



Land Use and Land cover Change Feedbacks on Climate, Water and Energy Demand

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11/12/2014

Research Question:

- 1. How well can high-resolution RCM simulations reproduce urban climate, especially temperature structure and precipitation events?
- 2. How much would future extreme precipitation be under warmer climate and land use and land cover change (LULCC)?
- 3. How water and energy demand respond to LULCC and climate change?

Challenges and Opportunities:

- Providing **input data** for ecosystem service analysis such as:
 - Climate regulation analysis: **getting hotter!**
 - Natural hazard analysis: **extreme precipitation**
 - Flood regulation analysis
- Important support data for decision making regarding infrastructure design, such as sewage system.

Research Domain:

(Blue box) includes the entire Sun Corridor as projected to 2050 from Laura Norman, USGS.

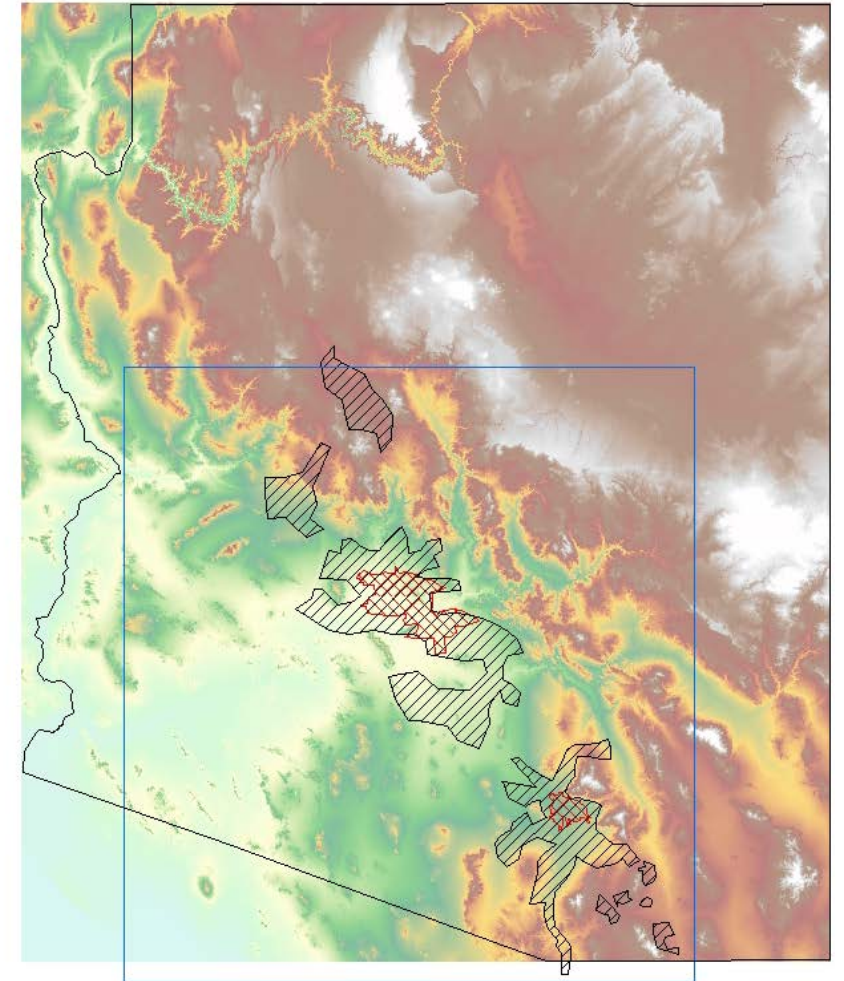
It overlaps with research areas of other members in SWAN, serves as physical base for further analysis including hydrological modeling, ecosystem service, groundwater modeling.

Legend

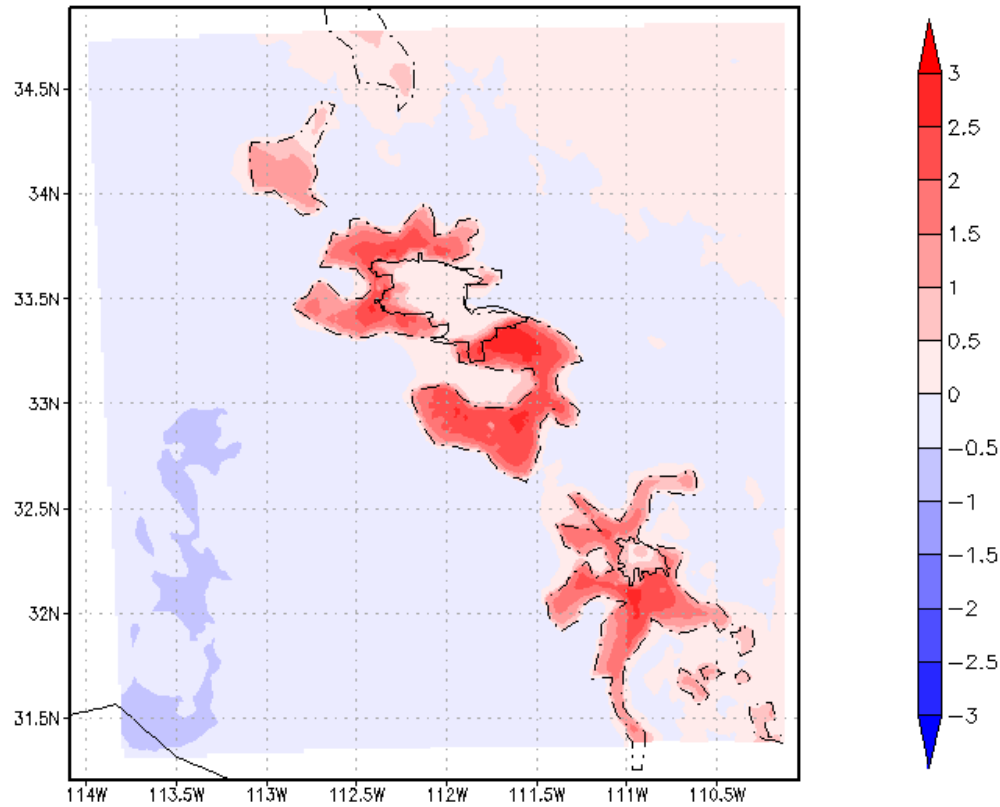
- Arizona
- Domain
- urban_2050
- urban_2050_tucson
- urban_2050_phoenix

DEM

- Value
- High : 3759
 - Low : -17

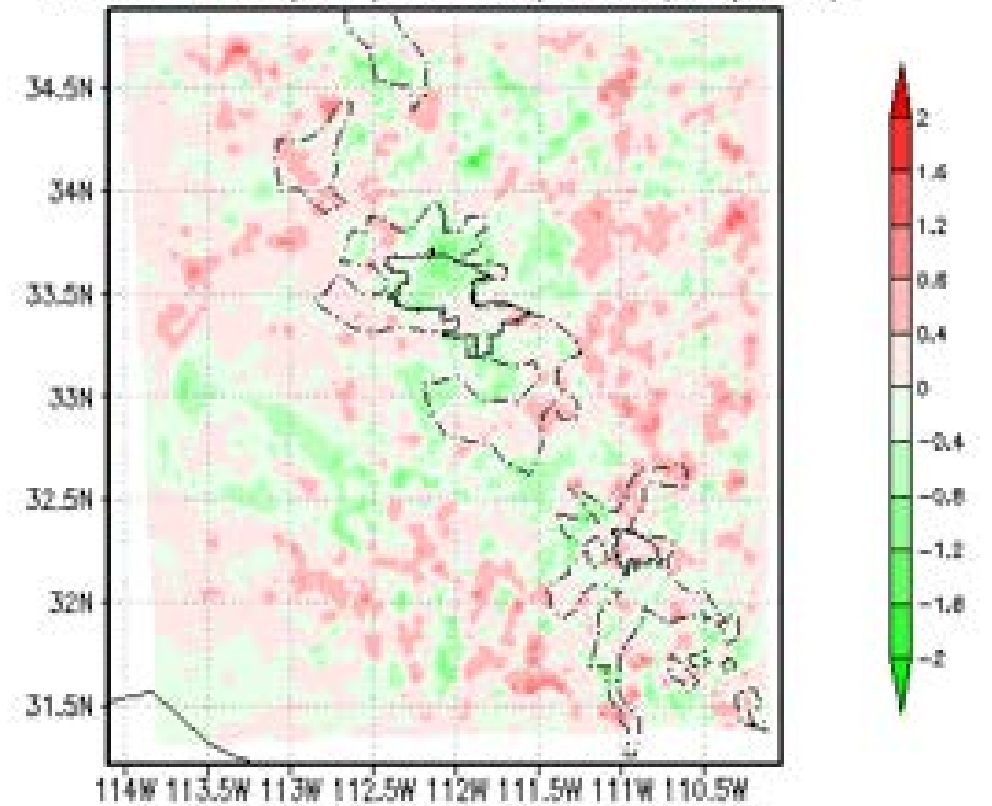


Mean HI difference (F)

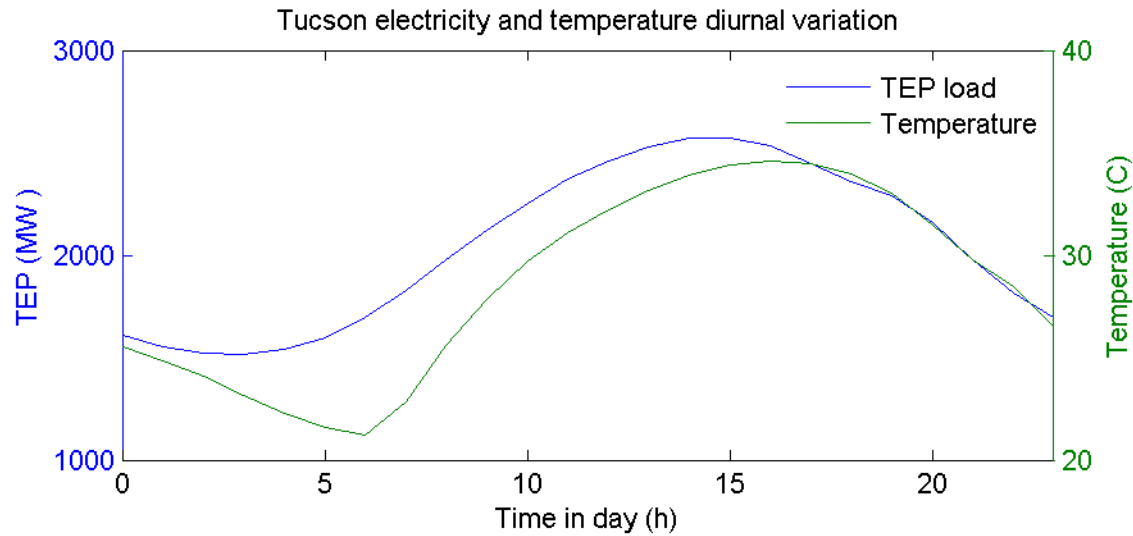
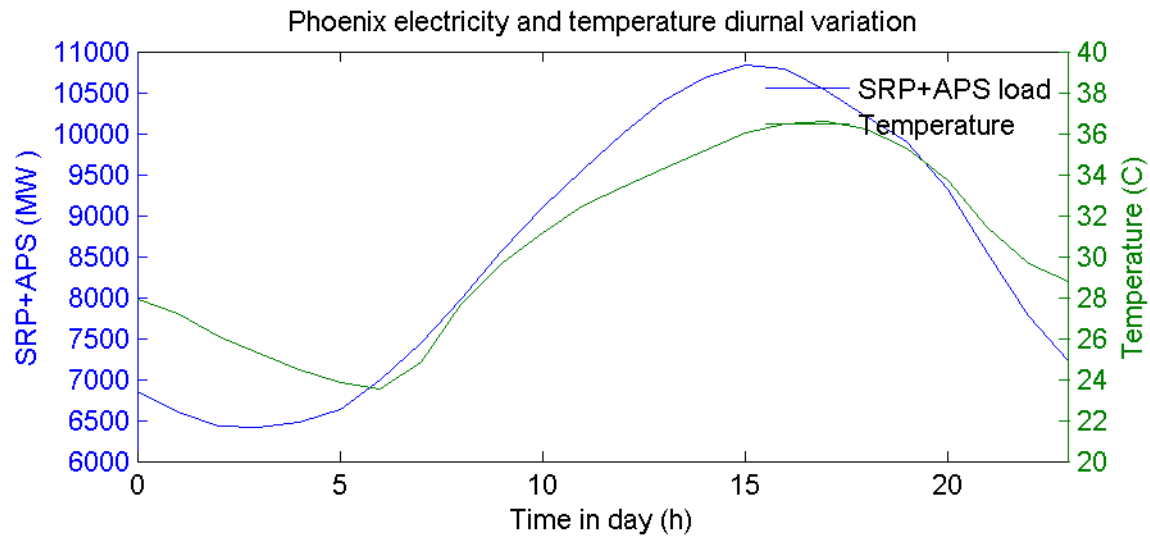


Urban Heat Island (UHI) has been well simulated in the urban areas, leading to even higher temperature in the desert cities. Posing higher health risks of heat stroke, heat stress, heart and lung problems.

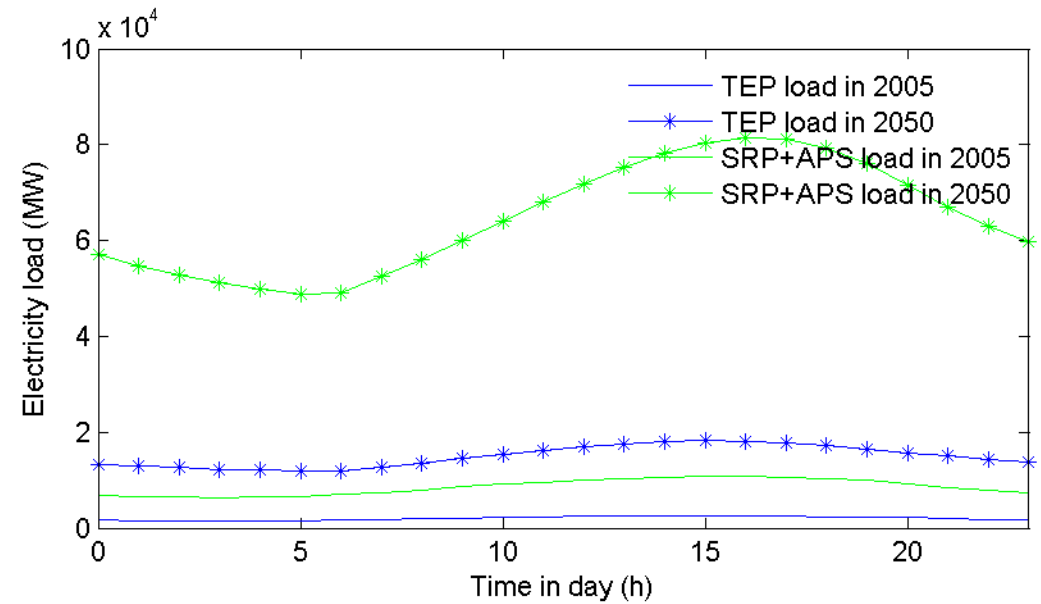
99% & above precip. intensity diff. (mm/hour)



Hourly extreme precipitation shows increase at 99% level.



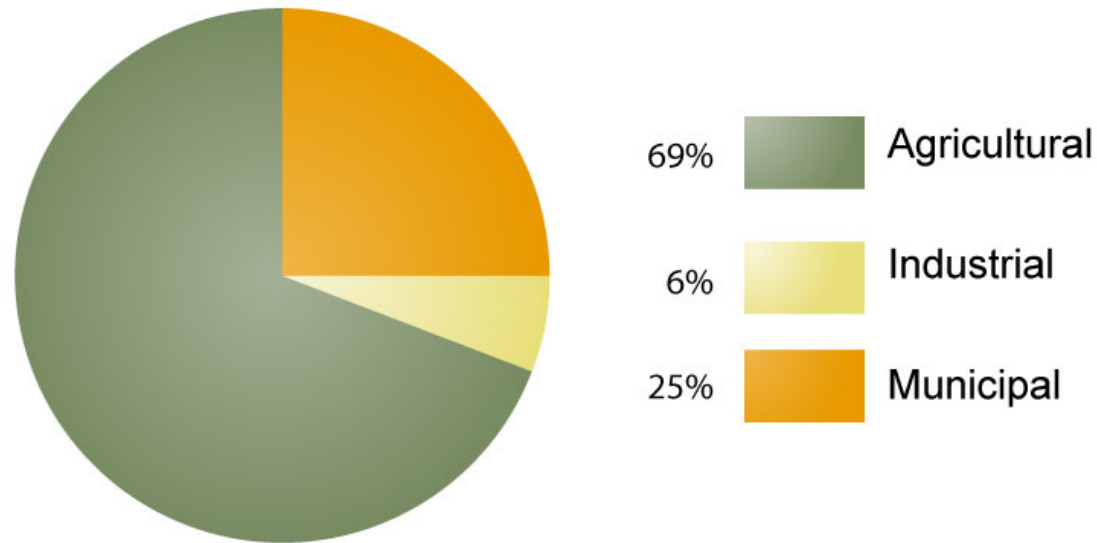
Temperature and Energy demand highly correlated, indicating temperature is an important factor influencing energy demand.



Energy demand in Tucson and Phoenix projection based on temperature increase and urban area increase in 2050.

Future work: Agriculture consumes 69% of incoming water

How do we use water?



Values based on Arizona Department of Water Resources
<http://www.azwater.gov/AzDWR/PublicInformationOfficer/documents/supplydemand.pdf>

Legend

- Arizona
- Domain
- urban_2050
- urban_2005_tucson
- urban_2005_phoenix

IRR_FRA

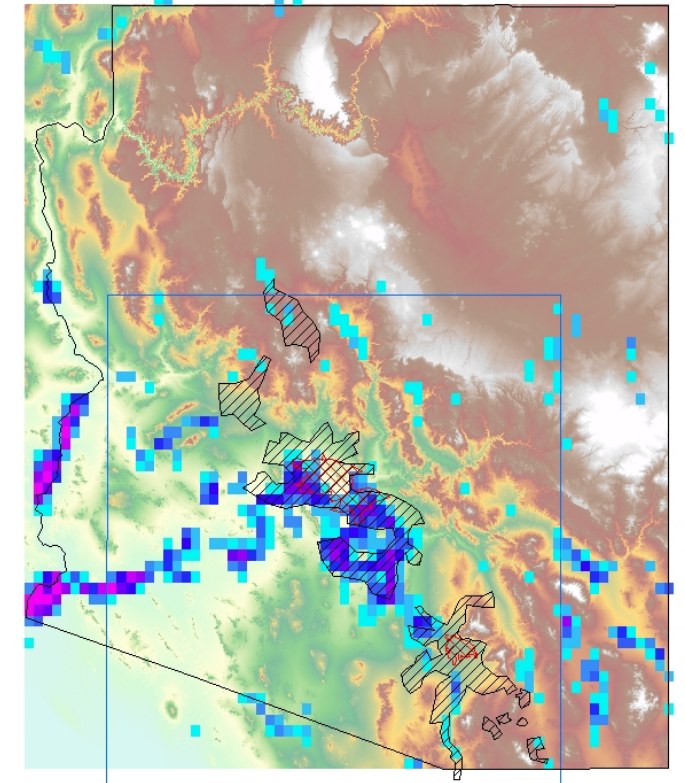
VALUE

- 1 - 4
- 5 - 9
- 10 - 16
- 17 - 23
- 24 - 31
- 32 - 38
- 39 - 44
- 45 - 50
- 51 - 57
- 58 - 64

DEM

Value

- High : 3759
- Low : -17



Incorporate the significant irrigation water usage in our climate model, looking forward to more accurate atmospheric output variables feeding hydrological models.

Thanks!

