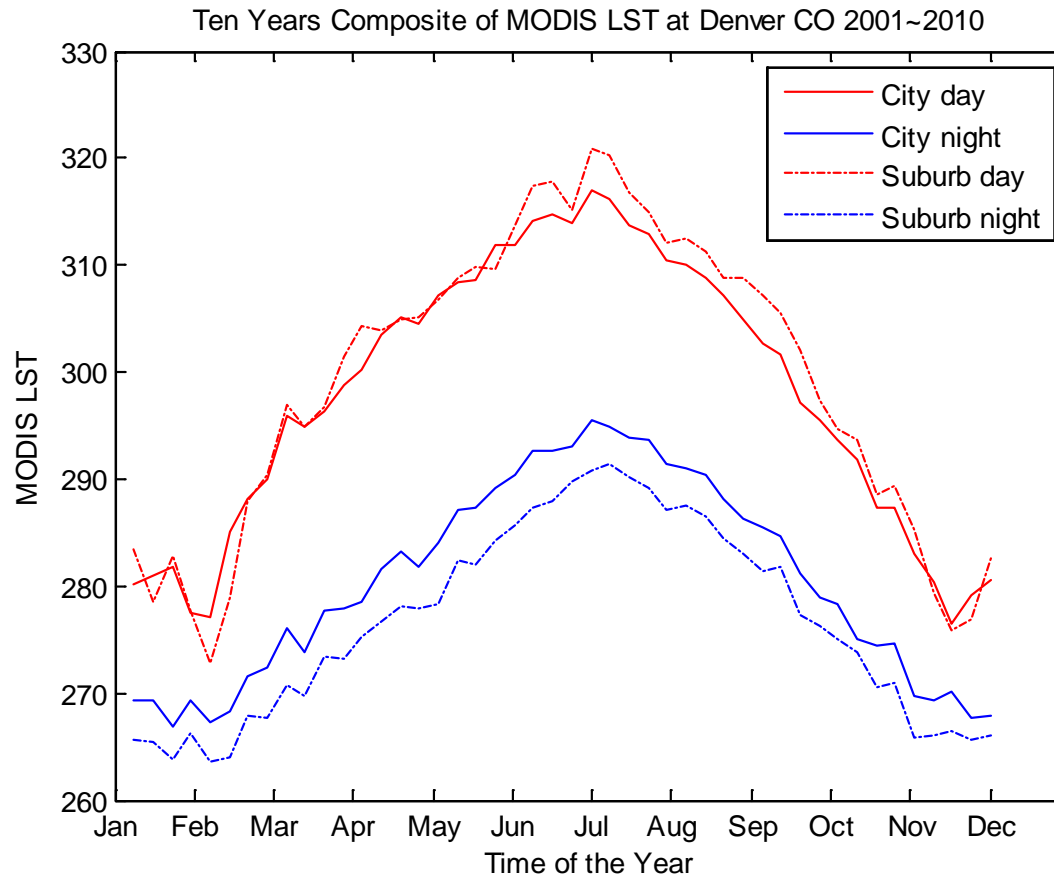
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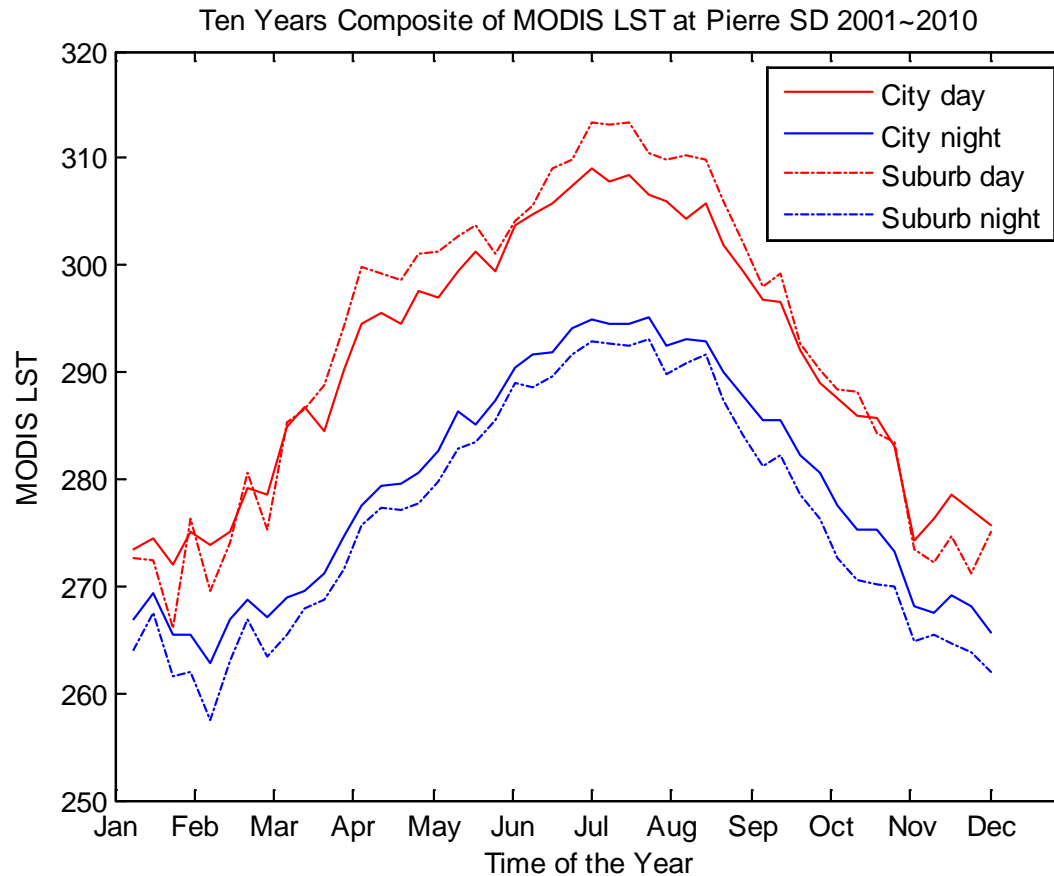
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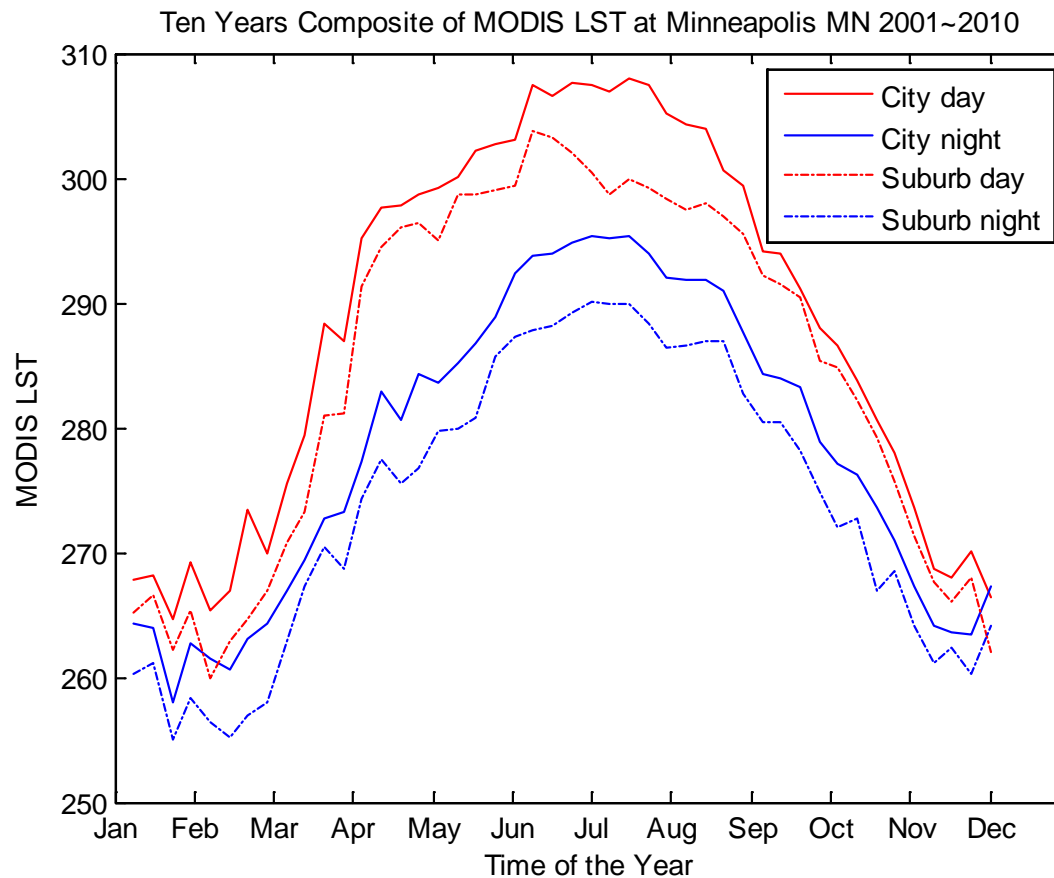
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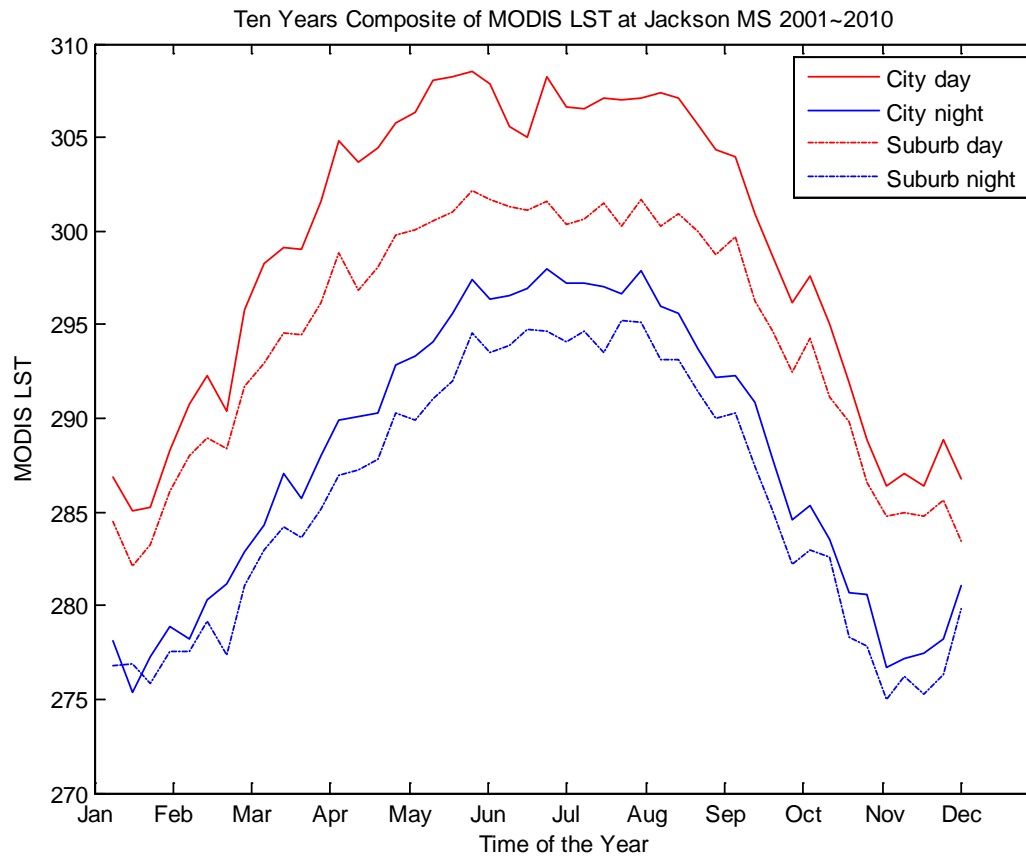
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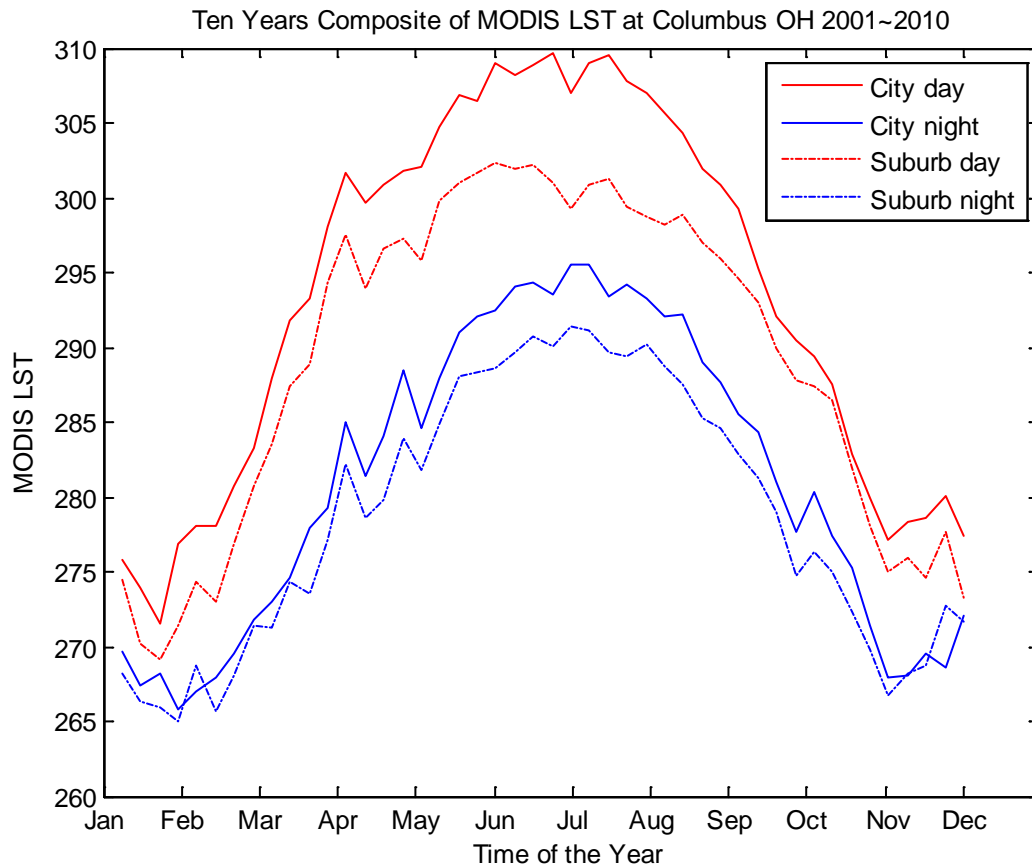
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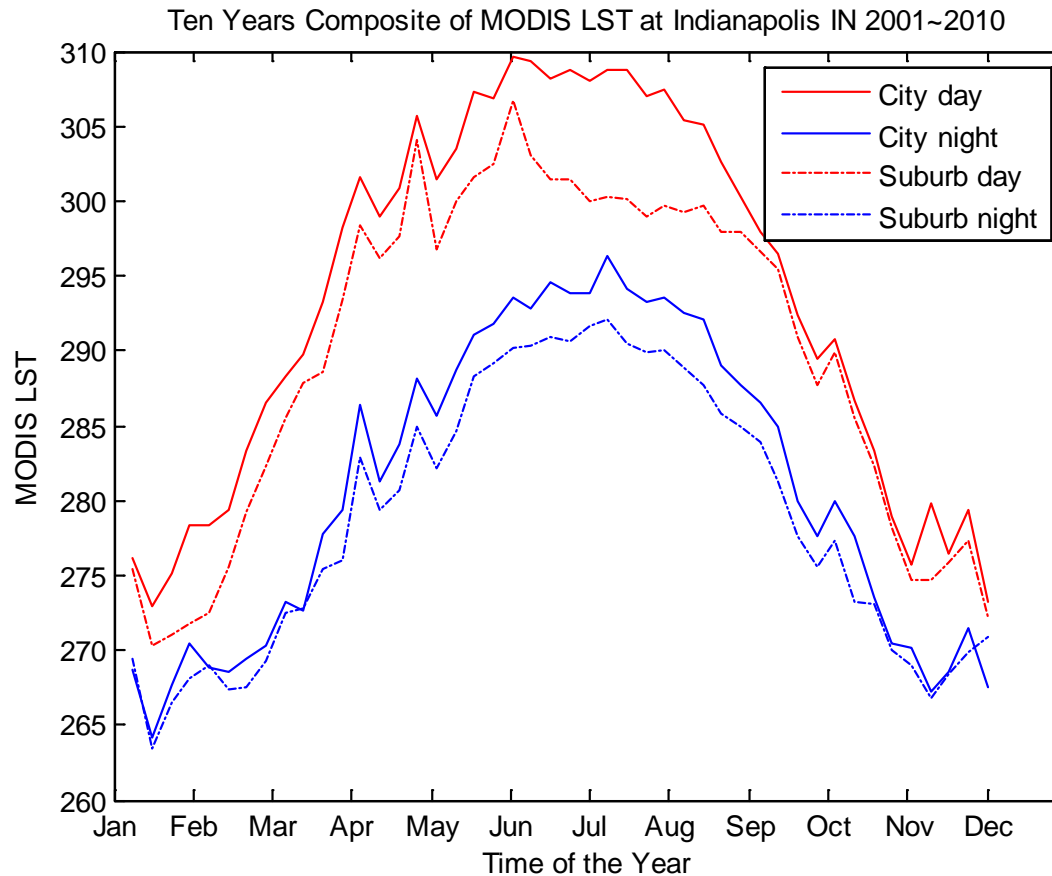
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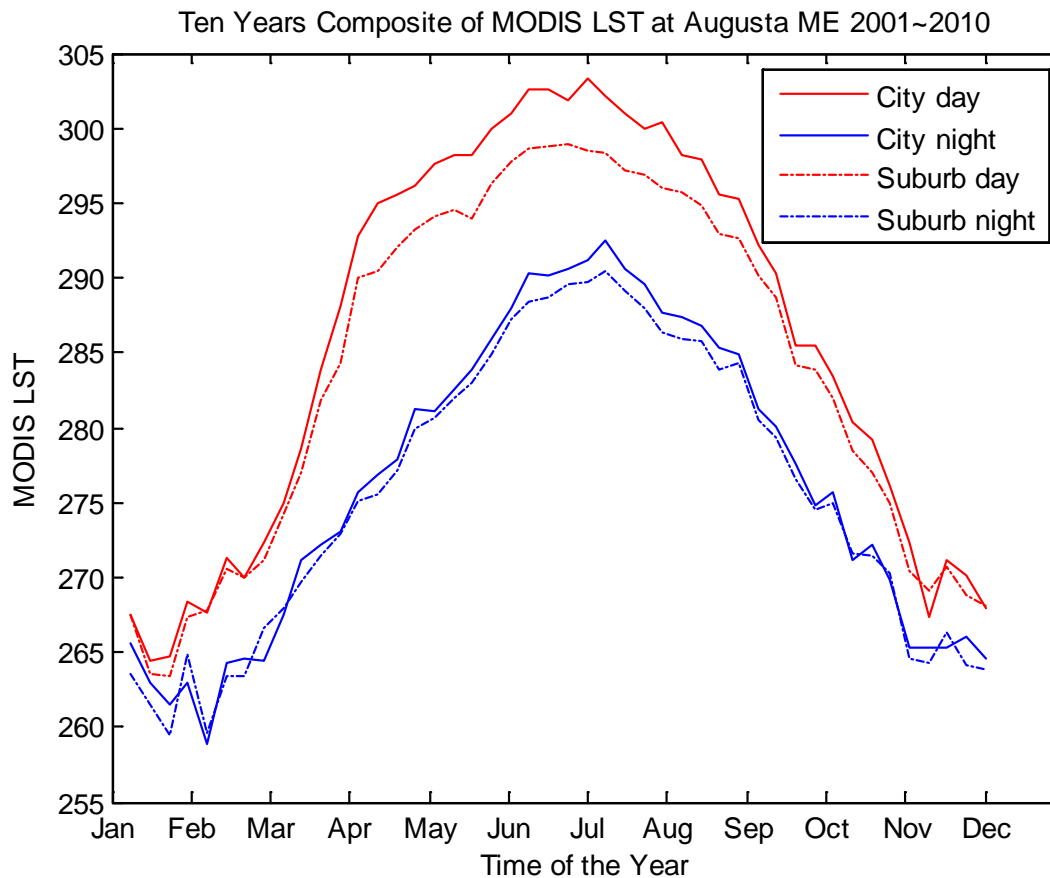
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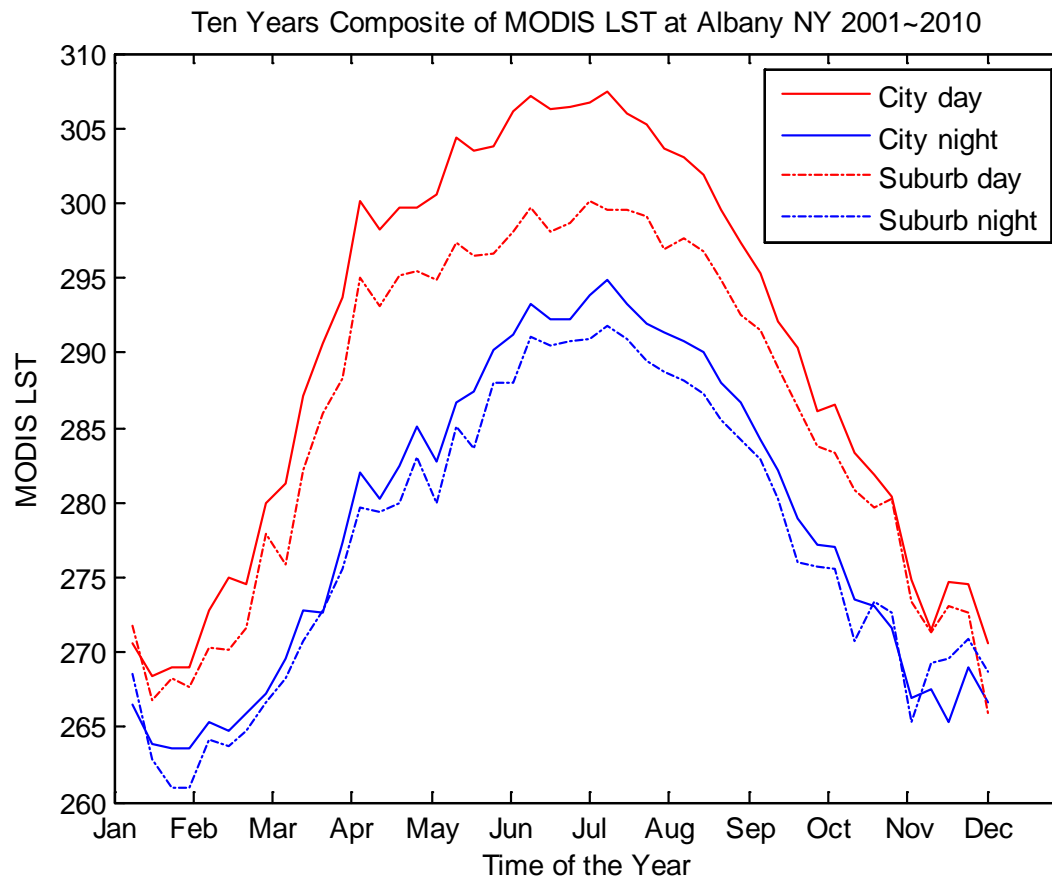
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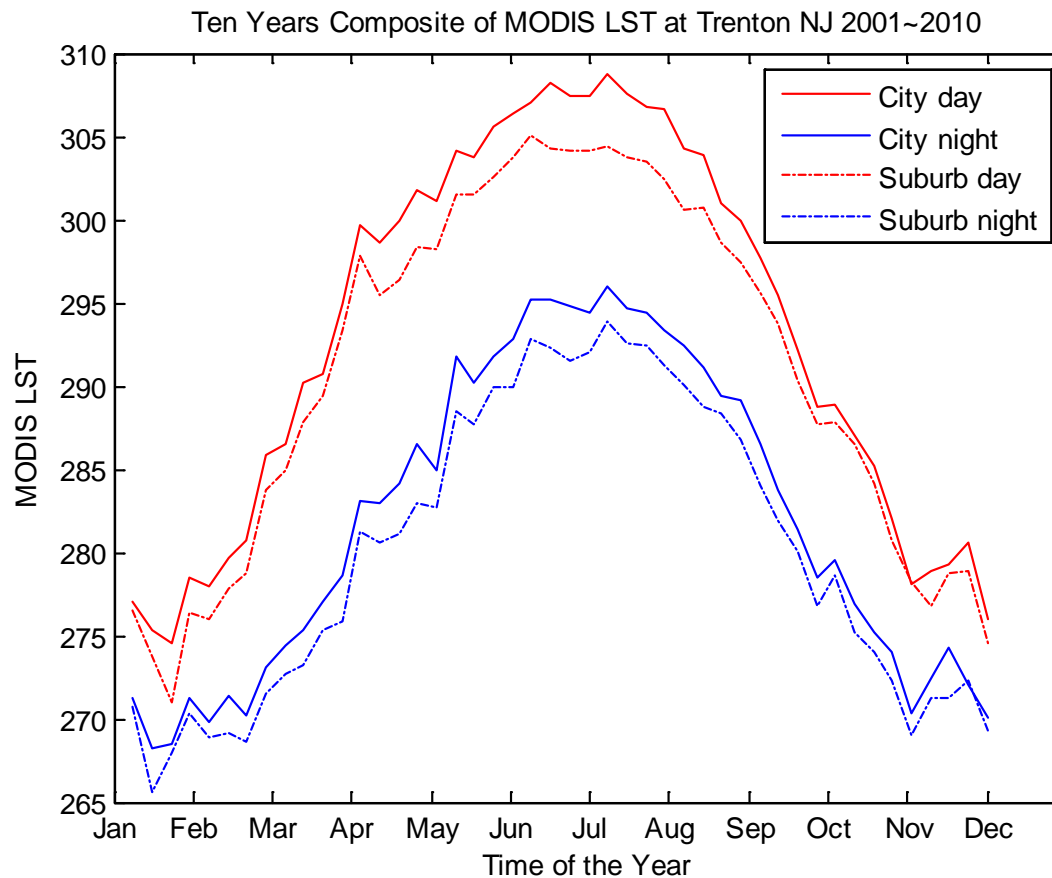
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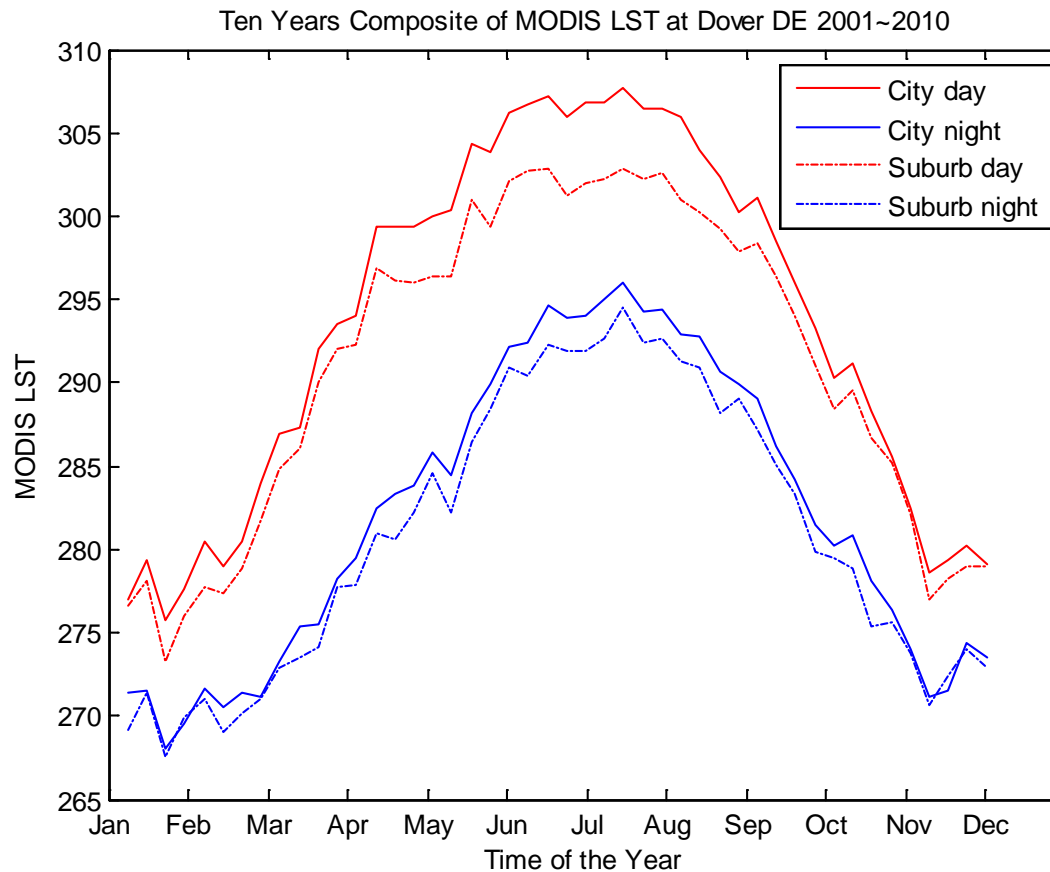
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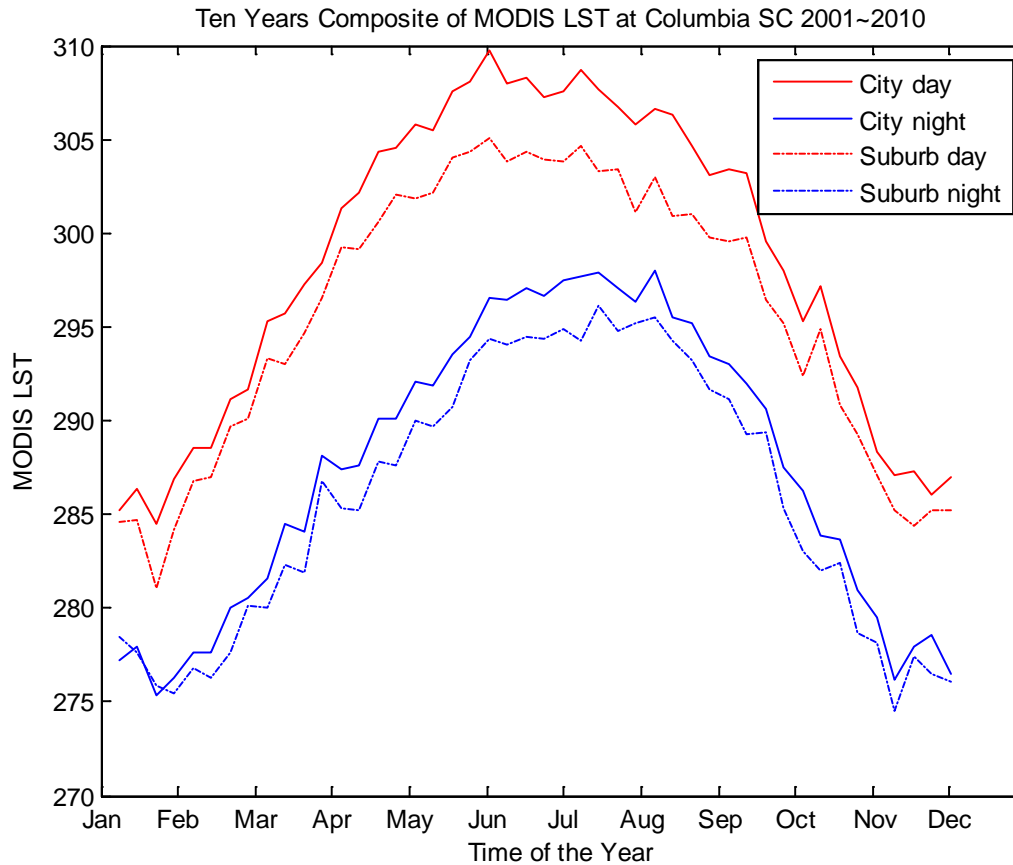
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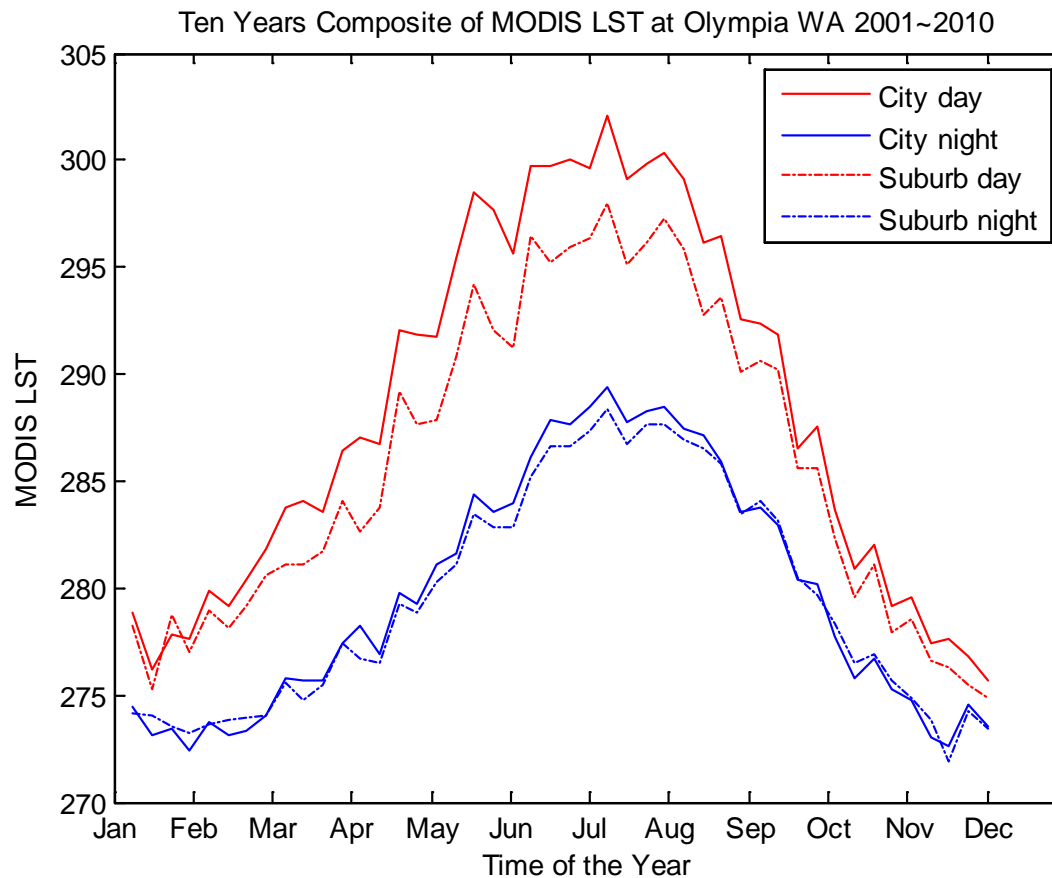
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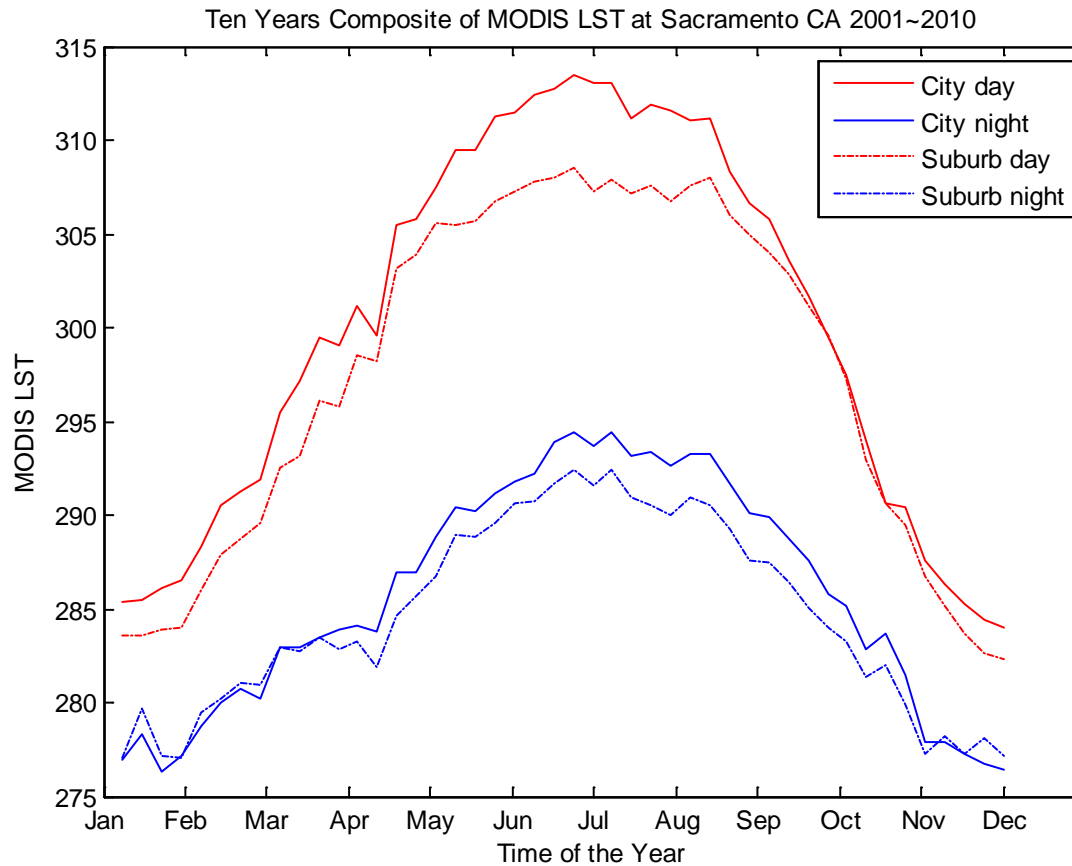
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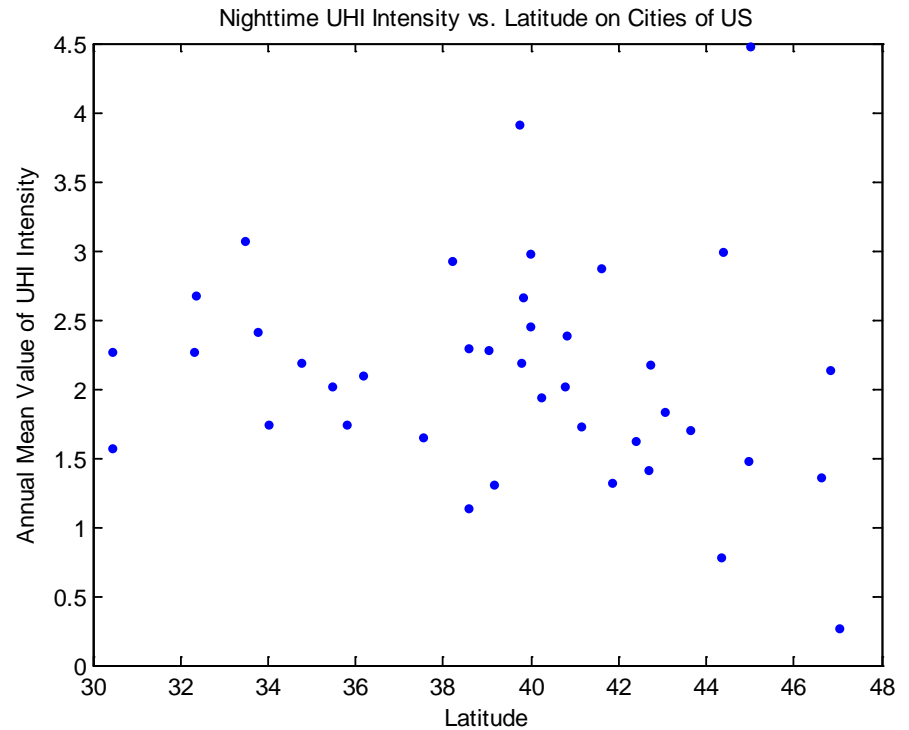
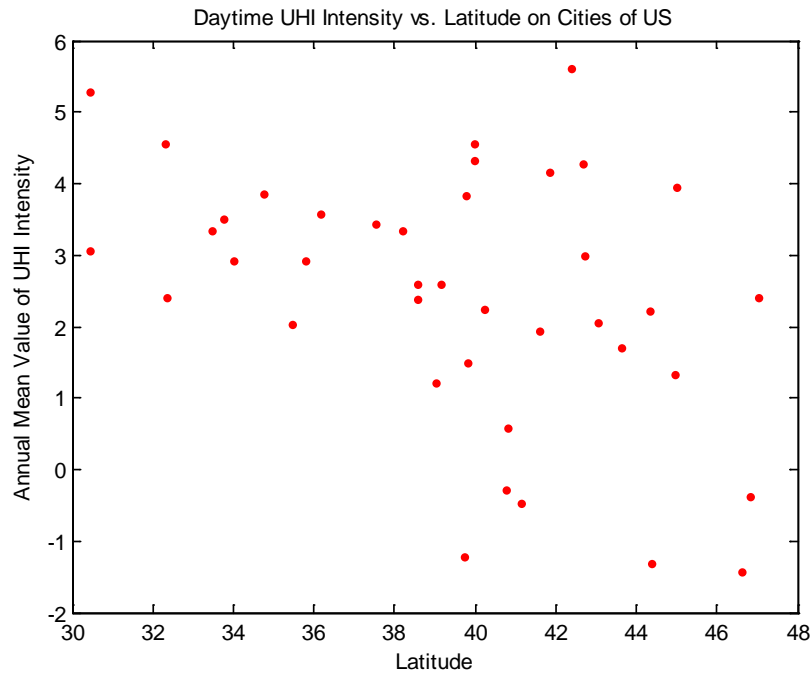
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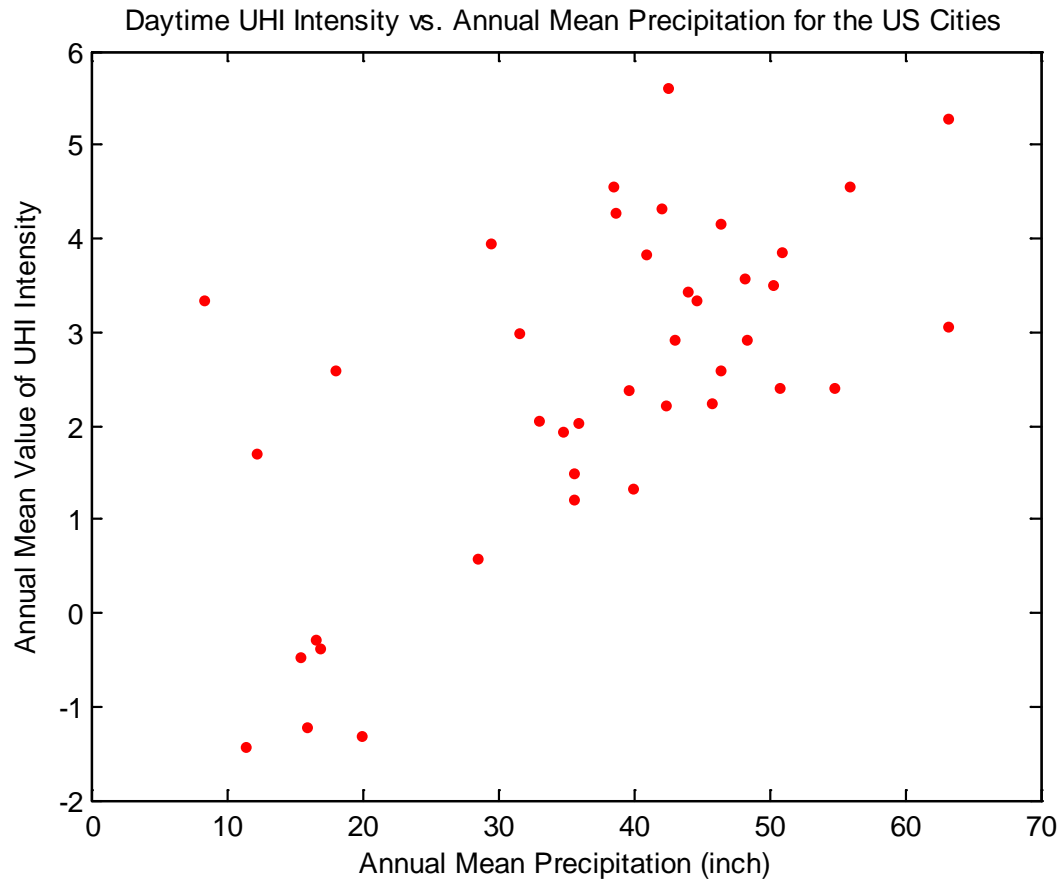
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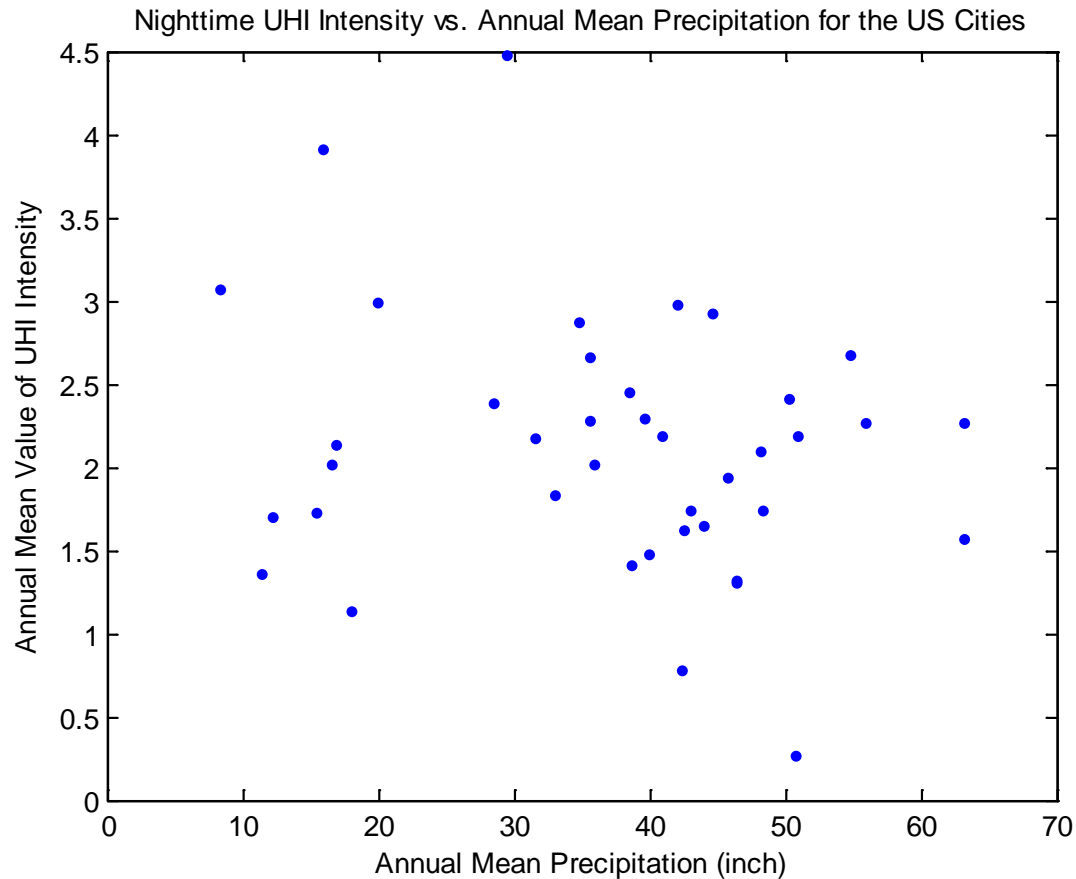
Preliminary Trend Analysis



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Some Intuitions

- In most of the cities, UHI at daytime is stronger than that at nighttime (MODIS LST derived UHI), which contradict the traditional idea.
- In some cities, daytime LST even do not indicate UHI
- Nighttime temperature can always show UHI
- Summer seasons have the stronger UHI intensity than winter seasons, which contradict the traditional idea.

Some Intuitions

- Background environment does influence the UHI, for example. Wet background environment seems to increase the UHI.
- UHI intensity is formed by complex causes, cities with similar background environment and similar scale still have difference UHI intensity. City forms and other factors do influence.

Upcoming work

- Correlate UHI with:
 - Aridity index
 - Vegetation fraction in the city
 - Population density
 - City size
 - Mean building height
- Define the parameters to embody the various factors of UHI.