Urban Impacts on Deep Convection

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HYPERFACETS
A Framework for Improving Analysis and Modeling of Earth System and Intersectoral Dynamics at Regional Scales

Deep convection

- Major hazard in Southern Great Plains (SGP) + societally important over urban areas (NE US)

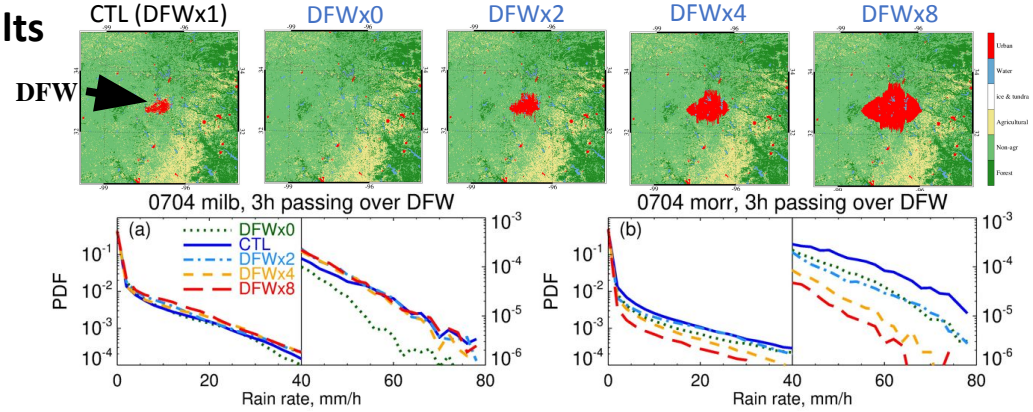
Research question

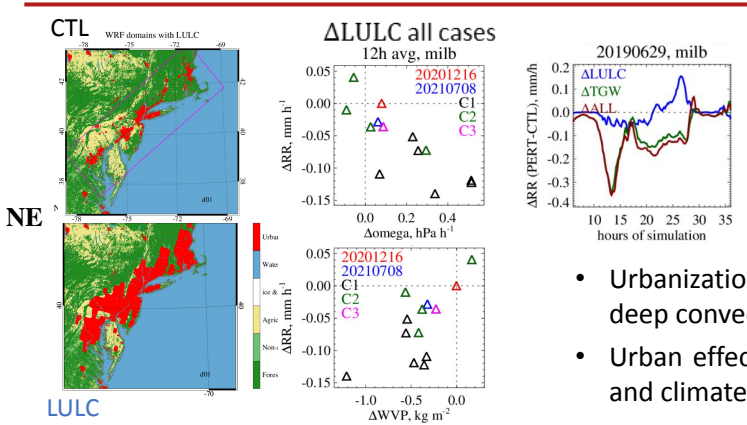
- Will urbanization enhance the hazards?

Method: WRF simulations

- Build WRF ensemble simulations for storylines over two areas
  - Dallas-Fort Worth (DFW): 2 cases
  - Northeast urban corridor (NE): 13 cases
- Convection permitting + different microphysical schemes
- Modified land use land cover (LULC)
  - DFW: changes from 0-8 times
  - NE: population based SSP5 projection
- Combined with thermodynamic-global-warming (TGW)

Results





- Urban effect is non-linear to the urban cover
- Sensitive to MP physics when the urban cover is small

- Urbanization reduces the intensity of deep convection in general
- Urban effect varies with different cases and climates

Conclusion: hazards↓ + exposed population↑