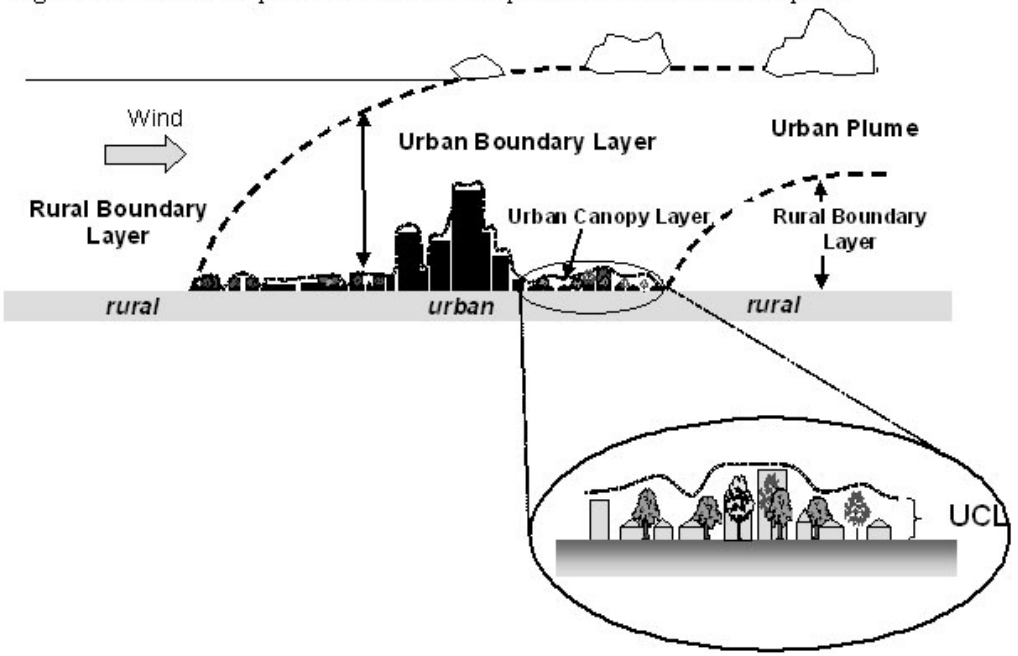
Urban Scale Climate Modeling

- Leader: Marshall Shepherd, UGA
- Group Members:
  - Alfie Vick
  - Mariana Alfonso
  - Rosana Rivero
  - Jeffrey Raven
  - Jamie Voogt
  - Matt Georgescu
  - Tracy Twine
  - Brian Smoliak
  - Brian Stone
  - Pat Hamilton

Figure 1. Schematic depiction of the main components of the urban atmosphere.



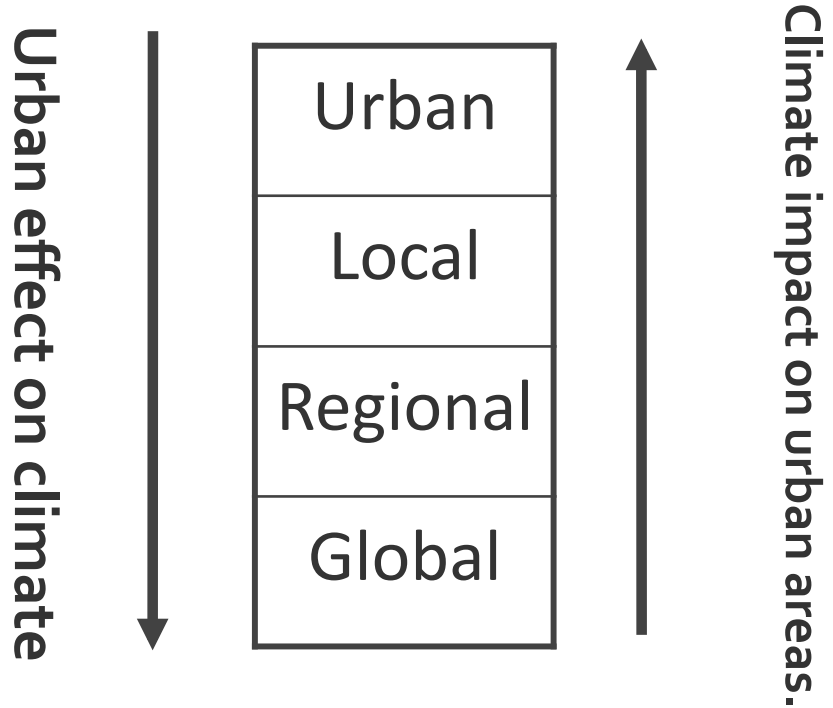
The University of Georgia

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.