Urban Scale Climate Modeling

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Where is there consensus?

- We need to quantify uncertainty and represent it with ensemble approaches
  - Accuracy vs Precision
- Urban areas modify regional climate (vice versa)
- In regions of active urban land development, the largest change is apparent
- There is uncertainty in the variability of urban heat and other climate variables
- Urban design/implementation can impact climate and models must capture this
- Better and optimized observation systems/networks are needed in urban areas
  - Who needs high density observations?
- Mitigation strategies vary regionally, geographically
- Higher complexity is required (spatial, 3-D urban form, topographical)
- Impervious and vegetative surfaces are significant to climate forcing
- Mitigation of urban heat can be more immediate and apparent through local/regional mitigation (relative to GHG mitigation efforts and climate action plans)
  - Biggest Change in Temperature (Natural to Urban)
- Urban climate processes are affected by other nearby urban areas (feedbacks-interactions)
Areas of uncertainty

- What is “urban” and “rural”?  
- Are we testing the right things or just what we can test?  
- Various models are critical at different scales from neighborhood to global. How do we seamlessly utilize/integrate?  
- What does “ready” mean (are urban scale climate models ready?)  
  - Depends on the application, need  
- What is the appropriate downscaling mechanism and to what scale can you go?  
- How heterogeneity of urban areas in models, observations, etc are represented.  
- What is the value proposition of a model output (i.e., it differs depending on the applications)?  
- Mitigation efforts may reduce ozone, but could reduce PBL/increase stability which would possibly offset benefit  
  - Context and regional specific—→ but strategies definitely exists…..  
  - Optimizing strategies are important too  
    (vulnerable populations, apparent temperature “hotspots”…….)  
- How do we evaluate our models?
What information is useful for practitioners?

- Modelers and practitioners don’t communicate well with each other. The “valley of death” is real.
- Better optimization is needed when quantifying/distributing mitigation strategies/processes for cities
- Mitigations strategies effective but not one size fits all. Regionally specific and context is important
- Mitigation strategies have co-benefits (bang for buck)
- Must understand mitigation vs adaptation (meaning, when is one more applicable than other, etc.)
- Urban design, urban ventilation, solar impact mitigation, tree shading, and other strategies---proven methods exist just need to talk to the urban climate community.